Preoperative Weight Loss for Patients Undergoing Lumbar Spine Surgery Utilizing Motivational Interviewing to Decrease Postoperative Complications: A Quality Improvement Project

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Abstract

Nature and scope of project: In 2018, over 70% of United States (U.S.) citizens were overweight and or obese. More than two million lumbar spine surgeries were performed in the U.S. in 2014. Postoperative spine wound infections can cost up to $43,000 per patient. The objective of this quality improvement (QI) project is to evaluate if preoperative weight loss through motivation interviewing (MI), for patients who are obese, based on body mass index (BMI) of >30 and have lumbar spine surgery, improves postoperative outcomes.

Synthesis: Multiple studies have shown obesity increases the risk of postoperative complications. MI is an effective intervention to provide meaningful weight loss. Telehealth visits are equally as efficacious as face-to-face visits.

Project implementation: This QI project was implemented at a site where patients were offered lumbar spine surgery and had a BMI>30. They were contacted by the author and once the participants reviewed informational videos and signed the consent, the six-week program was implemented through a combination of in person and telehealth office visits (OV). Limitations of this QI program included: lack of potential participants due to Covid19 illness, >75% reduction in number of daily surgical cases, program took place over the holidays which can negatively affect weight due to over-eating, staff illness, management turnover, and inclusion criteria of requiring surgery to be 7-8 weeks prior to the date of surgery.

Evaluation criteria: Pre and post-QI MI intervention weights were measured for the participant. Preoperative Oswestry Disability Index (ODI) scores were completed for the control and MI intervention participants. Five postoperative criteria were measured for both participants:

deep being thrombosis (DVT), pulmonary embolus (PE), length of stay (LOS), 30-day hospital readmission, and wound infection.

Outcomes: The outcomes were analyzed using Intellectus software. There was a correlation between the higher class of BMI and postoperative wound infection. MI was shown to have a positive correlation with initial preoperative weight loss (by week three, the QI MI patient achieved 98% of the 2% weight loss goal). The intervention (MI) patient with a lower BMI, did not have any postoperative complications.

Recommendations: The findings of this QI project suggest elevated BMI is a risk factor for postoperative complications. MI was shown to have an initial positive result with weight loss. Telehealth is efficacious in providing care to patients. Further studies with a larger sample size would be beneficial to provide ongoing recommendations.

Keywords: motivational interviewing, body mass index, obesity, lumbar surgery, preoperative weight loss, postoperative complications

Preoperative Weight Loss for Patients Undergoing Lumbar Spine Surgery Utilizing Motivational Interviewing to Decrease Postoperative Complications

Obesity, based on body mass index (BMI) over 30, is dramatically increasing in the U.S. and Minnesota (He et al., 2020; U.S. Preventative Task Force, 2018). In 2018 over 70% of the U.S. were overweight and or obese (Fryar et al., 2020). In addition to rising obesity rates there has been a marked increase in lumbar spine surgeries in the U.S. (Raad et al., 2019). Over two million lumbar spine surgeries were performed in the U.S. in 2014, alone (Raad et al., 2019). Multiple studies have shown obesity increases the risk of postoperative complications including: wound infections, deep vein thrombosis, pneumonia, higher length of stay (LOS) and pulmonary embolism (Bamgbade et al., 2007; Higgins et al., 2016; Planchard et al., 2015; Tjeertes et al., 2015; Zusmanovich et al., 2018). The focus for this quality improvement (QI) project is preoperative optimization of health via weight loss in patients with a BMI>30 through utilizing motivational interviewing (MI).

Problem Statement

The problem statement for this QI project is broken down into population, intervention, comparison, outcome, and timeframe (PICOT) format. P-Do patients who are obese, based on BMI>30 and are offered lumbar spine surgery I-who undergo preoperative MI via telehealth to lose weight, C-compared to those who don't undergo MI O-have decreased postoperative complications T-at 30 days postoperatively? Improving patients' health prior to surgery is vital to successful postoperative outcomes and decreasing postoperative complications. This problem statement also correlates with one of Healthy People 2030 goals, which is to decrease the rate of obesity and improve nutrition. Part of BMI calculation is weight, and one of the main goals for

this QI Program is to promote weight loss through the utilization of MI and instill lifelong healthy nutrition habits.

Background

For neurosurgery patients at the QI site, there is no standard of care for preoperative weight loss for patients who are obese and undergo lumbar spine surgery. Therefore, this QI project is considered to have a specific population focus. The group of interest for this QI health program is neurosurgical patients who are obese (based on BMI of 30 or greater) and have lumbar spine surgery. The QI site and Neurosurgery Clinic is located in the Midwest. Both the clinic and hospital are in an urban county. The county specific statistics show the QI site within the said county, to be ranked 29th out of 87 total counties for Health Factors (University of Wisconsin [WI] Population Health Institute, 2020). One aspect of Health Factors is obesity. The data from this healthcare report found 28% of adults in the QI site's county were obese (those 20 years and older were deemed "adults") (University of WI Population Health Institute, 2020). The incidence of obesity in this Midwest state and QI site's county are slightly lower than the national average of 40% (Hales et al., 2020). In Minnesota, greater than 30% of adults were obese in 2019 (Hales et al., 2020).

Problem Scope

Obesity is a well-known problem in the U.S., the QI site's state, and county (U.S. Preventative Task Force, 2018; University of WI Population Health Institute, 2020). The QI site currently serves sixteen counties and approximately 690,000 patients (Wikipedia, 2021). Over two million lumbar spine surgeries were performed in the U.S. in 2014 (Raad et al., 2019). The rates of elective spine surgeries have also increased over the years (Raad et al., 2019). In addition, a study performed by Young and Nestle (2002) on portion size found a significant

increase in the serving size of food-since the 1970's. For example, the United States Department of Agriculture (USDA) serving size of a cookie compared to the Food and Drug Administration (FDA), was over 700% larger (Young & Nestle, 2002). The result- increase in energy intake, which vastly outweighs energy expenditure. The equation is simple-but of profound concern for patients, healthcare providers, and the community.

Problem Consequences

The cost of doing nothing would mean insurmountable costs to patients and the healthcare system. The average annual medical cost per patient with obesity in the U.S. in 2014 was $1,901 more than their non-obese counterpart and was over $149 billion for all patients with obesity (Kim & Basu, 2016). A retrospective study by Planchard et al., (2015) included 3,270 patients who underwent elective spine surgery and found that obese patients compared to their non-obese counterparts had $1,632 in more costs. Obesity increases the risk of postoperative complications because there is more tension on the wound, less blood supply due to adipose tissue, longer operating room times, and higher blood loss (Bamgbade et al., 2007; Kalanithi, 2012; Tjeertes et al., 2015; Zusmanovich et al., 2018). Furthermore, these alarming healthcare costs are expected to rise dramatically in the upcoming years, which is detrimental to patients' lives and the healthcare system. If more of a focus is placed on preventing obesity instead of treating the multitude of diseases, then patients can reap the benefits of improved health and decreased postoperative complications.

A retrospective cross-sectional study performed by Kalanithi (2012) found patients with morbid obesity in comparison to non-obese patients had $23,743 more costs when they had a lumbar fusion and higher length of stay (LOS) ($p=.001$). In addition, a study performed on patients who had elective spine surgery demonstrated that BMI was an independent risk factor of

30-day hospital readmissions (Elsamadicy et al, 2016). Epstein (2017) found that morbidly obese patients who underwent elective spine surgery had higher postoperative complications.

Knowledge Gaps

Currently there is no preoperative standard of care for patients who are obese, based on BMI>30 and undergo elective lumbar spine surgery. Specialties, including orthopedics, have had success with decreasing postoperative complications with preoperative weight loss (Liljensøe et al., 2021). A 12-month randomized control study performed by Liljensøe et al. (2021) on patients who participated in an intense preoperative weight loss program prior to total knee replacement demonstrated improved body composition, lower cardiovascular risk, and 10% preoperative weight loss. This study affirms the problem with patients who are obese and undergo elective surgery. The profound problem of obesity is not unique to neurosurgical patients. This QI program aims to have similar effects, with decreasing postoperative complications through a preoperative intervention-MI and weight loss, but on a smaller scale.

In addition, this QI program focuses on knowledge deficits for patients and their nutrition status. It mirrors Healthy Peoples' 2030 goal which is to decrease the rate of obesity and improve nutrition. Weight is part of the BMI calculation and the obvious knowledge gap in this vulnerable population is reflected by Healthy People 2030 because it affirms the problem (Healthy People, 2020). Nutrition, weight, and BMI are all interconnected.

Proposed Solution

The proposed solution to this health problem is a QI project. This health program for this clinical project will utilize an APRN to promote weight loss through motivational interviewing (MI) via telephone office visits (telehealth), after their initial face-to-face consultation, for patients who are obese and undergo lumbar spine surgery. According to Patel et al. (2019),

motivational interviewing (MI) with telehealth interventions can provide meaningful weight loss. MI is a technique that utilizes collaborative conversation to strengthen a patient's own motivation and commitment to change (Rollnick, et al., 2008). Behavior change is at the foundation of MI. There are six stages of behavior change: pre-contemplation, contemplation, preparation, action and maintenance, and termination (Prochaska & Velicer, 1997). With MI, the healthcare provider utilizes change talk to focus on the patient's own ambivalence to promote a healthy behavior change (Rollnick, et al., 2008). The specific health behavior targeted with this QI project is weight loss, utilizing MI, which will be accomplished through implementing healthy nutrition habits. To fortify healthy eating habits for participants in this QI program, the MyPlate method will be utilized. The MyPlate method encourages patients to use a smaller plate for meals, where there are four groups on the plate: fruits, vegetables, grains, protein, and dairy is on the side. Half of the plate should consist of fruits and vegetables (U.S. Department of Agriculture, 2021). With MyPlate, there are smaller portion sizes, which leads to decreased intake to attain the goal of weight loss (Hughes et al., 2017).

A study performed by Dirnberger and Waisbren in 2020, demonstrated that postoperative telehealth visits were just as effective as face-to-face office visits and were more convenient for patients. The specific aim of this quality improvement (QI) health program is to promote preoperative weight loss for patients who are obese and undergo spine surgery, through MI to decrease postoperative complications within 30 days, postoperatively.

Due to the brief timeframe of the QI health program, the goals and outcomes will be modified because "meaningful" weight loss is described as 5% of body weight, which typically occurs over six months (Centers for Disease Control, 2020; Patel et al., 2019). The length of the health program will be six weeks and the goal loss of weight will be 2% of their initial weight at

consultation. After the six-week preoperative program, and 30-day postoperative appointment is complete, the frequency of postoperative complications will be measured at 30 days, postoperatively. The metrics will be the frequency of: infections, deep vein thrombosis (DVT), pulmonary embolism (PE), length of stay (LOS) and 30-day readmission rates. Patients' weights will also be measured at 30 days-postoperatively. A ten-year observational study performed by Thomas et al. (2014) found that 87% of the 2,886 participants maintained their 10% achieved weight loss over a ten-year period through diet and exercise.

The long-term goal would be for the patients to continue to lose weight throughout their postoperative course and maintain their weight loss and healthy eating and lifestyle habits. Since weight loss affects more than just lumbar spine health and postoperative complications, the implications of this QI project are multisystem. This QI project could positively impact other specialties who care for these mutual patients including primary care, endocrinology and cardiovascular.

Project Setting, Sponsor, Stakeholders, and Participants

The setting where the health program will be implemented is at a QI Neurosurgery Clinic in a Midwest state. The QI site is a large healthcare organization and cares for patients in 16 counties (Wikipedia, 2021). Patients for the health program are selected from QI site Neurosurgery Clinic and will have lumbar spine surgery at the QI site's hospital. The city where the QI site is located, is considered an urban community, based on population (City of St. Cloud, 2016).

An interprofessional team is a group of individuals with a common goal (Green & Johnson, 2015). The health program team members include: clinic nurses, neurosurgeons, advanced practice providers (APPs), schedulers, DNP chair, DNP mentor, and management. This

health program is interprofessional because several different specialists are involved in attaining a common goal for the QI site's Neurosurgical patients.

The stakeholders in this health program are: clinic managers, nurses, neurosurgeons, advanced practice providers (APPs), schedulers, the QI site's organization (clinic and hospital), patients involved in the study, patients' family, and me, the Doctor of Nursing practice (DNP) student and advance practice registered nurse (APRN), who will provide the intervention of MI to patients.

For this QI health program, the participants will need to meet specific guidelines. The inclusion criteria for this QI health program are the QI site's Neurosurgical patients who are 18 years or older, have a BMI of 30 or more, be able to consent to the health program, be offered lumbar spine surgery, have internet, have an active patient portal account through their electronic health record (EHR), and have a functioning scale to weigh themselves weekly. Exclusion criteria will be patients who are vulnerable adults, have documented underlying cognitive impairment or dementia, are currently in a weight management program, have a history of bariatric surgery, have documented hearing impairment *without* any hearing aid/assistant device, those who have a neurologic deficit and cannot wait six weeks to have surgery, no internet, and those who do not have a telephone. Inclusion criteria are essential to define the population target for the health program. Exclusion criteria are vital so accurate results and communication through MI and telephone interventions can be performed by the DNP student.

Organizational Needs Assessment/SWOT Analysis

An essential aspect of implementing a QI project is being aware of challenges and attributes of the organization/QI site. Strengths, weaknesses, opportunities, and threats (SWOT) will be reviewed for this QI site. The QI organization site has an exceptional director who

utilizes her leadership skills to collaborate with the interdisciplinary team and network with available resources to improve patient care. Fortunately, the QI site has a vast research department and a state-of-the-art EHR which is paramount for data extraction. Other rural QI sites may not have adequate resources for data extraction and the collaboration of a research team. In addition, the QI site has consultants and casual employees who are professors of nursing which can assist full-time staff with ongoing projects.

The QI site, specifically, clinic management has had high turnover rates. In the last eight years, there have been over six clinic managers. The current manager of the QI site clinic has been involved in the clinic for under one year and therefore the director has been the most supportive of this QI health program. In addition, the clinic recently added a financial manager three months ago. The lack of steady direct management has had a negative impact on all staff members within the clinic. Not surprising, with the high turnover of clinic managers, there has been nursing and scheduler staff turnover. These vital positions are essential in implementing a seamless QI project. Other QI sites that have consistent management may have less hurdles because of dedicated, knowledgeable staff. One last concern is vaccination mandates. Although the health and safety of our staff are paramount, there have already been two people who have left. Staff shortages increase workload burden, which can negatively impact the implementation of change, even if it is on a micro-level.

Policy changes at the QI site clinic for nursing staff and non-licensed staff are being implemented monthly. Scope of practice policies are being revised and created to improve patient care. This will positively impact staff because they will be more educated on what a person in a specific role can or cannot do. The QI site also has monthly Neurosurgery section meetings to communicate any new changes. This opportunity will enhance communication and

the DNP student will also get to present the QI program, prior to sending out emails. The meeting will reinforce the importance of the QI project as it relates to positively impacting patient care and outcomes. If the QI project is successful, a new policy could be implemented.

In an ongoing pandemic, threats exist and can be detrimental to the success of this QI project. For example, when I submitted my application request for data extraction, I was unable to select the highest level of significance, because more pressing data (e.g., Covid19 data) are of higher priority. There is a supply and demand problem with a limited amount of data extractors and the demand for big data, there is a supply and demand problem. Data extraction takes time, and the Doctor of Nursing practice (DNP) Project Lead's requests are not a priority as it relates to the significance of a more vulnerable population and problem. Despite this threat, the director of the department requested a QI nurse to assist in the process and application to expedite the request for this QI project.

Literature Search Process

Search terms utilized for this literature review included: best practice for obesity, ambulatory spine surgery, protocols, elective lumbar spine surgery, spine surgery, postoperative complications, obesity, best practice, efficacy, effectiveness, clinical decision support, efficacy, health belief model, weight loss, perioperative care, behavior change, motivational interviewing, portion control, and obesity prevention. Boolean phrases included AND with multiple of the above listed searched terms.

The databases and clinical practice sites searched for this paper were: The College of St. Scholastica's Searching Online Library Academic Resources (SOLAR), google scholar, google, National Institutes of Health (NIH), Cumulative Index of Nursing and Allied Health

Literature(CINAHL), Uptodate, Agency for Healthcare Research and Quality (AHRQ), Pubmed, Center for Disease Control (CDC) and Elsevier.

The articles were further narrowed by publication year, English language, peer review, level of evidence, sample size, and relevance to the topic. Exclusion criteria for this paper were children (considered less than 18 years old). Studies involving spine surgery related to an oncological process were excluded because this population often has an underlying nutritional or malabsorption diagnosis. The articles also had to be published within the last ten years, except for historical studies.

Literature Matrix Table

The literature matrix table is another way to visualize the articles within an organized categorical format. The matrix used for this QI project has the following column headings: reference, level of evidence, purpose/question, design, sample, intervention, results, and notes. The matrix table can be used as a quick reference to the reader, instead of reviewing the tenuous reference list. Please see Appendix 1.

Literature Synthesis

The levels of evidence varied from one through five, with one being the most clinically sound evidence. The obesity pandemic was well documented. Numerous articles demonstrated obesity is on the rise (Fryar et al., 2020; He et al., 2020; U.S. Preventative Task Force, 2018). There were two systematic reviews and one clinical practice guideline (CPG). Two studies found weight-loss counseling was successful with a multimodal approach of a mobile application and a registered dietitian (Haas et al., 2019; Heideman et al., 2019). This QI project utilizes a similar technique: telehealth, MI by a healthcare professional and the EHR for communication. The second systematic review found patients with obesity had increased healthcare costs, compared

to their non-obese counterparts (Kim & Basu, 2016). The CPG reinforced Haas et al., (2019) study about the need for a multidisciplinary approach to weight loss (Heideman et al., 2019; Wharton et al., 2020).

Several category three studies emphasized the profound impact of obesity on postoperative complications. The factors influencing postoperative complications include: tension on the wound, less blood supply from adipose tissue, longer operating room times, and higher blood loss (Bamgbade et al., 2007; Elsamadicy et al., 2016; Kalanithi, 2012; Lang et al., 2017; Lee et al., 2017; Tjeertes et al., 2015; Zusmanovich et al., 2018).

Motivational interviewing (MI) has been shown to be an effective method for weight loss and utilizes the stages of behavior change (Patel et al., 2019; Prochaska & Velicer, 1997; Rollnick, et al, 2008). MI is when the healthcare provider utilizes change talk to focus on the patient's own ambivalence to promote a healthy behavior change (Rollnick et al., 2008). This technique can be utilized in numerous healthcare settings and was first utilized in psychology (Rollnick et al., 2008).

Theoretical Framework

The Health Belief Model (HBM) was developed in the early 1950s by social scientists in the U.S. to try and understand the relationship between the lack of community members seeking free healthcare. The six main principles of the HBM include: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cue to action, and self-efficacy (National Institutes for Health [NIH], 2005). One similarity of this theoretical framework and the QI project is that the program also provides complementary healthcare, just like when the HBM was created.

Research studies have shown when obese individuals acknowledge the risk and receive proper education (perceived susceptibility and severity), they can continue to act with interventions and self-efficacy (Das & Evans, 2014; Saghafi-Asl et al., 2020). A cross-sectional study performed by Saghafi-Asl et al. (2020) found the college students in the underweight group who were compared to normal weight and overweight participants had higher perceived self-efficacy (p=.001). Although no specific literature is available regarding utilization of the HBM for patients who are obese *and* undergo spine surgery, the model would be applicable to this high-risk population. The HBM parallels some of the concepts of MI with enhancing the patient's own ambitions and health beliefs related to the intended healthy behavior change. The DNP student would utilize the HBM when they counsel the patient on weight loss and interventions. In addition, the HBM supports the QI site's mission statement, "Because Health Means Everything" (CentraCare, 2021).

Change Theory

Change theories enhance the QI project change. The change theory for this QI health program is Lewin's Change Theory. It is a three-step model. The first step is to "unfreeze" the current practice (Hussain et al., 2018). For this QI project, there is no current best practice for patients who are offered lumbar spine surgery and are obese. So, changing the status quo will be the unfreezing process.

The second step is to "change" the current practice and encourage a new perspective. The goal: to look at obesity and the imperativeness for proactive weight loss for our patients. The change process will be most affected by those who are not informed of the clinical significance of the problem. This QI program will help alleviate the resistance to change by educating the multidisciplinary team about the scope of the problem.

The final stage is “refreezing” which entails implementing the new change. If this QI program is successful, it will provide a new practice change. This change would be in the form of setting a new standard of care for patients who are obese and offered lumbar spine surgery. It would enhance patient care and improve their postoperative outcomes.

Theory Application/Clinical Fit

Lewin’s Change Theory was created in the 1950’s but is still pertinent to current times. It is a concise model based on change (Hussain et al., 2018). It is applicable to this QI project, because the goal is to elicit a healthy behavior change through MI. The change model melds to the goal and purpose of this QI project, because remaining stagnant would be detrimental to our patients, their health, and the healthcare system.

Project Goals: Overall Goals/Mission Statement

The QI site’s mission statement is, “Because Health Means Everything” (CentraCare, 2021). This mission statement is holistic and inclusive because it is a collective statement to alert the consumer and patient on the multifaceted nature of health. “Everything” in the mission statement implies the importance of health across the spectrum of life. “Means Everything” also focuses on the priceless, sacred nature of health.

There are several goals for this QI health program and the mission is embedded through all of them. The mission statement for this quality improvement health program is, “You have the power to take the first step: Together we can achieve a healthier You.” This mission statement mirrors the QI site’s circular focus on health. The addition of the “first step” engages and empowers the patient. “Together” highlights the collaborative approach of how the patient will attain an improved state of health with the healthcare provider. The patient is not alone on the destination to achieve an improved version of themselves. Another meaning of “Together” is

the utilization of MI *and* preoperative weight loss. The "You" focuses on accountability and to center the patient on themselves, because this is *their* body, and they have the opportunity to improve it. The mission statement for this QI health program embodies the aim to promote preoperative weight loss for patients who are obese and undergo spine surgery, through MI and decrease 30-day postoperative complications. This mission statement helps the patient envision the imperativeness of taking the first step on their health journey.

This quality improvement (QI) health program was developed based on a needs assessment of QI site's Neurosurgery patients, in an urban county in a central Midwest state. In the Midwest state, greater than 30% of adults were obese in 2019 (Hales et al., 2020). Similar to the state average, 28% of adults in the QI site's county were obese (those 20 years and older were deemed "adults") (University of WI Population Health Institute, 2020). This QI site and health program has one essential objective for its Neurosurgery patients: to decrease postoperative complications, 30 days postoperatively, for patients who undergo lumbar spine surgery and are obese, through motivational interviewing (MI). MI is an evidenced-based intervention which has been utilized in multiple specialties to improve health and weight loss including psychology, primary care, and weight management (Barnes & Ivezaj, 2015; Patel et al., 2019). This QI health program utilizes the SMART format for goal setting (specific, measurable, achievable, relevant, and time-bound) (Center for Disease Control, n.d.).

Project (SMART) Objectives

Objective 1

The first objective is to educate the interdisciplinary Neurosurgery team via PowerPoint on (QI) Health Program with a confirmatory follow up email received by November 1st, 2021. The target response rate is >60%.

Implementation. Education of the interdisciplinary team will take place by sending a group email through a concise PowerPoint presentation about the QI health program. It will take the reader less than five minutes to read. Prior to sending out the PowerPoint, it will first be vetted by the Neuroscience Spine Clinician and Neuroscience Educator to confirm the proper format and content. A study by Gambari et al. (2015) found PowerPoint presentations to be superior compared to traditional methods of learning such as chalkboard or written presentations.

Outcome Measure and Evaluation. The objective will be measured with a confirmation email that will be sent to me, the DNP student. The last slide of the PowerPoint presentation and the brief email will request the reader to email me any questions or concerns. The request for the confirmation email will be seven days after the initial email is sent out. If the benchmark of 60% is not achieved, a second email will be sent out. The method to achieve this outcome is via email and the statistical analysis will be based on the percentage response rate.

Objective 2

The second objective is to enlist 5-10 patients at the QI site, who are obese, based on a BMI of >30 and are offered spine surgery through APP/Neurosurgeon staff recruitment by November 15th, 2021.

Implementation. The recruitment of patients will take place over a two-week period (ten business days) after the interdisciplinary team has been educated about the QI health program. Neurosurgery providers and nursing staff will send a secure message to me about eligible candidates. There will be a one-page flyer, written at a sixth grade reading level. The rationale for this reading level is because most Americans read at an eighth grade level or lower

(Stossel et al., 2012). Readability of patient education materials is essential. When the information is more readable, it can be better understood, so that the outcome can be achieved. The information sheet/flyer will also be placed in the Neurosurgery clinic exam rooms, during the recruitment phase. My contact information (the DNP student) will be on the flyer, so patients can call and leave a voicemail if they have questions about the QI Program. If they agree to participate in the QI health program, a message will be sent through MyChart which will include an informational PowerPoint video to learn about the program. MyChart is part of the Electronic Privacy Information Center (EPIC) system, where patients can electronically interact with their care team (Epic Systems Corporation, 2021). If they want to enlist in the program, they will send me a message through MyChart, and I will send them a consent for the program. I will also send them a second PowerPoint link about the MyPlate method, before the QI Program starts.

Once the recruitment phase is completed, with a total number of participants, in the MI intervention group, the same number of patients will be selected for the control group (non-MI intervention). The control group will be randomly selected from a surgery que and have similar inclusion criteria at the MI intervention group (BMI>30 and be offered lumbar spine surgery).

Outcome Measure and Evaluation. The outcome measure and evaluation will be confirmed, when a total of 5-10 participants are signed up for the QI health program. Once they are signed up, I will add myself to their treatment team in the electronic health record, Electronic Privacy Information Center (EPIC). This outcome will be achieved by utilizing a multidisciplinary healthcare team. Descriptive statistics with Intellectus software, will be applied to measure and evaluate the two groups.

Objective 3

The third objective is for patients enlisted in the QI program to complete their consent via electronic health record (EHR) by November 21st, 2021.

Implementation. The DNP student will confirm the patient has an active MyChart (a patient portal to access their electronic health record), prior to signing up for the QI project. This will ensure that the patient can receive all important documents, including the consent, to fully participate in the QI health program.

Outcome Measure and Evaluation. The evaluation of this goal will be complete once the DNP student checks EPIC and confirms all participants have signed and dated their consent forms. If they have not, the DNP student will send them a message to remind them to complete this. The last reminder, if needed, will be a telephone call.

Objective 4

The fourth objective is for patients in the QI program to attend and complete six weeks of the telehealth visits in the QI Health Program by January 2nd, 2022.

Implementation. The schedulers will contact patients in the QI program and schedule all six office visits with the DNP student once they are enrolled in the program. This will enhance adherence so the participant can plan. The QI site also has automatic reminders for patients which they receive through their cell phones.

Outcome Measure and Evaluation. If participants in the QI Health Program intervention group do not complete the entirety of their six-week office visits, then the total number of participants will be affected. Completion of the number of office visits will be measured in percentage format. The evaluation will use descriptive statistics.

Objective 5

The fifth objective is for patients in the QI program will be to lose 2% of their body weight through MI, document weekly weights, and complete their seven question survey by January 2nd, 2022.

Implementation. The DNP student will provide weekly telehealth visits to the enrolled participants for a 20-minute visit, for six consecutive weeks. The schedulers will schedule the office visits. Nursing staff will "room" (contact the patient and collect their weight verbally and document it in EPIC and let me know they are ready to start their visit). The visits will be non-billable. Through the utilization of MI, the DNP student will teach the patient about portion control through the MyPlate method. The MyPlate method encourages patients to use a smaller plate for meals, thereby decreasing portion size (Hughes et al., 2017). Patients will be given a seven question survey about the program including intake of fruits, vegetables, preference of in person versus telehealth visits and if they would recommend the program to all patients.

Outcome Measure and Evaluation. The outcome will be tracked weekly through data extraction from EPIC at the end of each week and after the six-week QI health program. The data will be stored in a Health Insurance Portability and Accountability Act (HIPAA) compliant drive, which the QI site owns. This outcome will be achieved if the participants meet their 2% body weight loss goal. There will also be a comparative analysis of those in the MI group compared to the control group. The survey will be compared to the pre-QI program survey. The evaluation will be presented in bar graph format, for a pictorial representation.

Objective 6

The sixth and final objective is for patients participating in the QI program to show reduced postoperative complications at their one-month postoperative visit as evidenced by the DNP Project Lead's review of the EHR.

Implementation. The prerequisite to this objective is for the participants to have completed their six-week preoperative telehealth visits. Unlike the six-week preoperative telehealth program, the one-month office visit can be done face-to-face. The patient's weight will be entered in EPIC by the nursing staff. The patient will fill out another Oswestry Disability Index form (ODI). This will be done when I see the patient for their one month, postoperative office visit.

Outcome Measure and Evaluation. This objective will be measured and evaluated through data extraction. I will review EPIC to evaluate if there was any documented postoperative complication(s). The postoperative complications and data values that will be reviewed include: wound infections, deep vein thrombosis, length of stay (LOS), 30-day readmission rates, and pulmonary embolism. I will compare the participants in the QI program who were in the MI/intervention group to the control group.

The method to achieve this outcome measure will be with EPIC, and the multidisciplinary healthcare team because data will be extracted from EPIC. The database will be utilized as a comparison for statistical analysis. The statistical analysis will be nominal and ordinal because patient demographics (e.g., age) will be included in the BMI category. The percentage of postoperative complications is another component of statistical analysis. This objective is a process measure because it utilizes prevention measures (weight loss through MI)

on patients with a known problem (obesity based on BMI of greater than 30). It is also an outcome measure because it reviews postoperative complications.

Methodology and Influencing Factors

The methodology to implement this QI project will require the support of the multidisciplinary team. In addition, the DNP student will be the leader and support all questions and concerns from staff and participants. One of the significant influencing factors will be the staff shortage at this QI site during an ongoing pandemic.

Pre-implementation: Protection of Human Subjects

The pre-implementation phase for this quality improvement (QI) project will include separate requirements for the interdisciplinary team. The interdisciplinary team will include: me, the Doctor of Nursing practice (DNP) student lead, nurses, managers, schedulers, neurosurgeons, and advanced practice providers (APPs). The DNP student completed a short clinical/observation experience, this past summer, with Weight Management registered dietitians (RDs) who are also health coaches and the advanced practice provider (APP) lead. The DNP student read a recommended book, "*Motivational Interviewing in Healthcare*" which has four guiding principles (RULE): resist the righting reflex (R), understand/explore the patient's own motivations (U), listen with empathy (L), and to empower the patient (E) (Rollnick et al., 2008). The DNP student also received permission from the authors to use the principles in the book for the QI project. The DNP student attended a two-day course on motivational interviewing (MI) to further enhance her knowledge and provide optimal patient care for the QI program.

The DNP student will complete the DNP project application for the QI program site and present it to their review board in late October. The DNP student will also apply to The College

of St. Scholastica's Institutional Review Board (IRB). If both review boards grant permission, the DNP student will proceed to the next phase.

The interdisciplinary team at the QI project site will be educated by sending a group email through a concise PowerPoint presentation about the QI health program. Prior to sending out the PowerPoint, it will first be vetted by the Neuroscience Spine Clinician and Neuroscience Educator to confirm the proper format and content. The goal is to attain a 60% or greater response to the educational PowerPoint by staff via email confirmation. If the response rate is below the goal, a second email will be sent.

This quality improvement (QI) health program will include a pilot group: up to ten patients who are obese, based on body mass index (BMI) of >30 who are offered spine surgery. I, the Doctor of Nursing practice (DNP) student, will have direct contact with all participants in the program and patient data will be collected. Therefore, both application of ethical standards and the Health Insurance Portability and Accountability Act (HIPAA) will be followed, judiciously.

The 45 Code of Federal Regulations (45 CFR) 46 is the United States (U.S.) Department of Health and Human Services (HHS) policy that protects human subjects involved in research (HHS, 2021). There are multiple subparts for various human participants and the last revision was made in 2018 (HHS, 2021). CSS follows 45 CFR 46 and subpart 117, specifically requiring written informed consent by the participants. This document ensures patients understand what is being asked of them and what information will be utilized in the QI health program (HHS, 2021). There are two IRB boards: CSS and the QI site. I have contacted the DNP research department at QI site and the application process has been initiated. I also need to obtain CSS IRB approval.

Implementation

Patients enrolled in the QI health program will be required to have an active MyChart account (an electronic tool to access health records and communicate with care team members). Prior to starting the program, they will have two tasks: to sign a consent form via MyChart and watch two short YouTube videos (created by the DNP student), one explaining the program, the second describing the MyPlate method.

The DNP student will monitor the participants in the QI program via the electronic health record (EHR) for five postoperative complications: infection, deep vein thrombosis (DVT), pulmonary embolism (PE), 30-day readmission rates, and length of stay (LOS). Two additional data values will be monitored and include weekly weights and Oswestry Disability Index scores, (ODI). The participants will be given one brief survey once enrolled in the program and another survey after the QI health program. The purpose of the surveys are to collect qualitative and quantitative data about the QI program, for future use. Please see Appendix 4 for the surveys.

Each participant will receive six weekly 20 minute visits via telehealth with the DNP student. The schedulers will schedule all office visits. The visits will be non-billable. Please see Appendix 5 for the MI note template. Nursing staff will "room" the patients. Through utilization of MI, the DNP student will teach the patient about portion control through the MyPlate method. The MyPlate method encourages patients to use a smaller plate for meals, where there are four groups on the plate: fruits, vegetables, grains, protein, and dairy is on the side. Half of the plate should consist of fruits and vegetables (U.S. Department of Agriculture, 2021). With MyPlate, there are smaller portion sizes, which leads to decreased intake to attain the goal of weight loss (Hughes et al., 2017). The goal of weight loss for patients in the QI program is 2%.

The DNP student will review the data from participants in the QI program weekly. The data will be stored on a spreadsheet in a secure drive, approved by the project site compliance

officer. The data analysis platform will be Intellectus Statistics, which is provided by The College of St. Scholastica (CSS). ODI scoring is completed by the patient and entered into the electronic health record (EHR) by nursing staff. ODI is currently a standard of care at the QI project site and given to patients at their initial consult and at their postoperative appointment(s). ODI is a valid and reliable tool that is a type of patient-reported outcome and uses a Likert scale. The higher the total score is, the more disabled the patient is by their pain/condition (Asher et al., 2020; Khor et al., 2018). In addition, a case report study of 53 patients, performed by Coronado et al. (2020) regarding physical activity after surgery found that an average improvement in ODI scores of 30% was acceptable. So, if a patient has an ODI score of 70% prior to surgery, it would be projected to decrease to 40%.

Post-Implementation/Monitoring

The analysis was mixed methods because there were both qualitative and quantitative data from patient's surveys which included a Likert scale and open-ended questions. A T-test was utilized to compare two groups. The two groups were those in the QI program and those not in the program. The charts were reviewed for five postoperative complications: infection, DVT, PE, 30-day readmission rates, and LOS. Intellectus was used to complete the above listed analysis.

There were several anticipated challenges to implementing the QI program. The paramount concern was staffing. Like any QI project site, everyone is short-staffed and learning something new, even if it involves a slight change to current practice, is concerning. The DNP student tried to abate this by always encouraging staff to voice their concerns and tried to empower the staff member. If there were additional concerns beyond the DNP student's scope of

practice, the site manager or QI project mentor would be contacted. At the completion of this QI program, there were no occurrences.

The second concern was patient adherence to the MyPlate method. The DNP student re-evaluated and utilized MI principles at each of the six visits to encourage and modify the participant's plan (e.g., giving up late night snacking). The third challenge was completion of the program. The rationale for the six-week timeframe for the QI program is because most private insurance companies, such as Blue Cross Blue Shield of Minnesota (BCBSMN) (2021) require six weeks of conservative treatment (usually deemed as physical therapy, medication therapy, chiropractic care, epidural steroid injections) and fail these interventions, before a prior authorization is given to proceed with lumbar spine surgery. So, the goal was to optimize patients' health by also working on weight loss while they are in insurance required physical therapy.

In addition, once the QI program is fully completed, the required form will be submitted to the Institutional Review Board. The data collected during this QI health program followed both the policies of the academic institution, QI site review board and federal regulations. If there were any breaches in the data, the involved participants would have been alerted in a timely manner. There have not been any data breaches, so far.

Communication Matrix: See Appendix 6

Implementation/Work Plan

A work plan is like a map of where people are needed, so everyone can be accountable and accomplish their task. A devoted interdisciplinary team is essential to implement a successful QI project. At the forefront of a work plan is skillful communication and education.

The key players cannot be accountable if they do not know their role and task. The clinic manager at the QI site sent out a daily email of where the clinic staff were and who was responsible for specific duties. This process continued for the QI project and staff could reference the email so they would know when the DNP student would be seeing patients in the QI program and how to contact her if there were any questions or concerns.

Project Tasks, Stakeholders, Participants, Administration

The director at the QI site approved the QI project to take place. She networked with other specialists within the organization and acted as the project manager, until all key members were connected with the DNP student. The QI site mentor for the DNP student provided additional support and helped guide her project through challenges at the QI site. The stakeholders were the interdisciplinary team at the QI site. The participants had the responsibility to watch two videos and sign a consent to start the QI program. They were accountable for weighing themselves weekly and attending all six telehealth office visits and one face-to-face postoperative office visit.

Milestones, Critical Events

Milestones are completed tasks and goals accomplished during the preparation and implementation of the QI project. The DNP student had several meetings with the QI site department to discuss the initiation, progress, and completion of the QI project. These meetings consisted of many key players which included: management, directors, neurosurgeons, APPs, nurses, and surgery staff.

A critical event in this QI program was the lack of participants. The initial goal was to enroll 5-10 patients. Due to a multitude of factors, of the twenty eligible patients who fit the inclusion criteria, only one participated. Another possible critical event would be if participant(s)

dropped out of the program. Thankfully, the one patient who participated in the QI project, completed the program.

Gantt Chart: See Appendix 2

Logic Model: See Appendix 3

Budget

There were no costs incurred to the patient for participation in this QI health program. The DNP student provided six complimentary telehealth visits to the patient, prior to their scheduled spine surgery. The goal of no cost visits was to entice participants, but also improve patient care. The DNP student provided office visits on her scheduled day off. The staff needed to schedule and "room" the patient(s). Staff were paid their routine hourly wage. Since there was only one patient, the budget costs were minimal. This is because the staff were working their routine hours. The importance of having a minimal budget is vital in a pandemic because of the financial burden associated with change and staffing shortages.

Key Facilitators, Barriers, and Unintended Consequences

Key facilitators of this QI project included the: QI site, multidisciplinary team, and DNP student-who is the lead of the QI project. Strengths of this program were the utilization of telehealth and the complimentary benefits of office visits to the participants. The patient also received a free MyPlate as a visual tool to use this method for eating. The weakness of this project was the short course of six weeks. Studies show "meaningful" weight loss takes six months (Centers for Disease Control, 2020; Patel et al., 2019). In addition, a study done by Fruh (2017), demonstrated obese patients who had frequent follow-ups with their healthcare provider, could maintain their weight loss for longer than twelve months, compared to those who had less visits.

There were no unintended consequences for this QI project. If they did occur, it would involve emotional distress from a discussion about weight and weight loss, as many patients who are obese have an unhealthy relationship with food. This did not occur for the one participant in the QI program; however, if it had, the DNP student would have offered an appropriate referral to psychology.

Project Sustainability/Future Directions

The sustainability of this QI project is vital to enhance patient care. Instilling healthy habits for patients who are obese is a lifestyle change. This project was like a sprint, and the ongoing need is like an eternity of marathons. There were struggles along the way, but when altruistic healthcare providers treat patients, relationships were established, and barriers were broken. At the end of this QI project, patient #1 was offered a referral to the QI site's Weight Management program or to a Registered Dietitian. Patient #1 declined these consults and wanted to work on weight loss on their own.

Results from Data Collection

The results from this QI project were collected from the EHR one a weekly basis by the DNP student and filed in a secure drive approved by the QI site. The data was manually entered into Intellectus statistics software. In adherence with HIPAA, the two patients who were in this QI project were de-identified and given names of patient #1 and patient #2. The MI intervention patient was (patient #1) and the non-intervention patient was (patient #2). Both patients met inclusion criteria with BMI>30 and had lumbar spine surgery.

Providers and nurses alerted me with potential candidates and their dates of surgery, via the EHR. Then I contacted possible participants either via telephone if they did not have MyChart or through MyChart. The initial recruitment phase was extended by four weeks, secondary to lack

of participants. There were a total of 20 eligible participants. Four candidates showed interest in the QI program but ultimately did not sign up. Some of the reasons given were: overwhelmed with insurance companies already requiring smoking cessation, patient's spouse desire to be in the program-but not the patient, apprehension about accomplishing weight loss, overwhelmed by pain and their clinical condition(s), and disinterest in change.

The statistical analysis was limited because there were only two participants in the QI program. A multitude of statistical analysis requires a minimum of three or greater participants. Preoperative ODI scores were compared; however, patient #2 did not have any postoperative ODI score. The reason for the limited ODI scores (preoperative only) for patient #2 is because there are no standard postoperative ODI scores at the QI site. This is a limiting factor because assumptions cannot be validated without a comparison score. Patient #1 had both preoperative and postoperative ODI scores because he was in the MI intervention group. His ODI score showed significant improvement from 32% preoperatively to postoperatively 8%. The higher the ODI percentage, the more disabled the patient is by their condition (Asher et al., 2020).

There were no unexpected consequences or ethical implications. One factor which was not anticipated was patient travel during the QI program. Food access is a notable variable which was not predicted. This could have had negative consequences on patient #1's weight loss goal because more processed food was eaten during the travel and lack of access to home cooked meals and choice with portion size was not an option.

The results from the data collection were analyzed using mixed methods because there were both qualitative and quantitative data from patient's surveys which included a Likert scale and open-ended questions. A T-test was utilized to compare two groups. The two groups were those in the QI program and those not in the program using five postoperative complications:

infection, DVT, PE, 30-day readmission rates, and LOS. Intellectus was used to complete the above listed analysis.

Two-Tailed Paired Samples *t*-Test

A two-tailed paired samples *t*-test was conducted to examine whether the mean difference of wound infection and BMI class was significantly different from zero. Levene's test was conducted to assess whether the variances of wound infection and BMI class were significantly different. The result of Levene's test was significant based on an alpha value of .05, $F(1, 2) = 8.11 \times 10^{31}$, $p < .001$. This result suggests it is unlikely that wound infection and BMI class were produced by distributions with equal variances, indicating the assumption of homogeneity of variance was violated.

The result of the two-tailed paired samples *t*-test was not significant based on an alpha value of .05, $t(1) = -3.00$, $p = .205$, indicating the null hypothesis cannot be rejected. This finding suggests the difference in the mean of wound infection and the mean of BMI class was not significantly different from zero. The results are presented in Table 1. A bar plot of the means are presented in Figure 1.

Table 1

Two-Tailed Paired Samples t-Test for the Difference Between Wound Infection and BMI Class

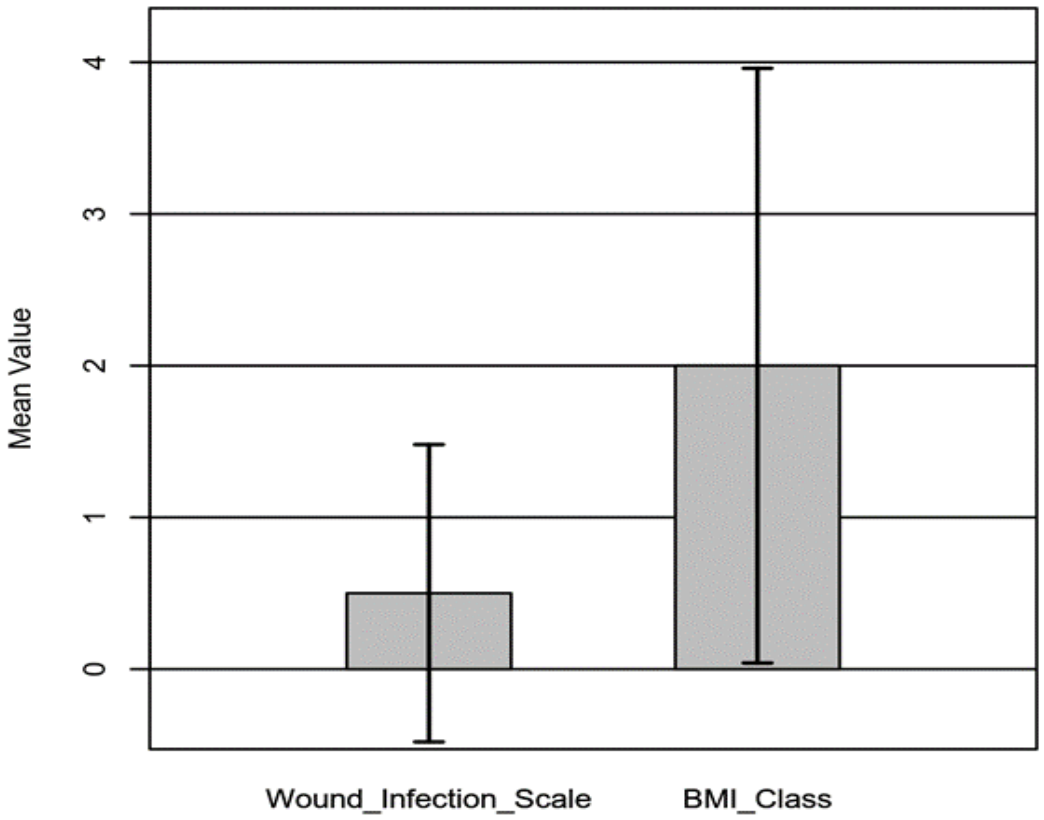
Wound Infection		BMI Class				
M	*SD*	*M*	*SD*	*t*	*p*	*d*

0.50	0.71	2.00	1.41	-3.00	.205	2.12

Note. N = 2. Degrees of Freedom for the *t*-statistic = 1. *d* represents Cohen's *d.*

Figure 1

The means of Wound Infection and BMI Class with 95.00% CI Error Bars



Two-Tailed Wilcoxon Signed Rank Test

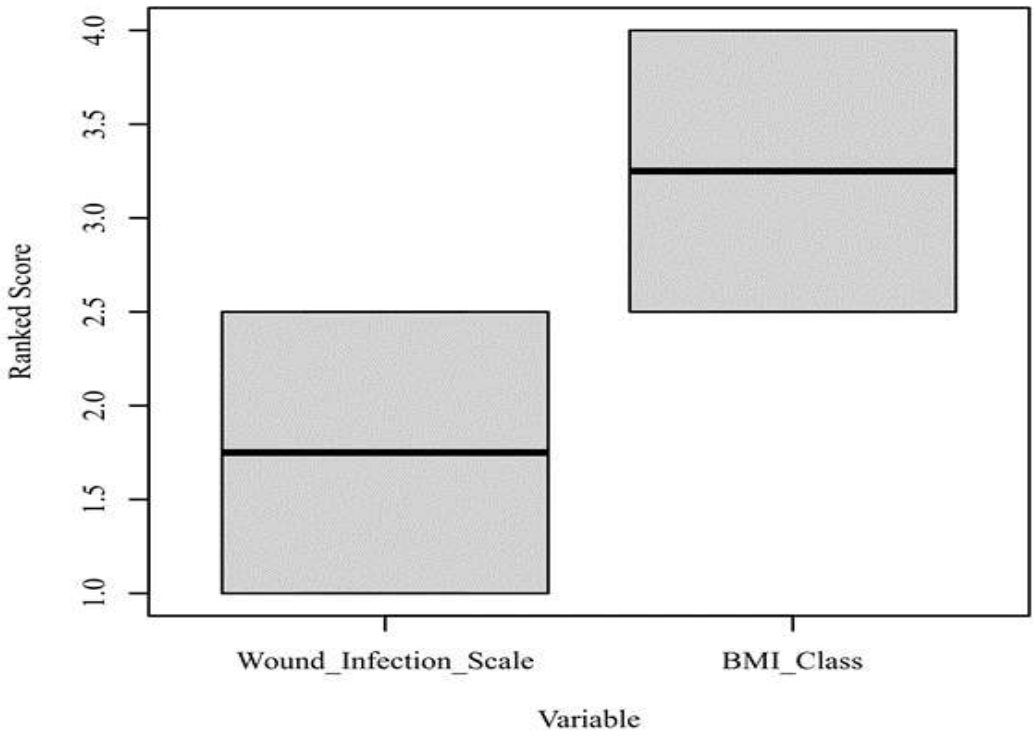
A two-tailed Wilcoxon signed rank test was conducted to examine whether there was a significant difference between wound infection and BMI class. The two-tailed Wilcoxon signed

rank test is a non-parametric alternative to the paired samples *t*-test and does not share its distributional assumptions (Conover & Iman, 1981).

The results of the two-tailed Wilcoxon signed rank test were not significant based on an alpha value of .05, $V = 0.00$, $z = -1.34$, $p = .180$. This indicates that the differences between Wound infection ($Mdn = 0.50$) and BMI class ($Mdn = 2.00$) are explainable by random variation. Figure 2 presents a boxplot of the ranked values of Wound infection and BMI class.

Figure 2

Ranked values of Wound Infection and BMI Class



Summary Statistics

There were insufficient observations to calculate summary statistics for: DVT, readmission, PE, wound infection, and LOS. When the skewness is greater than 2 in absolute value, the variable is considered to be asymmetrical about its mean. When the kurtosis is greater than or equal to 3, then the variable's distribution is markedly different from a normal distribution in its tendency to produce outliers (Westfall & Henning, 2013). The summary statistics can be found in Table 2.

Table 2

Summary Statistics Table for Interval and Ratio Variables for patient #1

Variable	*M*	*SD*	*n*	SE_M	Min	Max	Skewness	Kurtosis
PE	0.00		1		0.00	0.00		
Readmission	0.00		1		0.00	0.00		
DVT	0.00		1		0.00	0.00		
LOS	0.00		1		0.00	0.00		
Wound Infection	0.00		1		0.00	0.00		

Note. '-' indicates the statistic is undefined due to constant data or an insufficient sample size.

Descriptive Statistics

Summary statistics were calculated for PE, Readmission, DVT, LOS, and Wound Infection. There were insufficient observations to calculate summary statistics for: DVT, readmission, PE, wound infection, and LOS. When the skewness is greater than 2 in absolute value, the variable is considered to be asymmetrical about its mean. When the kurtosis is greater than or equal to 3, then the variable's distribution is markedly different from a normal distribution in its tendency to produce outliers (Westfall & Henning, 2013). The summary statistics can be found in Table 3.

Table 3

Summary Statistics Table for Interval and Ratio Variables Patient #2

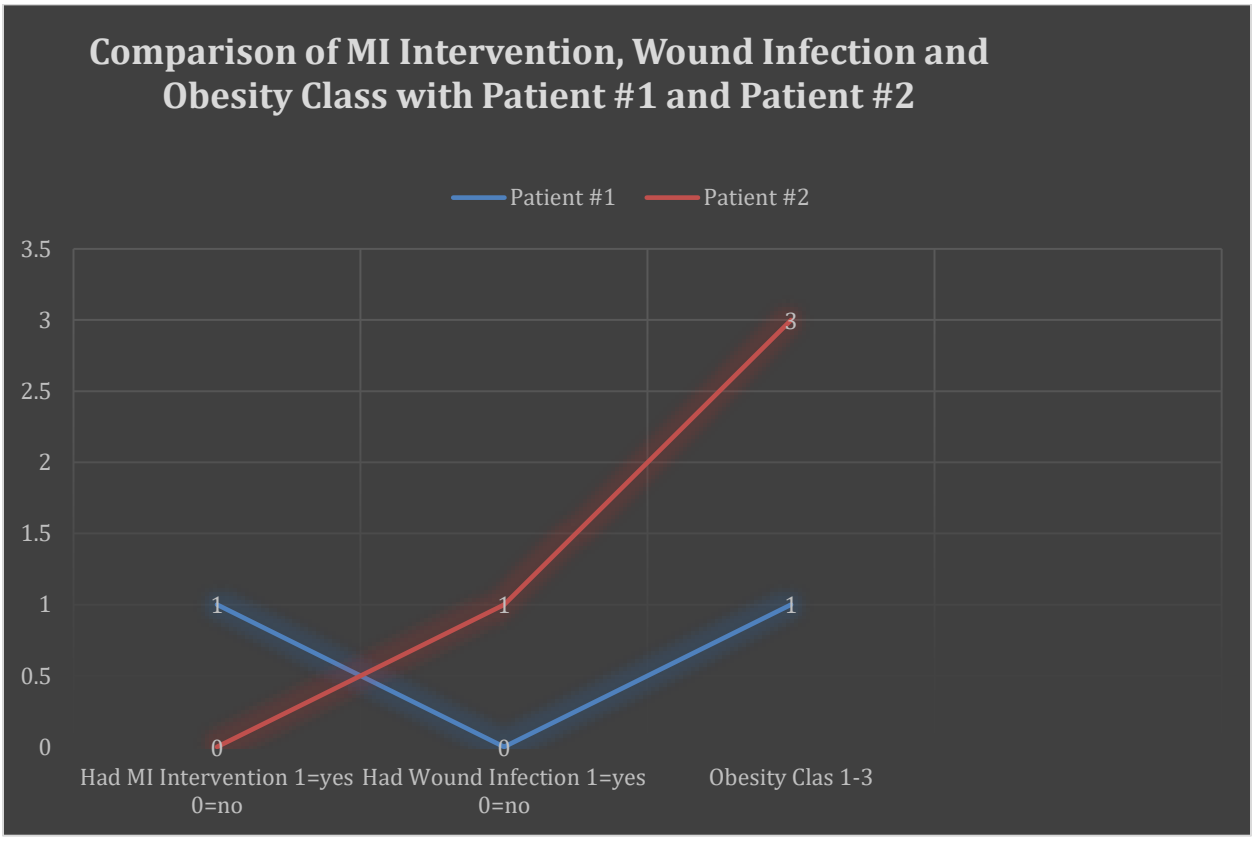
Variable	*M*	*SD*	*n*	SE_M	Min	Max	Skewness	Kurtosis
PE	0.00		1		0.00	0.00		
Readmission	0.00		1		0.00	0.00		
DVT	0.00		1		0.00	0.00		
LOS	0.00		1		0.00	0.00		
Wound Infection	1.00		1		1.00	1.00		

Note. '-' indicates the statistic is undefined due to constant data or an insufficient sample size.

A line graph was created to compare patient #1 (MI intervention) and patient #2 (non-intervention) BMI class and occurrence of wound infection. Given the limited data, there were

only two lines and six points for the graph. There was a correlation with higher BMI class, and wound infection. There was also a correlation with wound infection, and not having the QI MI intervention. These results are summarized in Figure 3.

Figure 3



Pre/Post Surveys

A pre and post survey was administered to patient #1 with four repeated questions about: daily servings of vegetable, daily servings of fruit, motivation to change and lose weight, and if they felt eating habits contributed to their current weight. Motivation to lose weight was answered on a 1-5 Likert scale. There was one open-ended question in the post-survey questionnaire which asked the participant if he would recommend this QI MI program to all

patients who met inclusion criteria. The patient *did* recommend this QI MI program to all patients who meet inclusion criteria. The results are listed below in Figure 4.

Figure 4

Patient #1	Vegetable intake (number of servings/week)	Fruit intake (number of servings/week)	Motivation to lose weight (Likert scale 1-5)	Eating habits, contributing factor to current weight
Pre-MI	7	3	4	Maybe
Post-MI	21	11	3	No

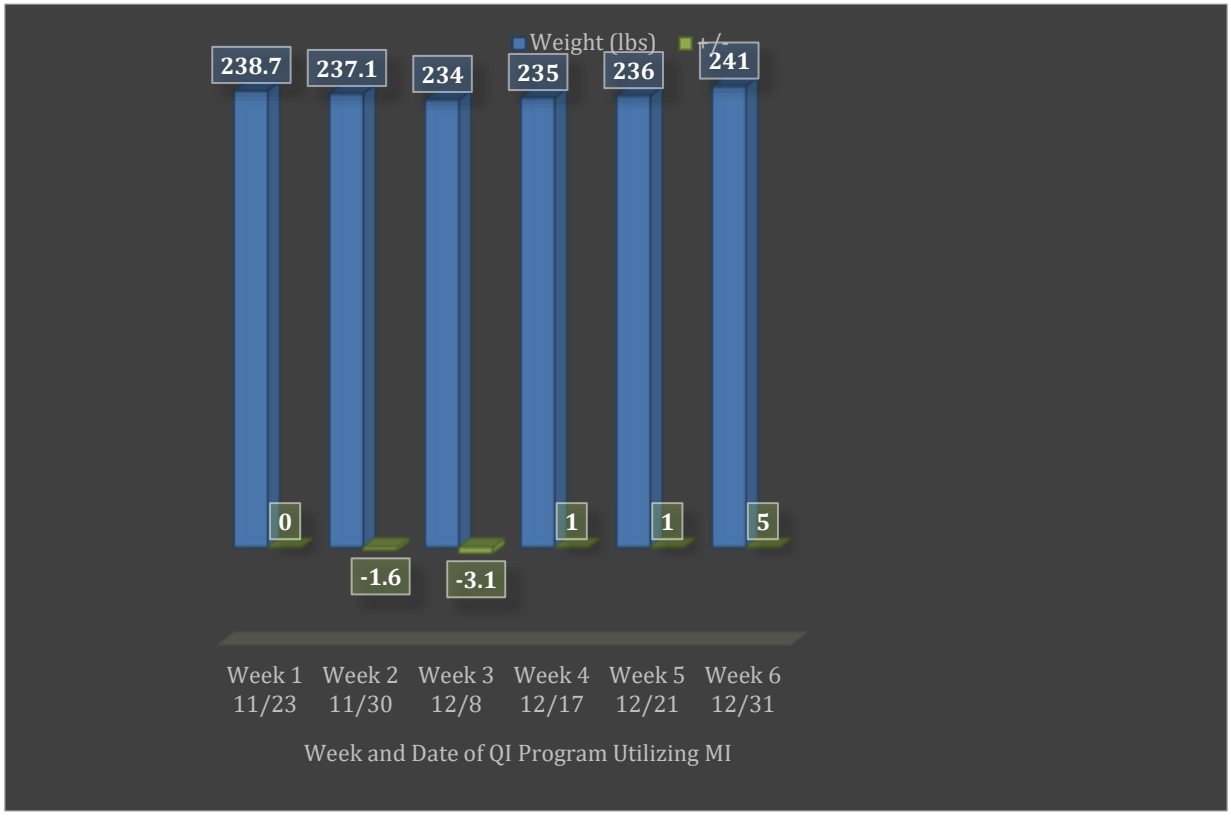
There was a correlation between the higher class of BMI and postoperative wound infection, which is reflected on the scatter plot graph. MI was shown to have a positive correlation with initial preoperative weight loss. By week 3, patient #1 achieved 98% of the 2% weight loss goal. A 2% weight loss goal was 4.8 pounds with a goal end weight of 233.9 pounds. Figure 5 is a summary of patient #1's weights, dates, number of minutes of telehealth OV which MI was utilized and comments from the patient. Figure 6 is a bar graph of patient #1's weights, throughout the six week program.

Figure 5

Week	1	2	3	4	5	6
Date (month and day)	11-23	11-30	12-8	12-17	12-21	12-31
Weight (lbs)	238.7	237.1	234	235	236	241
+/-	NA	-1.6	-3.1	+1	+1	+5
Comments	Voices excitement to start program, hopes to increase	+2 more serving sizes/week of fruits and vegetables	1)Achieved 98% of 2% weight loss goal 2)+2 more serving	Notes that upcoming travel could affect food craving/access to nutritious	Voices frustration of slight weight gain	1)+8 more serving sizes/week of fruits and +14 more serving

	number of serving sizes of fruits and vegetables		sizes/week of fruits and vegetables	foods, discussed carry water bottle around to curb craving, distancing from where food is easily available		sizes/week of vegetables 2)Frustrated he gained weight back but feels he would have gained even more if he was not in MI QI program
Minutes of telehealth visit utilizing MI	25	55	55	30	20	30

Figure 6



Discussion/Limitations .

There were numerous limitations in this QI program. The QI program was implemented over the holiday months. This was a limiting factor with patient #1 achieving his 2% preoperative weight loss goal because Americans gain between two and five pounds during the holiday season (Melore, 2021). At the end of the QI program, there was an open ended section and patient #1 felt he would have eaten *more* over the holidays, had he not been held accountable for his weekly weight. Patient #1 had completed two open ended questions at the end of the program. It was noteworthy to mention he recommended this QI program for *all* patients because it helped him with initial weight loss and it made him take ownership for healthy eating habits, on a weekly basis. Patient #1's fruit and vegetable intake initially increased at the beginning of the QI program but then later dropped. One of the contributing factors for this could have been holiday food consumption and travel with lack of access to healthy, home cooked meals.

The scales for weekly weights were not validated prior to the program. One of the inclusion criteria was that the participant had to have a functional scale; however, no specific criteria was given to clarify what "functional" meant. This was another limitation of the QI program. In addition, patient #1 traveled and one of the weekly weights was not from his primary scale, but a family member's scale. Being weighed on different scales can skew the accuracy of results. The third scale which was utilized for patient #1 was the QI site scale. On a consistent note, both patient #1 and patient #2 were weighed on the same QI site scale when they had their consultation.

There were no unexpected consequences or ethical implications. One factor which was not anticipated was patient travel during the QI program. Food access is a notable variable which was not predicted. This could have had negative consequences on patient #1's weight loss goal

because more processed food was eaten during the travel and lack of access to home cooked meals and choice with portion size was not an option. In addition, this QI program took place during the holiday season and winter season which can be limited factors for exercise, and over consumption of food which can negatively impact weight loss.

Dissemination

The findings from this QI project will be disseminated in multiple ways. The DNP student will present a DNP project poster at the QI site's Nurse Research Days in April 2022. The paper, abstract and poster will be sent via email to the multidisciplinary team at the QI site. The paper will be submitted to the Doctoral Project Repository. In addition, the DNP student will collaborate with her mentor who works with nursing students and social work students who have a focus on MI and patient outcomes to hopefully have this QI project implemented on a larger scale. The goal of replicating this QI program is to have a larger data set and based on the results implement a new practice change to improve patient care and decrease postoperative complications.

Conclusion

There are alarming rates of obesity and increased costs of care for patients; therefore, it is paramount to take a proactive and preventative approach to improve current practices and standards of care. Obesity can be quiescent, but the literature clearly shows this vulnerable group of patients has more postoperative complications than their non-obese counterparts (Bamgbade et al., 2007; Elsamadicy et al., 2016; Kalanithi, 2012; Tjeertes et al., 2015; Zusmanovich et al., 2018). Preoperative weight loss through MI can be a cost-effective intervention for patients with obesity (Platel et al., 2019) and MyPlate with portion control, can be utilized to decrease portion size to promote weight loss (Heideman et al., 2019; Hughes et al., 2017). In addition, this QI

program parallels Healthy People 2030 goals to improve nutrition and decrease obesity rates, as they are well-documented public health problems (Healthy People, 2020).

This novel and vital multimodal QI program suggests elevated BMI class is a risk factor for postoperative complications; however, these results should not be generalized due to the small participant size. MI was shown to have an initial positive result with weight loss by the third week of the six-week program, as patient #1 achieved 98% of his 2% total weight loss goal. However, there was a limited number of participants due to the Covid19 pandemic, management changes, surgery scheduling process changes, and significant reduction of possible candidates due to limited surgical volumes. Telehealth is efficacious in providing care to patients. Further studies with a more robust sample size would be beneficial to provide ongoing recommendations, before considering changing clinical practice.

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Appendix 1

Literature Table

Reference	Level of Evidence	Purpose/Question	Design	Sample	Intervention	Results	Notes
Asher, A. M., Oleisky, E. R., Pennings, J. S., Khan, I., Sivaganesan, A., Devin, C. J., Bydon, M., Asher, A. L., & Archer, K. R. 2020 USA	4	To determine if a benchmark of 30% improvement in pain and disability, after back surgery was a valid figure	Retrospective	23,280 patients who underwent lumbar spine surgery	Patient reported outcome tools (PRO) on lumbar spine patients, including ODI	Over a 30% improvement (decreased in ODI scores) and improvement in physical activity, after lumbar spine surgery	30% improvement was deemed to be a reasonable expectation from lumbar spine surgery
Bamgbade, O. A., Rutter, T. W., Nafiu, O. O., & Dorje, P 2007 USA	4	Evaluate severity of postoperative complications in obese compared to non-obese patients	Retrospective	7,271 surgical cases	Comparison between 2 groups	Patients with obesity had higher postop complications of: wound infection, nerve injury, MI, UTI & mortality	Obesity is an independent risk factor of postop complications
Barnes, R. D., & Ivezaj, V 2015 USA	2	To determine what interventions were effective in weight loss (MI) compared to control group (no intervention) in primary care	Systematic Review	24 RCTs with variable sample size around usually 18 patients	MI	Over 35% of studies utilizing MI as an intervention had significant weight loss, compared to their control groups Over 50% of the research studies reported patients who had MI as a treatment had 5% or more weight loss.	Fidelity was not tested/measured

Coronado, R. A., Master, H., White, D. K., Pennings, J. S., Bird, M. L., Devin, C. J., Buchowski, M. S., Mathis, S. L., McGirt, M. J., Cheng, J. S., Aaronson, O. S., Wegener, S. T., & Archer, K. R. 2020 USA	4	To compare changes postoperatively in patients physical activity & function at six weeks, three months & six months	Prospective Case Study	53 patients with DDD & had lumbar spine surgery	PRO including ODI scores	There were notable improvements in ODI scores postop	Small sample size
Das, B. M., & Evans, E. M. 2014 USA	4	To understand first year college students' perception of their weight management using the Health Belief Model (HBM)	Cross-sectional study	45 students with nominal group technique (NGT) -pregnant women (those planning on or those who recently gave birth were excluded from the study)	Eight sessions of NGT using the HBM	Most college students understand the benefits of physical activity and healthy eating. -Women felt weight was more important for independence and multitasking, men felt it was more important for care and financial reasons	-small sample size -predominantly Caucasian (20/45) -mostly female (29/45)
Dirnberger, J., & Waisbren, S. 2020 USA	6	To understand if Telehealth was a cost-effective, efficacious way to provide postoperative care	Mixed methods	167 participants/veterans	Postoperative Telehealth visits	Efficacy of telehealth visits both for patients and the healthcare system with significant cost savings and NO postoperative complications were missed	- patients preferred face to face visits -did not have the cost or burden of travel
Elsamadicy, Aladine & Adogwa, Owoicho &	3	To understand 30-day unplanned readmissions of	Retrospective cohort study	-500 patients from one hospital who had spine surgery -281 non-obese	Comparative, those with and without obesity	-preoperative obesity is an independent factor in 30-day hospital readmissions	-one academic center -patients with complications could have sought care at other hospitals (altering the results)

Vuong, Victoria & Mehta, Ankit & Vasquez, Raul & Cheng, Joseph & Bagley, Carlos. 2016 USA		obesity compared to non-obese patients who had spine surgery		-219 obese		-Obesity awareness should flag the patient and provider about the implications surrounding spine surgery	
Epstein N. E. 2017 USA	5	To better understand the morbidity and mortality of operating on patients who are obese and have spine surgery	literature review	-Multiple studies reviewed -Definition of obesity was BMI>35 -Also recorded comorbidities such as HTN, DM2	Multiple different studies	-Those with obesity AND >3 comorbidities (e.g., HTN, DM2) have higher complications than non-obese -Weight loss can improve outcomes, but bariatric surgery can pose a challenge too	-This is a review of literature, not an actual study -Bariatric surgery can increase risk of osteoporosis and hardware failure
Fruh 2017 USA	4	Effects of obesity on health with weight loss and weight management strategies to maintain weight loss	-Narrative Review -Some studies followed patients up to 12 months	Multiple studies with multiple samples, -largest sample size: >10,000	-Multiple: counseling, exercise +diet, weight management consultations -Planned family meals	-5-10% decrease in weight has multiple benefits: decrease in joint pain, CVD mortality, lipids, glucose, PCO, urinary incontinence, liver disease -Those who had 1-5 family meals/week were less likely to be obese	-Those who had more frequent visits with their healthcare provider were able to maintain their weight loss more at 12 months vs those who had less OV
Haas K., Hayoz, S., & Maurer-Wiesner, S.	2	To evaluate the success of weight-loss counseling by dietitians using a mobile phone	-Case Control Pilot Study -Followed patients for 12 months	-43 initially, 36 completed the entire study -Adults with obesity and or overweight	-mobile application with dietitian assisted recommendations	-The following metrics were measured and all improved: BMI, BP, HgA1C, fasting glucose, waist circumference, BP	-Small sample size -Sample size was educated/affluent

2019 Switzerland		application for patients who are obese and overweight		-studied occurred between 2016-2018	-Personalized behavior based interventions -Group chat options -3 different coaching phases: phase 1-1-3 months, phase 2-4-6 months, phase 3-7-12 months -Used Global physical	-Healthy eating habits also improved (increased consumptions of fruits, vegetables, avoidance of alcohol, sweets, and fat consumption) ->50% achieved 5% weight loss -BMI decreased	
Hales, C.M., Carroll, M.D, Fryar, C.D., & Ogden, C.L. 2020 USA	5	Frequency of obesity and assessing for disparities	Data brief	-2,000 projected from 1999-2008 in combination with NHANES study	No intervention, just data analysis	-Obesity was highest in non-Hispanic Black adults --those 40-59 years old were highest group with obesity	-Used prior data from NHANES -People often under-reports their BMI, which can skew the results
Heideman W. H., Rongen, F. C., Bolleurs, C., Govers, E., Kroeze, W., & Steenhuis, I. 2019 Netherlands	5	To evaluate the delivery of by dietitians of a weight loss program (SMART size) to identify and barriers and facilitate the implementation of SMART size	Qualitative Study	-43 Dutch dietitians -63 Patients who enrolled in study were either overweight or obese with BMI >25	SMART size program which includes multidisciplinary team	-Dietitians found program implementation was effective -challenges included participants having to have insurance -Insurance companies did not cover cooking class portion of intervention, so they had to pay out of pocket for classes -Group cooking classes did not allow for individual counseling	Study suggests implementation of SMART size to patient populations with low socioeconomic status
He, X., Fei, Q. & Sun, T.	3	Does MetS increase risk of postoperative	Retrospective cohort	2,880 Adults >18 yo at 1 academic center who underwent PLIF	No intervention	Those with MetS had higher complications than those without,	The study used BMI instead of waist measurement for

2020 USA		outcomes in patients who undergo PLIF			Those with MetS and those without	including SSI=2.2 vs. 0.79, increase in LOS	classification of MetS (which is also a limitation of the study)
Higgins , D. M., Mallory, G. W., Planchard, R. F., Puffer, R. C., Ali, M., Gates, M. J., Clifton, W. E., Jacob, J. T., Curry, T. B., Kor, D. J., Fogelson, J. L., Krauss, W. E. & Clarke, M. J. 2017 USA	3	To understand the effect of obesity on early complication rates for patients who undergo lumbar spine surgery for degenerative spine disease	Retrospective cohort study	-801 patients between 2008-2012 in 3 groups: non-obese BMI<30, obese BMI>30 and morbidly obese BMI>40	Those with and without obesity based on BMI class	-Obese patients have longer anesthesia and surgical time p=.008 and p=.002, -Obese patients had over 2x more likelihood of wound complication p=.01 -Morbid obesity had 10x higher rates of wound complications p=<.001 -Morbid obesity patients averaged $9,078 more in cost p=.005	-Single institution -Geographic location -short term study -Based on results further research is warranted to decrease risk factors including preoperative weight loss
Hughes, J. W., Goldstein, C. M., Logan, C., Mulvany, J. L., Hawkins, M., Sato, A. F., & Gunstad, J. 2017 USA	4	To understand if portion control plate implementation would promote smaller portion size compared to larger plate	Case Control	110 university students	Those who had a regular plate verses a smaller plate	Portion control plates showed decreased self-selected portion size	Patients can relate to portion control with visual plate
Hussain, Syed T., Lei, Shen, Akram, Tayyaba, Haider, Muhammad J., Hussain, Syed H., & Ali, Muhummad	5	To understand & examine the three stages of Lewin's model & compare to other models to apply to a specific situation	Critical Review	None	No comparison, applied to organizational leadership and business	Leadership & employee involvement in change is an essential for process change in an organization	

2018 China							
Kalanithi P. A., Arrigo, R., & Boakye, M. 2012 USA	3	To understand the effect of morbid obesity and complications on patients undergoing spinal fusion surgery	Retrospective cross-sectional study	-84,607 patients, of which 1,405 were morbidly obese, between 2003-2007	Those with and without morbid obesity based on BMI class	-Morbidly obese patients had $23,743 more cost than non-obese patients, LOS was increased with p=.0001, complications were increased -Morbidity and mortality were increased p=.001	-Single institution -Geographic location -more research is needed to include long term follow up, possible focus on minimally invasive surgery
Katsevman G. A., Daffner, S. D., Brandmeir, N. J., Emery, S. E., France, J. C. & Sedney, C. L. 2020 USA	3	To evaluate effect of super obese patients (BMI>50) compared to BMI>30 for those who underwent spine surgery	Retrospective cohort with matched control	-Patients who underwent spine surgery between 2012-2016 -A total of 123 patients in study -60 in obese BMI>30 -63 super obese >50	Presence or absence of super obesity	-Super obese underwent more surgical procedures and had higher reoperation AND infection rates compared to obese group p=.045	-Small sample size -No comparison with patients who were overweight, based on BMI
Kim & Basu, 2016 USA	1	To understand variations in the cost of obesity in the U.S.	Systemic Review and Meta-analysis	Range from 1,300- 80, 510	No intervention, reviewed 12 recent studies	Cost is $1,901 for patients with obesity National cost is projected to be $209.7 billion	There were studies that reported lifetime cost range from $227-7,269 See p.606
Khor, S., Lavallee, D., Cizik, A. M., Bellabarba, C., Chapman, J. R., Howe, C. R., Lu, D., Mohit, A. A., Oskouian, R. J., Roh, J. R., Shonnard, N., Dagal, A., & Flum, D. R.	3	To understand patient reported outcomes (PRO) after back surgery and to develop a PRO	Cohort study	1,935 participants	Different PRO tools, including ODI	Clinicians should inform patients of their realistic improvements as it related to pain and function, prior to proceeding with surgery	PRO tools explained variability in patient & population related data

2018 USA							
Lang, L. H., Parekh, K., Tsui, B., & Maze, M. 2017 USA & Europe	5	How to manage & prepare obese patients who undergo surgery & compared to the obesity paradox	Invited Review	-Multiple studies including Interrogation of the VA Surgical Quality Improvement (VASQIP and American College of Surgeons (ACS) NSQIP	Comparative studies based on the class of obesity 1, 2, 3	-Obesity increased the rate of wound infections in VASQIP patients -ACS NSQIP showed those with abdominal surgery and obesity and morbid obesity was an independent factor in infections	-There is needs to be more consideration in caring for an obese patient "healthy obese" -need for more biologic labs/tests to further assess adiposity
Lee, N. J., Shin, J. I., Kothari, P., Kim, J. S., Leven, D. M., Steinberger, J., Guzman, J. Z., Skovrlj, B., Caridi, J. M., & Cho, S. K. 2017 USA	3	To understand the frequency, impact, and risk factors for wound complication within 30 days postoperatively for those who undergo elective adult spinal deformity surgery	Case Control study using CPT codes for selection	-5,803 patients who were 18 and older who underwent adult spinal deformity surgery, utilized American College of Surgeons (ACS) NSQIP database	Comparative studies based on those with and without spinal infection, multiple variables were reviewed including class of obesity 1, 2, 3, ASA score, age, operative time, anterior versus posterior approach, superficial versus deep wound infection	Patients who had-class 2 (p=.046) and class 3(p=.0001) obesity, higher ASA score, posterior approach to surgery, and preoperative blood transfusion had higher rates of postoperative infection	-This is one of few studies that compare anterior versus posterior approach for surgery -Academic centers are overrepresented in the NSQIP database, -High rate of missing data in databases
Liljensøe, A., Laursen, J. O., Bliddal, H., Søballe, K., &	1	To compare difference in total knee replacement	RCT	76 patients, 38 in the control and 38 in intervention group	Compared control group to intervention group	10% weight loss can be achieved and showed reduction in body composition, decreased	Small sample

Mechlenburg, I. 2021 Scandinavia		standard care group (control) verses intervention group-those who low energy diet 8 weeks prior to surgery				cardiovascular risk & sustained s-leptin	
Patel, M. L., Wakayama, L. N., Bass, M. B., & Breland, J. Y. 2019 USA	1	To understand efficacy of MI, compared to those who did not have MI	A systematic review, included RCTs	Various population samples	MI compared to non-MI interventions for weight loss	MI studies had greater weight loss compared to the non-intervention groups/studies	Fidelity not tested
Planchard, R.F., Higgins, D.M., Mallory, G.W., Puffer, R.C.Jacob, J.T., Curry, T.B., Kor, D.J., & Clarke, M.J 2015 USA	4	To determine if those with obesity & under lumbar spine surgery have different resource use, compared to their non-obese counterparts	Retrospective case series	Over 3,000 patients 1,853 non-obese, 1,417 obese	Comparison obesity to non-obese	There were more associated costs & resource use with obese patients, compared to non-obese counterparts	A study done at one healthcare system
Raad, M., Reidler, J. S., El Dafrawy, M. H., Amin, R. M., Jain, A., Neuman, B. J., Riley, L. H., III, Sciubba, D. M., Kebaish, K. M., & Skolasky, R. L.	4	To determine different outcomes, & costs amidst different geographic locations for lumbar spine surgery	Retrospective Cohort	Patients who had surgery from 2010-2014 and were aged 40-65 yo	Comparison across 3 geographic locations: central, eastern, and western U.S.	Outcomes & costs varied significantly along with diagnosis	No control group

2019 USA							
Saghafi-Asl, M., Aliasgharzadeh, S., & Asghari-Jafarabadi, M. 2020 Chile	3	Effects of behavioral intention of weight management to evaluate the predictive power of the Health Belief Model (HBM) on body mass index (BMI)	Cross-sectional study	336 female college students 3 categories: underweight, normal weight and overweight	-Questionnaire of HBM, Content Validity Tool (CVT) used	-Significant relationship between family history of obesity and the student being obese (p=.00 4) -50% wanted to control their BMI for looks, while less than 33% wanted to for their health -underweight showed strongest self-efficacy(p= .001)	-Uniform sample (only females) -BMI was self-reported, which can make data skewed
Tjeertes, E. K., Hoeks, S. E., Beks, S. B., Valentijn, T. M., Hoofwijk, A. G., & Stolker, R. J. 2015 Netherlands	3	To determine effects of obesity on postoperative complications	Prospective Analysis	4,293 patients who had general surgery, with follow up after 6.3 years	-No intervention	Obesity is an independent risk factor for postoperative wound infections & higher EBL	-Obesity was a positive factor for long time survival (obesity paradox) -Study done at a single center

Wharton, S., Lau, D., Vallis, M., Sharma, A. M., Biertho, L., Campbell-Scherer, D., Adamo, K., Alberga, A., Bell, R., Boulé, N., Boyling, E., Brown, J., Calam, B., Clarke, C., Crowshoe, L., Divalentino, D., Forhan, M., Freedhoff, Y., Gagner, M., Glazer, S., & Wicklum, S. 2020 USA	1	Obesity Management in Primary care	Clinical Practice Guideline Public Engagement Committee, including experts	n=7	Multiple: exercise, dietitian consult +/- psychological counseling, medications, bariatric surgery	Each clinical recommendation was graded	Sample of n=7 is only of patients, n=15 consisted of consultants and volunteers
Young, L. R., & Nestle, M. 2002 USA	5	To see if larger portion sizes are contributing to obesity pandemic	Analytical Review	No sample size, USDA & FDA portion sizes analyzed	No intervention, review of portion sizes	-Portion size had significantly increased since 1970s varying from 200-700% increase in sizes -Energy content is directly related to portion size, there should be more education and resources to focus on smaller portion sizes	Review done in one country
Zusmanovich, M., Kester, B. S., & Schwarzkopf, R.	4	To understand rates of complications with the 3	Retrospective cohort	268,663 patients	No intervention	-Those with higher obesity rates have more complications -Class 2 obesity had less complications,	Based on database and DRG/CPT codes

2018 USA		different classes of obesity				including wound infection, compared to class 3 obesity	

Appendix 2

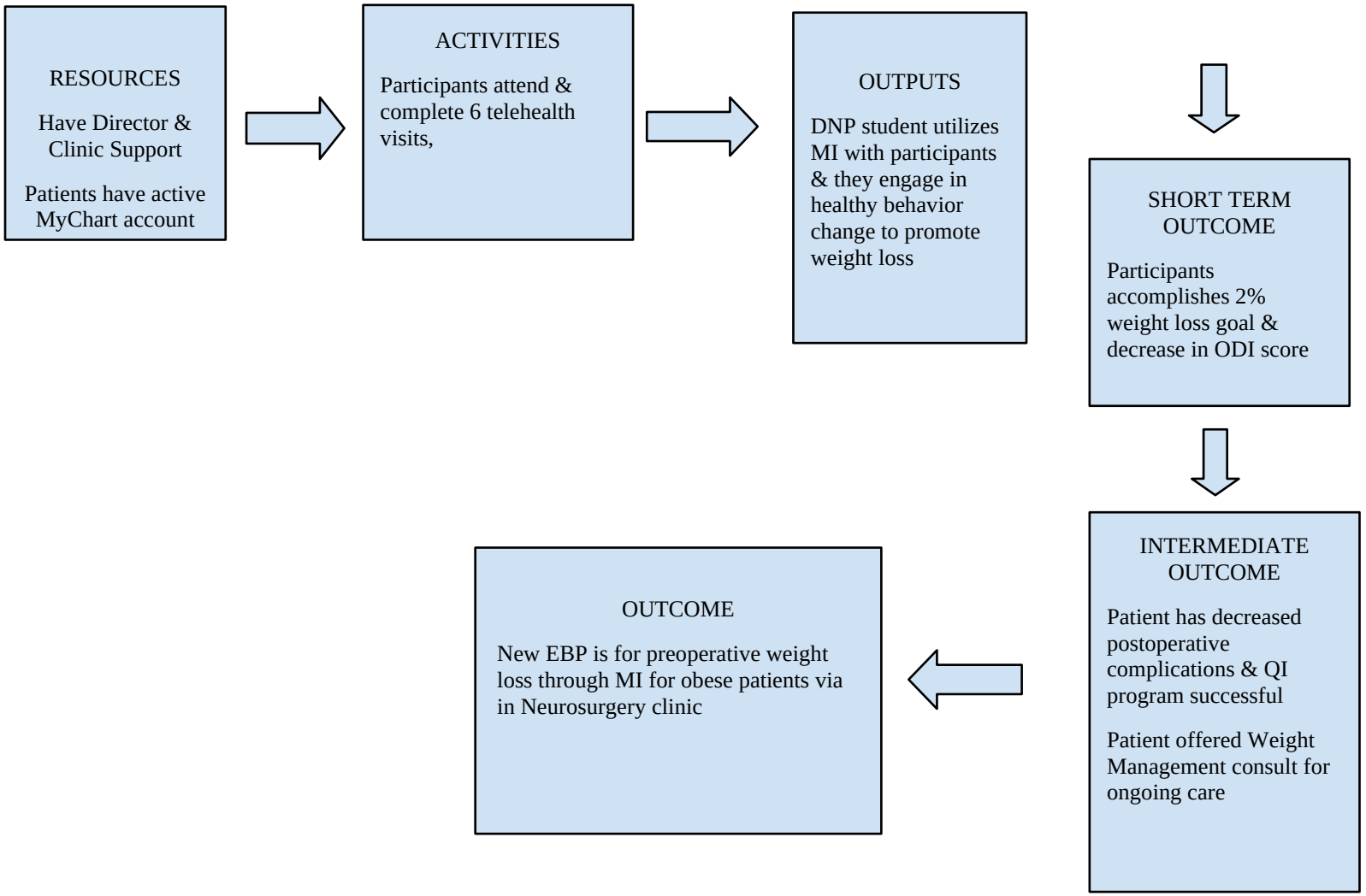
Gantt Chart

Objective	Indicators or Evidence	Timing of Data Collection	Data Collection				Data Analysis Plan		
			Source	Method	Sample	Instrument	Range of Values	Level of Measurement	Statistical Analysis
1.Educate Neurosurgery colleagues, managers, nursing staff, and schedulers of the QI health program one month prior to the patient recruitment phase	Reply email	Complete within 1-2 weeks	Self-reported	Email	Educational PowerPoint	NA	0-100 percent	NA	Percentage of employees' response
2. Enlist 5-10 patients who are obese, based on BMI of greater than 30 and are offered spine surgery over a two week (10 business days) period	Number of participants	Completed within 2 weeks	Participants contact DNP student	Via telephone or MyChart/ EPIC	Patients who undergo spine surgery with BMI >30	BMI as inclusive criteria	0-10 participants	Ordinal based on level of obesity	NA
3.Patients will lose 2% of their body weight by the end of the six-week telehealth QI health program	Patient's weight at each weekly telehealth visit and at end of 6 week telehealth program	Complete 6 week telehealth program	EPIC, telehealth visit note	EPIC, multi-disciplinary team	Patients enrolled in the QI health program	Weight, BMI	Baseline (zero) up to 99 (no one can lose 100% of their weight)	Ordinal	Percentage of weight loss

4. Patients will have decreased postoperative complications at 30 days postoperatively	Number of postoperative complications	Postoperative 30-day appointment completed by January 2022	EPIC	EPIC,	Neurosurgery patient participants and the same number of participants in the QI project who had low back surgery but did not have intervention (control group/comparison)	Weight, list of postoperative complications	Numerical 0-100	Ordinal	Percentage of complications at 30 days postoperatively compared to control group

Appendix 3

Logic Model



Appendix 4

Pre-Quality Improvement Project Questionnaire

1. How many servings of vegetables do you currently eat per day (one serving size is approximately 1 cup)?
2. How many servings of fruits do you currently eat per day?
3. On a scale of 1 to 5 (one being the lowest/not at all), how motivated are you to change your eating habits?
4. Do you think your current eating habits and weight are contributing to your condition (the reason you need surgery)? YES NO
5. Do you think the portion sizes of food have increased over the years? YES NO

Post-Quality Improvement Project Questionnaire

1. How many servings of vegetables do you currently eat per day (one serving size is approximately 1 cup)?
2. How many servings of fruits do you currently eat per day?
3. On a scale of 1 to 5 (one being the lowest/not at all), how much did you change your eating habits?
4. Do you think your current eating habits and weight have contributed to your condition (the reason you needed surgery)? YES NO
5. Would you recommend this program to all patients? YES NO
6. Did you prefer in person visits or telephone/telehealth visits, or both (circle one)?

IN PERSON TELEPHONE/TELEHEALTH BOTH

7. Any additional comments?

Appendix 5

QI Program MI Note Template

1. Motivational interviewing used to explore motivation and possibilities to change. Patient's motivation is at:
2. Problem Solving used to identify barriers to change and brainstorm solutions. Goal:
3. Goal Setting used to select diet activities to implement. Goal:
4. Social Support used to identify and develop social support for change. Goal:
5. Stimulus Control used to identify and modify social and/or environmental triggers/cues. . Goal:
6. Cognitive Restructuring used to identify irrational beliefs and malfunctioned behavior and reframe into effective new thinking.

   Goal:
7. Relapse Prevention used to identify and prepare for high-risk situations for relapse. Goal:

   Sleep Hygiene:
8. Self-Monitoring using food records assigned: Goal:
9. Water consumption:
10. Intake: servings of vegetables per week:
11. Intake: servings of fruits per week:
12. Weekly weight: lbs Start weight: Net loss/gain +2.3 lbs. Ultimate goal of 2% weight loss by the end of the program would be
13. Contributing factors to not accomplishing weight loss goal:

Start time:

End time:

Total visit time including chart review, prep, and documentation:

Appendix 6

Communication Matrix

COMMUNICATION	PURPOSE	FORMAT	FREQUENCY	AUDIENCE	OWNER	DELIVERABLE
Neurosurgery Section Meeting	Introduce project QI Project. Review objectives and goals	Webex and email	Once	Interdisciplinary team (Director, Clinic Manager, APPs, Neurosurgeons, RN Manager, Scheduling Manager, Neuro RN Educator)	DNP Student	Agenda and power point presentation
QI Site Daily Schedule	Inform QI site staff where providers & nurses are (e.g., out of clinic, OR)	Email	Daily	All staff at QI Site	RN Clinic Manager	Schedule
APP Neurosurgery Meeting	Discuss, review technical & design problems and solutions	Face-to-face and email	Pre-initiation of QI project then weekly and PRN	Nursing and Providers at QI Site	DNP Student	Agenda and power point slide presentation
DNP QI Collaboration	Recruit possible QI candidates	Face-to-face and EHR staff message	2-3x/week and PRN	Nursing and Providers at QI Site	DNP Student	MRN via secure EHR
Neurosurgery Section Meeting	Update on completion of project QI Project. Review conclusions.	Webex	Once	Interdisciplinary team	DNP Student	Agenda