Association Between Out-of-Pocket Expenses and Attendance at the Six Month Post-Operative Appointment in a Cohort of Gastric Bypass Patients

By

Kelly A. Machovec

A thesis submitted to the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Master of Public Health in the Public Health Leadership Program

Chapel Hill
2005

Advisor: Margaret Gourlay, M.D., M.P.H.

Second Reader: Timothy Farrell, M.D.

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Introduction

Gastric bypass is an increasingly popular treatment for morbid obesity, especially in smaller medical centers and community clinics. Evidence-based guidelines for gastric bypass post-operative follow-up are needed to help minimize complications from this high-risk surgical procedure. Long term outcomes research to develop such guidelines is lacking, and future research is especially needed to explore important patient-related factors needed for a successful post-operative follow-up protocol.

We performed a systematic review of relevant studies and the results of a data analysis addressing appointment keeping behavior in gastric bypass patients in the University of North Carolina Hospitals Department of Gastrointestinal Surgery. We then conducted a study to examine patient-level factors associated with no-show behavior at the 6 month post-operative appointment at a tertiary care hospital. Our goal was to determine if an association existed between non-attendance at the 6 month post-operative follow-up appointment and out-of-pocket patient expenses due at that appointment.

Importance of Follow up for Gastric Bypass Patients

Long term follow up after gastric bypass procedures is important for three main reasons, discussed in this section.

Post-surgical complications

Serious surgical complications can result from gastric bypass procedures. Complications are typically classified as early- versus late-occurring. Early complications may include incisional hernias, intra-abdominal adhesions,
infection, thrombo-embolism, and anastomotic leak\(^1\). Replacement of open procedures with laparoscopic technique has reduced some of these complications, but increases the chances of internal hernias with small intestine strangulation\(^1\). Most late (occurring more than 30 days post-operatively) surgical complications, including anastomotic leak, are no longer a concern by 6 months, although patients are still at risk for gastric outlet obstruction. Thus, close follow-up in the immediate post-operative period is critical for timely identification of early and late complications from surgery.

**Malabsorption and nutritional compromise**

Because of the restrictive and malabsorptive nature of the procedure, nutrient and biochemical deficiencies are common and may be very serious. Patients are at risk for iron, vitamin B\(_{12}\), folate and calcium deficiencies after gastric bypass procedures\(^2\). Depending on the specific type of gastric bypass, patients may also be at risk for protein and fat-soluble vitamin (vitamins A, D, E and K) deficiencies\(^2\).

One study of gastric bypass patients found that more than 44% had low hemoglobin, ferritin and iron four years post-operatively\(^3\). The American Society of Bariatric Surgery estimates that the incidence of iron deficiency or anemia is 14-16% after roux-en-y gastric bypass. Reasons for iron deficiency include reduced acid secretion of the stomach, leading to reduced ability to absorb iron effectively, and removal of the duodenum and proximal jejunum, where iron is typically absorbed\(^2\). Even if patients take vitamin supplements containing iron, it may not be sufficient to correct the deficiency, especially in menstruating women\(^2\).
Thiamine deficiency is also multifactorial. The acidic environment of the proximal duodenum allows maximum thiamine absorption, so reduction of the stomach into a gastric pouch and removal of the proximal duodenum puts patients at risk for thiamine deficiency. Further, multiple case reports in the literature describe thiamine deficiency due to persistent post-surgical vomiting. Researchers are concerned that clinically asymptomatic, untreated thiamine deficiency may lead to Wernicke's encephalopathy, which is irreversible. Administration of supplemental thiamine can prevent these negative sequelae in patients who are regularly evaluated for thiamine deficiency.

Removal of the part of the stomach that secretes intrinsic factor, required for vitamin B<sub>12</sub> absorption, results in vitamin B<sub>12</sub> deficiency. Body stores of vitamin B<sub>12</sub> are not sufficient to compensate for lack of absorption. One study estimates that 12-33% of patients who undergo gastric bypass have vitamin B<sub>12</sub> deficiency. Unfortunately, patients may not have symptoms of this deficiency until late in the process. Blood levels of vitamin B<sub>12</sub> must be followed in patients who have had gastric bypass procedures to prevent irreversible neurologic damage due to long term B<sub>12</sub> deficiency.

People who undergo gastric bypass procedures are also at risk for bone metabolic abnormalities. Removal of the duodenum and proximal jejunum prevents efficient uptake of calcium. Vitamin D is absorbed primarily in the jejunum and ileum, which are mostly intact after the procedure, but low intake of fat may prevent adequate uptake of vitamin D, a fat soluble vitamin. Deficient vitamin D worsens calcium malabsorption. In turn, low levels of blood calcium stimulate parathyroid hormone to increase release of calcium stores from bone. Coates et al. looked at patients 9 months after having gastric bypass procedures and found that compared to baseline, pre-operative values, patients had reduced
bone mineral density in the hip (7.7 +/- 4.8%), trochanter (9.3 +/- 5.7%) and total body (1.6 +/- 2.0%)\(^5\). The losses were statistically significant in all three measurements. Further, the majority of these patients had abnormal calcium and vitamin D levels 4 years post-operatively, despite increased dietary calcium and vitamin D intake. Of note, these patients had normal levels of parathyroid hormone\(^5\).

In contrast, Marceau et al. found no significant changes in bone density in a cohort of gastric bypass patients 4-10 years post-operatively\(^5\). However, these patients were followed very closely to avoid metabolic deficiencies, and were aggressively supplemented when needed, underscoring the importance of long term follow-up in gastric bypass patients\(^6\).

\textit{Minimal evidence base available to guide practice}

Gastric bypass is increasingly common, but its effectiveness for sustained weight loss has not been demonstrated conclusively. Some reports show that gastric bypass is superior to other treatments for obesity at one year, by which time most patients can expect to lose 65-75% of excess body weight, but long term follow-up data are lacking. Most studies of gastric bypass patients report outcomes at 1-2 years; very few studies follow patients to 5-15 years, and even then, attrition is very high. Institutions that use this procedure as a treatment for obesity need to maintain long-term follow up to measure long-term effectiveness and to capture late outcomes and complications.

In fact, the American Society for Bariatric Surgery (ASBS) includes follow-up requirements in their guidelines for granting privileges in bariatric surgery\(^7\). ASBS requires that credentialed bariatric surgery programs demonstrate programs to prevent, monitor and manage both short- and long- term
complications of bariatric procedures. Further, ASBS requires that bariatric surgery centers have a system to follow up at least 50% of patients with restrictive procedures and at least 75% of patients with malabsorptive procedures for at least five years\textsuperscript{7}.

The Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) also emphasizes the long term consequences of surgical treatment for obesity, and states that patients must be followed for life to provide nutritional counseling and biochemical surveillance\textsuperscript{8}. They recognize the benefit of a multidisciplinary approach, including medical management of comorbidities, dietary and exercise counseling, nursing care and psychological assistance. Moreover, SAGES recommends that management of comorbidities post-operatively should be undertaken by a practitioner familiar with bariatric procedures\textsuperscript{8}.

Systematic Review of the Literature

We conducted a systematic review of the literature to identify important patient-oriented factors that might be associated with poor attendance at post-operative follow-up visits in patients who have gastric bypass surgery.

Selection of Articles

The Medline/Pubmed database was searched for the terms "no-shows," "care utilization bariatric surgery," "barriers to care access cost," "bariatric surgery follow-up," "out-of-pocket expense" and "out of pocket expenditure." Searches were limited to English language articles published since 1990.

All abstracts were reviewed, and articles that focused on psychiatric or pediatric populations were excluded, because clinical characteristics of these patients were too dissimilar to post-operative gastric bypass patients. Articles
examining no-show behavior for colonoscopy, Pap smear, mammogram and colposcopy appointments were also excluded because they focus on preventive medical care. Bibliographies were hand-searched, and articles that appeared to be relevant to our hypothesis (e.g. articles with “appointment-keeping” or “no-show” in the title) were reviewed. Case reports, review articles and editorials were excluded.

The only search term that yielded articles used in this paper was "no-shows." The search resulted in ten articles examining reasons for missed clinic appointments (Table 1). Three articles employed cross-sectional design, three were qualitative, and 4 were case-series. Five articles examined patients in primary care settings; the remaining articles examined patients in specialty clinics (diabetes, gastroenterology, high risk obstetrics, HIV, systemic lupus erythematosus).

Appraisal of Literature Exploring Patient Appointment Keeping Behavior

Internal Validity Ratings

Table 2 presents quality ratings for each of the ten articles classified according to study design (cross-sectional, qualitative and case-series). The ten articles identified in the search were assigned quality ratings by the primary reviewer (KM) using a 0-3-point scale checklist (0=poor, 1=fair, 2=good, 3=excellent) for each of the categories described below, i.e., setting and study populations, measurement methods and/or tools, statistical analysis and overall reporting of results (Table 2).

Selection of Study population
Selection of the study population was evaluated according to whether the source population was adequately described and whether the study population was representative of the source population. All ten studies received good or excellent ratings on describing the source population, but only two studies received good or excellent ratings on whether the study population represented the source population\textsuperscript{9,10}.

Eight studies received poor or fair quality ratings due to selection bias, especially concerns about volunteer bias. For several studies, a significant number of subjects declined to participate, return a questionnaire or telephone call, or could not be reached\textsuperscript{11,12,13,14,15}. These behaviors clearly could have been related to the reasons for the missed clinic appointments. Also, studies that chose only selected days to recruit patients received lower quality rating scores if they did not state a systematic method for choosing those selected days\textsuperscript{13,16,17}.

**Measurements**

Measurements were evaluated based on means of data collection and identification of data collectors. Studies received higher quality scores if the authors adequately described the methods of data collection, including questionnaires or interview questions used. Reliability and validity of instruments was an important factor in measurement quality score assignment. Studies also received higher scores for identifying the data collectors.

Only one study received an excellent score for means of data collection\textsuperscript{18}. Five studies received good scores for means of data collection\textsuperscript{9,10,15,16,17}. These studies received higher quality scores for data collection because they employed chart review or medical database review to gather information. Smith and Yawn
audited charts of a subsample of the study population to confirm accuracy and found that 3.8% of the data were incorrectly recorded^{10}.

Mirotznik et al. developed a questionnaire to explore the application of the Health-Belief Model to appointment keeping behavior^{15}. The authors provided a detailed description of methods used to develop the questionnaire. They also described the process of evaluating the instrument for social desirability as well as reliability and construct validity. While their questionnaire had face validity, it was not tested in another population, so its accuracy and precision is uncertain.

The remaining four studies received poor or fair scores for quality of measurements. Three studies utilized interview questions or written questionnaires to assess reasons for non-attendance^{12,13,11}. Lacy et al. developed an open-ended interview guide to assess patient's personal experiences of missed appointments and access to care, but this instrument was not tested for validity or reliability^{11}. Murdock et al. mailed a questionnaire to patients who missed appointments, but did not describe the questionnaire^{12}. Telephone calls were placed to patients who did not return questionnaires; the authors list the questions asked but do not describe the script for the telephone call or who made the calls^{12}. Campbell et al. also called patients to inquire reasons for missed appointments; these authors provide a description of the purpose of the interview questions but do not actually list the nine questions asked^{13}.

Measurements were not blinded for any of the studies reviewed. While this was a concern regarding the potential for incorrect or manipulated data, we expected data coding and entry errors to be randomly distributed between both groups of patients (i.e. patients who did/did not miss appointments). Two studies
received good quality ratings for identifying the data collectors\textsuperscript{13,18}. The remaining studies received poor quality ratings for this category.

Overall, in synthesizing the quality scores for means of data collection and blinding and identification of data collectors, only one study receives a quality rating of good\textsuperscript{18}. The remaining nine studies receive quality ratings of poor to fair because of measurement bias that could weaken internal validity of the studies.

**Statistical Analysis and Confounding**

Quality of analysis was based on the use of appropriate statistical methods and the potential for confounding of the results. None of the studies received a quality score of 3 (excellent) for the analysis because all had high potential for confounding, due to the study designs. In five studies, statistical analysis included regression models to predict no show behavior controlled for covariates\textsuperscript{10,14,16,17,18}.

Nine studies received a score of good for appropriate analysis. One study received a fair rating because the analysis was not well described and therefore could not be fully evaluated\textsuperscript{16}.

The studies differed in analysis of results. Five studies compared characteristics of patients who missed appointments versus patients who did not miss appointments\textsuperscript{9,10,15,16,18}. Four studies described characteristics of patients who missed appointments only\textsuperscript{11,12,13,14}.

**Results**

**Age**

Age is consistently associated with appointment-keeping behavior, with younger patients generally missing more appointments (Table 1)\textsuperscript{9,10,14,16,17,18}. 
This trend appears to be linear throughout adulthood, with the oldest patients keeping the most appointments. No studies found absence of a correlation between age and appointment keeping behavior.

**Race and Sex**

Three studies found that frequency of missed appointments was significantly associated with race, with African Americans or blacks more likely to miss appointments\textsuperscript{10,14,16}. However, the relationship between race and frequency of missed appointments was not adjusted for potential confounders in these studies. Race may be helpful to predict frequency of missed appointments as a covariate in a regression model\textsuperscript{10}. Sex is not associated with frequency of missed appointments\textsuperscript{16,16}.

**Cost**

Cost appeared to be involved in patient's decisions to attend appointments. Mirotznik et al. found that among systemic lupus erythematosus (SLE) patients at an Arthritis Clinic in Brooklyn, the perceived cost of doctor visit negatively correlated with past and future appointment keeping (p<0.01)\textsuperscript{15}. In a linear regression model, perceived cost of doctor visits was associated with prospective (p<0.05) and retrospective (p<0.01) appointment keeping behavior, when controlling for general health motivation, perceived susceptibility to SLE, perceived severity of SLE and perceived benefit of doctor visits\textsuperscript{15}.

Karter et al. found that the amount of copayment affected appointment keeping behavior in a cohort of diabetes patients in the Kaiser Permanente system in California\textsuperscript{9}. Compared to patients with no copay, patients with $1-5 or $6-10 copay had a 10% greater odds of missing more than 30% of appointments;
patients with greater than $10 copay had a 30% greater odds of missing more than 30% of appointments\textsuperscript{9}. Patients living in what the researchers classified as a "high poverty area" had a 50% greater odds of missing more than 30% of appointments\textsuperscript{9}.

Type of Insurance

The relationship between insurance type and appointment keeping behavior is undetermined. Three studies examined the relationship in family practice clinics. Smith and Yawn found that using private insurance as a reference, people receiving traditional medical assistance (e.g. traditional Medicaid) were less likely to miss appointments (OR 0.7), while people receiving managed care medical assistance were more likely to miss appointments (OR 1.1); these results were unadjusted\textsuperscript{10}. Majeroni et al. found that patients with Medicaid managed care and private managed care had higher rates of missed appointments after adjusting for sex, race and age (P<0.001)\textsuperscript{18}. However, Cashman et al. found that insurance type was not significantly associated with number of missed appointments when controlling for age and psychological conditions\textsuperscript{17}.

Other Reasons

Results of the qualitative studies suggested additional reasons why patients miss appointments. Lacy et al. found that 65% of patients interviewed identified emotional barriers to keeping appointments\textsuperscript{11}. These patients indicated that negative feelings about going to see a doctor outweighed their perceived benefit of the appointment. The authors also concluded that overall, patients do
not understand the appointment scheduling system, and do not realize that missing an appointment depletes clinic resources\textsuperscript{11}.

Studies by Murdock et al. and Campbell et al. found that the most frequent reason for missing clinic appointments was that the patient forgot (30\% and 18\%, respectively)\textsuperscript{12,13}; Campbell et al. also found that 29\% identified lack of transportation as a reason for missing clinic appointments\textsuperscript{13}.

Summary of Internal Validity

The overall quality of the articles analyzed in this systematic review was fair to good. The most significant problem affecting internal validity of these studies was the potential for selection bias. Most studies provided clear definitions of their source population, but did not adequately sample from that population to create a representative study population. A second problem is potential for measurement bias. Lack of blinding of data collectors and lack of description of measurement tool were common problems. Finally, all studies had high potential for confounding as a result of the study designs (cross-sectional, descriptive/qualitative and case-series).

External Validity of Findings from the Systematic Review: Generalizability to Gastric Bypass Populations

External validity of the findings from the systematic review as they relate to post-operative follow-up in gastric bypass patients is discussed in this section. Quality ratings for external validity were not assigned.

The majority of the articles appraised in this systematic review concern patient appointment-keeping behavior in primary care clinics. The relevance of some of these studies to gastric bypass patients is uncertain, since primary care
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Clinic patients seek appointments for a much wider variety of reasons than gastric bypass patients. Unlike some primary care clinic patients who seek care for acute concerns, the gastric bypass patients in our study returning to the surgeon at the 6 month post-operative visit for surveillance purposes. During the 6 month follow-up visit, the surgeon inquires about progress with diet and exercise, helping to troubleshoot with any problems faced by the patient. The surgeon checks the wound incision to ensure appropriate healing. Blood work, including a complete blood count, total iron and vitamin B₁₂, is also completed to monitor for nutritional or metabolic deficiencies.

However, primary care clinic patients who are seen for maintenance of chronic diseases, including diabetes, osteoporosis and hypertension are likely to resemble gastric bypass patients in several ways. Perceptions about disease, especially "silent" diseases like hypertension, may influence a patient’s decision to attend an appointment. Further, patients may feel that they are making solid lifestyle changes but are not seeing results. For example, diabetic patients may be making good dietary changes and exercising more frequently, but may not be losing weight or experiencing improvement in blood glucose levels. Perceptions of the severity of disease and utility of treatment likely influence a patient’s decision to visit with a physician.

Primary care patients with chronic diseases may be very similar to post-operative gastric bypass patients in terms of appointment keeping behavior. By the 6 month post-operative visit, gastric bypass patients may feel that they are making progress with weight loss and lifestyle changes, including diet and exercise. Patients may not feel ill, even if they are experiencing vitamin deficiencies or metabolic abnormalities. This feeling of well-being may contribute to decisions to attend a follow-up visit.
Alternatively, patients may feel that they are not making good progress by the 6 month post-operative visit. A patient who has not lost the amount of weight she expected to lose might feel that the procedure has failed her or that she has failed in some way. She might not want to return to the surgeon because of the perception that she did not meet "expected" weight loss or lifestyle change goals. Patients may have barriers to good weight loss progress that are not being addressed; patients also may have unrealistic expectations of the procedure at such an early time point (6 months post-operatively).

Unfortunately, the studies from primary care clinics did not differentiate between patients with appointments for acute versus chronic concerns, so the applicability of results to post-operative gastric bypass populations cannot be determined. However, other studies included in the review examined behaviors of chronic disease populations. Mirotznik et al. examined patients with systemic erythematous lupus, a chronic disease that requires on-going surveillance even if the patient is not experiencing symptoms\textsuperscript{15}. Catz et al. examined patients with HIV, another chronic disease that requires on-going surveillance\textsuperscript{14}. HIV is associated with social stigma and marginalized populations, and these social factors may make HIV patients less similar to gastric bypass patients.

**Defining the Problem of Follow-up after Gastric Bypass Surgery: UNC Hospitals Department of Gastrointestinal Surgery**

UNC Hospitals Department of Gastrointestinal Surgery has been conducting gastric bypass procedures since 2000. Patients are carefully selected pre-operatively, following National Institutes of Health (NIH) guidelines for selecting patients who meet criteria for weight loss surgery\textsuperscript{19}. Our policy is that patients follow up at 2 weeks and 3, 6 and 12 months post-operatively. After
the first post-operative year, patients are instructed to follow-up at least every 12 months.

Patients are not responsible for any out-of-pocket co-payment or co-insurance up to 90 days post-operatively. Charges for this 90 day period, termed the “global period,” are included as part of the procedure charge. Therefore, patients do not have to pay out-of-pocket for post-operative care until 90 days after surgery. The 3 month post-operative visit sometimes occurs during this 90 day global period.

The bariatric team at UNC Hospitals noticed that all patients attend the 2 week post-operative appointment, but recognized a decrease in patient appointment attendance after this period. We chose to focus on the 6 month post-operative appointment for two reasons. First, all patients are outside of the global period, so all patients are responsible for payment for the visit, according to their insurance type and provider. Second, attendance at the 6 month appointment is likely a marker of future appointment compliance; that is, patients who do not attend the 6 month appointment may be less likely to attend the 12 month post-operative appointment. We wanted to explore factors that may be associated with loss to follow-up at this early period. We hypothesize that out-of-pocket expenses are associated with patient non-attendance.

Methods

Subjects

When patients interested in gastric bypass contact the Department of GI Surgery at UNC Hospitals, the nurse (Karen Colton, R.N. [KC]) conducts an initial assessment, following a standardized form. The nurse gathers the patient's name, mailing address, telephone number, age and self-reported weight and
height. UNC Hospitals does not perform gastric bypass procedures on candidates who are more than 55 years old or weigh more than 450 pounds. The nurse also asks for the patient’s insurance type and policy number. The nurse contacts the insurance company to ensure that gastric bypass procedures are covered under their policy; patients also have the option to pay out of pocket. The nurse sends the patient an information packet that must be filled out by the patient and the patient’s primary care physician. The primary care physician must agree to participate in the patient’s post-operative care, including following the patient’s medication requirements and micronutrient levels post-operatively. Each patient must also have nutritional and psychiatric consults prior to the procedure. Informed consent is obtained from all patients who meet eligibility criteria and agree to participate in the study. The research protocol has been reviewed and approved by the University of North Carolina Institutional Review Board.

Once a patient has fulfilled these criteria, the patient may schedule an appointment with a GI Surgery fellow. Patients are warned of the risks of the procedure and are told that they are expected to follow-up at 2 weeks and 3, 6 and 12 months post-operatively, and then yearly after that. At each post-operative follow-up visit, the patient is weighed. The attending physician (TF) sees each patient and discusses lifestyle changes, including progress with diet and exercise regimen. The physician answers any questions that patients have. The physician checks each patient’s incision wound. Blood work, including a complete blood count, vitamin B₁₂ and total iron levels are drawn to monitor nutritional status. The 6 month post-operative visit takes approximately 10-15 minutes to complete.
Data Collection

Outcome Variable Measurements

In our study, we are interested in the association between out-of-pocket expenses and patient attendance at the 6 month post-operative visit. The outcome variable in our study is missed versus attended 6 month post-operative appointments. Missed versus attended appointment data were gathered from a master patient list; this list is updated by the clinic nurse (KC), and contains patient name, age, sex, BMI before surgery and at each post-operative follow up appointment, town/zip code and insurance provider.

In the GI Surgery clinic, patients schedule a given follow-up appointment at the time of the previous appointment. For example, patients schedule the 6 month post-operative visit at the time of their 3 month post-operative visit. Two weeks prior to a scheduled appointment, patients receive an appointment reminder slip in the mail.

At the end of a given clinic day, the nurse (KC), attending physician (TF) and fellows look at the schedule to determine which patients missed appointments. The attending physician documents via dictation note that a given patient missed an appointment. Attempts to contact the patient to reschedule appointments are sometimes made, but not for every patient. Currently, the department does not have a system to contact patients who miss appointments. Patients who attend appointments have their weight at that appointment entered into the master patient sheet; a missed appointment is indicated on the master patient sheet by a blank space under the column “6 Mo Visit.”

Measurement of Patient Out of Pocket Expenses
A financial planner in the Department of Surgery (Joellen Buckio) conducted a payment history search of the patient database for all gastric bypass patients since July 1, 2000. The search produced the charges, adjustments and net amount owed for every patient who has had a gastric bypass procedure or had an outpatient appointment in the bariatric surgery clinic since July 1, 2000. The charges for each appointment do not include fees for laboratory services used at that appointment; patients are billed for laboratory fees separately. Therefore, laboratory costs were not included in this analysis. Patients in this study with an outstanding balance at the time of their 6 month follow-up were not required to pay the balance at the time of their appointment, so these charges were not included in this analysis.

For patients who attended their 6 month follow-up appointment, we determined the net amount owed by that patient. Knowing the patient’s insurance provider, we estimated the amount of co-payment owed or co-insurance rate. The copayment for that insurance company, or the co-insurance rate multiplied by the amount owed, was the out-of-pocket expense for each patient.

For patients who missed their 6 month follow-up appointment, we used an estimate of what their out-of-pocket expenses would have been. For each insurance provider, we determined the amount of co-payment that the insurance provider charges for a post-operative visit. Many times, we deduced this information using the co-payment amounts or co-insurance rates for other patients with the same insurance provider who attended their 6 month follow-up appointment.

Measurement of Covariates
Patient names and medical record numbers are kept by the attending physician (TF) in a database for gastric bypass patients. Each time a new patient is scheduled for gastric bypass surgery, the clinic nurse (KC) collects the patient's name, sex, address (city/town and zip code), pre-operative weight and insurance provider from the computerized medical database system. Pre-operatively, all patients are weighed, in clothing, on a Scaletronics digital scale. Patient height is measured using a height bar that is part of the digital scale. This information is kept in a master patient list. Patient's weights at the 2 week and 3, 6 and 12 month post-operative follow-up appointments are also recorded on this master list.

Patient city/town and zip code was put into MapQuest online to calculate approximate distance from UNC Hospitals, in miles.

**Statistical Analysis**

Descriptive statistics are used to report age, distance from UNC Hospitals, pre-operative BMI, sex, race and out-of-pocket expenses for patients who missed appointments versus patients who kept appointments for the 6 month post-operative visit. Bivariate statistics analyzed associations between appointment keeping behavior, out-of-pocket expenses and covariates. Chi-squares tests were used to describe the relationship between missed appointments and sex and missed appointments and race. Two sample t-test with unequal variance was used to evaluate the association between appointment keeping behavior and out of pocket expenses, age, distance from UNC Hospitals and pre-operative BMI. Statistical significance was defined as P-value <0.05.
Results

Study Subjects

One hundred eighty-nine patients had gastric bypass procedures at UNC Hospitals from July 2000 through May 2005. Of these patients, five were deceased at the time of their 6 month follow-up appointment. Two patients were officially discharged from the practice (e.g. moved out-of-state). Data were missing for one patient. One patient was not able to attend the 6 month appointment due to Guillain-Barre syndrome. Twenty-five patients did not have 6 month follow-up appointments before May 1, 2005, which was the time of data analysis. Therefore, the final study population comprised 155 patients.

Characteristics of the study population are provided in Table 3. Mean age was 40.7 years (range 20-65). One hundred thirty-six subjects were female, nineteen were male. One hundred fourteen subjects classified themselves as white, 36 as black, one as Asian, one as Hispanic, and three as other. Average pre-operative BMI was 51.6 kg/m² (range 32.6-83.3). Subjects traveled an average distance of 76.3 miles (range <1-740) to UNC Hospitals. When excluding the distance value for the subject who traveled 740 miles, the average distance is 72.0 miles (range 0-329.9). Ninety-six patients attended the 6-month post-operative appointment; fifty-nine did not attend. The average out-of-pocket expense due at the time of 6 month appointment was $10.07 (range 0-61).

Association Between Attendance and Covariates

Bivariate statistical analysis did not show a statistically significant relationship between attendance at the 6 month post-operative appointment and any of the patient characteristics (Table 4). The association between age and attendance is not statistically significant (P=0.079) but suggests a trend, with
older patients being less likely to attend the 6 month post-operative appointment. Insurance type was not associated with attendance at the 6 month post-operative appointment (P=0.845). Out-of-pocket expenses were not associated with attendance at the 6 month post-operative appointment (P=0.607).

Table 3. Characteristics of gastric bypass study population.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean (SD), yo</td>
<td>40.7 (10.0)</td>
</tr>
<tr>
<td>Pre-operative BMI, mean (SD), kg/m²</td>
<td>51.6 (9.4)</td>
</tr>
<tr>
<td>Distance from UNC Hospitals, mean (SD), miles</td>
<td>76.3 (79.3)</td>
</tr>
<tr>
<td>Sex, Female, n (%)</td>
<td>136 (87.7)</td>
</tr>
<tr>
<td>Male, n (%)</td>
<td>19 (12.3)</td>
</tr>
<tr>
<td>Race/ethnicity: White, n (%)</td>
<td>114 (73.6)</td>
</tr>
<tr>
<td>Black, n (%)</td>
<td>36 (23.2)</td>
</tr>
<tr>
<td>Hispanic, n (%)</td>
<td>1 (0.65)</td>
</tr>
<tr>
<td>Asian, n (%)</td>
<td>1 (0.65)</td>
</tr>
<tr>
<td>Other, n (%)</td>
<td>3 (1.9)</td>
</tr>
<tr>
<td>6 Month Appointment Attendance, Attended, n (%)</td>
<td>96 (61.9)</td>
</tr>
<tr>
<td>Missed, n (%)</td>
<td>59 (38.1)</td>
</tr>
</tbody>
</table>

Table 4. Analysis of association between missed versus attended appointment and potential predictors of attendance.

<table>
<thead>
<tr>
<th>Missed Appointment</th>
<th>Attended Appointment</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N=59</td>
<td>N=96</td>
<td></td>
</tr>
<tr>
<td>Out-of-pocket expenses*, $</td>
<td>9.7 (1.6)</td>
<td>10.3 (1.2)</td>
</tr>
<tr>
<td>Age, y</td>
<td>42.2 (1.3)</td>
<td>39.8 (1.0)</td>
</tr>
<tr>
<td>Pre-operative BMI, kg/m²</td>
<td>49.9 (1.2)</td>
<td>52.6 (1.0)</td>
</tr>
<tr>
<td>Distance from UNC Hospitals, miles</td>
<td>79.0 (8.3)</td>
<td>67.7 (5.6)</td>
</tr>
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<td>Sex: Male, %</td>
<td>26.3</td>
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<td>Female, %</td>
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<td>Race/ethnicity: White, %</td>
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<td>Black, %</td>
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<td>Asian, %</td>
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<tr>
<td>Other, %</td>
<td>33.3</td>
<td>66.7</td>
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Two-sample t-test used to measure association between the missed vs. attended appointment and the following variables: out-of-pocket expenses, age, pre-operative BMI and distance. Distance from UNC hospitals missed appointment n=58, attended appointment n=96; one value was dropped because it was a statistical outlier.

Chi-square tests used to measure association between appointment attendance and sex and race. Fischer's exact test was used to evaluate statistical significance for race because of small sample size in some groups.
Discussion

The purpose of our study was to describe associations between patient level factors and appointment keeping behavior for the 6 month post-operative appointment. The long term goal of this project is to determine potential reasons why patients fail to follow-up so that we can design an intervention to ensure that patients are getting the care they need after this serious procedure.

Our study did not show an association between attendance at the 6 month post-operative follow-up appointment and out-of-pocket expenses due at the appointment. Financial reasons for missed appointments have significant face validity, especially when patients are driving to UNC Hospitals from an average distance of 76.3 miles. Our study could not explore other potential reasons why patients did not return for the 6 month follow-up appointment. Our methods did not include assessment of health perceptions and experiences of our patients, such as how they view their weight loss progress and whether or not this may have affected the decision to return to the surgeon for treatment. Patients may have unrealistic expectations of weight loss progress, and this may affect their decision to return for follow-up. For example, a patient who expected to lose 25% of excess body weight within a few months of having the gastric bypass procedure but who did not achieve this amount of weight loss may be hesitant to return to the clinic for follow-up. Such a patient may feel as if she/he failed the procedure, or that the surgery team will be disappointed with their weight loss progress. Alternatively, a patient may feel that the procedure failed her, or that the surgery team did not perform the procedure correctly and that is why she has not lost weight. Patients may also have expected improvement in or resolution of comorbidities, such as diabetes, by the time of their appointment. Patients may harbor unrealistic weight loss expectations even after repeatedly
being told that the weight loss process may be slow, and that only 50-75% of excess weight is lost in the first 1-2 years after the procedure.

Excellent weight loss progress may also be a reason for failing to follow-up. A patient who is not having a difficult time with diet and exercise changes and who is losing weight rapidly may not feel that he has to follow-up. The patient may feel well physically, and decide that there is no reason to attend the visit.

Knowledge of the content of the 6 month post-operative follow-up visit may help discern reasons why patients miss this appointment. At the UNC Hospitals GI Surgery Clinic, the gastric bypass 6 month post-operative follow-up appointment takes approximately 10-15 minutes. The patient is weighed and informed of their weight loss progress. The attending physician (TF) sees each patient and reviews progress with diet and exercise. The physician also checks the incision wound(s), often healed by this time. At the end of the visit, the patient is sent to the laboratory to have blood drawn to have iron, vitamin B12 and complete blood cell counts checked. From the perspective of the patient, the interactions during the appointment may seem unnecessary. Patients also may not understand the purpose of blood draws at every follow-up visit.

Considering these potential reasons why patients choose not to return for the 6 month post-operative follow-up visit, it may be useful to evaluate our follow-up schedule. Patients are instructed to follow-up regularly during the first post-operative year and then yearly afterward because of the potential for nutritional and metabolic deficiencies and for late surgical complications. The bariatric surgery team is responsible for following patients because they are the experts regarding the consequences of the procedure. However, much of the content of
the 6 month follow-up appointment could be conducted by a primary care physician.

All patients who undergo gastric bypass procedures at UNC Hospitals are required to have a referral form filled out by their primary care physician. The primary care physician must agree to participate in the follow-up care of the patient. Primary care physicians manage the obesity-related comorbidities of the patient, including diabetes, hypertension, coronary artery disease, GERD and sleep apnea. Patients usually see their primary care physician more frequently than the bariatric team; the primary care physician’s office is often closer to the patient’s home, and visits usually have a lower copayment rate than specialty surgery clinic. Thus, primary care providers may be well-equipped to follow patients once they are 6 months post-operative.

Study Strengths and Limitations

To our knowledge, this is the first study to examine follow-up in post-operative gastric bypass populations. All patients who have had gastric bypass procedures at UNC Hospitals since July 2000, were living at the time of their 6 month follow-up appointment and could be contacted were included in this study. Data collectors were blinded to the purpose of our study. We recognize the importance of post-operative follow-up to ensure good patient outcomes.

Our study has several limitations. First, we used an existing data set to begin exploration of the problem of loss to follow up, and were limited by our data, which did not include any subjective patient-oriented or physician-oriented factors. Second, our hypothesis assumes that patients were aware of any out-of-pocket expenses due at the six month post-operative visit before the actual visit. Third, we assumed that patients are not returning to their primary care physicians
for post-gastric bypass surveillance. Even though each patient had a primary
care physician at the time of referral for the procedure, they may not have had
that same physician at the time of the six month post-operative appointment.

Summary and Future Studies

Maintaining post-operative follow-up is an essential component to
ensuring the long term health of patients who have had gastric bypass
procedures. We conducted a systematic literature review to inform a follow-up
study of gastric bypass patients in the UNC Department of GI Surgery,
specifically addressing reasons for lack of attendance at the 6 month
postoperative visit. We found limited evidence exists to explain reasons for poor
follow-up in our particular patient population. However, studies of follow-up in
other patient populations indicate that younger age, higher perceived cost of a
doctor visit and higher amount of copayment due at the time of the visit may be
reasons for lack of appointment attendance.

Our study of gastric bypass patients at UNC Hospitals did not find that
attendance at the 6 month post-operative appointment was significantly related to
out-of-pocket expenses due at the time of the appointment. Based on these
findings, we plan to expand our current study with patient and primary care
physicians surveys to further explore this topic. Patient surveys may uncover
reasons for lack of attendance and may help guide future post-operative care.
Primary care physician surveys may help discern the role that these physicians
are able to play in the care of post-operative gastric bypass patients.

Acknowledgments
I thank Dr. Margaret Gourlay for her encouragement and expertise throughout the thesis writing process. I also thank Dr. Timothy Farrell for helping me to develop this topic, and for support and guidance in completing the project. Karen Colton, R.N., provided the patient demographic data, and Joellen Buckio was instrumental in helping me gather and understand the financial data that was the core of this project. Finally, thanks to Dr. Russ Harris and Dr. Diane Calleson for guidance throughout the writing process.

References


5 Coates PS, Fernstrom JD, Fernstrom MH, Schauer PR, Greenspan SL. Gastric bypass surgery for morbid obesity leads to an increase in bone turnover and a decrease in bone mass. Journal of Clinical Endocrinology and Metabolism. 2004;89:1061-1065.


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<tr>
<th>Study Authors, Year</th>
<th>Study Design</th>
<th>Source Population</th>
<th>Study Population</th>
<th>Measurements</th>
<th>Significant Results</th>
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<tr>
<td>Lacey, Paulman, Reuter and Lovejoy, 2004</td>
<td>Qualitative and chart review</td>
<td>Urban, university affiliated family practice outpatient clinic</td>
<td>34 patients selected adult, English-speaking patients &lt;br&gt; Sex: 32 women, 2 men &lt;br&gt; Age: mean 40 y &lt;br&gt; Race/Ethnicity: 56% African-Am, 37% Euro-Am, 4% Hispanic-Am.</td>
<td>Open-ended interview guide developed by authors &lt;br&gt; 12-15 minute patient interviews to assess patient's personal experiences of missed appointments &lt;br&gt; Retrospective chart review to determine patients' missed versus kept appointments</td>
<td>Reasons for non-attendance (% of sample reporting this reason): &lt;br&gt; Emotional barriers, such as negative feelings about seeing doctor (65%) &lt;br&gt; Perception that clinic staff does not respect respondent's time or opinions (44%)</td>
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<tr>
<td>Murdock, Rogers, Lindsay and Tham 2002</td>
<td>Descriptive, Cross-sectional</td>
<td>University-affiliated gastroenterology clinic in urban Belfast, Northern Ireland &lt;br&gt; Inclusion: all living patients who missed appointments during 27 consecutive clinics</td>
<td>All living patients who missed appointments during 27 consecutive clinics (n=100) &lt;br&gt; Sex: NR &lt;br&gt; Age: NR &lt;br&gt; Race/Ethnicity: NR</td>
<td>Mailed questionnaire to all patients who missed appointments, and telephoned patients who did not return questionnaires &lt;br&gt; Questionnaire designed to determine: &lt;br&gt; • why referred to GI clinic &lt;br&gt; • if patient missed appointment before &lt;br&gt; • if patient was new or returning &lt;br&gt; • why patient did not keep appointment</td>
<td>Reasons for non-attendance (percent of sample reporting this reason): &lt;br&gt; Forgot to attend or cancel (30%) &lt;br&gt; No reason (26%) &lt;br&gt; Clerical errors (10%) &lt;br&gt; Feeling better (8%) &lt;br&gt; Fear of junior medical staff (3%) &lt;br&gt; Inpatient in hospital at time of appointment (3%) &lt;br&gt; Other (20%)</td>
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<td>Campbell, Chez, Queen, Barcelo and Patron 2000</td>
<td>Qualitative</td>
<td>Tertiary care outpatient clinic for indigent, high-risk obstetric patients</td>
<td>All patients who did not return for follow-up appointments during 3 separate one month intervals in 1998-1999 (n=261) &lt;br&gt; Sex: 100% women &lt;br&gt; Age: NR &lt;br&gt; Race/Ethnicity: NR</td>
<td>Nurse case manager called patient within 24 hours after missed appointment to interview patients &lt;br&gt; Interview tool was 9 close ended questions developed by authors designed to determine: &lt;br&gt; • reason for missing appointment &lt;br&gt; • if patient knows why her pregnancy is high risk &lt;br&gt; • effect complications could have on pregnancy outcome &lt;br&gt; • if patient believes that attending clinic will improve outcome</td>
<td>Reasons for non-attendance (percent of sample reporting this reason): &lt;br&gt; Lack of transportation (25%) &lt;br&gt; Scheduling problems (19%) &lt;br&gt; Forgot or overslept (18%) &lt;br&gt; Sick child/relative (10%) &lt;br&gt; Lack of childcare (10%) &lt;br&gt; Financial reason (4%)</td>
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<td>Study Setting</td>
<td>Study Population</td>
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<td>Karter, Parket, Moffet, Ahmed, Ferrera, Lui, Selby 2004</td>
<td>Descriptive, Cross-sectional</td>
<td>Kaiser Permanente No. CA Diabetes Registry</td>
<td>84,040 patients with continuous health plan membership who had at least one outpatient visit in 2000; excluded patients with missing values</td>
<td>Administrative utilization records used to calculate missed appointment rate and gather demographic data</td>
<td>Associations with Poor Appointment Keeping Behavior (&gt;30% missed appointments): Primary care physician vs. specialist vs. no PCP assigned: NS³ Women vs. men: NS Living in poverty area: 1.5x greater odds of poor appointment keeping behavior Copay amount (compared to $0 copay): $1-5 copay 1.1x greater odds of poor appointment keeping behavior $6-10 copay 1.1x odds poor appointment keeping behavior $&gt;10 copay 1.3x odds poor appointment keeping behavior</td>
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<td>Smith and Yawn 1994</td>
<td>Cross-sectional</td>
<td>Family Practice residency clinic of Hennepin County Medical Center, Minnesota</td>
<td>Patients who kept or missed a scheduled appointment with physicians April-June 1991</td>
<td>Patient schedule database used to gather appointment data</td>
<td>Appointment keeping varied by age: 0-19 y 72.7% kept appointments 20-39 y 69.3% kept appointments 40-59 y 80.4% kept 60+ y 89.9% kept Odds of appointment keeping by Insurance type (using private insurance as reference): 0.7x odds for traditional medical assistance 1.1x odds for managed care medical assistance Predictive model: Among people &gt;16 yo, type of insurance, race and age predict appointment-keeping behavior</td>
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<td>Weingarten, Meyer and Schneid 1997</td>
<td>Cross-sectional</td>
<td>Family Medicine Institute, Augusta, ME, an outpatient practice of Maine-Dartmouth family practice residency</td>
<td>Patients scheduled for appointments during 36 randomly selected months in 1995 (n=3962 scheduled visits, n patients NR)</td>
<td>Hospital computer system and clinic schedule sheets used to gather information on kept versus missed appointments, sex, DOB, and insurance status</td>
<td>Appointment keeping associated with age and insurance type P for trend: P=0.0001 for age (older more likely to keep appts) P=0.0001 for insurance type</td>
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<td>Study</td>
<td>Type</td>
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| Catz, McClure, Jones and Brantley 1999 | Case-series         | Ambulatory care HIV clinic at Earl K. Long Medical Center, Baton Rouge, LA | Sequential patients who were HIV+, 18+ y and agreed to participate (n=160) | Interviewed patients to gather demographic information                   | Correlations with % no-showed R = -0.21 for age, p<0.0001  
R = -0.15 for education, p NS  
R = 0.02 for months HIV +, p NS  
15% appointment no-show rate for Caucasians, 30% for minorities, p<0.0001  
Multiple Regression Model: Age and race predict % no-show appointments (p<0.01) |
| Mirotznik, Ginzler, Zagon and Baptiste 1996 | Case-series         | Arthritis Clinic at SUNY Brooklyn | Patients with SLE enrolled in Arthritis clinic > one year, with > one appointment in past 3 years; excluded 210 patients who died, moved away or were mentally incapable (n=153) | Developed questionnaire using HBM definitions; tested reliability and construct validity of questionnaire in this population only  
Abstracted data from clinic files: 12 months retrospective and 6 month prospective appointment keeping behavior | When adjusted for other HBM variables, general health motivation (P<0.01), perceived benefits of visits (P<0.05) and perceived costs of visits (P<0.01) associated with appointment keeping measure  
Percieved costs of doctor visit correlated with 12 month retrospective % appts kept, r=-0.21, p<0.01 and with 6 month prospective % appts kept, r=-0.24, p<0.01  
Linear regression models: perceived costs of dr visits sign associated with 12 month retrospective (p<0.01) and 6 month prospective (P<0.05) % of scheduled appts kept, when controlled for general health motivation, perceived susceptibility to SLE, perceived severity of SLE, and perceived benefits of doctor visits |
<table>
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<th>Study</th>
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<td>Majeroni, Cowall, Osborne and Graham 1996</td>
<td>Case-series</td>
<td>Urban family practice residency training clinic</td>
<td>477</td>
<td>2 student RAs reviewed medical records to gather information on age, race, sex, type of insurance, # missed appts, # kept appts</td>
<td>Miss rates differed significantly as a function of age and race (P&lt;0.001); miss rates higher for blacks than whites in all age groups except &gt;75 yo. Medicaid managed care and private managed care have higher miss rates after adjusting for sex, race and age (P&lt;0.001)</td>
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<td>Cashman, Savageau, Lemay and Ferguson 2004</td>
<td>Case-series</td>
<td>Urban Family Practice Community Health Center in New England</td>
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<td>Audited charts of patients scheduled during selected week in February 1999, and examined patient appointment keeping behavior during an 18 month period, Aug 1998-Feb 2000. Also gathered sociodemographics, chronic health problems, substance abuse from medical charts</td>
<td>Number of scheduled appointments (P=0.000), patient age (P=0.000), and number of psychological conditions (P=0.009) associated with number of missed appointments. Gender, insurance, distance from practice, provider type, number of diagnosed physical conditions, obesity not associated with number of missed appointments when controlling for all other factors in model.</td>
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NR = not reported.
NS = not significant.
BHS, ISEL, WROC =
HBM = Health Belief Model.
Table 2. Quality ratings for studies in systematic review. Each study was rated 0-3 for each category, with 0=poor, 1=fair, 2=good, 3=excellent.

a. Cross-sectional studies

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<tr>
<th>Study Authors Year</th>
<th>Source population Adequately Described?</th>
<th>Study Population representative of source population?</th>
<th>Adequate means of collecting data?</th>
<th>Data collectors identified?</th>
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b. Qualitative studies.

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Table 2 (Continued). Quality ratings for studies in systematic review. Each study was rated 0-3 for each category, with 0=poor, 1=fair, 2=good, 3=excellent.
### c. Case-Series.

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<th>Study Authors, Year</th>
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