2018

Strategies to Reduce Hospital Readmission Rates After Bariatric Surgery

Catherine Scarlett
Walden University

Walden University

College of Health Sciences

This is to certify that the doctoral study by

Catherine Scarlett

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review Committee
Dr. Janice Long, Committee Chairperson, Nursing Faculty
Dr. Diane Whitehead, Committee Member, Nursing Faculty
Dr. Marisa Wilson, University Reviewer, Nursing Faculty

Chief Academic Officer
Eric Riedel, Ph.D.

Walden University
2018

Abstract

Strategies to Reduce Hospital Readmission Rates After Bariatric Surgery

by

Catherine Scarlett

MSN, Walden University, 2008

BSN, Nova Southeastern University, 2004

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

Walden University

November 2018

Abstract

Bariatric surgery is a major surgery that has become a frequent procedure in North America; growth in the number of bariatric surgery procedures has resulted in an increase in readmissions after the procedure. A systematic review of the literature using the shifting processes model as a guide was used to answer the practice-focused questions regarding reasons for hospital readmissions for postoperative bariatric surgery patients and strategies that reduce complications of the procedure. Providing Innovative Service Models and Assessment chart (PRISMA) was used to quantify 17 studies that met the inclusion criteria. Results demonstrated that the reasons for readmissions after bariatric surgery were related to leakage of the surgical site, infections, bowel complications, and lack of family support or other support system at home. Strategies reported in the literature that were effective in reducing complications included having a support system and preoperative and discharge education for bariatric patients. The most effective method to prevent readmission following bariatric surgery was careful preoperative assessment and screening for comorbidities, particularly gastrointestinal disorders. The results of this project may promote positive social change by providing evidence-based information for professionals and consumers to prevent readmissions following bariatric surgery.

Strategies to Reduce Hospital Readmission Rates After Bariatric Surgery

by

Catherine Scarlett

MSN, Walden University, 2008

BSN, Nova Southeastern University, 2004

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

Walden University

November 2018

Dedication

I would like to dedicate the end of this milestone to my family, but especially my daughter, Kameka Scarlett, who has always been at my side every step of the way. Without her I would have quit.

Acknowledgments

I would like to acknowledge everyone who has helped me along this long journey. To all my committee members, thank you all for your support and reminder that the process is not easy, but it is very rewarding at the end to earn that title.

—Doctor Catherine Scarlett

Table of Contents

List of Figures

Section 1: Nature of the Project

Introduction

Major surgery can be a risk, posing the possibility of readmission and causing a significant burden on healthcare resources (Doumouras, Saleh, & Hong, 2016). Bariatric surgery has now become one of the most popular surgical procedures in North America, and along with this growth in incidence of the procedure is an increase in readmission after the procedure (Doumouras et al., 2016). Preventing hospital readmissions is a major problem in the healthcare system (Doumouras et al., 2016). According to Doumouras et al. (2016), every year the total cost of readmissions in the United States alone is estimated at $2.5 billion, and readmissions 30 days after surgery or earlier often have unfavorable outcomes (Doumouras et al., 2016).

In the United States, bariatric surgery accounts for more than 100,000 procedures per year, and the numbers are rising (Doumouras et al., 2016). Readmission rates vary based on the type of procedures, for example, from 0.5% after gastric banding to 11% for Roux-en-Y gastric bypass (RYGB). Also, hospital use more than doubles after gastric bypass surgery (Doumouras et al., 2016), and readmissions after bariatric surgery nearly triple healthcare expenditure in the first six months post-procedure (Doumouras et al., 2016).

The rise in bariatric procedures nationwide and the growing focus on quality and outcome measures, including reducing early hospital readmission rates, has generated heightened clinical interest in readmission rates for bariatric surgery patients (Aman, Stem, Schweitzer, Magnuson, & Lidor, 2016). The focus of this project was on

conducting a systematic review of the literature on preventing readmission 30 days after bariatric surgery.

Section 1 of this project covers the problem statement, the relevance to nursing practice, and the significance, purpose, and nature of the project.

Problem Statement

The purpose of this systematic review was to identify factors that contribute to early readmission of patients after bariatric surgeries and to find published evidence-based strategies for preventing readmissions. Bariatric patients may be readmitted for various complications including abscess, anastomic leak, cardiac complications, dehiscence, hemorrhage, and gastrointestinal complications (Telem et al., 2015). Thus, the readmissions of bariatric patients impact the healthcare system by lowering the number of positive patient outcomes and increasing the healthcare expenditure.

Outcome research indicates bariatric surgery may increase healthcare costs due to the increase in hospital readmission (El Chaar, Claros, Ezeji, Miletics, & Stoltzfus, 2014). Insurers and providers are focused on reimbursement for procedures and the expenses associated with the poor-quality patient outcomes, including the length of stay, readmission, and satisfaction. Eliminating the costs associated with poor quality bariatric outcomes needs to be addressed and a systematic review of the literature may begin preparing the foundation for improving practice in prevention of complications in bariatric centers. For example, one study conducted at a university hospital medical center evaluated the implementation of an evidence-based Bariatric Surgery Accreditation and Quality Improvement Program. The aim was to estimate the cost

savings associated with preventing patient readmissions following bariatric surgery (El Chaar et al., 2014). A clinical protocol, with discharge criteria, was implemented and evaluated for patients ($N = 239$) with laparoscopic Roux-en-Y Bypass (LRYGB, $n = 71$) or laparoscopic sleeve gastrectomy (LSG; $n = 158$). The program resulted in an average length of stay decrease to 32.45 (range 24-72) and a reduction in the readmission rate to 3.0% (7/229 patients). Furthermore, the 30-day complication rate (e.g., intervention, reintubation, and reoperation) declined to 2.6% (6/229), and 30-day mortality rate declined to 3%. The cost for both procedures declined ($2,016 for LRYGB and $1,209 for LSG). The conclusion of the study was that the clinical protocol was safe with substantial cost savings at the health system where the study took place. Patients had low readmission and complications rates (El Chaar et al., 2014). Further studies such as the El Chaar et al. (2014) study may further shed light on the problems associated with bariatric surgery and offer insights into the strategies that may prevent complications from occurring. The significance of conducting a systematic review of the literature is focused on identifying the published factors that contribute to hospital readmissions post bariatric surgery. Also, the effect of establishing a series of actions that have been shown to prevent readmission for the bariatric patient is apparent on and financial burden it can have on the patients, family, and communities. Another reason for the review is to offer options that may reduce the mortality rates for those who have undergone the procedure. Through this project, the benefits of knowledge and skills for promoting positive social change through postoperative health advancement can be made available to the staff, providers, and patients who have undergone bariatric procedures.

Purpose Statement

The purpose of this systematic review of the literature was to determine reasons for hospital readmission of patients who have had recent bariatric surgery and to provide ways to prevent early readmission. Obesity is increasing in the United States; currently one third of Americans and 17% of teenagers are obese (Telem et al., 2015). "Avoidable readmission after surgery is a major burden on healthcare resources and is common after major surgery" (Doumouras et al., 2016, p. 2066). Bariatric surgery is now a common procedure in the United State because of the focus on preventing and maintaining healthy weight. Yet with bariatric surgery other complications may occur that are related to losing too much weight. Excess weight loss will increase malnutrition and lead to physical and even mental complications for the bariatric patient (Doumouras et al.,2016).

It is important to address the hospital readmission of patients who have had recent bariatric surgery and to provide ways to prevent early readmission. The importance includes improving patient satisfaction; reducing readmission costs because with every readmission, the healthcare expenditure increases; and facilitating the patient's return to productive life and work (Doumouras et al., 2016).Bariatric patients are readmitted for numerous reasons including gastrointestinal complications, malnutrition, and infections. According to Telem et al. (2015), one in four bariatric patients will be readmitted for complications within 2 years of surgery.

The American Society for Metabolic and Bariatric Surgery (2016) evaluated the first National Quality Improvement Program for weight loss surgery reducing readmission approximately 30%. According to the American Society for Metabolic and

Bariatric Surgery (2016), the first National Quality Improvement Program implemented interventions similar to the team approach system such as the Decreasing Readmissions Opportunities Provided (DROP) Program, which implemented a system consisting of the bariatric patients and a nutritionist to implement healthy eating plan throughout the process for preoperative to postoperative bariatric surgery. The DROP Program decreased readmission rates by more than 30% (American Society for Metabolic and Bariatric Surgery, 2016).

There are limited published resources on factors that would contribute to early readmission of patients post bariatric surgery. Bariatric surgery has gained popularity, and a vast amount of clinical interest has centered on prevention of hospital readmission following bariatric procedures (Aman et al., 2016). Many sensible considerations have pointed to readmission rates becoming a very important factor. For example, the ACS Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program (ACS-MBSAQIP) monitors safety and quality outcomes such as length of stay, complications, readmissions, reoperations, and 30-day mortality at all accredited bariatric centers. It is essential to prevent hospital readmissions following bariatric surgery to preserve and maintain MBSAQIP accreditation (Aman et al., 2016).

Examples of changes instituted by healthcare facilities to manage outcome measures tied to reimbursement include:

- The Affordable Care Act established the Hospital Readmissions Reduction Program, which requires the Centers for Medicare & Medicaid Services to

reduce payments to hospitals with excess readmissions for all patient discharges after October 1, 2012 (Aman et al., 2016).

- Acute myocardial infarction and pneumonia are publicly reported outcome measures that impact a hospital's overall reputation and funding. With this notation, a bariatric programs' reputation might be impacted in the same way with its readmission rate.

It is essential therefore to prevent readmission of the bariatric patients, and the purpose of this systematic review was to examine the reasons for readmission of bariatric patients and strategies for preventing readmissions.

Practice Focused Question

The guiding practice focused questions for this project were:

PFQ1: What are the reasons for hospital readmissions for patients who have undergone bariatric surgery?

PFQ2: What strategies have been implemented to reduce the complications that may accompany bariatric surgery?

This doctoral project has potential to address the gap in practice by providing a systematic review of current literature on the causes for postoperative complications of bariatric procedures and for identifying strategies to reduce them.

Nature of the Doctoral Project

This project was a systematic review of the literature with a focus on bariatric care for a bariatric care unit in the Southeast United States. Sources of evidence used for this systematic literature review included articles gathered from Walden Library

databases such as CINAHL, Medline, Joanna Briggs Institute, Cochrane, and ProQuest. Articles selected were peer-reviewed, English language articles that included systematic reviews and meta-analyses and were published over the past 5 years.

Significance

Bariatric patients are stakeholders in healthcare because of the growing population of patients who are admitted for bariatric surgery on a daily basis. The benefit of reducing readmission of the bariatric patient is it will improve the patient outcomes and the overall wellness of the patient while providing a holistic approach to patient quality care. The project is significant to nursing practice as nurses who work with bariatric patients must have the most current evidence to support the care provided to bariatric patients and for delivering quality education for patients and their families at discharge. This project supports positive social change through the information and education it provides that can reduce complications, costs, and improve health outcomes.

Implications for Positive Social Change

The project on the postoperative bariatric patients will promote positive social change by helping nurses and other healthcare workers through the literature review. Obesity is for a major health concern; reducing readmissions following bariatric surgery will have an immense impact on society. Obesity is a complex issue requiring considerations such as the patient's environment, genetic factors, behavior, education, and economic situation. Combined, these factors contribute to obesity (Blythe & Powers, 2011). Through bariatric surgery and continued work to achieve behavior change, patients can reverse their obesity and improve their health. Yet, while weight loss is

critical for obese patients, preventing excess weight loss can reduce the risk of complications and rehospitalizations

Summary

In this section, the method for improving bariatric surgery outcomes has been identified. In addition, there is a gap in the literature specific to measuring the results of excess weight loss that can occur with bariatric surgery. The complications associated with bariatric surgery can be addressed by implementing evidence-based research into practice in bariatric care units in the practice site.

Section 2: Background and Context

Introduction

In the past few years bariatric surgery rates performed in the United States have fluctuated (American Society for Metabolic and Bariatric Surgery, 2018). According to the Centers for Disease Control and Prevention in 2015 more than one-third of American adults underwent some form of bariatric surgery with an annual medical cost exceeding $147 billion (Abraham et al., 2015). Currently, the growing rate of obesity among the American population is responsible for $190.2 billion a year in health costs and approximately 21% of America's national healthcare disbursement (Telem, Yang, Talamini, Zhang, & Pryor, 2017).

Bariatric surgery is recommended for patients with serious medical conditions who have been unsuccessful with other treatments. Such conditions include severe sleep apnea, respiratory issues, cardiac problems, and diabetic complications related to being overweight. It is frequently recommended for patients with body mass index of BMI > 25kg/m^2 (overweight), BMI > 30kg/m^2 (obese), and BMI > 40 kg/m^2 (morbidly obese; Fejfer et al, 2017).

Yet, bariatric surgery also has complication that may result in excess weight loss. Some programs have shown that excess weight loss can be prevented. The purpose of this project is to complete a systematic review of the literature to identify reasons for complications in bariatric postoperative patients and to identify strategies for prevention.

Section 2 includes the practice focused question, theories, models and concepts, relevance to nursing practice, local background and context, role of the DNP student, and a summary.

Theories, Models, and Concepts

Theories, frameworks, and models are useful for organizing a clinical program to help planners understand factors influencing health behaviors and interactions with the environment (Naranjo, Smitz, & Priya, 2011). The model that is most appropriate to the problem of 30-day readmission of bariatric patients after surgery is the shifting processes model (Pagoto & Rodrigues, 2013). The shifting process model is ideal for this project because of its view and focus on individual weight loss and maintenance in relation to family dynamics such as eating and exercise habits, home environment, and family relationships (Pagoto & Rodrigues, 2013). The model shifts the burden of change from the whole family dynamics to the individual so that more attention and effort is on maintaining their weight.

The model highlights the fact that a typical barrier to weight loss can be developed especially if the change is moving against lifestyle changes, which is inherent in bariatric surgeries. Christake and Fowler (2007), stress that obesity is described as "socially contagious" because an individual risk of obesity increases when family and friends are obese.

Project Relevance to Nursing Practice

By the year 2030 it is estimated that preventable comorbidities of obesity related diseases will upsurge by 48 to 66 billion (Telem et al., 2015). The Centers for Disease

Control and Prevention estimates more than one-third of American adults will undergo some form of bariatric surgery with an annual medical cost exceeding $147 billion (Abraham et al., 2015). The current literature shows the importance of reducing hospital readmissions for all patients which includes patients who undergo bariatric procedures and health systems are penalized when readmissions occur within a given period of time (Abraham et al., 2015). For example, the Affordable Care Act established the Hospital Readmissions Reduction Program, which requires the Centers for Medicare & Medicaid Services to reduce payments to hospitals with excess readmissions for all patient discharges after October 1, 2012 (Aman et al., 2016). This project will address the need to reduce hospital readmissions for bariatric procedures. Reducing complications in the bariatric surgical patient is imperative to the nursing practice because it will improve patient quality care and provide positive outcome for the bariatric patient. The project is significant to nursing practice as nurses who work with bariatric patients must have the most current evidence to support the care provided to bariatric patients and for providing education for patients and their family at discharge.

Term Definitions

The search items included: bariatric patient, readmission rates, and decreasing bariatric patients' length of stay.

Bariatric patient: A patient who has met the weight criteria determined by the medical team that is appropriate for surgery in order to lose weight.

Readmission rate: The rate that is used by a healthcare industry to determine the appropriate admission date for a patient after surgery.

Decreasing bariatric patients' length of stay: The reduction in the amount of days the patient stays in the hospital after surgery.

Patients living with bariatric surgery: Patients with serious medical conditions such as severe sleep apnea, respiratory issues, cardiac issues due to overweight, and diabetic complications related to overweight who have been unsuccessful with other treatments and have been recommended for and undergone bariatric surgery (Zhao & Encinosa, 2007).

Obesity: The condition of patients with body mass index (BMI) > 35–40, (Zhao & Encinosa, 2007).

Decreasing readmissions opportunities provided (DROP) Program: A program that includes a system for bariatric patients involving a nutritionist to implement a healthy eating plan throughout the process for preoperative to postoperative bariatric surgery (American Society for Metabolic and Bariatric Surgery, 2016).

Specific Literature

All readmissions to the hospital within 30 days of surgery were reviewed to determine the cause, demographics, and patient characteristics. A logistic regression analysis was used to assess the impact of various factors on the risk of readmission (Saunders et al., 2007). In addition, 2,823 patients were identified using the corrected operative log. Of these, 165 (5.8%) patients required 184 (6.5%) readmissions within 30 days of their index bariatric operative (Saunders et al., 2007). Laparoscopic adjustable gastric banding (LAGB) had the lowest patient readmission rate of 3.1%; vertical banded gastroplasty-Roux-en-Y gastric bypass (VBG-RYGBP) had a 6.8% rate, and LRYGBP

had a 7.3% rate (Saunders et al., 2007). Technical considerations were the most common cause for readmission (41% of readmissions). White race and undergoing LAGB decreased the odds of readmission, while total operating-room time > 20 minutes, initial hospital stay of > 3 days, and deep venous thrombosis increased the odds for readmission (Saunders et al., 2007).

Evidence to Address the Gap in Practice

The American Society for Metabolic and Bariatric Surgery (2016) evaluated the first National Quality Improvement Program for weight loss surgery. According to the American Society for Metabolic and Bariatric Surgery (2016), the first National Quality Improvement Program implemented interventions similar to the team approach system such as the DROP Program, which is a system pairing the bariatric patients and a nutritionist to implement a healthy eating plan throughout the process for preoperative to postoperative bariatric surgery. The DROP Program decreased readmissions rates by more than 30% (American Society for Metabolic and Bariatric Surgery, (2016).

Local Background and Context

The readmission of bariatric patients 30 days after surgery remains a major issue in the local healthcare setting as well as nationally (Doumouras et al., 2016). Each year the total cost of these readmissions in the United States alone is estimated at $2.5 billion (Doumouras et al., 2016). In addition to increased costs, readmissions are coupled with poorer outcomes for surgical patients.

Bariatric surgery accounts for more than 100,000 procedures per year in the United States, and the use of this surgical procedure is growing rapidly around the world

(Doumouras et al., 2016). Readmission rates vary according to the type of procedure from 0.5% after gastric banding to 11% for RYGB. Readmissions double after gastric bypass surgery and readmissions after bariatric surgery can triple risk-adjusted health expenditure in the first 6 months post-procedure (Doumouras et al., 2016).

The studies done on 30 days readmission of bariatric patients highlight the importance of reducing the readmission rates and the effect that it has on hospitals' expenditures (Doumouras et al., 2016).

Role of the DNP Student

My role as the DNP student in this project was to research and analyze the literature to find ways to prevent readmission after bariatric surgery. Using the systematic review is the most appropriate approach because I am able to provide a more fundamental awareness of the importance of preventing readmission of the bariatric patients after surgery. This is important to help reduce cost and defer expenses for the healthcare industry. My motivation for helping to reduce early readmission is from having close experiences of relatives and friends who have had this surgery and from working with bariatric patients. The ability of being able to share the success and joy has been very rewarding. I can honestly say I have no biases toward this topic.

Summary

The implication of using a systematic review was to show the importance regarding the issue of 30 days readmission of the bariatric patients. Early readmission is a major concern because of the rise in cost for the hospital and other services. It is

imperative, therefore, to prevent the readmission of these patients if possible. In addition, having a system in place to prevent this 30 day readmission is of paramount importance.

Section 3: Collection and Analysis of Evidence

Introduction

The focus on weight loss and the steps to lose excess fat has heightened my interest in reviewing the literature to find ways of preventing early 30 days readmission of patients following major surgeries such as bariatric surgeries, which was the purpose of this literature review. Bariatric surgery is recommended for patients with serious medical conditions such as severe sleep apnea, respiratory issues, cardiac issues, and diabetic complications resulting from or exacerbated by overweight who have been unsuccessful with other treatments. Overweight and obesity are described as patients with body mass BMI > 25kg/m2 (overweight), BMI > 30kg/m2 (obese), and BMI > 40 kg/m2 (morbidly obese; Fejfer et al., 2017).

According to the literature, in 2013 there were 179,000 bariatric surgeries performed in the United States (Abraham et al., 2015). The Centers for Disease Control and Prevention estimated that more than one-third of U.S. adults are obese, and the medical cost of obesity in the United States in 2008 was $147 billion (Abraham et al., 2015). This surge in bariatric surgeries has made the analysis of patients' outcomes and reasons for readmission important.

Practice-Focused Questions

The guiding practice focused questions for this project are:

PFQ1: What are the reasons for hospital readmissions for patients who have undergone bariatric surgery?

PFQ2: What strategies have been implemented to reduce the complications that may accompany bariatric surgery?

This doctoral project has potential to address the gap in practice by providing a systematic review of the current literature on causes for postoperative complications of bariatric procedures and for identifying strategies to reduce them.

Purpose

The purpose of this systematic review of the literature was to determine reasons for hospital readmission of patients who have had recent bariatric surgery and to provide ways to prevent early readmission. Obesity is increasing in the United States; currently one third of Americans and 17% of teenagers are obese (Telem et al., 2015). "Avoidable readmission after surgery is a major burden on healthcare resources and is common after major surgery" (Doumouras et al., 2016, p. 2066). Bariatric surgery is now a common procedure in the United States because of the focus on achieving and maintaining healthy weight. Yet with bariatric surgery other complications may occur that are related to losing too much weight. Excess weight loss may indicate malnutrition and lead to physical and even mental complications for the bariatric patient (Doumouras et al., 2016, p. 2066).

Sources of Evidence

The sources of evidence that were used to meet the purpose of this doctoral project included information obtained from a variety of literature sources. Sources of evidence used for this systematic literature review included articles gathered from Walden Library databases such as CINAHL, Medline, Joanna Briggs Institute, Cochrane,

and ProQuest. Articles selected were peer-reviewed, English language articles that included systematic reviews and meta-analyses and were published over the past 5 years.

This literature search addressed the practice focused question by reporting on recent peer-reviewed articles addressing bariatric procedures, their complications, and the strategies used to prevent the complications. The search terms used included *bariatric surgery, bariatric surgery and excessive weight loss, bariatric surgery and readmission,* and *bariatric and prevention of readmission.*

Published Outcomes and Research

The topic that I have chosen is very important in the healthcare industry. However, there are few systematic reviews that address bariatric readmissions and strategies for preventing readmissions in the literature. The search terms that I initially used for the systematic literature review included *bariatric surgery, bariatric surgery and excessive weight loss, bariatric surgery and readmissions, bariatric surgery,* and *prevention of readmissions.*

Inclusion Criteria

The inclusion criteria for this systematic review were articles that were peer reviewed, systematic reviews or metanalyses published between 2013 and2018. Articles were in English and were between evidence levels I–IV (Appendix A) as defined by Melynk et al., (2017) guide on hierarchy of evidence-based studies.

Exclusion Criteria

I excluded articles that were not peer reviewed or did not focus on outcomes of bariatric procedures and the 30-day readmission rates or on strategies for improving readmission rates and complications post bariatric surgery.

Analysis and Synthesis

Once I completed the literature review, I organized the articles in a Microsoft Word table—Literature Review Matrix—to ensure that the literature met the inclusion and exclusion criteria and for ease of analysis. Several peer-reviewed articles and research articles focused on prevention of complications post bariatric procedures and these were included. I used the Melnyk, B.,Fineout-Overholt, E, Giggleman,M., and Choy, K.(2017), model of levels of evidence to grade the literature that I reviewed. I used a PRISMA chart to show the articles that were identified in the initial search, then the number articles after inclusion criteria were met, and the levels of evidence graded. The articles that met the inclusion criteria were analyzed for the level of evidence. The lower the hierarchy level, the more significant the rigor that was expected. The level of evidence used was based on Melynk et al. (2017) guide on hierarchy of evidence-based studies. I then grouped articles by topic and result to answer the project focused questions.

Summary

In summary, weight loss is important to many because it can result in improved care deliveries, healthier lifestyles, and enhanced overall well-being of the person. The literature review articles that I used for this project were intended to represent a

systematic review of studies that can help a bariatric health care setting improve patient outcomes and thereby promote positive social change.

Section 4: Findings and Recommendations

Introduction

The focus on achieving and maintaining healthy weight in the United States has led to bariatric surgery becoming a common procedure. The risk for readmission for complications is a concern common to patients who undergo any major surgical procedure; however; after bariatric procedures, the risk may be higher due to the rate of weight loss in some patients or other comorbid conditions (Abraham et al., 2015).

Readmissions are costly to the patient who must return to the hospital and costly to the health system that may have financial penalties imposed by insurance providers or Medicare when readmission occurs within 30 days of discharge. Therefore, it is imperative to understand the causes of post bariatric surgery complications and to identify strategies to prevent early readmissions in the bariatric patient population. The goal of this systematic review of the literature was to provide recently published evidence to help reduce readmissions post bariatric surgery. Ultimately, the systematic review may provide insights that assist providers in understanding the reasons for readmission post bariatric surgery and to provide strategies that prevent readmissions.

Section 4 highlights the results of the systematic review in answering the practice focused questions:

PFQ1: What are the reasons for hospital readmissions for patients who have undergone bariatric surgery?

PFQ2: What strategies have been implemented to reduce the excessive weight loss that may accompany bariatric surgery?

This doctoral project has potential to address the gap in knowledge by providing a systematic review of the literature on the currently published causes for postoperative complications of bariatric procedures and for identifying strategies to reduce them.

The sources of evidence for the systematic review were obtained using the electronic databases found in ProQuest, Academic Search Complete, CINAHL, Medline, and Cochrane. The search was set to include studies published between 2013 and 2018 that were peer reviewed, English language articles and that addressed complications of bariatric procedures and the strategies used to prevent them. My approval for research was granted by Walden University Institutional Review Board on 6-14-18. The IRB approval number was 0040114.

Findings and Implications

Upon initial search with the search term *bariatric surgery and complications,* 1,970 published studies resulted. When I added the search term *excess weight loss,* eight studies resulted, and only one of these studies addressed *excessive weight loss* post bariatric surgery as a complication. I then searched with the same databases and criteria with the search terms *bariatric surgery, complications and prevention* and six studies resulted, one of which was relevant to the practice focused questions for this project. I then added *30-day readmission,* which yielded two studies, one of which was relevant to the current project focused question. Finally, I searched using the terms *bariatric surgery and 30-day readmission,* which resulted in 20 studies, with 15 of those studies relevant to

the practice focused questions. This left a total of 36 studies identified for potential inclusion and 18 studies that did not meet the inclusion criteria.

I used a PRISMA chart (Figure 1) to show the articles that were identified in the initial search, as well as the number of articles after inclusion criteria were met. The articles that were excluded are the articles that did not focus on bariatric procedures and outcomes or did not address readmission rates or strategies for prevention of readmissions of patients with bariatric procedures

With the 15 studies from the final search and the three relevant studies from the first three searches, the studies for the systematic review of the literature resulted in 18 studies for review. One study was a duplicate and was therefore eliminated yielding 17 studies for the final analysis.

The 17 articles that I included were appropriate because they met the criteria for inclusion and provided information to answer the two project focused questions. In addition, they were written in English and the levels of evidence were between I and IV as defined by the Melynk and Fineout-Overholt's guide (see Appendix A) on hierarchy of evidence-based studies (Melnyk et al, 2017).

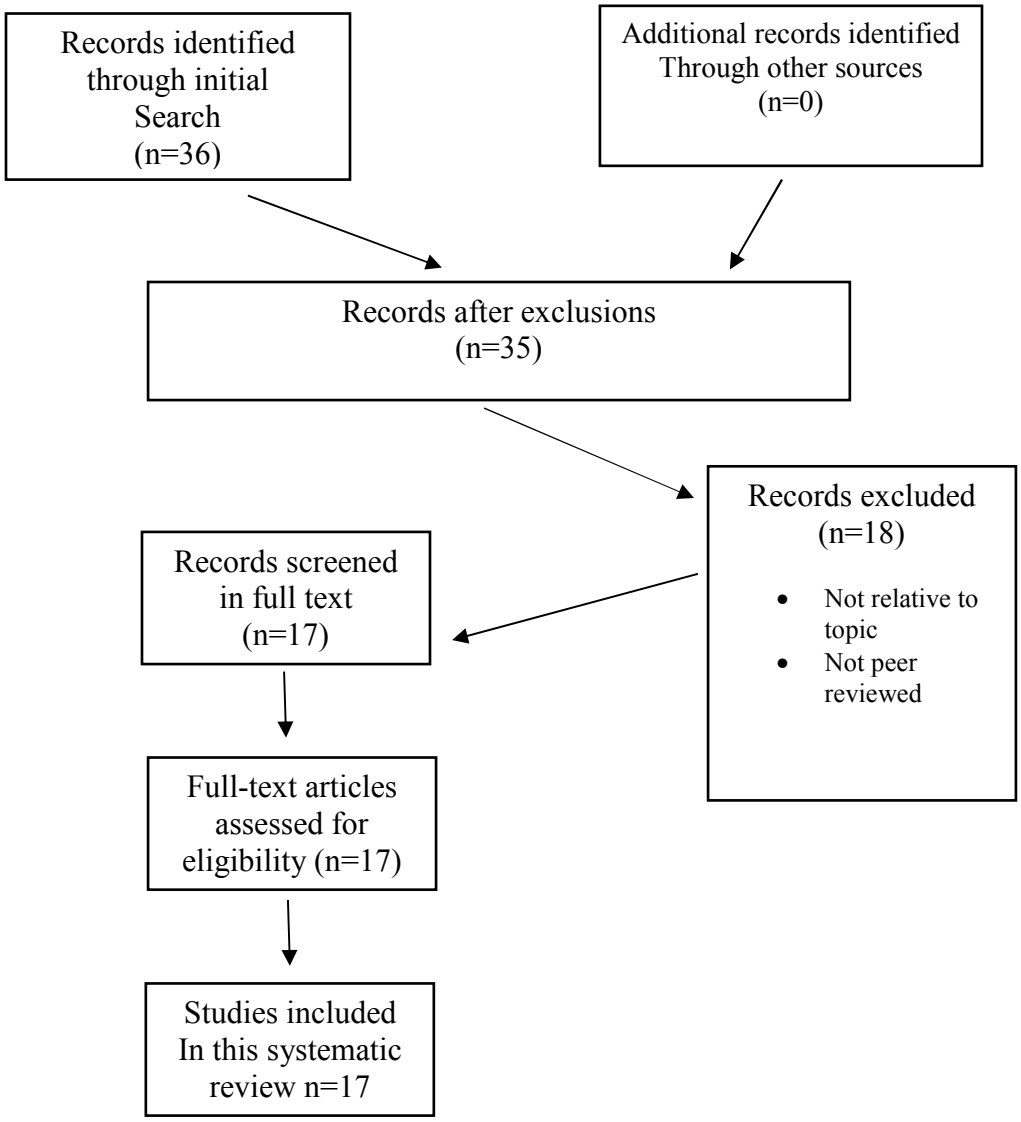

Figure 1. PRISMA flow diagram.

Practice Focused Question 1

PFQ1: What are the reasons for hospital readmissions for patients who have undergone bariatric surgery?

I used three major headings in answering this question. Younger patients have better outcomes than older patients, general complications of bariatric surgery, and inadequate follow up results in complications.

Younger patients have better outcomes. Johnson and Simpson (2014) found that the age of patients undergoing bariatric surgery is lower now indicating that more patients who undergo the procedure are younger than in past reports. This result indicates that we may see fewer complications and readmissions in the younger population compared to those who are older with more comorbidities undergoing the procedure. Still, the rate of complications overall is such that understanding the reasons for readmission is needed.

Complications and bariatric surgery. Various contributors to complications were identified including older age, type of procedures, and existence of preexisting conditions. Additionally, race or ethnicity played a role in the risk for complications and resultant readmission.

Obeid et al. (2015) conducted a retrospective study that examined the outcome of laparoscopic gastric bypass or LSG surgeries at organizations between 2009 and 2013. The results of the study concluded that 9.0% of the 533 bariatric patients had repeat surgery due to complications from bariatric surgery; the mean follow-up was 43.9 months (Obeid et al., 2015). In addition, the study revealed that European American bariatric

patients had a higher rate 2.2 fold upsurge for having repeat surgery and African Americans had a lower significant risk (OR 2.1, $P = 0.029$; OR 5.0, $P < 0.000$).

Sethi et al. (2015) conducted a multivariable regression study to identify the risk factors associated with the readmission rates of bariatric surgery patients. The results of the study concluded that 30-day readmission after LSG was approximately 3.6%. In addition, approximately 47 patients were readmitted for various complications including thrombosis and gastrointestinal complications; "30-day readmission included index admission length of stay (LOS) ≥ 3 days (OR 2.54, CI = [1.19, 5.40]), intraoperative drain placement (OR 3.11, CI = [1.58, 6.13]), postoperative complications (OR 8.21, CI = [2.33, 28.97]), and pain at discharge (OR8.49, CI = [2.37, 30.44])" (Sethi et al., 2015, p. 244).

Garg et al. (2016) utilized methods including demographic intraoperative data to review 1,775 bariatric patients and found that 6.37% were readmitted, and the mean time for readmission was 52.1 days. The most common reasons for readmission were gastrointestinal complications, which was 34.5 % (Garg et al., 2016). The study concluded that LRYGB had an increased risk for postoperative complications and length of stay (Garg et al., 2016).

Doumouras et al. (2015) conducted a retrospective cohort study to examine the 30-day readmission rates of bariatric patients postoperatively for a population located in Ontario, Canada. The results indicated that from 2009 to 2012, of the 5,007 bariatric patients, 305 (6.1%, 95% CI 5.4 -6.8) required readmission within 30 days (Doumouras et al., 2015). The 305 bariatric patients were readmitted for various conditions including

wound infection (25%), postoperative pain (16%), gastrointestinal complications (12%), and risk for thrombosis (12%; Doumouras et al., 2015).

Rogers et al. (2014) conducted a multiple randomized controlled study with internal phase to analyze the two most prevalent bariatric by-band surgeries: gastric bypass and adjustable gastric band surgery. The design of the study was an open parallel-group randomized controlled trail. Summary of the study total patients mentioned for bariatric surgery = 100%, eligible for by-band, 168 randomized to: 84, band = 84. Phase 1 and 2 bariatric patients followed up after surgery = *n* = 724, and 85% followed up to primary outcome approximately 3 years (Rogers et al., 2014). Posttreatment complications included hemorrhage, malnutrion, wound infection, venous thrombosis, and bowel obstruction (Rogers et al., 2014). The study recommended improvements including an in-depth pre- and postoperative thorough lab profile, review of medications, review of activities, wound care, patient demonstration and teach back regarding dietary restrictions, and educating the patient and patient's support system regarding the early warning sign of complications.

Li et al. (2016), used a systematic review and metanalysis to study renal function of patients that undergo bariatric surgery and concluded that bariatric surgery further diminishes renal function by reducing the albumin level in the bariatric patients (Li et al., 2016). Patients with renal failure should seek comprehensive history and physical before considering bariatric surgery due to the higher risk for complications.

Peterson, Anderson, Boundy, Ferguson, and Erickson (2017) conducted a review of bariatric surgery in patients with tremendously high BMI(BMI> 50 kg/m2) and found

that the duodenal switch included in the surgery increased overall weight loss but may lead to more complications and co-morbidities. Interventions to improve or prevent the problem includes pre and post education and analyzing the well-being of the patient regarding which bariatric surgery will provide the most positive outcome for the patient. Some of the complications of duodenal switch procedure included: wound infection, hemorrhage, and gastrointestinal complications.

Complications related to inadequate follow up. Obeid, Schwack, Kurian, Ren-Fielding, and Fielding (2014) conducted a retrospective cohort study investigating single-stage versus 2-stage sleeve gastrectomy as a conversion after failed adjustable gastric banding: 30-day outcomes. According to Obeid et al. (2014) the study concluded that the 83 bariatric patients with sleeve gastrectomy after band removal occurred because of lower follow-up medical care. The total average of the gastric band was approximately 5.8 years in 1 stage group and 4.8 years in the 2 stage group (Obeid et al., 2014).

Owen-Smith, Donovan, and Coast (2016), conducted a qualitative study on the experience of reviewing the obesity surgery information through National Health Program Service. The method implemented was an in-depth interview with 21 bariatric patients ($N = 21$), and clinicians for approximately 3 years. The results of the study concluded that healthcare providers were reluctant to discuss follow-up care with the bariatric patients due to lack of knowledge or tendency to try not to offend by the healthcare providers (Owen-Smith et al., 2016).

Practice Focused Question 2

PFQ2: What strategies have been implemented to reduce complications that may accompany bariatric surgery?

While little information was found on how to prevent complications or how to treat complications after bariatric surgical procedures, studies generally indicated that bowel management, dietary management, and positive social support were factors contributing to reducing complications. More importantly, the need for careful preoperative risk assessment for patients scheduled for bariatric procedures was listed as the most important factor to prevent complications. Additionally, adequate follow up was listed as important for complications prevention.

Excessive weight loss. Kehagias, Zygomalas, Karavial and Karamanakos (2016) found that the weight loss from bariatric surgery continued and had a positive effect on patient health long term after bariatric procedures.

Prevention of bowel complications postoperative bariatric surgery. Chang, Nguyen, Sampath, and Alizadeh-Pasdar (2018) reviewed and discussed the various complications associated with bariatric surgery. Thus, the complication discussed included: Anastomotic leak which usually occurs early post-operatively, internal hernia, ulcer, gallstone formation (Chang et al., 2018). According Chang et al. (2018), interventions to decrease post-operative complications include: bowel management, medication management, reduce alcohol intake, dietary management, and positive support system and social behaviors.

Vines and Schiesser (2014) conducted a review of the various bariatric surgery including: sleeve gastrectomy, omega loop bypass, metabolic surgery, and Roux En Y gastric Bypass surgery. The recommendations from the authors suggest that for any bariatric procedure and particularly for Roux en Y, that preoperative risk assessment should be a priority. The authors further stated that the incidence rates of early complications such as leakage decreased with the experience of the surgical team over time.

Osland, Yunus, Khan, Memon, and Memon (2017), conducted a systematic review of randomized control trials. A summary of the systematic review included database search ($N = 473$), additional records identified through other sources ($n = 5$), full-text articles assessed for eligibility ($n = 58$), records excluded from abstract($n = 420$), full-text excluded with reasons($n = 51$), $n = 39$ not RCTs. The results of the study concluded that both Laparoscopic Vertical Sleeve Gastrectomy (LVSG) and Laparoscopic Roux-En-Y Gastrectomy (LRYG) are effective in improving positive outcomes of bariatric patients with type 2 diabetes, cardiovascular diseases, and other comorbidities (Osland et al., 2017). The authors examined early and late complications and early surgical revisions were equally effective with no significant differences across the two types of procedures.

Obeid et al. (2015) conducted a retrospective study that examined the well-being and outcome of laparoscopic gastric bypass or LSG surgeries at organizations between 2009 and 2013. The results of the study concluded that patients with preoperative

gastroesophageal reflux disease were more likely to have complications with higher reoperation rates so preassessment of patients with GERD is important.

Education and prevention of complications. Education and assessment plays a critical role in preventing complications post bariatric surgery. El Chaar et al. (2014) studied 229 patients undergoing bariatric surgery in which patients were required to lose 5% to 10% of their body weight, have counseling with a dietician and social worker, have a work up by a pulmonologist and a cardiologist, and attend team meetings for education for 2 weeks before undergoing the procedure. The results postoperatively showed reduced hospital length of stay, improved patient outcomes, reduced readmissions, and reduced complication rates.

Agabiti-Rosei et al. (2018) conducted a study to analysis the decreasing circulating T regulatory lymphocytes in obese patients undergoing bariatric surgery. The design and method utilized investigational study of approximately 32 obese patients. The study concluded that obese patients had a decrease of Treg lymphocytes. Treg lymphocytes are the key component for a healthy immune system. Bariatric surgery assisted in increasing Treg lymphocytes in bariatric patients, which lessen the chances of cardiovascular diseases (Agabiti-Rosei et al., 2018) In addition, a decrease of Treg lymphocytes may lead to insulin resistance, increased leptin levels, systemic inflammation, endothelial dysfunction, and oxidative stress.

Summary of Outcomes

The shared themes in the articles highlighted the bariatric patient outcomes pre/post-surgery and discharge planning to reduce 30-day readmission. The most

imperative topics addressed in the articles included: careful risk assessment for patients scheduled for bariatric surgery, preoperative and postoperative education to recognize and prevent complications that can result in 30-day readmissions, and the burden it places on patients their families and on the healthcare system.

Implications

Preventing early readmission of the postop bariatric patient is important because of the impact that early readmission can have on any facility; for example, loss of reimbursement and lower patients' satisfaction scores. It is imperative, therefore, to prevent early readmission to facilitate improvement of patients' satisfaction scores and reduce readmission cost because with every readmission the healthcare expenditure increases, and facilitate the patient's return to productive life and work (Doumouras, Salch & Hong, 2016). Unanticipated limitations or outcomes included finding outdated articles and articles that do not pertain to healthcare and/or bariatric surgery. Potential impact on the findings included broadening the search for potential sources of evidence.

Implications for Positive Social Change

The project on the post-op bariatric patients may help nurses and other healthcare workers through the literature review by promoting positive social changes. Obesity is an issue for concern and requesting change will have an immense impact on society. Obesity is complex condition requiring considerations such as the patient's environment, genetic factors, behavior, education, and economic situation. Combined, these factors contribute to the presence of obesity (Blythe & Powers, 2011). Through bariatric surgery and continued work to achieve behavior change, patients can reverse their obesity and

improve their health. Yet, while weight loss is critical for obese patients, preventing excess weight loss can reduce the risk of complications and hospitalizations.

The proposed or recommended solutions that will potentially address the gap-in-practice, as informed by the findings discussed above, include levitation of the awareness of the causes of early readmission of bariatric post-op patient and present strategies that have been used to reduce complications and readmissions. Thus, providing in-service seminars are vital regarding strategies on evidence-based strategies to reduce hospital readmission rates for people with bariatric surgery.

Section 5: Dissemination Plan

Introduction

The purpose of this systematic review was to identify factors that contribute to early readmission of patients after bariatric surgeries and to find published evidence-based strategies for preventing readmissions. Bariatric patients may be readmitted for various complications including abscess, anastomotic leak, cardiac complications, dehiscence, hemorrhage, and gastrointestinal complications (Telem et al., 2015). My plan is to share the results of my review of the literature with the clinical site where I work and to continue to study the topic providing evidence-based studies to nurses who work with patients post bariatric surgery.

Plan for Dissemination

The dissemination of a project is an essential process to pass valuable information to a targeted or interested group. This project will serve as a source of information on published evidence about bariatric surgery with the potential for helping caregivers recognize the risks for complications and to prevent them. The information will be disseminated in small groups to the clinical practice setting and through presentations at conferences and clinical education programs.

Analysis of Self

My role as a practitioner is to be dedicated and committed as a patient advocate and to strive for positive patient outcomes. As a scholar, I will continue to improve my knowledge base through a lifelong process of analyzing and implementing evidence-based research in my nursing practice. Also, as a project manager, I will continue to

collaborate with other health care and community professionals regarding public health issues including the readmission rates of bariatric patients.

The long-term professional goals that I have are to continue being a patient advocate and to broaden my horizon by becoming a nurse legislator to represent health care professionals and to assist in implementing progressive and affirmative initiatives to promote positive patient outcomes. Thus, with the completion of my project, I will continue translating evidence-based research to my nursing practice.

My journey through this program began 3 years ago with the focus on obtaining my Doctorate in Nursing Practice. There have been many hurdles that I had to overcome with many valuable lessons learned. I have learned the value of significant research and the benefits it will offer to my continued practice. Finally, the lessons learned from gathering information to complete my systematic review are irreplaceable and will help me on my scholarly journey.

Summary

The completion of the project is a major accomplishment. The unforeseen challenges included designing and organization of the project. Insights gained from the scholarly journey include the importance of striving to realize a dream even when it seems impossible and remembering that success is more gratifying with the challenges. I greatly appreciate the assistance and leadership of the doctoral project committee chair, second member, and URR member.

References

Abraham, C. R., Werter, C. R., Ata, A., Hazimeh, Y. M., Shah, U. S., Bhakta, A., T., Stain, S. C. (2015). Predictors of hospital readmission after bariatric surgery. *Journal of the American College of Surgeons*, *221*(1), 220–227. http://dx.doi.org/10.1016/j.jamcollsurg.2015.02.018

Agabiti-Rosei, C., Trapletti, V., Piantoni, S., Ario, P., Tincani, A., De Ciucesis, C. . . . Rizzoni, D. (2018). Decreased circulating T regulatory lymphocytes in obese patients undergoing bariatric surgery. *Plos One, 13*(5), 1–13. https://doi.org/10.1371/journal.pone.0197178

Aman, M. W., Stem, M., Schweitzer, M. A., Magnuson, T. H., & Lidor, A. O. (2016). Early hospital readmission after bariatric surgery. *Surgical Endoscopy, 30,* 2231–2238. https://doi.org/10.1007/s00464-015-4483-4

American Society for Metabolic and Bariatric Surgery. (2016). First national quality improvement program for weight loss surgery reduces readmission by more than 30% for some hospitals. Retrieved from http://www.newswise.com/articles/first-national-quality-Improvement-program-for-weight-loss-surgery-reduces-readmissions-by-more-than-30-days for-some-hospitals

American Society for Metabolic and Bariatric Surgery. (2018). Estimate of bariatric surgery numbers 2011-2016. Retrieved from https://asmbs.org/resources/estimate-of-bariatric-surgery-numbers

Blythe, L., & Powers, J. (2011). Caring for our bariatric patients. *Nursing made Incredibly Easy, 9*(4), 5. Retrieved from http://journals.lww.com/nursingmadeincrediblyeasy/Fulltext/2011/07000/Caring_for_our_bariatric_patients.1.aspx

Centers for Disease Control and prevention. (2015). Overweight and Obesity. Retrieved from https://www.cdc.gov/obesity/strategies/index.html

Chang, J., Nguyen, N., Sampath, S., & Alizadeh-Pasdar, N. (2018). Prevention and management of complications after bariatric surgery. *BC Medical Journal, 60(*3), 156–159.

Christakis, N. A., & Fowler, J. H. (2007). The spread of obesity in a large social network over 32 years. *New England Journal of Medicine, 357*(4), 370–379. https://doi.org/10.1056/NEJMsa06608

Doumouras, A., Saleh, F., & Hong, D. (2016). 30-Day readmission after bariatric surgery in a publicly funded regionalized center of excellence system. *Surgical Endoscopy, 30*(5), 2066–2072. https://doi.org/10.1007/s00464-015-4455-8

El Chaar, M., Claros, L., Ezeji, C. G., Miletics, M., & Stoltzfus, J. (2014). Improving outcome of bariatric surgery: Best practices in an accredited surgical center. *Obesity Surgery, 24*(7), 1057–1063. http://dx.doi.org/10.1007/s11695-014-1209-y

Fejfer, K, Buczko, P., Niczyporuk, M., Ladny, J., Hady, H., Kna's, M., . . . Maciejczyk, M. (2017). Oxidative modification of biomolecules in the non-stimulated and stimulated saliva of patients with morbid obesity treated with bariatric surgery. *Biomed Research International, 2017,* 1–8. https://doi.org/10.1155/2017/4923769

Garg, T., Rosas, U., Rogan, D., Hines, H., Rivas, H., Morton, J., & Azagury, D. (2016). Characterizing readmissions after bariatric surgery. *Journal of Gastrointestinal Surgery, 20,* 1797-1801. https://doi.org/10.1007/s11605-016-3247-3

Johnson, E. E., & Simpson, K. N. (2014). Discharge disposition after bariatric surgery. *Obesity Surgery, 24*(10), 1821–1825. https://doi.org/10.1007/s11695-014-1372-1 https://doi.org/10.4103/jrms.jrms_931_16.

Kehagias I; Zygomalas A; Karavias D; Karamanakos S. (2016). Sleeve gastrectomy: have we finally found the holy grail of bariatric surgery? A review of the literature. *European review for Medical and Pharmacological Sciences, 20*(23), 4930-4942.

Li, K., Zou, J., Ye, Z., Han, X., Zhang, H., Liu, W., Zhang, P. (2016). Effects of bariatric surgery on renal function in obese patients: A systematic review and metanalysis. *PLOS One, 11*(10), 1–19. https://doi.org/10.1371/ journal.pone.0163907.

Melnyk, B.,Fineout-Overholt, E, Giggleman,M., and Choy, K.(2017). A test of the ARCC model improves implementation pf evidence-based practice, healthcare, culture, and patient outcomes, *Worldviews on Evidence-based Nursing,14* (1), 5-9.

Naranjo, L., Smitz, K., & Priya V. (2011). Applying Donabedian's theory as a framework for bariatric surgery accreditation. *Bariatric Nursing & Surgical Patient, 6(*1), 33–37, 5.

Obeid, N., Schwack, B., Kurian, M., Ren-Fielding, C. & Fielding, G. (2014). Single-stage versus 2-stage sleeve gastrectomy as a conversion after failed adjustable gastric banding: 30-day outcomes. *Surgical Endoscopy, 28*(11), 3186–3192. https://doi.org/10.1007/s00464-014-3585-8

Obeid, T., Krishnan, A., Abdalla, G., Schweitzer, M., Magnuson, T., & Steels, K. (2015). GERD is associated with higher long-term reoperation rated after bariatric surgery. *Journal of Gastrointestinal Surgery, 20,* 119–124. https://doi.org/10.1007/s11605-015-2993-y

Osland, E., Yunnus, R., Khan, S., Memon, B., & Memon, M. A. (2017). Diabetes improvement and resolution following laparoscopic vertical sleeve gastrectomy (LVSG) versus laparoscopic roux-en-y gastric bypass (LRYGB) procedures: A systematic review of randomized controlled trials. *Surgical Endoscopy, 31*(4), 1952–1963. https://doi.org/10.1007/s00464-016-5202-5

Owen-Smith, A., Donovan, J., & Coast, J. (2017). Experiences of accessing obesity surgery on the NHS: A qualitative study. *Journal of Public Health, 39*(1), 163–169. https://doi.org/10.1093/pubmed/fdv209

Pagoto, S., & Rodrigues, S. (2013). Commentary on the shifting processes model for weight management. *Journal of Collaborative Family Healthcare, 31*(4), 338–340. https://doi.org/10.1037/fsh0000006

Peterson, K., Anderson, J., Boundy, E., Ferguson, L., & Erickson, K. (2017). Rapid evidence review of bariatric surgery in super obesity (BMI >50 kg/m2). *Journal of General Internal Medicine, 32*(S1), 56–64. https://doi.org/10.1007/s11606-016-3950-5

Rogers, C., Welbourn, R., Byrne, R., Donovan, J., Reeves, B., Wordsworth, S. . . . Blazeby, T. (2014). The By-Band study: Gastric bypass or adjustable gastric band surgery to treat morbid obesity: Study protocol for a multicenter randomized controlled trial with an internal pilot phase. *Bio Med Central*, *15*(1), 1–27. https://doi.org/10.1186/1745-6215-15-53

Saunders, K. J., Ballantyne G. H., Belsley, S., Stephens, D. R., Trivedi A., Ewing D. R., & Schmidt, H. J. (2007) 30-day readmission rates at a high-volume bariatric surgery center: Laparoscopic adjustable gastric banding, laparoscopic gastric bypass, and vertical banded gastroplasty-roux-en y gastric bypass. *Obesity Surgery, 17*(9), 1171–1177. http://doi.org/10.1007/s11695-008-9517-8

Sethi, M., Patel, K, Zagzag, J., Parikh, M., Saunders, J., Ude-Welcome, A. . . . Ren-Fielding, C. (2015). Thirty-day readmission after laparoscopic sleeve gastrectomy: A predictable event? *Journal Gasrtrointest Surg, 20,* 244–252. https://doi.org/10.1007/s11605-015-2978-x

Telem, D., Talamini, M., Gersten, F., Patterson, W., Peoples, B., Gracia, G. . . . Pryor, A. D. (2015). Hospital admissions greater than 30 days following bariatric surgery: Patient and procedure matter. *Surgical Endoscopy and Other International Techniques, 29*(6), 1310–1315. https://doi.org/10.1007/s00464-014-3834-x

Telem, D., Yang, J., Talamini, M., Zhang, Q., & Pryor, A. D. (2017). Hospital charge and health-care quality in bariatric surgery. *American Surgeon, 83*(2), 170–175.

Vines, L., & Schiesser, M. (2014). Gastric bypass: Current results and different techniques. *Digestive Surgery, 31,* 33–39. https://doi.org/10.1159/000360433

Zhao, Y., & Encinosa, W. (2007). Statistical Brief #23: Bariatric surgery utilization and outcomes in 1998 and 2004. Rockville, MD: Agency for Healthcare Research and Quality. Retrieved from http://www.hcup-us.ahrq.gov/reports/statbriefs/sb23.jsp

Appendix A: Level of Evidence

Level	Rating System for the Hierarchy of Evidence
Level 1	Systematic Reviews, Meta-analysis of all relevant RCTs
Level 11	Evidence from well-designed RCTs
Level 111	Evidence obtained from well-designed controlled trials without randomization
Level 1V	Evidence from well-designed case-control and cohort studies
Level V	Evidence from systematic reviews of descriptive and quantitative studies
Level V1	Evidence from a single descriptive and quantitative studies
Level V11	Evidence from the opinion of authorities and /or reports of expert committees

(Melnyk, & Fineout-Overholt, 2011).

Appendix B: Literature Review Matrix

Citation (in APA style with doi or link)	Aim/ Sample size /Setting	Strengths of the study	Weaknesses of the study	Level of Evidence
Agabiti-Rosei et al.(2018)	Decreased circulating T regulatory lymphocytes in obese patients undergoing bariatric surgery.	Population of the study	Did not discuss the correlation between oxidative stress and inflammation due to the decreased circulating T regulatory lymphocytes	Level III
Chang et al.(2018)	Prevention of complications bariatric surgery	Population of the study	Correlation between adequate education regarding bariatric surgery	Level III
Documorous et al. (2015).	30 day readmission rate of the bariatric patient	Population of the study	Did not address interventions such as support groups	Level II
El Chaar et al.(2014)	Best Practices for the bariatric Surgery programs	Population of the study	Correlation between adequate education regarding bariatric surgery	Level II
Garg et al.(2016)	Readmissions after bariatric surgery	Population of the Study	Did not address interventions such as support groups	Level III
Gonzalo Caris, Almarza Canales, and Sabra, (2016)	Found that excessive weight loss was rare with Roux-En-Y procedures and little information was known about reversal of Roux-En-Y gastrectomy.	Covered complications of excessive weight loss		Level II
Johnson and Simpson(2014)	Discharge disposition after bariatric surgery	Population of the Study	Did not address pre/post care of the bariatric surgery. Support Groups and did not address pre/post care for the bariatric patient	Level I
Keleidari et al.(2017)	Qualitative study on the quality of life of Bariatirc patients	Population of the study	Interventions, Pre-op education and support groups	Level IV
Kehagias, Zygomalas, Karavial and Karamanakos(2017)	Found that the weight loss from bariatric surgery continued and had a positive effect on patient health long term after bariatric procedures.			Level II
Lee et al.(2018)	retrospective cohort and mixed study	Population of the Study	Did not address interventions such as support groups	Level II
Li et al. (2016).	Systematic review and meta-analysis of the renal function of bariatric patients	Population of the study	Did not address interventions such as support groups	Level III

Obeid, Schwack, Kurian, Ren-Fielding, and Fielding(2014)	retrospective cohort study investigating single-stage versus 2-stage sleeve gastrectomy as a conversion after failed adjustable gastric banding n- 83			Level II
Obeid, Krishnan, Abdalla, Schweitzer, Magnuson, and Steels, K 2015	Bariatric surgery complication: GERD	Population of the study	Did not address pre/post care of the bariatric surgery. Support Groups and did not address pre/post care for the bariatric patient	Level VII
Osland et al. (2017). Owen-Smith et al.(2017)	Diabetes improvement and resolution following laparoscopic vertical sleeve gastrectomy (LVSG) versus laparoscopic roux-en-y gastric bypass (LRYGB) procedures: a systematic review of randomized controlled trials,	Population of the study	Discussion of interventions and support groups	Level I
Owens-Smith, Donovan, and Coast (2016),	Qualitative study on the experience of reviewing the obesity surgery information through National Health Program Service. in-depth interview with twenty-one bariatric patients (n=21)	healthcare providers were reluctant to discuss follow-up care with the bariatric patients due to lack of knowledge or tendency to try not to offend		Qualitative study
Rogers et al.(2014).	The By- band study: gastric bypass or adjustable gastric band surgery to treat morbid obesity: study protocol for a multicenter randomized controlled trial with an internal pilot phase.	Population of the study	Did not address post care interventions	Level I
Seth et al.(2015)	30 day readmission after laparoscopic sleeve gastrectomy-	Population of the study	Did not address post care interventions	Level I
Vines et al. (2014).	Different techniques gastric bypass surgery Roux En Y Gastric bypass complications were high but with improved techniques now much lower. Patient risk assessment before surgery one of the most important recommendations for prevention of complications.	Population of the study	Interventions to reduce the 30-day readmission rate of the bariatric patient and support groups	Level VII