OBES SURG (2008) 18:1241–1245
DOI 10.1007/s11695-008-9615-7

RESEARCH ARTICLE

The Impact of Medicaid Status on Outcome After Gastric Bypass

J. Wesley Alexander · Hope R. Goodman · Lisa R. Martin Hawver · Laura James

Received: 3 June 2008 / Accepted: 4 June 2008 / Published online: 10 July 2008

Abstract
Background Socioeconomic status has been a predictor of poor outcome in many surgical diseases including morbid obesity. Potential differences in treatment and initial severity of disease have often not been well controlled in patients with bariatric surgery. This study was performed to compare the results of bariatric procedures in financially disadvantaged Medicaid patients compared to patients with Medicare and those with Commercial insurance under controlled conditions.
Methods Prospectively collected data from 183 Medicaid, 77 Medicare and 570 Commercial/self-pay insurances were compared to determine the influence of poor economic status on outcome. All the patients received surgical care by the same surgeon at a large University-affiliated private hospital.
Results Medicaid patients were larger (BMI 58.4 vs. 52.8 and 50.9, respectively) and had a greater incidence of serious comorbid conditions at outset. The death rate and complications were also significantly higher postoperatively in Medicaid patients. However, when the patients were matched for age and BMI, results became similar.
Conclusion Increases in postoperative mortality and morbidity appear to be associated with advanced disease because of poor access to care. When matched for age, BMI, and severity of disease, outcomes are similar. Changes in Medicaid policies could improve access and outcome.

Keywords Morbid obesity · Gastric bypass · Medicaid · Socioeconomically disadvantaged

Disclosure of commercial interest or source of financial or material support: N/A.

J. W. Alexander (✉) · H. R. Goodman · L. R. M. Hawver
Center for Surgical Weight Loss, Department of Surgery,
University of Cincinnati College of Medicine,
Cincinnati, OH, USA
e-mail: jwesley.alexander@uc.edu

J. W. Alexander · H. R. Goodman · L. R. M. Hawver
Weight Loss Service, The Christ Hospital,
Cincinnati, OH, USA

J. W. Alexander · H. R. Goodman · L. R. M. Hawver · L. James
Department of Surgery, University of Cincinnati
College of Medicine,
Cincinnati, OH, USA

Introduction

Socioeconomic status has been found to be a significant predictor of poor outcome in a variety of conditions, including appendicitis [1], breast cancer [2, 3], liver transplantation [4, 5], coronary artery bypass surgery [6], stroke [7], knee arthroplasty [8], and intensive care [9], among others [10].

Patients who undergo bariatric surgery are disproportionately middle aged white women with private insurance. Those who have publicly funded insurance (Medicare/Medicaid) have a decreased chance of selection for surgery (OR, 0.54) [10] and have longer length of stay, increased charges, more comorbidities and increased mortality compared to privately and self-insured patients [11, 12]. Publicly funded patients also have more medical and psychiatric complications after gastric bypass surgery than those who have private medical insurance [13]. While most reports combine Medicare and Medicaid patients under "public assistance", funding by Medicare may not necessarily mean that the patient is economically deprived. Furthermore, some of the outcome differences in the above studies related to "public assistance", may have been

caused by differences in surgical technique, medical follow-up or initial comorbidities.

The present study was performed to provide a more controlled analysis of outcomes in bariatric patients with the lowest socioeconomic status.

Materials and Methods

The records of 830 consecutive patients with primary open gastric bypass (804) or banded sleeve gastrectomy (26) between 3/9/98 and 1/17/08 were analyzed, excluding patients with renal failure/transplants or revisions. The banded sleeve gastrectomy was a typical sleeve gastrectomy with a band of Alloderm® placed 6 cm from the GE junction using a 37F sizer to prevent subsequent dilatation of the sleeve. Surgical outcomes of the two procedures were the same (data not shown). Performance of the procedures by a single surgeon in the same hospital using the same technique with follow-up in the same office eliminated differences in surgical technique and aftercare. The patients were divided into three groups: (1) Medicaid with or without Medicare to represent socioeconomically deprived patients who could not afford any private insurance (Medicaid), (2) Medicare patients with or without Commercial coinsurance to represent a nondisadvantaged but high-risk group (Medicare), and (3) patients who had Commercial insurance or self-pay who were considered as nondisadvantaged (Commercial). A further breakdown revealed that of the 183 Medicaid patients, there were 78 who also had Medicare. Of the 77 Medicare patients, 13 had Medicare only without coinsurance. Of the 570 Commercial patients, 566 had Commercial insurance only and four were self-pay.

Results

Follow-up was imperfect despite having patients sign contracts, routine telephone calls to patients, mailed questionnaires and inquiries to offices of primary care physicians.

Table 1 Comparison of initial status and outcomes

	Medicaid		Medicare		Commercial	
Avg Age	42.1		53.2		44.0	
Gender (M/F)	26 (14.2%)/157 (85.8%)		30 (39.0%)/47 (61.0%)[a]		93 (16.3%)/477 (83.7%)	
GBP/BSG	173/10		72/5		559/11	
*High risk	39 (21.3%)		19 (24.6%)		82 (14.4%)[b]	
Avg LOS	3.0		2.9		2.9	
	Preop (183)	1 Year	Preop (77)	1 Year	Preop (570)	1 year
Percent Follow-up (actual/expected)		91.3% 147/161		90.1% 64/71		89.5% 488/545
Avg. BMI	58.4[c]	38.1[d]	52.8	33.4	50.9	32.8
Decrease in excess BMI		64.1%		72.3%		72.8%
DM (% total)	76 (41.5%)[e]	13 (9.8%)	37 (48.1%)[e]	12 (19.0%)[f]	110 (19.3%)	27 (5.7%)
(avg. meds±SE)	(1.9±0.1)	(1.3±0.2)	(1.9±0.2)	(1.3±0.2)	(1.9±0.1)	(1.1±0.1)
HTN (% total)	87 (47.5%)	32 (24.2%)	39 (50.6%)	15 (23.8%)	223 (39.1%)	77 (16.4%)
(avg. meds±SE)	(1.7±0.1)	(1.4±0.1)	(1.7±0.2)	(1.3±0.2)	(1.7±0.1)	(1.4±0.1)
Hyperlipidemia (% total)	39 (21.3%)	5 (3.8%)[g]	19 (24.7%)	8 (12.7%)	105 (18.4%)	17 (3.6%)[h]
(avg. meds±SE)	(1.0±0.1)	(1.0±0.2)	(1.2±0.1)	(1.1±0.2)	(1.1±0.1)	(1.0±0.1)
SA (% total)	72 (39.3%)[i]	25 (18.9%)[j]	28 (36.4%)	8 (12.7%)	145 (25.4%)	28 (5.9%)
DJD (% total)	133 (72.7%)	85 (64.4%)	52 (67.5%)	35 (55.6%)	395 (69.3%)	187 (39.7%)

**High Risk*, Hx of thrombolic disease or cardiac disease (myocardial infarction, congestive heart failure, angioplasty or bypass graft), *GBP* gastric bypass, *BSG* banded sleeve gastrectomy, *LOS* length of stay, *BMI* body mass index, *DM* diabetes mellitus, *HTN* hypertension, *SA* sleep apnea, *DJD* degenerative joint disease

[a] $p<0.0001$ vs. Medicaid and Commercial

[b] $p=0.035$ vs medicaid and 0.030 vs. Medicare

[c] $p<0.0001$ vs. Medicare and Commercial

[d] $p<0.0001$ vs. Medicare and Commercial

[e] $p<0.0001$ vs. Commercial

[f] $p=0.0005$ vs. commercial

[g] $p=0.0229$ vs. Medicare

[h] $p=0.004$ vs. Medicare

[i] $p<0.0001$ vs. Medicaid and Medicare

[j] $p<0.0001$ vs. Medicaid and Medicare

Table 2 Mortality in patients at risk at different time intervals

	Medicaid	Medicare	Commercial
30 days deaths	2 (1.1%)	1 (1.3%)	2 (0.4%)
90 days deaths	4 (2.2%)	1 (1.3%)	2 (0.4%)
1 year deaths	7 (4.8%)*	1 (1.6%)	4 (0.8%)

*p=0.0067 compared to commercial group

Follow-up for deaths was supplemented by accessing deaths reported to Social Security Administration.

Table 1 provides a comparison of the Medicaid, Medicare, and Commercial groups. Preoperatively, the Medicaid and Medicare patients had a higher BMI (58.4 vs. 52.8 vs. 50.9), and more comorbid conditions. There was also an increased occurrence of preoperative thromboembolytic disease and/or cardiac disease in Medicare and Medicaid patients. The percentage of resolution of diabetes mellitus in the Medicaid patients was 76.4% of patients affected compared to 60.5% in the Medicare group and 70.5% in the Commercial group, but the preoperative incidence was greater in the Medicaid and Medicare patients, related to both age and body size.

Mortality at 30 days, 90 days, and 1 year is shown in Table 2 and cause of death is shown in Table 3. Six of the seven patients who died in the Medicaid group had BMIs>65. Mortality increased in all groups by 3 years: Medicaid 8.0%; Medicare 3.0%; and Commercial 2.0%. However, follow-up was incomplete (about 50%) despite vigorous efforts, making interpretation difficult. There were no deaths in the 19 patients ≥65 years.

Thirty-three of the 183 patients in the Medicaid group had readmissions potentially related to their surgery during the first year (18.0%). Twelve patients were admitted because of nausea, vomiting, and dehydration and three because of pancreatitis. Five patients had GI bleeding, and three had small bowel obstructions. Ten of the Medicare patients (13.0%) had readmissions, three for nausea, vomiting, and dehydration. In contrast, 59 of the 570 Commercial patients (10.4%) were admitted during their first year. Nausea, vomiting, and dehydration caused the admission of 15 patients, GI bleeding occurred in 12 patients and small bowel obstruction in six. The above data show the Medicaid group had much higher initial BMI and comorbid conditions than the Commercial group, and this was associated with higher death and complications.

In order to help determine whether these differences were related to economic factors or severity of the initial disease, patients were matched by computer (SAS® System Release 9.1, Cary, NC, USA) between the Medicaid and Commercial groups for age and BMI (Table 4). Only patients with follow-up data for 1 year were included in this particular analysis. Of the 140 patients per group, the matched Medicaid patients had more comorbidities both at onset and after 1 year. However, the decrease in BMI and percentage of resolution of comorbidities was similar. For example, 75% of patients with diabetes in the Medicaid group resolved compared to 74.1% in the Commercial

Table 3 Causes of death

Preop		Gender	Risk factors		POD	Cause of death
Age	BMI		DVT	Cardiac		
Medicaid group						
39.3	120.6	M			10	Aspiration pneumonia, Acute renal failure
40.5	65.9	F			28	Pulmonary Embolus
42.7	87.0	F			32	Pneumonia
48.0	68.5	M		Yes	51	Pulmonary Embolus
28.7	50.5	M		Yes	104	Pulmonary Embolus
36.4	89.6	F			123	Acute renal failure, C-difficile sepsis
43.0	68.4	F		Yes	274	Cirrhosis of liver, renal failure, respiratory failure
Medicare group						
54.5	69.6	F			16	Cardiac arrest
Commercial group						
18.6	40.7	F			6	Aspiration pneumonia
50.1	48.6	M	Yes	Yes	19	Gastrointestinal bleed
45.4	41.0	M			116	Myocardial Infarction
31.5	41.5	F		Yes	171	Sepsis

Cardiac risk factors—as in Table 1
DVT deep veinous thrombosis

Table 4 Comparison of matched groups

	Matched medicaid		Matched commercial	
Avg Age	42.5		43.0	
Gender (M/F)	23/117		34/106	
GBP/BSG	138/2		137/3	
# high risk*	26 (18.6%)		18 (12.9%)	
Avg LOS	2.7		2.7	
	Preop (140)	1 year (140)	Preop (140)	1 year (140)
Avg. BMI	58.3	38.0	57.0	37.0
Decrease in Excess BMI		64.6%		65.2%
DM (% total) (avg. meds±SE)	55 (39.3%)[a] (1.9±0.1)	14 (10.0%) (1.3±0.2)	27 (19.3%)[a] (1.6±0.2)	7 (5.0%) (1.1±0.2)
HTN (% total) (avg. meds±SE)	67 (47.9%) (1.7±0.1)	34 (24.3%) (1.4±0.1)	57 (40.7%) (1.6±0.2)	22 (15.7%) (1.4±0.2)
Hyperlipidemia (% total) (avg. meds±SE)	24 (17.1%) (1.0±0.1)	7 (5.0%) (1.0±0.2)	23 (16.4%) (1.0±0.1)	4 (2.9%) (1.3±0.3)
SA (% total)	56 (40.0%)	25 (17.9%)[b]	44 (31.4%)	10 (7.1%)[b]
DJD (% total)	108 (77.1%)	88 (62.9%)	95 (67.9%)	57 (40.7%)

*High risk** Hx of thrombolic disease or cardiac disease
[a] p=0.0004
[b] p=0.0003

group. Twenty of the matched Medicaid patients (14.3%) compared to ten of the matched Commercial patients (7.1%) had admissions during the first year. Admission for nausea, vomiting, and dehydration were more common in the Medicaid patients (six patients vs. two patients).

Discussion

The influence of socioeconomic status in morbidly obese patients has been reported before. Carbonell et al. [11] examined the results in 5,876 gastric bypass operations performed in 137 hospitals in 2000. Medicare and Medicaid patients were indicated as one or the other being the primary carrier, but they did not separate the two groups by financial status. Medicare and Medicaid insured patients had longer length of stay, higher charges, more comorbidities and postoperative morbidity and mortality compared to patients with insurance or who paid for the operation themselves. Age, gender and race all played a factor in in-hospital mortality. In the males, in-hospital mortality was 1.7% compared to 0.36% in the females. In our study, gender also had an influence on mortality in Medicaid patients at 1 year (male 3.3% vs. female 0.9%). Their data also reported that Medicaid patients had an in-hospital mortality of 1.70% whereas Medicare had a hospital mortality of 2.00%. Our study focused on Medicaid patients because this ensured that they were financially unable to pay for their own medical care. In contrast, many Medicare patients are financially well off and are receiving Medicare only because of their age [14].

Flum et al. [15] used Medicare claims' history to evaluate mortality among Medicare beneficiaries undergoing bariatric surgery. Of 16,155 patients undergoing bariatric procedures, the 30-day mortality was 2% and the 1 year mortality was 4.6%. Male gender and older age were associated with a higher death rate. This is similar to our experience with Medicaid but not Medicare patients where Medicare patients had a mortality of 1.6% at 1 year.

Martin et al. [13] examined the effect of preoperative insurance status on results following gastric bypass and showed that patients with public funding had a greater risk of complications. The only factor that was associated with postoperative complications by univariate analysis was lower socioeconomic status. Like our study, the BMI was higher in the publicly funded group (52.2 vs. 47.6). Only two patients died, and these were in the publicly funded group. Dallal et al. [16] reported that both Medicare and Medicaid patients had a prolonged length of stay after bariatric surgery which was not seen in our study.

In contrast to some of the other studies, Livingston and Langert [17] found that poverty itself was not a risk factor for bariatric surgery. Significant factors in their analysis of 25,428 patients were age, male sex, electrolyte disorders, and congestive heart failure. Durkin et al. [18] also reported that financial status did not predict weight loss after bariatric surgery which is consistent with our findings.

In our study, the Medicaid patients had a significantly higher BMI and more severe comorbid conditions than the Medicare or Commercial groups. This is most likely related to poor access to this life-saving procedure. Santry et al. [10] and Livingston and Ko [19] both demonstrated that lower income and public insurance were associated with decreased odds of selection for bariatric surgery. We feel that this under-representation is caused by several factors including prejudice against economically deprived individuals, decreased payment to physicians and hospitals for the care of Medicaid patients (many practices

will not take Medicaid patients) and a marked decrease in the ability to obtain approval for their surgery from the various Medicaid agencies. As examples, Medicaid policies vary between states but are extremely restrictive, sometimes requiring BMI>50 regardless of comorbidities, physician-supervised diet for up to 12 months and prolonged times for review.

Conclusions

Our study is unique in that it eliminates potential differences in hospital, surgical technique and follow-up. Socioeconomic status had no influence on short-term outcome in medically similar patients. The increased risk for inferior outcome in Medicaid patients appears to be related primarily to an inability to be approved for surgical care by Medicaid providers and denial of care because of poor reimbursement. Changes in Medicaid policy to allow treatment before the disease becomes far advanced will improve survival and long-term costs.

References

1. Pieracci FM, Eachempati SR, Barie PS, et al. Insurance status, but not race, predicts perforation in adult patients with acute appendicitis. J Am Coll Surg. 2007;205:445–52.
2. Bouchardy C, Verkooijen HM, Fioretta G. Social class is an important and independent prognostic factor of breast cancer mortality. Int J Cancer. 2006;119:1145–51.
3. Bradley CJ, Given CW, Roberts C. Race, socioeconomic status, and breast cancer treatment and survival. J Natl Cancer Inst. 2002;94:490–6.
4. Yoo HY, Thuluvath PJ. Outcome of liver transplantation in adult recipients: influence of neighborhood income, education, and insurance. Liver Transpl. 2004;10:235–43.
5. Russo MW, Sandler RS, Mandelkehr L, et al. Payer status, but not race, affects the costs of liver transplantation. Liver Transpl Surg. 1998;4:370–7.
6. Kim C, Diez Roux AV, Hofer TP, et al. Area socioeconomic status and mortality after coronary artery bypass graft surgery: the role of hospital volume. Am Heart J. 2007;154:385–90.
7. Kapral MK, Wang H, Mamdani M, et al. Effect of socioeconomic status on treatment and mortality after stroke. Stroke. 2002;33: 268–73.
8. Davis ET, Lingard EA, Schemitsch EH, et al. Effects of socioeconomic status on patients' outcome after total knee arthroplasty. Int J Qual Health Care. 2008;20:40–6.
9. Hutchings A, Raine R, Brady A, et al. Socioeconomic status and outcome from intensive care in England and Wales. Med Care. 2004;42:943–51.
10. Santry HP, Lauderdale DS, Cagney KA, et al. Predictors of patient selection in bariatric surgery. Ann Surg. 2007;245:59–67.
11. Carbonell AM, Lincourt AE, Matthews BD, et al. National study of the effect of patient and hospital characteristics on bariatric surgery outcomes. Am Surg. 2005;71:308–14.
12. Dallal RM, Bailey L, Guenther L, et al. Comparative analysis of short-term outcomes after bariatric surgery between two disparate populations. Surg Obes Relat Dis. 2008;4:110–4.
13. Martin LF, Tan T-L, Holmes PA, et al. Preoperative insurance status influences postoperative complication rates for gastric bypass. Am J Surg. 1991;161:625–34.
14. Paeratakul S, Lovejoy JC, Ryan DH, et al. The relation of gender, race and socioeconomic status to obesity and obesity comorbidities in a sample of US adults. Int J Obes. 2002;26: 1205–10.
15. Flum DR, Salem L, Broeckel Elrod JA, et al. Early mortality among Medicare beneficiaries undergoing bariatric surgical procedures. JAMA. 2005;294:1903–8.
16. Dallal RM, Datta T, Braitman LE. Medicare and Medicaid status predicts prolonged length of stay after bariatric surgery. Surg Obes Relat Dis. 2007;3:592–6.
17. Livingston EH, Langert J. The impact of age and Medicare status on bariatric surgical outcomes. Arch Surg. 2006;141:1115–20.
18. Durkin AJ, Bloomston M, Murr MM, et al. Financial status does not predict weight loss after bariatric surgery. Obes Surg. 199;9: 524–6.
19. Livingston EH, Ko CY. Socioeconomic characteristics of the population eligible for obesity surgery. Surgery. 2004;135:288–96.