Barriers to Bariatric Surgery: A Mixed Methods Study Investigating Obstacles Between Clinic Contact and Surgery

by

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Callie Hlavin, MPH

University of Pittsburgh, 2022

Abstract

Morbid obesity has emerged as a major public health concern as rates have skyrocketed over the past few decades. Populations most affected by obesity are not reflected in the patients who seek evaluation for and undergo bariatric or weight loss surgery. This study aims to identify patient populations at risk for attrition during bariatric surgery assessment and determine modifiable barriers to combat access inequality to bariatric surgery. We conducted a single institution, retrospective, mixed methods study investigating the compositional differences between adult patients who achieved or withdrew from bariatric surgery. We collected demographic, socioeconomic, and medical data from the electronic medical record between 2012 and 2021. We then performed computer-assisted self-administered interviews of patients who withdrew from surgery, collecting information on patient knowledge, expectations, and barriers to bariatric surgery. Patients who attained bariatric surgery were more likely to be younger (mean age, 42.2 ± 11.9 vs. 43.8 ± 12.5, $p<0.0001$), female (82.3 vs. 76.5%, $p<0.0001$), White (81.2% vs. 75.6%, $p=0.0002$), married (48.5% vs. 44.1%, $p=0.004$), and employed full-time (48.2% vs. 43.8%, $p=0.01$). They were less likely to live in an area with a low-income tract (37.1% vs. 40.7%, $p=0.01$) or poverty (poverty rate 15.8 ± 15.3 vs. 17.4 ± 16.8, $p=0.0002$). The surgery group had lower frequency of type 2 diabetes (11.1% vs. 15.6%, $p<0.0001$), hypertension (29.0% vs. 33.7%, $p=0.0003$), and current everyday tobacco use (5.4% vs. 12.0%). We received 280 completed surveys for a response rate of 8.9%. Respondents were majority female sex (75.5%) with at least

some college education (81.8%) and a household income of $50,000 or greater (61.7%). During their clinic visit, patients gained knowledge about bariatric surgery and the insurance process. Fear of complications, length of the insurance approval process, and wait time between initial evaluation and surgery were the most reported barriers. Clinic patients who undergo surgery are more likely to identify with characteristics of historically privileged communities, which do not reflect communities most affected by obesity. Our results suggest the insurance approval process is a major barrier to bariatric surgery for marginalized populations and should be a focus of future healthcare reform.

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Preface

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1.0 Introduction

The prevalence of obesity is steadily increasing in the United States across race, sex, and age; however, it disproportionately affects minorities and those of low socioeconomic status. First studied by Stunkard et. al in 1989, income and education were found to be inversely associated with obesity risk in women in developed countries.[1] In subsequent years, similar trends were observed[2–4] and extended to race with prevalence of obesity lowest among non-Hispanic Asian adults (17.4%) and highest among non-Hispanic black adults (49.6%) from 2017-2018. There have been no significant differences identified between men and women.[5]

Obesity is second leading cause of preventable deaths in the United States.[6] Using U.S. National Center Health Statistics mortality datasets, Gerardo de Cosio et. al demonstrated that people with obesity die an average of 15.4 years earlier compared to their counterparts of normal weight.[7] The consequences of obesity are pervasive, affecting heath, economics, society, and culture. Obesity increases the risk of many chronic health conditions, including type 2 diabetes, respiratory problems, cardiovascular disease, arthritis, and certain cancers, such as breast, endometrial, colorectal, esophageal, pancreatic, and prostate.[8] In addition, rates of disability are higher in people with obesity leading to productivity loss and increased healthcare costs. The subsequent economic impact is enormous.[9,10] Based on data from the Medical Expenditure Panel Survey, Cawley et. al. calculated that, in 2011, obesity was responsible for $6,899 of annual direct cost per capita.[11] Nationally, the aggregate cost of obesity is over $260 billion annually.[12] These costs are largely due to the higher cost of medical care for individuals with obesity.

Bariatric surgery is safe, effective, and economical,[13–15] yet it is considerably underutilized. Less than 1% of obese individuals undergo bariatric surgery[16,17] despite the widely encompassing

referral criteria for adults laid forth by the National Institutes of Health stating those with BMI ≥40 or ≥35 with obesity-related co-morbid conditions may be considered. Since the late 1990s, the proportion of non-white individuals undergoing bariatric surgery has increased as well as those in the lowest income quartile;[18] however, there remains a discordance between populations most affected by obesity and those obtaining surgery.

There are two distinct barriers to bariatric surgery: referrals and pre-operative counseling. The socioeconomic and racial disparities in the referral system have been previously researched. Martin et. al found that the population of patients eligible for bariatric surgery is more likely to be minority, lower socioeconomic status, under or uninsured, and with less access to healthcare. Yet, these eligible patients are neither reflected proportionally in the demographics of those who are being referred nor in those who undergo surgery.[19] The cohort having surgery largely consists of patients who are women, white, reside in urban areas, and are economically and medically advantaged.[20–24] Nationwide innovations, such as the expansion of Medicaid under the Affordable Care Act and centralization of care to Centers of Excellence (COE) have positively impacted access to bariatric surgery.[25,26] Gould et. al found that the adjusted incidence rate of bariatric surgery in Medicaid or uninsured populations increased by as much as 15.8% in one fiscal quarter in states that expanded Medicaid.[26] In 2012, bariatric surgery COE requirements were established through a collaborative effort by the American College of Surgeons (ACS) and the American Society for Metabolic and Bariatric Surgery (ASMBS). Hospitals are required to meet the serval criteria to become certified. These pre-requisites include:[27,28]

- Perform at least 125 bariatric surgery per year as an institution
- Employ a Bariatric Surgeon Director to lead the program and report to leadership

- Employ at least two American Board of Surgery (ABS) certified bariatric surgeons who have performed 125 bariatric surgery procedures over their lifetime and at least 50 per year
- Create a multidisciplinary bariatric team for optimized patient care, including surgeons, nurses, medical physicians, nutritionists, and psychologists
- Collect and report long-term patient outcomes

In 2006, the Centers for Medicare and Medicaid services determined that Medicare would only provide reimbursement for bariatric surgeries performed at COE. Subsequently, many private insurance companies followed suit and there was a shift to centralize bariatric surgical care. While there was concern that this funneling of care could jeopardize access for disparate populations, Kuo et. al found that the proportion of Medicare patients receiving bariatric surgery at COE increased by 10.4% from 2008 to 2011.[25] Despite these health system and policy changes, there are still major deficiencies in access to bariatric surgery, particularly for underserved communities.

There are fewer studies investigating the barriers patients face navigating the pre-operative evaluation once referred to surgical centers. Patients who are male, smokers, and attended fewer preoperative appointments are less likely to progress to surgery, but the most encountered issue is that of insurance requirements.[29,30] Insurance company requirements for coverage of bariatric surgery can vary widely, and few provide no coverage at all. These requirements can be time-consuming, confusing, and expensive for patients. In a retrospective cohort study investigating insurance-specific predictors of surgical dropout in 1475 patients, Love et. al concluded that patients were more likely to withdraw from surgery if their insurance required a longer pre-operative diet duration, a primary care physician letter of necessity, evaluation by a cardiology specialist, or advanced laboratory testing.[29] Additionally, patients self-report fear of complications,

financial hardship, and insurance coverage as barriers.[31] Other obstacles, such as health literacy, transportation, and social support have yet to be investigated. It is the aim of this study to identify patient populations at risk for attrition from bariatric surgery referral, determine modifiable barriers to bariatric surgery, and implement programmatic change to combat access inequality to bariatric surgery.

2.0 Methods

2.1 Electronic Medical Record Data Collection

Using the UPMC electronic medical record (EMR), we performed a retrospective cohort study investigating the compositional differences between clinic patients who ultimately attain bariatric surgery and those that do not. We collected data on patients aged 18 and older who had a completed new bariatric patient visit in the University of Pittsburgh Medical Center (UPMC) health system between 2012 and 2019. All visits were included if they were documented as "new bariatric" visits, had a "reason for visit" related to being overweight or another related disorder (Table 1), and had a "completed" appointment status. Both telemedicine and in-person visits were included.

Table 1. Reason for bariatric surgery visit by percentage of patients

Reason for visit	Percentage of patients (N=5982)
Multiple unsuccessful attempts at non-surgical weight loss	96.16%
Weight gain	1.89%
Weight problem	1.22%
Dysphagia	0.20%
Gastroesophageal reflux disease (GERD)	0.15%
Gastroparesis	0.07%
Hypertension	0.07%
Sleep problem	0.05%
New patient	0.05%
Back pain	0.02%
Pre-op exam	0.02%
Polycystic kidney disease (PCKD)	0.02%
Hypercholesterolemia	0.02%
Joint pain	0.02%
Diabetes	0.02%
Migraine	0.02%
Establish care	0.02%
Fatigue	0.02%

We also collected all bariatric surgery procedures performed within the UPMC system from 2012-2021. The two datasets were then linked to separate patients into two cohorts: (1) those who proceeded to surgery and (2) those that withdrew. Demographic and socioeconomic variables were collected from the EMR, including age on date of the visit, age on date of procedure (if applicable), race, sex, ethnicity, primary language, zip code, marital status, employment status, and insurance payor on the date of the visit. Zip code was linked to 2020 census tracts and subsequently matched to selected variables from the 2019 Food Access Research Atlas (FARA) which are publicly available data from USDA Economic Research Service and the Columbia Area Deprivation Index (ADI).[32,33] These variables included low-income tracts, poverty rate, and median family income. The Columbia ADI is calculated within census tracts. Because each zip code includes many census tracts, we calculated the average ADI from all census tracts within each zip code. Selective medical information from the EMR was also collected, including BMI at the time of the visit and presence of relevant comorbidities – mental health diagnosis, type 2 diabetes, dyslipidemia, gastroesophageal reflux disease, hypertension, chronic kidney disease, nonalcoholic fatty liver disease, obstructive sleep apnea, lower extremity osteoarthritis, polycystic ovarian syndrome, pulmonary embolism/deep vein thrombosis, smoking status, and substance use disorder. Patients were excluded if they were pregnant within one year of the first bariatric surgery encounter.

Sociodemographic factors were compared by bariatric surgery status with chi-square tests for categorical variables, Fisher's exact test for dichotomous variables or T-tests for means of continuous measures. SAS v9.4 (copyright 2016 SAS Institute Inc., Cary, NC, USA) was used for analyses.

2.2 Survey Data Collection

2.2.1 Sampling

The sampling frame was identified through the EMR and is defined as adult patients aged 18 years and older who completed at least one appointment in bariatric surgery clinic at UPMC (as defined above) and have a valid email address available in the EMR. The sampling units were email addresses, and the sampling elements were individual patients.

The "withdraw" cohort included 3,661 patients. We anticipated an eligibility rate of 80% which was defined as patients within our cohort that had a valid email address accessible in the EMR. Therefore, our target population was 2,929.

The expected response rate was 20%. Accepting a 5% margin of error, a 95% confidence interval, and a response distribution of 50%, the number of responses required was 340. Anticipating a response rate of 20%, the expected total sample size needed for adequate power is 1,700.[34] We distributed surveys to all eligible patients in the "withdraw" cohort (N=2,298) so we expected that the survey would be sufficiently powered.

2.2.2 Data Collection Mode

The survey was performed through computer-assisted self-interviewing (CATI) using the REDCap platform. Selected patients were sent an email with the link to the REDCap survey. As mentioned above, email addresses were captured from the EMR. We performed survey collection over six weeks. After initial distribution on week one, reminder emails were sent weekly for five additional weeks.

2.2.3 Survey Instrument

The survey instrument can be divided into three main components: (1) patient knowledge and expectations about bariatric surgery and the insurance approval process, (2) patient-perceived barriers to bariatric surgery, and (3) demographic and socioeconomic background (Appendix A).

There are six questions on patient knowledge, expectation, and perceived barriers to bariatric surgery. These are largely ordinal. We ask patients to rate the degree to which they agree with each statement.

There are six questions regarding demographic and socioeconomic background. These are variables of interest that were not available through the EMR.

Four of the demographic and socioeconomic questions are adapted from the Behavioral Risk Factor Surveillance Survey (BRFSS).[35] As such, these questions are validated and reliable.

2.2.4 Qualitative Methodology

The survey contained one open-ended question that allowed respondents the opportunity to list three ways that bariatric surgery could be made more accessible or easier to attain. The qualitative responses were coded using grounded theory.[36] Responses were coded and analyzed by a single researcher using NVivo software.[37]

2.2.5 Ethical Review

The University of Pittsburgh Medical Center Quality Review Committee reviewed and approved this study and therefore it did not require additional IRB oversight and informed consent of study participants was waived.

3.0 Results

3.1 Electronic Medical Record Data

We collected data on 5982 patients who had a completed, first bariatric surgery appointment. Most patients did not go on to have bariatric surgery (61.2%). Patients who attained bariatric surgery were more likely to be younger (mean age, 42.2 ± 11.9 vs. 43.8 ± 12.5, p<0.0001), female (82.3 vs. 76.5%, p<0.0001), and White (81.2% vs. 75.6%, p=0.0002) compared to those who withdrew. There were differences in marital status (p=0.004) and employment status (p=0.01). The surgery group had higher frequency of marriage (48.5% vs. 44.1%) and full-time employment (48.2% vs. 43.8%). They were less likely to live in an area with a low-income tract (37.1% vs. 40.7%, p=0.01) or poverty (poverty rate 15.8 ± 15.3 vs. 17.4 ± 16.8, p=0.0002). There were no differences noted in Columbia Area Deprivation Index (ADI), median family income or insurance payor (Table 2).

Table 2. Demographic and socioeconomic factors by bariatric surgery status

Variable	No Bariatric Surgery (N = 3661)	Bariatric Surgery (N = 2321)	p-value
Age at encounter (years)	43.8 ± 12.5 (18.0 – 83.0) (Q1: 34.0; Median: 44.0; Q3: 53.0)	42.2 ± 11.9 (18.0 – 74.0) (Q1: 33.0; Median: 41.0; Q3: 51.0)	< 0.0001
Age at surgery (years)	---	43.4 ± 12.0 (18.0 – 76.0) (Q1: 34.0; Median: 43.0; Q3: 52.0)	---
Male	860 (23.5%)	411 (17.7%)	< 0.0001
Race	Alaskan Nat: 1 (0.03%) Am Indian: 7 (0.2%) Black: 770 (21.0%) Filipino: 0 (0%) Hawaiian: 0 (0%)	Alaskan Nat: 0 (0%) Am Indian: 7 (0.3%) Black: 377 (16.2%) Filipino: 2 (0.1%) Hawaiian: 0 (0%)	0.0002

	Indian (Asian): 4 (0.1%) Korean: 0 (0%) Other Asian: 4 (0.1%) Other PacIslnd: 2 (0.05%) Vietnamese: 0 (0%) White: 2768 (75.6%) Other: 2 (0.05%) Declined: 30 (0.8%) Unknown/blank: 73 (2.0%)	Indian (Asian): 2 (0.1%) Korean: 1 (0.04%) Other Asian: 2 (0.1%) Other PacIslnd: 1(0.04%) Vietnamese: 1 (0.04%) White: 1885 (81.2%) Other: 1 (0.04%) Declined: 16 (0.7%) Unknown/blank: 26 (1.1%)	
Hispanic	No: 3399 (92.8%) Yes: 42 (1.2%) Declined: 99 (2.7%) Unknown: 121 (3.3%)	No: 2150 (92.6%) Yes: 26 (1.1%) Declined: 85 (3.7%) Unknown: 60 (2.6%)	0.08
Area Deprivation Index (ADI)	49.1 ± 14.3 (5.8 – 87.1) (Q1: 41.0; Median: 50.3; Q3: 59.4)	48.9 ± 14.0 (11.3 – 87.1) (Q1: 40.8; Median: 50.9; Q3: 59.0)	0.56
Low Income Tract	1487/3657 (40.7%)	861/2318 (37.1%)	0.01
Poverty Rate	17.4 ± 16.8 (0.7 – 69.7) (Q1: 6.4; Median: 12.2; Q3: 20.3)	15.8 ± 15.3 (1.2 – 69.7) (Q1: 6.6; Median: 11.8; Q3: 16.9)	0.0002
Median Family Income (dollars, $)	70,877.10 ± 31604.60 (171,61.00 – 187,250.00) (Q1: 53,152; Median: 67,944; Q3: 83,393)	72,113.20± 30,088.30 (17161.00 – 187,250.00) (Q1: 56,417; Median: 67,757; Q3: 83,393)	0.13
Primary language	Arabic: 3 (0.1%) Armenian: 0 (0%) English: 3582 (97.8%) Ganda: 0 (0%) Modern Greek: 0 (0%) Sign languages: 0 (0%) Spanish: 8 (0.2%) Declined: 0 (0%) Unknown: 68 (1.9%)	Arabic: 4 (0.2%) Armenian: 0 (0%) English: 2282 (98.3%) Ganda: 0 (0%) Modern Greek: 1 (0.04%) Sign languages: 0 (0%) Spanish: 1 (0.04%) Declined: 0 (0%) Unknown: 32 (1.4%)	0.11
Marital status	Single: 1392 (38.0%) Married: 1613 (44.1%) Divorced: 360 (9.8%) Separated: 83 (2.3%) Widowed: 89 (2.4%) Committed. : 8 (0.2%) Other: 3 (0.1%) Unknown: 113 (3.1%)	Single: 843 (36.3%) Married: 1126 (48.5%) Divorced: 212 (9.1%) Separated: 42 (1.8%) Widowed: 46 (2.0%) Committed: 8 (0.3%) Other: 0 (0%) Unknown: 44 (1.9%)	0.004
Employment	Not employed: 1025 (28.0%) Self-employed: 62 (1.7%) Full time: 1604 (43.8%) Part time: 137 (3.7%) Student full time: 80 (2.2%) Student part time: 1 (0.03%) Retired: 188 (5.1%) Disabled: 3 (0.1%) Unknown: 561 (15.3%)	Not employed: 551 (23.7%) Self-employed: 39 (1.7%) Full time: 1119 (48.2%) Part time: 95 (4.1%) Student full time: 61 (2.6%) Student part time: 2 (0.09%) Retired: 107 (4.6%) Disabled: 1 (0.04%) Unknown: 346 (14.9%)	0.01
Insurance	Private: 2611 (71.3%) Medicaid: 37 (1.0%) Medicare: 937 (25.6%) VA insurance: 3 (0.1%)	Private: 1718 (74.0%) Medicaid: 10 (0.4%) Medicare: 549 (23.7%) VA insurance: 2 (0.1%)	0.07

Other:	6 (0.2%)	Other:	5 (0.2%)
Unknown:	67 (1.8%)	Unknown:	37 (1.6%)

The surgery group had lower frequency of type 2 diabetes (11.1% vs. 15.6%, p<0.0001), dyslipidemia (23.5% vs. 26.3%, p=0.02), hypertension (29.0% vs. 33.7%, p=0.0003), and current everyday tobacco use (5.4% vs. 12.0%), but a higher frequency of polycystic ovarian syndrome (8.3% vs. 6.2%, p=0.004). BMI at the time of the first encounter and initial weight were no different between the two groups. Additionally, there was no difference between the surgery and non-surgery groups with regards to frequency of anxiety or depression, gastroesophageal reflux disease, chronic kidney disease, non-alcoholic fatty liver disease, obstructive sleep apnea, lower extremity osteoarthritis, pulmonary embolism or deep vein thrombosis, or current substance abuse (Table 3).

Table 3. Medical factors by bariatric surgery status

Variable	No Bariatric Surgery (N = 3661)	Bariatric Surgery (N = 2321)	p-value
BMI, initial (kg/m^2)	46.9 ± 9.5 (5.0 – 100.9) (Q1: 40.1; Median: 44.9; Q3: 51.5)	47.3 ± 7.8 (21.9 – 100.0) (Q1: 41.6; Median: 45.8; Q3: 51.7)	0.10
Weight, initial (lbs)	291.5 ± 69.9 (29.0 – 641.0) (Q1: 242.0; Median: 277.0; Q3: 326.0)	290.2 ± 57.5 (127.0 – 618.0) (Q1: 250.0; Median: 281.0; Q3: 321.0)	0.43
Anxiety or depression	1214/3221 (37.7%)	812/2026 (40.1%)	0.09
Type 2 diabetes	501/3221 (15.6%)	224/2026 (11.1%)	< 0.0001
Dyslipidemia	848/3221 (26.3%)	475/2026 (23.5%)	0.02
Gastroesophageal reflux disease	1053/3221 (32.7%)	665/2026 (32.8%)	0.93
Hypertension	1086/3221 (33.7%)	587/2026 (29.0%)	0.0003
Chronic kidney disease	39/3221 (1.2%)	18/2026 (0.9%)	0.34
Non-alcoholic fatty liver disease	110/3221 (3.4%)	76/2026 (3.8%)	0.54
Obstructive sleep apnea	732/3221 (22.7%)	450/2026 (22.2%)	0.68
Lower extremity osteoarthritis	279/3221 (8.7%)	195/2026 (9.6%)	0.24
Polycystic ovarian syndrome	199/3221 (6.2%)	168/2026 (8.3%)	0.004
Pulmonary embolism/Deep vein thrombosis	99/3221 (3.1%)	57/2026 (2.8%)	0.62
Smoking status	Never smoked: 1761 (48.1%)	Never: 1276 (55.0%) Former: 866 (37.3%)	< 0.0001

	Former smoker: 1338 (36.6%) Current some days: 110 (3.0%) Current everyday: 440 (12.0%) Unknown: 12 (0.3%)	Current some days: 52 (2.2%) Current everyday: 125 (5.4%) Unknown: 2 (0.1%)	
Substance abuse (current)	48/3221 (1.5%)	27/2026 (1.3%)	0.72

There were 2321 patients who attained bariatric surgery comprising 38.7% of the total cohort. Most of these patients underwent laparoscopic or robotic Roux-en-Y gastric bypass (62.1%). The next most common procedure was laparoscopic sleeve gastrectomy (32.0%). Other procedures, including laparoscopic adjustable gastric band placement and removal, intragastric balloon, and biliary pancreatic diversion/duodenal switch contributed to just under 5% of the type of operations performed (Table 4).

Table 4. Procedure for patients attaining bariatric surgery

Procedure	
Lap/robotic RNY	713 (63.1%)
Lap sleeve gastrectomy	361 (32.0%)
Lap adjustable gastric band	37 (3.3%)
Placement of intragastric balloon	2 (0.2%)
BP diversion/duodenal switch	2 (0.2%)
Removal adjustable gastric band	9 (0.8%)
Other	6 (0.5%)

3.2 Survey Data

The survey was distributed to 3141 patients who withdrew from surgery. There were 357 completed survey and 48 partially completed surveys for an overall response rate of 12.9%. Only participants with fully complete surveys were included. Completed surveys were defined as those that had responses for the required questions regarding patient knowledge, expectations, and perceived barriers to bariatric surgery. Of the completed surveys, 280 (8.9%) were eligible which

was defined as participants who indicated that they had an appointment with the bariatric surgery department and did not have bariatric surgery. There were several respondents who reported having bariatric surgery elsewhere during the study period.

Respondents were mostly female sex (75.5%) and female gender (74.7%) with at least some college education (81.8%) and household income $50,000 or greater (61.7%). However, there was a significant percentage of respondents (7.2%) reporting a family income of less than $10,000. 66.2% of respondents documented no children living in the same household. The demographic and socioeconomic questions were optional; therefore, there were a significant number of participants who opted to leave them incomplete. Missing data was excluded from analyses (Table 5).

Table 5. Demographic and socioeconomic factors for survey respondents

Variable	Frequency Distribution
Sex (N=249)	Male: 59 (23.7%)
	Female: 188 (75.5%)
	No answer: 2 (0.8%)
Gender (N=249)	Male: 60 (24.1%)
	Female: 186 (74.7%)
	Transgender: 0 (0%)
	Non-binary: 2 (0.8%)
	No answer: 1 (0.4%)
Number of kids in household (N=219)	0: 145 (66.2%)
	1: 36 (16.4%)
	2: 20 (9.1%)
	3: 10 (4.6%)
	4: 6 (2.7%)
	5: 1 (0.5%)
	6: 1 (0.5%)
Annual family income (N=235)	< $10,000: 17 (7.2%)
	$10,000 - < $15,000: 10 (4.3%)
	$15,000 - < $20,000: 5 (2.1%)
	$20,000 - < $25,000: 12 (5.1%)
	$25,000 - < $35,000: 11 (4.7%)
	$35,000 - < $50,000: 35 (14.9%)
	$50,000 - < $75,000: 40 (17.0%)
	≥ $75,000: 105 (44.7%)
Educational attainment (N=242)	Never attended: 0 (0%)
	Grades 1-8: 0 (0%)
	Some high school: 2 (0.8%)

High School Diploma/GED:	42 (17.4%)
Some college/ Technical School:	99 (40.9%)
College +:	99 (40.9%)

We asked survey participants to rate their knowledge about bariatric surgery and the insurance/approval process before and after their clinic visit.

The first series of questions related to patient knowledge about bariatric surgery. The respondents were asked to rate their knowledge about bariatric surgery from excellent to terrible both before and after their visit. Results suggest that patients gained knowledge about bariatric surgery during their visit. Before the visit, 50.7% of patients reported their knowledge about bariatric surgery to be "excellent" or "good" which improved to 65.7% after the visit. 14.3% reported their knowledge to be "poor" or "terrible" pre-visit which decreased to 6.5% post visit (Figure 1).

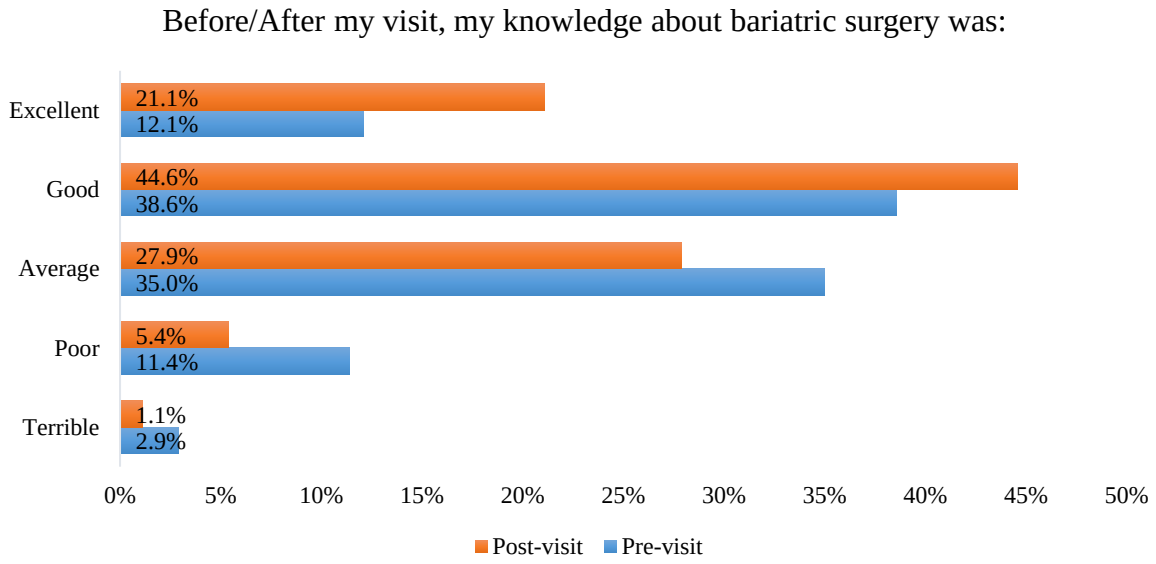

Figure 1. Survey - Knowledge about bariatric surgery

The second series of questions was about patient knowledge regarding the insurance process for bariatric surgery. Again, they were asked to rank their knowledge from excellent to terrible both before and after the visit. Patients appear to gain knowledge during the visit. Before the visit, 33.7% of patients report their knowledge about the insurance process to be "excellent" or "good" which increased to 43.3% post-visit. And 31.2% reported their knowledge to be "terrible" or "poor" pre-visit which decreased by 10 percentage points post-visit (Figure 2).

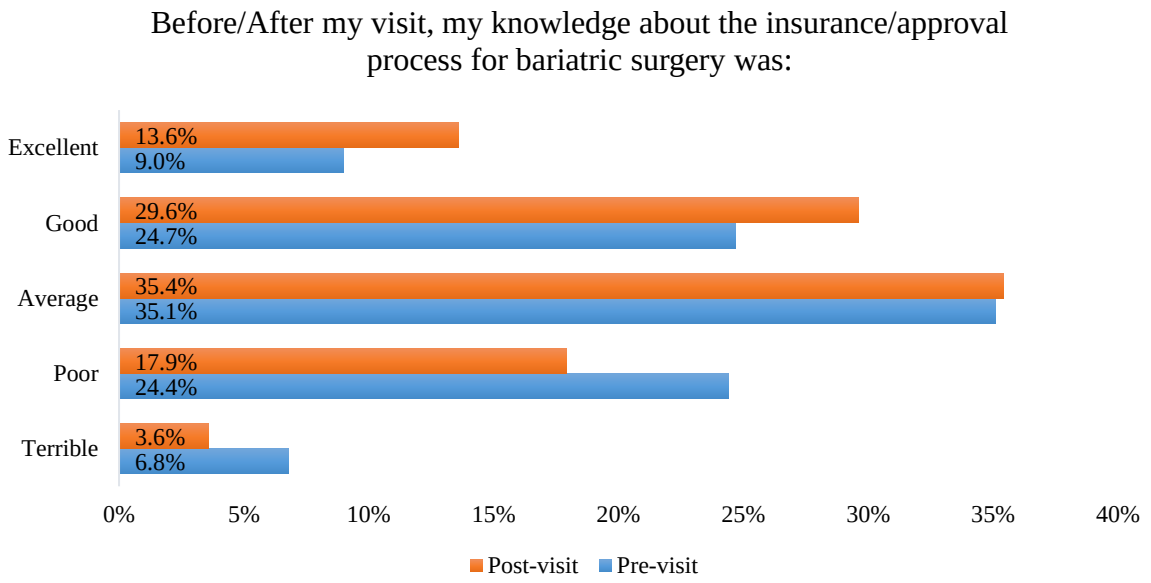

Figure 2. Survey - Knowledge about insurance/approval process for bariatric surgery

The next series of questions targeted patient expectation about the insurance process for bariatric surgery. Patients were asked to report their expectation of the ease or difficulty of the insurance process both before and after the visit. Unlike the first two series of questions, it does not appear that the visit imparted much guidance to patients regarding the ease or difficulty of the insurance process. More patients expected the insurance process to be "very difficult" or "difficult" both before and after the visit (Figure 3).

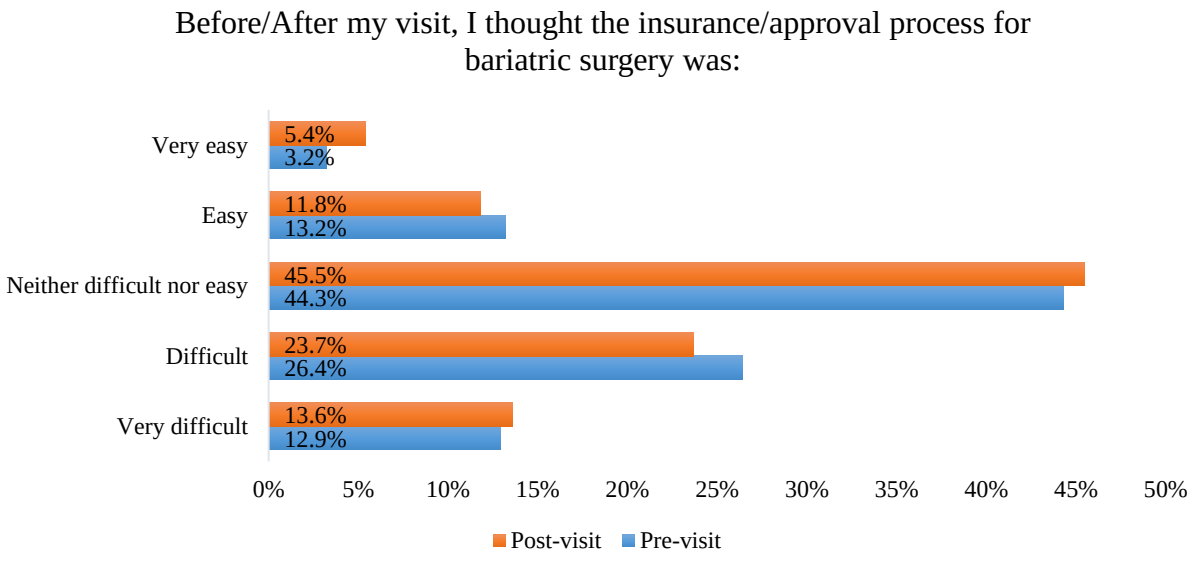

Figure 3. Survey - Patient expectation about the insurance/approval process for bariatric surgery

Survey participants were asked to about their expectation of processes that would occur during their clinic visit. They were then asked to report which processes occurred during their clinic visit. For this question, participants were given the option to choose more than one response. 42.9% of participants expected to start the surgical processes during their clinic visit; however, only 19.6% of respondents report doing this during the appointment. Additionally, while 25% of participants expected to meet the surgeon during their visit, 44.3% report meeting the surgeon. The expectation pre-visit about getting information about bariatric surgery and learning about surgical options was not different than the experience patients had during the visit. The "other" category in the pre-visit question included learning more about insurance process, talking about weight loss options in general (not just surgery), discussing the cost of surgery, and gathering information about risks and benefits of surgery as well as pre-and post-surgery expectations. The "during visit" "other" category included patients being told that they were ineligible or did not qualify for surgery and being referred to the medical weight loss clinic (Figure 4).

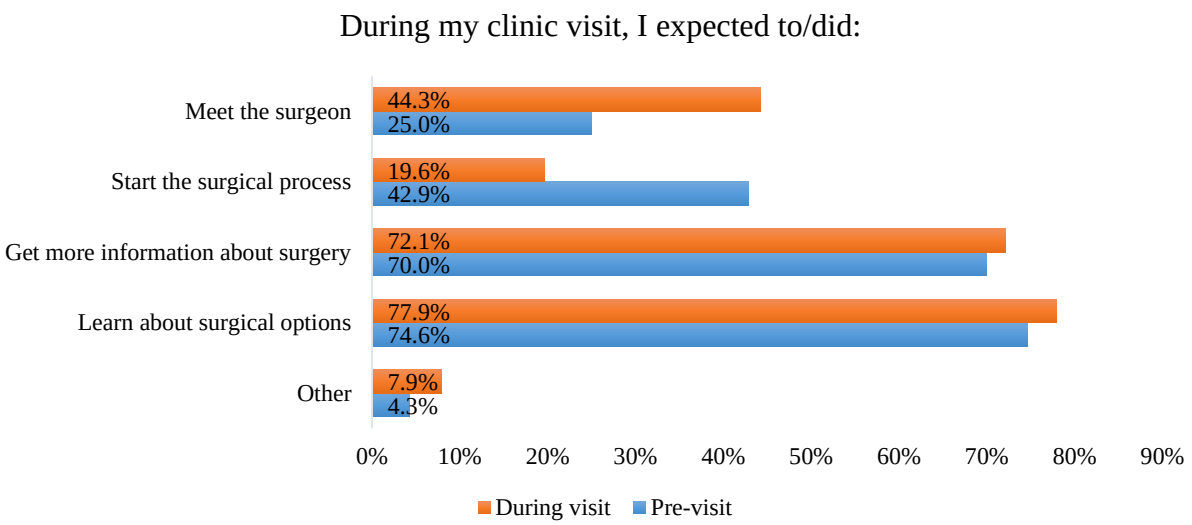

Figure 4. Survey - Expectation and reality of clinic processes

We listed several barriers to bariatric surgery and asked patients to rank the degree to which they agreed that these barriers served as reasons that they did not have bariatric surgery. Participants indicated the degree to which they agreed with each statement from "strongly agree" to “strongly disagree.” 48.4% of patients either “somewhat agree” or “strongly agree” that a reason they did not have bariatric surgery was due to being “afraid of risk of complications.” 48.9% reporting that they “strongly agree” or “somewhat agree” that the “insurance approval process takes too long.” Nearly 50% of respondents reported that they “strongly disagreed” that “no family/partner support” was a barrier. Additionally, insurance and financial issues were not as commonly selected as reason participants did not have surgery (Figure 5).

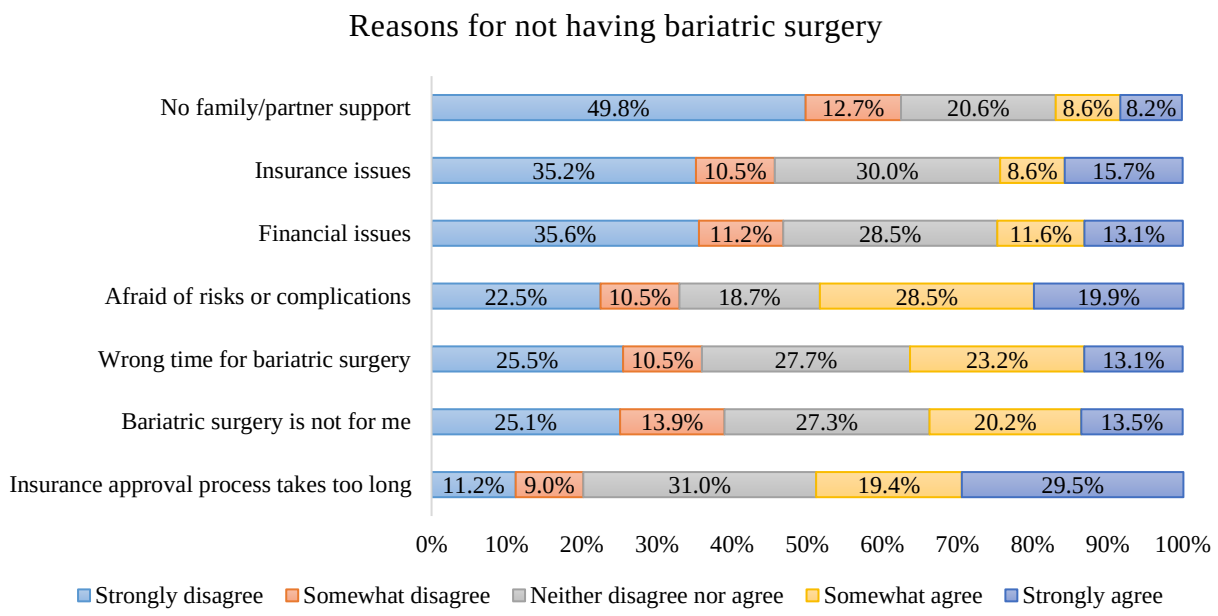

Figure 5. Survey - Reasons for not having bariatric surgery

The final survey question asked participants to name three things that would make getting bariatric surgery easier or more accessible. Participants were given space for three open-ended responses. Responses were coded into seven main themes: (1) communication, (2) cost, (3) COVID, (4) evaluation process, (5) insurance process, (6) personal, and (7) post-operative concerns.

Within the communication theme, there were several sub-themes that emerged which included issues with the answering service, desire for more education, frustration with lack of follow-up, interest in meeting the surgeon, problems with the nutritionist, need for more support, and request for discussion on more surgical options. Several patients expressed frustration with the answering service. One respondent reported:

"The office is very difficult to get in touch with."

Another wrote:

"When one calls the office, it would be great if an actual person answers the call…"

Participants mentioned needing more support from several different sources, including the surgical team, family, and peers. One patient commented:

"Maybe have someone that had gastric bypass during your consultation process!"

Another wrote:

"Well now I live alone and I don't have anyone to have at home to give me any support. This of course will be just another obstacle."

Another requested:

"More support from the surgical team."

Participants cited many problems related to cost, including concerns with the expense of the testing required to have surgery, the desire for creation of a payment plan, and more transparent patient financial responsibility.

The themes with the most responses were evaluation process and insurance process. Evaluation process was divided into numerous sub-themes: length of time, location, medical eligibility, number of steps, nutrition counseling, patient advocacy, pre-surgery weight loss, scheduling, telemedicine, transportation, and travel. Many patients reported that less waiting time, shorter pre-surgery evaluation process, and faster surgery scheduling would make bariatric surgery more accessible. One patient wrote:

"It takes a long time to get through the process to get surgery and it makes it easy to get discouraged."

Location also emerged as a barrier. Several patients commented that having access to more convenient locations for pre-operative testing as well as surgery itself would make bariatric procedures more attainable.

Participants reported problems with medical comorbidities as a barrier to surgery. One patient stated:

"Be preventive and allow people to get surgery so they don't have major health issues later"

Patients were also frustrated by the amount of pre-operative testing as well as the travel and time required. One participant suggested:

"Have one full day of appointments at UPMC scheduled for the patients so that all exams and insurance requirements can be met before they leave so that the only step still in the patients hands is scheduling the surgery and having it completed. When I left I was given a list of things I had to get done or find out and then get back to UPMC to tell them when it was done and then move forward."

Another shared:

"It's difficult for patients in rural areas to make it to all of these appts. Instead of taking off work for an hour or two to go to my local UPMC hospital or clinic, I have to take a full day off work for every appt and drive 3-4 hours round trip."

Several respondents suggested that patient advocacy in the form of peer support and patient navigation would make getting bariatric surgery easier. One patient wrote:

> *"Being able to talk with other patients about their experience. I realize everyone is different however, there is a lot to be learned from Peer education and support."*

Another recommended:

> *"Give me a patient advocate who could help walk me through all steps and acts as a clearinghouse of info with insurance."*

One of the most common themes were related to concerns regarding the insurance process. Overall, participants were discouraged by the complexity, lack of transparency, and nuances of insurance coverage and approval. One patient suggested:

> *"Making the preapproval process less complicated and restricted. It's very lengthy, and some items are really not applicable to the procedure."*

Another proposed:

> *"Clearer insurance steps/submission instructions. what is needed to gain insurance approval and how long test are valid for."*

One survey respondent remarked:

> *"The insurance process was too long and overwhelming."*

Another shared:

When I finally considered surgery after trying many diets, it seemed like an eternity to have to follow a regimen for 6 more months to possibly qualify for surgery. The timeline needs to be shorter.

And, lastly, a participant wrote:

Insurance requirements. I had a BMI between 35-39 however only had "mild" sleep apnea. It seemed like every option or task I had to do to show the insurance company to approve the surgery was present but not significantly bad enough to qualify for the surgery. It was a big let down to know that yes I have significant medical issues that bariatric surgery could be used as a tool to help, but not to the extent that insurance will approve."

Fear of complications and post-operative concerns was the final theme that emerged. Participants shared that they were concerned about the changes that bariatric surgery causes to their body, including vitamin deficiency, long-term lifestyle management, and possible changes in gastrointestinal function. One patient requested:

"More information regarding the risks and what to expect after the surgery"

Another proposed:

"In depth discussion about the change in life style that will occur after the bariatric procedure."

Only one respondent mentioned COVID as a significant barrier.

Overall, in the open-ended portion of the patient survey, length of the insurance approval process, number of pre-operative steps required by surgeon, amount of time needed for insurance approval, wait time between initial evaluation and surgery, and fear of complications were the most reported barriers (Figure 6).

Figure 6. Word cloud for patient-reported barriers to bariatric surgery

4.0 Discussion

In this mixed methods study investigating barriers to bariatric surgery, we discovered that patients who attained bariatric surgery were more likely to be from more affluent and socially supported backgrounds. After initial clinic evaluation, there was a higher frequency of young, female, White, married, and full-time employed patients in the cohort who underwent bariatric surgery compared to those who withdrew. Those who had surgery were less likely to live in an impoverished or low-income zip code.

The public health impact of obesity is impossible to ignore with prevalence rates continuing to climb. The Centers for Disease Control (CDC) reports the national obesity prevalence as 41.9% between 2017 and March 2020;[38] however, obesity is not equally distributed among the national population. Rates of obesity are highest in Non-Hispanic Black adults followed by Hispanic adults as well as those aged 40 to 59 years old. The prevalence of obesity is also affected by educational attainment and household income, particularly among women.[39] Residing in a community with a high rate of obesity confers a greater risk of obesity in the individual.[40] In addition, family environment and lifestyle are influential in the development of obesity, particularly in children.[41] Lastly, people categorized as obese have greater healthcare utilization and cost which is especially poignant in our current state of high healthcare demand and stressed resources.[42] The consequences of obesity are far-reaching and not only affect the number and severity of chronic conditions in individuals, but also have a reciprocal impact on the well-being families, communities, societies, and health systems.[43]

Built environment influences physical activity, neighborhood safety, employment opportunities, and resource availability, including access to recreational facilities and dietary

choices. Current literature demonstrates the association between obesity and built environment. In a review of reviews, Dixon et. al concluded that lower weight status is associated with greater diversity in land-use mix, more pleasant aesthetics, healthier food environments, and greater access to parks and playgrounds.[44] The positive association between obesity and fast-food exposure, urbanization, and land use mix were reflected in another systematic review yet with slightly less robust evidence.[45] Land use mix is defined as the diversity and integration of different land use types, including office, retail, industrial, service, entertainment, education, health, and public sector.[46] These structural determinants of health not only impact the prevalence of obesity, but also its treatment. We utilized patient zip codes as a proxy for built environment. By matching zip codes to census tracts in the Columbia Area Deprivation Index (ADI) and poverty rate and low-income tracts from the USDA's Food Access Research Atlas (FARA), our results suggest that patients who withdraw from bariatric surgery evaluation are more likely to live in less resourced neighborhoods. They are more likely to live in an area in a low-income tract and with higher rates of poverty.

A related, yet independent factor we studied was patient socioeconomic status (SES). Socioeconomic status is defined by the American Psychological Association as "the position of an individual or group on the socioeconomic scale, which is determined by a combination of social and economic factors such as income, amount and kind of education, type and prestige of occupation, place of residence, and ethnic origin or religious background."[47] We collected information related to socioeconomic status from both the medical record and by using zip code linking. While we found bariatric surgery more attainable in White and fully employed patients, we did not demonstrate an association between Hispanic ethnicity, primary language, median

family income, or insurance payor. Patients undergoing bariatric surgery were more likely to be married, suggesting that these relationships may portend a benefit with regards to social support.

There were other compositional differences between the cohort who underwent bariatric surgery and the group that withdrew. The cohort undergoing surgery was healthier, demonstrating lower frequencies of several chronic illnesses, including type 2 diabetes, dyslipidemia, and hypertension. This finding adds to the evidence that the type of patients able to achieve surgery are those that belong to a more privileged class, and that socioeconomic, societal, and structural factors contribute in a multifactorial manner to rates of obesity and chronic diseases as a well as to the ability of diverse populations to access healthcare. It is essential that healthcare providers and systems acknowledge, explore, and invest in these inequities.

We aimed to examine patient-reported barriers to bariatric surgery through a survey of patients who withdrew from pre-operative bariatric evaluation. We analyzed 280 completed surveys which correlates with a response rate of 8.9%. Survey respondents were asked several optional questions regarding their demographic and socioeconomic background. We had between 78% and 88% response rate for these questions and therefore assume that it reflects the entire participant cohort. Respondents were mostly female sex and gender with high educational attainment and household incomes of $50,000 or greater. It is likely that the composition of survey respondents reflects the experiences of patients of higher socioeconomic status. Survey results suggest that participants gained knowledge about bariatric surgery and the insurance approval process during their clinic visit. In close-ended format, patients reported primary barriers to bariatric surgery as being fear of complications and the length of the insurance approval process.

The qualitative portion of the survey prompted patients to list barriers and/or ways that we could make bariatric surgery easier to achieve. Like the close-ended question, patients reported the

length of the insurance approval process and fear of post-operative complications as common barriers. Additionally, respondents cited poor communication from the surgical team, number of pre-operative requirements, and waiting time between initial clinic appointment and surgery as barriers. Many of the frustrations voiced by patients can be attributed to insurance requirements for coverage of bariatric surgery procedures.

Coverage for bariatric surgery varies widely by insurance plan. Many plans require members to meet strict criteria, including supervised weight loss programs for up to 18 months before the procedure will be covered. A few insurance companies even mandate documented weight loss of 5-15% prior to coverage for bariatric surgery. A systematic review of the effectiveness of insurance requirements for supervised weight loss prior to bariatric surgery concluded that these programs may be detrimental to the health of patients and are not beneficial in achieving long-term weight loss.[48] In fact, delay in bariatric surgery or outright insurance denial results in continued obesity and morbidity from obesity-related conditions.[49] In 2016, the American Society of Metabolic and Bariatric Surgery published consensus guidelines stating that patient eligibility for bariatric surgery should be determined based on initial body mass index (BMI) rather than weight changes during insurance-mandated diet and exercise regimens.[50] While bariatric surgery alone is not a cure for obesity, it is the mainstay of treatment for severe obesity and should be regarded by insurance companies as a preventative and cost-saving measure.

There are several limitations in this study. First, we linked patient zip codes to several publicly available resources, including Columbia ADI and data points from the USDA FARA. These data are reported using census tracts. As our data collection included zip codes, we calculated average scores for all census tracts within each zip code for ADI as well as poverty rate, low-income tract, and median family income from FARA. Because of the larger capture area of

zip codes, we may lose granular, neighborhood level differences. Second, we elected to survey only patients who withdrew from bariatric surgery evaluation which makes the data for this portion of the study inherently descriptive. Lastly, the cohort of survey respondents was largely well-educated with household incomes of $50,000 and greater. Therefore, the responses may not reflect the experience of patients from low resource and underserved communities.

This study promotes several potential interventions to improve the accessibility of bariatric surgery. As seen both in the qualitative and quantitative portion of the patient survey, insurance policy plays a large role in the approachability of bariatric surgery. A federal mandate requiring all insurance companies to provide comprehensive weight management services, including coverage of bariatric surgery with elimination of pre-operative weight loss requirements would revolutionize access to bariatric surgery. Additionally, standardization of bariatric surgery preoperative requisites would enable surgical staff to improve transparency and allow for better patient communication. Many survey respondents communicated a desire for peer support during the bariatric surgery process. This patient advocacy would yield several important benefits, including clarity of peri-operative expectations, surgical risks, and post-operative recovery. Respondents also cited issues with communication with surgical staff as well as confusion with pre-operative processes. One possible solution to these concerns is a patient navigation or concierge program that would foster a relationship between healthcare staff with patients.

Patient navigators (PN) are trained professionals that serve as community-based, culturally sensitive advocates whose aim is to address social impediments and reduce institutional systemic barriers to optimize patient care.[51] PN bridge the hospital-community gap through a holistic approach with emphasis on health literacy, communication, and social support. Jean Pierre et. al. identified the importance of both “relational” and “instrumental” aspects of PN, highlighting that

nurturing rapport between patients and navigators was equally as important as aid in managing healthcare complexity.[52] The most convincing evidence of the success of PN in improving patient care comes from the cancer literature. Cancer screening, diagnosis, and treatment all improve with the addition of a PN to the healthcare team, particularly in minority patients.[53–55] PN have also emerged as beneficial adjunct in the treatment of chronic diseases with studies demonstrating increase in patient adherence and disease-specific outcomes.[56–59] There is a paucity of literature on the use of PN in bariatric surgery, but given the intricacies of insurance approval, high prevalence of obesity in minorities, and interplay with obesity and co-morbidities, PN would be a critical addition to the healthcare network and might expand access to bariatric surgery.

Addressing barriers to bariatric surgery is imperative for the health of our communities, particularly marginalized populations who are most affected by obesity. By making bariatric surgery more accessible, we can improve access to high quality healthcare for our most vulnerable populations.

Appendix A Survey

Barriers to Bariatric Surgery

Welcome to the "Barriers to Bariatric Surgery" Survey! The Department of Bariatric Surgery at UPMC Magee Women's Hospital is looking for feedback on your patient experience and expectations. The survey is for patients who have not had bariatric surgery. You have been randomly selected to participate in this survey. Your participation is completely anonymous, confidential, and voluntary. You will be asked questions about the evaluation process for bariatric surgery and your background. This survey will not affect your medical care at UPMC.

The survey will take about 5 minutes to complete. By participating, you will help us understand the barriers or obstacles that patients face during evaluation for bariatric surgery. We are not collecting any identifying information, so there is little to no risk of participating. There is no direct benefit to you, but your honesty will help us improve the experience for other patients. Thank you for participating!

Have you ever had an appointment with the Bariatric Surgery Team at Magee Women's Hospital to discuss weight loss surgery?	◯ Yes ◯ No
Have you had bariatric or weight loss surgery (ie. gastric bypass, sleeve gastrectomy, other)?	◯ Yes ◯ No
Who referred you to the UPMC Bariatric Surgery Center at Magee Women's Hospital?	☐ Self ☐ Family member or friend ☐ Primary care physician (PCP) ☐ Other physician/doctor ☐ Other medical professional ☐ Other: (Choose all that apply.)
Other:	_____

Before my clinic appointment:					
	Excellent	Good	Average	Poor	Terrible
My knowledge about bariatric surgery was	◯	◯	◯	◯	◯
My knowledge about the insurance/approval process for bariatric surgery was	◯	◯	◯	◯	◯

Before my clinic appointment:					
	Very easy	Easy	Neither easy nor difficult	Difficult	Very difficult
I thought the insurance/approval process for bariatric surgery was	◯	◯	◯	◯	◯

After my clinic appointment:

	Excellent	Good	Average	Poor	Terrible
My knowledge about bariatric surgery was	◯	◯	◯	◯	◯
My knowledge about the insurance/approval process for bariatric surgery was	◯	◯	◯	◯	◯

After my clinic appointment:

	Very easy	Easy	Neither easy nor difficult	Difficult	Very difficult
I thought the insurance/approval process for bariatric surgery was	◯	◯	◯	◯	◯

During my clinic appointment I expected to:

- ☐ Learn about surgical options
- ☐ Get more information about surgery
- ☐ Start the surgical process
- ☐ Meet the surgeon
- ☐ Schedule surgery
- ☐ Other:

(Choose all that apply)

Other: _____

During my clinic appointment I did:

- ☐ Learn about surgical options
- ☐ Get more information about surgery
- ☐ Start the surgical process
- ☐ Meet the surgeon
- ☐ Schedule surgery
- ☐ Other:

(Choose all that apply.)

Other: _____

The reason(s) I did not go through with bariatric surgery was:					
	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
The insurance/approval process has too many steps or takes too long.	◯	◯	◯	◯	◯
Bariatric surgery was not right for me.	◯	◯	◯	◯	◯
It was not the right time for surgery.	◯	◯	◯	◯	◯
I was afraid of the risks or complications.	◯	◯	◯	◯	◯
I had financial issues that prevented me from getting bariatric surgery.	◯	◯	◯	◯	◯
I had insurance issues that prevented me from getting bariatric surgery.	◯	◯	◯	◯	◯
I did not have family/partner support.	◯	◯	◯	◯	◯
Other:	◯	◯	◯	◯	◯

Other: _____

Name three things that would make getting bariatric surgery easier or more accessible.
1. _____
2. _____
3. _____

Next, you will be asked a few questions about your background.

What was your sex at birth?	◯ Male ◯ Female ◯ Prefer not to answer
What is your gender?	◯ Male ◯ Female ◯ Transgender ◯ Non-binary ◯ Prefer not to answer
How many children (under the age of 18) live in your household?	_____
How many adults (18 years and older) live in your household?	_____
What is your annual household income from all sources?	◯ Less than $10,000 ◯ $10,000 to less than $15,000 ◯ $15,000 to less than $20,000 ◯ $20,000 to less than $25,000 ◯ $25,000 to less than $35,000 ◯ $35,000 to less than $50,000 ◯ $50,000 to less than $75,000 ◯ $75,000 or more
What is the highest grade or year of school you completed?	◯ Never attended school or only attended kindergarten ◯ Grades 1 through 8 (Elementary) ◯ Grades 9 through 11 (Some high school) ◯ Grade 12 or GED (High school graduate) ◯ College 1 year to 3 years (Some college or technical school) ◯ College 4 years or more (College graduate)

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