

Effective nursing care and management of bariatric surgery for obesity

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Abstract

Obese people are susceptible to health complications and diseases, such as cardiovascular disorders, type 2 diabetes, hypertension, osteoarthritis, gallstone, hypoxia, certain cancers and even mental and intellectual disabilities. Bariatric surgery is a prevalent weight loss approach, predominantly in situations where prior efforts towards weight reduction proved ineffective. It engages a modification in the digestive system by limiting food consumption, leading to decreased stomach capacity and physiological ability for nutrient absorption. Since obesity associates with morbidity, the pre, intra and post-operative care and post-discharge rehabilitation comprise key determining factors for a successful bariatric surgery. The process may involve short- and long-term recuperation in nursing homes and hospitals, which accord significant impact on patient's well-being and psychology. Nursing care for these individuals with unique physiological and emotional problems is often an arduous task, requiring environmental modifications, mobility training facilities and bariatric program and care-related equipment. Special attention is required from nursing professionals towards minimum fall and injury, management of related problems, including arterial venous insufficiency, neuropathic ulcers, seromas, anastomotic leaks, abdominal wound dehiscence and post-surgery complications, together with increased hygiene and skin care. Through an interdisciplinary approach, regular monitoring of diet, nutritional parameters, including weight change, Body Mass Index, energy and protein requirement, medication, clinical complications, functional mobility, psychosocial issues, etc. can be essential. Overall, the current review enlightens the importance of bariatric surgery, and particularly offers critical assessment of nursing care systems and specialized rehabilitation services addressing physical and mental health care in obese and post-operative patients.

Key words: weight-loss surgery; nursing; diet; respiration; cardiovascular; wound; comorbidity

Introduction

Obesity is an aggressively expanding health problem affecting more than 300 million adults worldwide, estimated to affect around 60 % of males and 50 % females by the year 2050 predominantly in Western countries ¹. Obesity in children is a major concern too, predicted around 8-10 % of toddlers and greater than 60 % of adolescents turning into obese adults soon, driving them to a co-morbid condition ². Obesity also may culminate in several diseases and disorders, such as depression, immobility, diabetes, hypertension, cardiac distress, bone and cartilage loss, arthritis, etc. Hence, bariatric surgery appears as a good weight loss option ³.

Bariatric surgery is a metabolic surgical procedure that forms a predominant treatment for obesity. It alters gastrointestinal (GI) tract anatomy and gut hormone secretion and decreases GI-associated energy consumption. Bariatric surgery causes weight loss, reduces obesity-associated comorbidity and serves as a therapy for metabolic disorders, such as diabetes, cardiac ailments, hypertension, somnolence, and some categories of cancer as well, decreasing chances of untimely demise by 30-50% ⁴.

Although bariatric surgery is considered an unconditional remedy for obesity and associated detrimental health complications, nonetheless, effective pre-operative and post-operative care comprise essential prerequisites for achieving the desired patient outcome ³. Patients with perioperative complications require greater care, which necessitates a proper preoperative assessment, particularly for deciding the most applicable bariatric surgery procedure. Most importantly, patient teaching, awareness, cooperation and compliance are extremely essential for upgrading their health status and helping them to adapt to the changed health condition following surgery. This may involve significant participation of nurses and caregivers, helping the

perioperative surgery patients to participate in their well-being, manage their acute conditions and take accountability for their own healthcare. The patients or the family may be tutored in a planned manner, if needed through private education sessions, towards choosing a healthier lifestyle. The nurse may derive a fairly clear idea about the patient's perception of his or her own health condition, where the nurse may be prepared for reacting as per incident-based necessity⁵. Thus, a bariatric nurse is responsible for the comprehensive well-being of patients, adding to their role in reducing surgery-associated complexities and risks and offering quick recovery. Based on the patient's progress in consultation with the surgery team, nurses are also authorized for proposing patient discharge. The nurses are entitled to offer their expertise in selecting the type and category of bariatric surgery suitable for patients, including deciding on the medical examinations pertinent to the patient's condition⁶. The nurses stay extremely updated about the patient's medical records and help the surgeons in taking vital decisions appropriate for the patients, which may have a strong impact on the patient's functional status, safety and satisfaction⁷. The nurses, in collaboration with the medical team, need to see strategies for rapid surgical wound healing and drainage, and the same may be demonstrated to the patient's family together with written instruction. Additionally, it appears as the responsibility of the nurse to see that the patient undergoes hospital discharge with an explicit information regarding follow up diet, fluid intake, wound dressing, use of surgical drainage tube, permissible movements, self-care and stress reduction and other intricate details that demand medical support⁸. The nurses oversee the secondary and tertiary referral facilities that the patients need to avail themselves, and tend to their smooth happening, at both pre- and post-operative stages. Post-discharge follow-up is a fundamental necessity for a surgery patient. Hence, the nurses should ensure that the patients leave the hospital with the correct hospital call numbers⁶. Further, the nurse needs to track the patient's level of recuperation and welfare with necessary suggestions to attend to any complications by contacting him or her or the family⁹. All inclusive, the current review highlights the importance of perioperative nursing care, predominantly involving a regulated dietary plan, breathing and cardiovascular management, insulin needs and wound care as shown in Figure 1. It enlightens postoperative follow-ups in bariatric patients for enhanced recovery and better outcomes. Moreover, the review essentially focuses on the key functioning of the caregivers for providing an overall improved life of bariatric patients, where the nurses function as effective advocates.

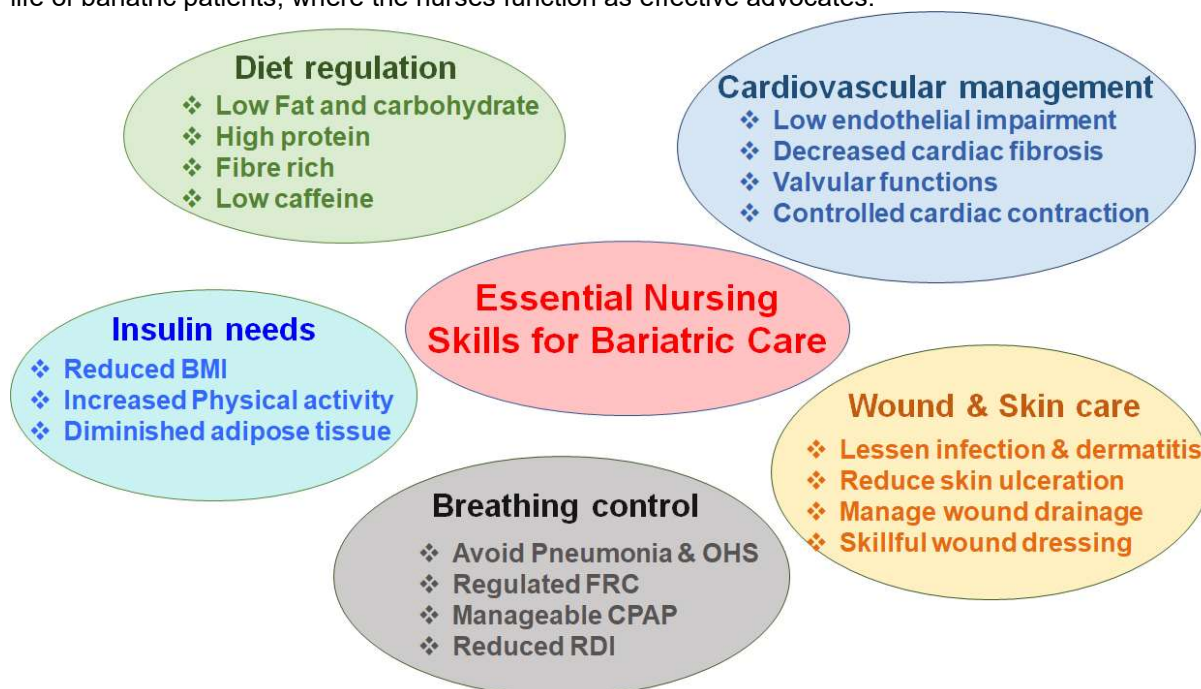


Figure 1: Nursing care for diet, cardiovascular management, regulated breathing, insulin needs, and wound healing as essential prerequisites for recovery following Bariatric surgery.

Pathophysiology of Obesity and Nursing care

Bariatric patients demonstrate a high risk involving postoperative problems and difficulties. Although the bariatric surgeons generally take intense cautiousness and perform the operations meticulously with strong surgical expertise, nonetheless, appropriate physical and psychological preparations of the patients and proper patient selection are absolute necessities⁵. Without the accurate recognition and handling of the presurgical state, the overall procedure can culminate into dire consequences. The nurses have a prominent role in this, where an understanding and partial mastery of the surgical approach, method, strategy, logistics and course of action, as well as knowledge regarding the pathophysiology of obesity is required¹⁰. The nurse should be erudite and capable

enough for offering quality nursing care to patients, lessen complications and be of adequate help to the operating bariatric surgeon. The nurses may preferably undergo courses that enable understanding bariatric surgery as a remedy to obesity, and the associated care in pre- and post-operative stages. The nurse should be capable of pre-operational assessment and preparation for bariatric surgery, should be aware of the benefits and dangers, as well as the short-term and long-term impacts of the surgery and the benchmarks (both physiological and psychological conditions of a patient) deciding clearance for surgery⁶. The nurse must be accomplished enough to gauge and command the patients for the entire process, pre- and post-operative. The nurses should be qualified and competent in recognizing the abnormalities associated with obesity, and probable changes in sleep pattern, thermoregulation, mobility, urinary and bowel habits, and they need to be aware of the necessity of cleanliness and hygiene, as well as competent in controlling the emotional and mental needs through counselling. Particularly, bariatric patients with morbid obesity need care and closer monitoring from nurses having specialized in training, competence and ability for thorough structured physical examination of these patients. These nurses have dedicated training on different aspects of patient recovery, which comprise overseeing a balanced diet, auscultation of the cardiac and respiratory systems, monitoring blood pressure, visual examination, auscultation, palpation and percussion of the abdomen, skin hygiene and care, predominantly including assessment of skin smoothness at the site of surgery. The nurses also require monitoring presence of any fluid ooze and regular health assessment⁶. The nurses should be capable of interventions, mainly involving the execution of a safe and constructive pathway for oxygenation and ventilation, mechanical ventilation (as and when required), deep venous thrombosis prophylaxis, heart rate measurement, physiological fluid/electrolyte balance assessment. They need to manage activity loss, wound healing, infection and sepsis, pain relief, and reducing depression and emotional stress^{6, 11, 12}. The nurses may reckon with the route of administration of formulations, which may include oral or enteral feeding. The oral pathway to ingestion is the most favorable route for both solid and liquid formulations. Additionally, nurses should also be aware of the factors that may affect the rate and magnitude of drug absorption, including drug bioavailability, a concept of enteric coating and slow-release formulations, which protect against the degradation of drugs from low gastric pH and for consistent effects when in systemic circulation with reduced side effects^{13, 14}. The nurses are expected to have a fair idea about the basics of intraperitoneal, subcutaneous and intramuscular injections. They need to be careful while injecting the bariatric surgery patients (with the vulnerable status) to prevent skin damage and to promote a stable release of drugs. For intravenous injections that provide good and quick bioavailability, the nurses need being cautious about reducing chances of infection and patient's pain and discomfort. To achieve this, the nurses require possessing awareness of the sterile conditions needed for the intravenous injection, and intra and inter drug compatibility for concurrent administration of the drugs with minimum toxicity¹⁵. Next, inhalation drug administration also requires precaution, particularly for cases dealing with bariatric surgery patients suffering from bronchospasms¹⁶. The nurses are desired to know the usage of drugs and creams for topical and transdermal application, the former being used for localized while the latter for systemic impact. The nurses should be updated about drugs that may be treated through sublingual or buccal administration for absorption into blood. Changes in the drug regimen and dosage may also be decided by the nurses based on situation and drug pharmacokinetics for absorption, distribution and elimination, predominantly with regards to the patient's drug propensity to stay in the plasma or disburse in a systemic pattern to other tissues. It may particularly depend on lipophilicity and hydrophilicity of the drugs, where the former demonstrates larger distribution volume with higher drug activity, while the opposite for the latter¹⁷. The nurses would have to decide the drug dose depending on the body weight of obese bariatric patients^{18, 19}. At the early post-operative stages, the patients often show clear signs of retraction, frustration and depression, and the nurses play an important role in motivating them, helping them in accepting or adapting to the physiological changes¹⁹.

Pre- and Post-operative diet management

A suboptimal dietary intake together with the bariatric procedure is essential for reducing obesity and towards maintaining a lean body-mass as shown in Table 1. This requires a credible bariatric team, where the nurses bear the most vital responsibilities. The nurses may instruct and change dietary patterns based on the specific needs and responses of individual patients, both pre, intermediate and post-operative. The nurses need to perform adequate dietary counseling after learning from the dieticians, which may be made evident to the patient and family through written labels and prominent methods for guidance. The nurses may design the meal plans, specify in appropriate serving portions, with the food being cooked in low-fat and cholesterol oils. The nurses should supervise and enquire whether the patient is consuming three meals a day, as recommended by the dietician, giving an adequate time of around 20-30 minutes and not beyond it for optimum digestion and nutrient absorption. The dietary strategy is generally based on a specific pattern, which needs to be judiciously conveyed to the patient and family^{20, 21}.

The diet is mainly low-fat and medically supervised, comprising food items that induce reduced generation of energy from carbohydrates and fats, high-protein and regulated non-starchy vegetable fibre-enriched food. In reality, this diet is expected to start six months to two weeks prior to surgery. Special attention is essential for fibre intake that mainly associates with smooth intestinal food transit. For the first two-years post-operation, mechanical and dietary adaptation plays a significant role, until a steady, balanced and habitual dietary routine has been reached. The dietary recommendation primarily includes more of fruits, vegetables and whole grains and a

restricted consumption of ultra-processed energy dense food. A hyper-sensitivity to bread, cereals, rice, pasta, fruits and vegetables has been observed that may lead to decreased carbohydrate and increased fibre-enriched food consumption²². The number of sources providing detailed information on the pre- and post-surgery bariatric patients are relatively limited, and often overwhelming, as well as misleading. The data available are varied, less updated, professionally unsanctioned and depend on the patients age and physical conditions. The registered dietitian generally specifies the diet based on nutritional requirement, which is further properly implemented by the nurses responsible for patient care. The nurses educate the patients and provide appropriate guidance to the family, in cooperation with the medical bariatric surgeons, specialists, behavioral health specialist, bariatric dietitians, bariatric physician assistants, patient service coordinators, and the other members of the bariatric surgery care team²³. The instructions in this concept encompass guidelines on nutrition, fitness, dietary compliance and hydration before and after surgery. Nurses have a significant participation in allowing patients to have recommended food intake, particularly an adequate but relatively low energy diet. The nurses need making a quantitative evaluation of nutrient uptake, based on the nutritional requirement of the patients²⁴.

Table 1: Dietary pattern after bariatric surgery

| Diet type | Post-surgery intake duration | Principle for the intake | Dosage | Benefits post-surgery |
|-----------------------------|---|---|---|--|
| Clear fluids | First 2 days | Reduced sugar-based liquid drinks, with electrolytes and restricted energy | 30-60 ml/hour along the whole day | Reinstating intestinal activities |
| Liquid diet | 2-3 days | Low fat-based nutrients (fruit juice, low-fat milk, etc) | One cup/hour along the day | Suitable hydration |
| Pureed low viscous food | From day 4 to 3-4 more weeks | High protein low carbohydrate soups, cooked apples, cottage cheese | Six-seven times /day of 60-70 ml | Introducing vitamins and minerals |
| Pulpy, soft and diced food | From 1-2 months to 2 more months | Cooked/boiled meat, fish, egg, potatoes, vegetables, oats, fruits, together with sufficient fluids and electrolytes | 5 times a day in a proportionate amount | Proteins, vitamins, micronutrients, low-fat, low-energy diet |
| Normal and regularized diet | Beyond 3 months of surgery, based on patient recovery | Adequate fluid, protein, vitamins, micronutrients, minerals, low-energy food and balanced calorie | 3 times a day | Reduced obesity and increased lean body mass |

In addition to family care, support is needed for emphasizing the advantages of bariatric surgery and providing psychological uplift at the pre- and post-surgery days. The nurses advise the patients on proper eating techniques and healthy dietary basics, which include avoiding distractions of watching television or engagement with electronic gadgets while eating, chewing of food before swallowing and offering at least 20 minutes time for meal consumption. The guidance further includes avoidance of carbonated and sugar-sweetened beverages, concentrated sweets, high-fat foods and caffeine intake, and gap maintenance between food and water or fluid consumption. The nurses may also define the rationale supporting these measures, such as to reduce acidity, indigestion, dyspepsia gastrointestinal pressure, intestinal malabsorption and calorie consumption. These dietary practices may also increase nutrient and vitamin absorption and maintain normal blood pressure²⁰. In fact, adherence to the medically advised dietary strategy at the pre-operative stages may lessen the problems and

obstacles during surgery and its duration. The pre-operative diet plan helps in partial weight reduction of patients and in decreasing liver size and fatty liver, which facilitate a smooth approach to the stomach and surgical process. The preadmission nurses should also ensure that patients are strictly on full-liquid diet that includes zero-calorie or <15 g sugar from a day prior to the surgery²⁵. The patients often display their reluctance in adapting to the required dietary directives, and the nurses may provide supplementary education, in a very empathetic manner, on the nutritional regimen highlighting its lifetime benefits, in association with the bariatric surgery. The patients may also need psychiatric follow-up, allowing him or her to adapt to the new or rather changed dietary plan. Failing to adjust to the dietary restrictions may lead to anger, anguish and distress in patients, and counseling sessions may help lessening negativity in these patients^{20, 25}. Hydration is a key necessity post-operation, involving recurrent fluid intake, and the nurses should check for features manifesting dehydration, such as dry mouth, fatigue, reduced urinary output, dull, rough and shrivelled skin, headache, giddiness and disproportionate thirst²⁶. The diet pattern follows a stage-wise pattern, to be intently taken care of by the nurses and care givers. Diet for the first two days (post-operation) generally comprises clear fluid consumption containing reduced sugar, but with electrolytes and restricted energy to reinstate the intestinal functioning. This should be followed with liquid low-fat diet supplemented with nutrients for one to two more days. Further, a mixture of high and low viscosity liquids, such as milk, yogurt, high protein and low carbohydrate soups, cooked apples, cottage cheese, etc., may be provided in the next week to ten days towards steadily introducing vitamins and minerals in the diet^{24, 27}. All these dietary components would help in healing, together with adequate hydration and significant protein intake, and this process needs continuing for few months post-surgery of the patients. In the 3rd phase, the food includes pulpy, mushy and diced food, and this continues up to around one month of surgery. Beyond this, at the 4th stage, the nurses in cognizance with the bariatric team members evaluate the resilience to the recommended until stage 3, and further advocate low calorie, protein rich, plant-derived solid diet. The nurses need to monitor the height, weight and physical activity of patients, which requires proportional estimation with the protein intake and necessity²⁸. Insufficient protein intake and protein intolerance are frequently observed following gastric bypass surgery, which result in reduced absorption and often excessive vomiting. Extended period of protein malnutrition may also lead to a sudden demise of the patient²⁹. Sometimes myopathy, and relatively milder conditions, such as fluid retention, loss in hair quality, skin shedding, rashes, delayed regeneration, inactivity, etc., are observed. The nurses need being careful about the patient's protein intake, and ensure its sufficiency to sustain lean body mass^{24, 30}. Vitamin and mineral supplementation need starting very soon after surgery, which may include fat-soluble ones as well within a fortnight to month following surgery. The multivitamins should be fortified with proportionate amounts of iron, folic acid, zinc, calcium and positively having vitamin B12, and elemental calcium citrate if treated with vitamin D3²⁴. Along with calcium, magnesium (preferably at a ratio of 2:1) intake is necessary following gastric bypass surgery, marked by reduction in BMD and increased bone resorption in hips, thigh bone, and overall body as well³¹. The combination of the two minerals, particularly in the presence of vitamin D, would help in the sustenance of calcitonin levels and inhibit bone breakage with reduced osteoclast functioning³². The calcium, magnesium and vitamin D3 intake may be administered at raised levels for menopausal and post-menopausal women who are reported with secondary hyperparathyroidism and associated loss in bone mass³³. Added to the above, zinc should be administered to increase vitamin absorption, generation and building of proteins and nucleic acids in cells and transport across cell and plasma membranes³⁴. A dietary supplementation with the micronutrients helps overcoming complications associated with peripheral neuropathy and neurological impairments, which develop in relation to insufficient diet following bariatric surgery^{24, 35}. This supplementation is supposed to continue until ninety days post-surgery, and the nurses are expected to examine the physiological status and the corresponding requirements intermittently. Moreover, the nurses need to monitor the timing of dietary intake, for example, maintaining a span of around two hours between iron and calcium supplements to avoid gastrointestinal discomfort. In fact, the nurses may supervise that menstruating and anemic women have been provided with a greater iron supplement. The nurses may also need to keep a record of the serum Vitamin B12 levels regularly. Iron deficiency (resulting from the operative blood loss, insufficient iron intake, gastric ulcer and related symptoms, etc.) reduces erythropoiesis and aggravates anemia. Hence, the nurses should ensure that the patient receives a diet containing 15–30 mg/day as ferrous iron. The iron-deficient condition may be evaluated through the serum iron levels as well as blood and reticulocyte counts^{36, 37}. A balanced combination of B vitamin and thiamine, vitamin B12, folic acid, vitamin A, D and K and micronutrients are essential to increase absorption, particularly for patients who have undergone the biliopancreatic with duodenal switch process. Micronutrient deficiencies are often observed in the intestinal bypass patients owing to poor absorption of iron, vitamin B12, calcium vitamin A and folic acid, due to reduced gastric secretion. A marked drop in the absorption and digestion of protein-bound vitamin B12 has been observed following the bypass, which often lead to macrocytic anemia^{24, 38}. Thus, significantly higher intake of vitamin B12 orally (via the intestine to blood) is essential that facilitates the formation of required protein-bound Vitamin B12, resulting in a proportionately accurate size and number of erythrocytes³⁹. Intramuscular injection of Vitamin B12 could also allow its direct entry into blood, and the mode of incorporation could be decided by the nurses, depending on patient's condition and comfort. Vitamin C further promotes iron absorption and supports the blood vessels, leading to faster wound healing and decreased chances of infection. Nonetheless, administration of Vitamin C and B12 should be carried out at a certain time gap to prevent deleterious drug interactions. The

appropriate supplementation helps in overcoming the deficiencies developed following the surgery²⁴. A post-operative nutrient deficiency due to altered absorption capacity and plasma nutrient levels, malnutrition and associated serious diseases, such as scurvy, beriberi and kwashiorkor may develop. There is a risk for other metabolic syndromes, including cardiovascular disease, diabetes and osteoporosis. The nurses themselves have to be versed with the nutrition, hydration and dietary recommendations of the patients, which may be appropriately conveyed to the patient and family members. They may detect probable complications and further guide accordingly during the stages of adjustment and recovery²⁶. The nurses need to see that the patients follow proper dietary strategies and continue with correct food selections to maintain the desired weight. The departmental nurses need to test for osteoporotic markers through Bone mineral density (BMD), anemia from the blood hemoglobin levels and protein status by measuring albumin levels; expected values being BMD >2.5, hemoglobin (men \geq 13.5 g/dl and women \geq 12.5 g/dl) and albumin level \geq 2.8–3.5g/dL. If the nurses detect no problems, then the patients visit may be suggested as three-monthly, further six-monthly and annually²⁴. Skimmed milk serves as a good protein source, provided the nurses observe no adverse effects, like acidity, gas, vomiting, etc. In such situations, milk may be replaced with lactase. Additionally, non-vegetarian meal like chicken, meat, eggs, fish and dairy items appears beneficial for main meals, if well tolerated. The main aim regarding this protein-based milk, vegetable and animal diet is to provide a complete protein nutrition with all the required amino acids. Moreover, the nurses need to monitor and report for any complications observed or signs of interference of diet with medicines to the relevant bariatric team members²⁶.

Breathing

Obese patients suffer from breathing problems and demonstrate signs of respiratory distress and bronchial asthma owing to reduced Functional Residual capacity. This, in association with hypoxemia, atelectasis and altered alveolar ventilation/perfusion ratios reduce lung compliance and baseline vital capacity. The effects are well reported post-anesthesia, mainly due to dyshomeostasis in the expiratory reserve and inspiratory reserve volumes of the obese patients. Particularly for morbidity, the inflexible chest wall posture reduces with an attenuation in pulmonary compliance, also characterized by loss in muscle functions for cranial displacement of the entire diaphragm^{40, 41}. The nurse in consultation with the surgeon, anesthesiologist and professional physiotherapists could decide on the post-operative posture, preferably semi-recumbent (30–45°) that decreases chances of ventilator-associated pneumonia, associated with a 0° to 10° supine position. Mechanical ventilation through pre- or post-operative tracheostomy could be helpful for this issue. Nonetheless, mechanical ventilation has its own adversities when involving High Airway Pressure, which may culminate into barotrauma (pneumothorax)⁴².

Severe Obstructive Sleep apnea (OSA) has been reported in bariatric patients that necessitate the assessment of Respiratory distress index (RDI) or sleep apnea, requiring effective and manageable continuous positive airway pressure (CPAP) and nonstop monitoring of sleep architecture association. Hence, all these patients should undergo assessment for OSA, obesity hypoventilation syndrome, hypercapnia, obstructive or restrictive lung diseases to decrease chances of perioperative problems⁴³. The measures needed during surgery include preoxygenation prior to anesthesia, tracheal intubation in ramped position and Positive end-expiratory pressure to increase the oxygen stores and postpone the onset of arterial hemoglobin desaturation and reduce atelectasis formation during apnea. Sleep apnea often remains undetected and nurses need to stay alert regarding situation. They need to care for CPAP compliance and educate the patients accordingly, particularly in terms of appropriate CPAP pressure (average of 10 cmH₂O), CPAP mask sizing and fitting and maintenance of alveolar and hydrostatic pressure dynamics⁴⁴. The nurse should educate patients on the probable difficulties in CPAP therapy.

Oropharyngeal associations often hinder the process of Endotracheal intubation, particularly in relation to CPAP, which may also necessitate maintaining the airway through surgical intervention by tracheotomy. In fact, re-evaluation of sleep apnea through postoperative polysomnography is extremely essential irrespective of weight loss. The situation demands a more careful attention for acutely obese patients, with very strong respiratory distress. Obesity hypoventilation syndrome as well marked by respiratory acidosis, hypoxemia, and polycythemia, pulmonary arterial hypertension, right ventricular enlargement and pulmonary artery blockage has also been reported⁴³. They may require tracheostomy to remove the upper airway obstruction, associated with intermittent measurement of the inspiratory and expiratory reserve volume to avert hypoxemia, hypercarbia and related cases of Chronic Obstructive Pulmonary Disease. The first few days would require frequent measurement of oxygen saturation using the pulse oximeter device, as well as oxygen therapy as and when needed. The nurses are expected to stay ready with the Laryngoscope, Endotracheal (ET) tube, suction catheters, syringes for inflating the ET tubes etc. all essential to perform rapid sequence intubation⁴⁵⁻⁴⁹.

Cardiovascular evaluation and control

Patients requiring bariatric surgery should undergo mandatory assessments for cardiovascular, pulmonary and related metabolic disorders and systemic impairments. This may not only help in determining the risks associated with operation, but may also indicate the possibility of surgery-induced success⁹. Obesity is associated with atherosclerotic cardiovascular diseases, heart failure, systemic hypertension, cardiac arrhythmias, deep-vein thrombosis, pulmonary embolism and reduced exercise capacity. These cardiac related health problems induce co-morbidities that have a significant impact on pre and perioperative patient management^{50, 51}. These patients suffer from respiratory muscle weakness, inefficiency and dysfunction, reduced functional cardiac reserve, and reserve

capacity, altered tidal volume, inspiratory reserve volume, vital capacity and total lung capacity, dysregulated tidal airway closure expiratory reserve volume and closure of peripheral lung units⁵²⁻⁵⁴. These features often result in a ventilation-perfusion mismatch, especially when in the supine position. Hence, the nurses need to see that the patient maintains a prone posture while under mechanical ventilation, helping to maintain a proper ventilation/perfusion ratio and air flow in the lung⁴⁴. Cardiovascular and pulmonary responses comprise important diagnosis and risk factors for pre- and post-operative bariatric surgery patients, where the intensive care nurse specialists may offer greater attention. The main cardiac parameters for checking include cardiac output, respiratory rate and pattern, spontaneous breathing process, ventilator support and its link with heart rate variability, sleep pattern and diaphragmic functions^{9,55}. Additionally, the nurses are expected to manage ineffective tissue perfusion towards eliminating vasoconstriction and augmenting peripheral blood flow, without compromising with the metabolic status. Monitoring statistical frequencies of contractility and preload changes in relation to cardiac output need to be assessed, particularly in link with hemodynamic condition in aortas^{56,57}. A regular BMI monitoring is also essential to prevent ventricular hypertrophy, cardiomyopathy and lethal disorder of cardiac contractility. The nurses should thus be well-trained with Electrocardiogram, Echocardiogram and Magnetic resonance imaging training, needed for assessing cardiac problems^{50,58}. A consistent inspection is required on endothelial impairment and interstitial fibrosis, subepicardial fibrosis and replacement fibrosis associated with valvular dysfunction, atherosclerotic cardiovascular disease and cardiac failure⁵⁹. Imaging techniques may also reveal any signs of megalocardia, either mild or severe. Truly, cardiorespiratory diseases form major perioperative complications in bariatric patients, necessitating selective cardiac stress tests intermittently.

Post-surgery management of diabetic patients

Weight loss and reduction in the adipose tissue mass and visceral fat appear difficult for type2 diabetes, and bariatric surgery has been found to be of help, particularly in patients with Body Mass Index (BMI) of 35–40kg/m² and central obesity, and for whom non-surgical methods failed to control the blood glucose levels⁶⁰⁻⁶². However, bariatric surgery may be opted for diabetic patients having a BMI greater than 50kg/m² and considered suitable for surgery⁶³. Data are available showing that in a time span of two years, a significant number of the patients recovered from diabetes, at least within a span of two years. Nonetheless, age is also a strong factor that determines the possibility of bariatric surgery in diabetic patients, where the younger patients responded better compared to their aged counterparts who are on insulin treatment for long⁶⁴. Here, nurses play a strong role in controlling the BMI, needing regular waist measurement, along with a recommendation on beneficial diet and increasing physical activity. Nurses provide necessary dietary interventions and advice on healthy diet and increased fitness. The nurses may also refer the patient to expert dieticians and exercise trainers. The responsibility for best nutritional and pharmacological therapies significantly rests on the nurses, which may be distinct and varied for different patients for these patients. Most importantly, medications for managing normal blood sugar levels should be carried out, predominantly by nurses having a proper concept and mastery on the relation between diabetes and obesity and their link with bariatric surgery, preferably through regulated insulin treatment^{65,66}.

Special skin, wound and drain care

One of the key jobs of nurses is to handle wounds, infection-induced complications, ulcers and lesions, skillfully, to maintain the physical and mental comfort of patients. The amount of pus and blood oozed may be recorded as well. It has often been seen that bariatric surgery leads or promotes a nutrient deficient condition, imposing dermatological problems³. Specifically, reports of skin fissures at the angles of mouth, scaling, desquamation, hair loss, hair dullness and dryness, skin pigmentation disorder, together with decreased hair follicle terminal differentiation, etc., have been observed even after three months of surgery in young women as well. This has been related to vitamin, zinc, essential fatty acid, selenium and biotin deficiencies and protein malnutrition. This may also have an association with fungal infection, Atopic dermatitis, skin itching, unrestrained sweating and overall decreased skin hygiene⁶⁷. Common skin problems observed in the bariatric patients comprise total flap loss and resultant inflammation, hematoma, blood vessel damage and skin tarnishing, seroma at the site of surgery, and Mastectomy skin flap necrosis, predominantly in breast reconstruction of obese patients. Skin ulceration occurs in association with moisture deposits, urinary incontinence, etc., which result in microbial growth on the skin and damage to skin surface. Skin blisters and edema have also been reported through skin-skin contact^{68,69}. Since the nurses need to provide wound care following bariatric surgery, a thorough discernment of the changes occurring within the body, and their impact on wound healing is essential. In fact, as recovery relates with functioning of the circulatory system, nurses need to be aware of nutrient, aeration and associated factors that direct patient status^{70,71}. The wound-induced leakage promotes entrapment of microbial growth factors and matrix that induce dysregulated formation and connectivity of collagen, connective tissue, blood vessels, essential glands, nerves, hair follicles, leading to the mal-formation of vasculature and dermal and epidermal layers of skin⁶⁹. The nurses may take care of these by a compression bandage, and if needed, multi-layered compression wrapping to control the formation of abscesses and edema and manage lymphedema, venous insufficiency and systemic hypertension. Stress response also hinders wound healing, which leads to abnormal generation of epinephrine, norepinephrine, adrenocorticotrophic hormone and catecholamines, which result in altered inflammatory cascades, peripheral vasoconstriction and cardiovascular defects, metabolic deficits and altered functional neural activation. Hence, a regular monitoring of these stress hormones is important for accurate understanding of the patient's

overall metabolic status. Moreover, since painkillers, immobility and stress cause constipation, laxatives may be suggested by the nurses, which may prevent intra-abdominal pressure that often opens the wound and increase inflammation^{72, 73}.

A primary job of the nurses involves adequate control of wound discharge, maintain aseptic condition around the lesion and hemostasis. Use of antiemetics and nasogastric tubes is also encouraged to prevent post-surgery vomiting and anti-cough agents and a support pillow would be encouraged to inhibit suture or stitch breakage^{6, 15}. Provision for a regulated breathing pattern through exercise or inspiratory spirometers may help in respiratory function, which could avert some of the above problems. Dressing the incision may also be performed skillfully by avoiding hurried removal of dirty bandage and proper wound surface cleaning prior to replacement of fresh dressing. The nurse has to inspect for undesired ulceration, edema, discoloration and oozing, and the formation of moisture barrier in skin folds to prevent friction-induced ulcers⁷⁴.

There are certain other aspects that fall within the nurse's domain, particularly providing appropriate supporting equipment to prevent further injuries. The patient would need a comfortable bed size, overhead trapeze attached at the headboard or footboard of the bed, walker at the initial few days or weeks post-surgery and a bed-side comfortable toilet arrangement. In terms of dressings, provision should be kept for extra bandages, as well as wearing loose and comfortable garments. The nurses need to demonstrate their efficiency, beyond doubt, and convince patients regarding the expertise and mastery of surgeons and associated bariatric care group⁷⁵⁻⁷⁷.

Additional comorbidity

Added to the cardiovascular, respiratory and type 2 diabetes-induced problems, hypertension, comorbid conditions involving gastrointestinal (GI) diseases, musculoskeletal disorders, obstructive sleep apnea (OSA), emotional distress and associated mental health issues are observed in the bariatric patients, which require immediate attention⁷⁸. The nurse practitioner needs to tend to this issue through a structured program. Postoperative paralytic ileus is common, with a cordial supportive supervision, requiring electrolyte replenishment, proper enteral intake, intravenous infusion of fluids, increased mobility, pain management, palliative adjustment and addressing the fundamental reasons^{79, 80}. Additionally, supervision of diet acceptance, noting abdominal inflation and other discomforts of the GI tract appear as priorities of nurses. Special mental health deliberations are also essential for post-surgery bariatric patients, particularly in relation food addiction and binge-eating disorder. Alcohol and even tobacco use disorder is found to be a major concern, affecting the normal emotional responses, mannerisms and social associations and connection⁸¹.

Conclusion

Nursing care of the pre- and post-operative patients require individual care, and the nurse may organize the interdisciplinary team members. The patient recovery markedly depends on nursing care, and bariatric surgery should be demonstrated to patients and family as an effective, remedial, curative and enduring mediation in reducing obesity. The nurses may achieve their goal of reducing comorbidity and improving patient welfare through education and guidance on healthy diet plan, correct physical activity, if needed together with the support system and well-informed human resources. The nurses may ensure a supportive environment for the patients, and assist in developing the same through proper instructions and tutoring for a definitive post-operative success.

Trained and experienced nurses are generally well-educated for precise diagnosis of peri-operative difficulties and problems, helping in patient welfare. However, there is a dearth in updated training and guidance programs on nursing of obese patients. Since bariatric surgery plays a key role in elevating the quality of life, further research and patient-based studies would be helpful in improving patient care. They may assist in best functioning of the bariatric surgery nurses, enlighten them on patient monitoring and supervision, make them aware of new tests and assays essential for disease and disorder diagnoses, and benefit in their interactive skills with members of the team, patients and their family. Moreover, improved nursing curriculum dedicated to the field of bariatric surgery is vital with distinct information on secondary or primary care. Furthermore, towards successful functioning of nurses, novel plans are needed that may offer an all-inclusive attention for bariatric patients. It makes the job of nurses convenient with effective results, where inter-professional and inter-disciplinary team-work is well-constructed and coordinated. This may not require a single nurse dedicated for an individual patient, but the same nurse may cater to several patients.

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