

In the Super-Obese, Weight Loss and Resolution of Obesity Co-Morbidities after Bilio-Pancreatic Bypass/Duodenal Switch (DS) Vary According to Health Insurance Carrier: Medicaid vs Medicare vs Private Insurance vs Self-Pay in 1681 BOLD Database Patients

Janette P. Gomez, DO, Michael A. Davis, DO, Gus J. Slotman, MD

Inspira Health Network, Vineland, NJ, USA

Correspondence author: Gus J. Slotman, MD, Department of Surgery, Inspira Medical Center, 1505 West Sherman Avenue, Suite B; Vineland, NJ, USA 08360. Email: SlotmanG@ihn.org.

Tel.: +1-856-641-8635. Fax: +1-856-641-8636.

SUMMARY: Weight loss and resolution of obesity co-morbidities vary by health insurance status after bilio-pancreatic bypass/duodenal switch. Private insurance had the best results and Self-Pay was intermediate. Medicaid and Medicare fared less well.

ABSTRACT

BACKGROUND: Differences in Medicaid versus Medicare versus Private versus Self-Pay DS results are unknown. This study identified DS outcomes variations by health insurance.

METHODS: Data from 1,681 DS patients was analyzed retrospectively: Medicaid (n=138), Medicare (n=313), Private insurance (n=1,171), Self-Pay (n=59). General Linear Models included baseline and post-operative data and were modified for dichotomous variables.

RESULTS: Hypertension, obstructive sleep apnea, abdominal hernia, diabetes, and nine other hepato-biliary and somatic conditions were lowest in Private ($p<0.05$). Self-Pay cholelithiasis, GERD, back/musculoskeletal pain, and three others were lowest; asthma, angina, CHF, alcohol use, liver disease and three others were highest ($p<0.05$). Medicare had highest abdominal hernia and musculoskeletal pain, pseudotumor cerebri; lowest asthma and PCOS. ($p<0.05$). Medicaid hypertension, sleep apnea, cholelithiasis, GERD, diabetes, back pain, and five others were highest ($p<0.05$); dyslipidemia and alcohol use were lowest.

CONCLUSIONS: Outcomes after DS vary by health insurance. These findings may facilitate management of DS patients.

SUMMARY: Weight loss and resolution of obesity co-morbidities after bilio-pancreatic bypass/duodenal switch vary by health insurance, Medicaid, Medicare, Private, and Self-Pay. Private results are best and Self-Pay intermediate with increased liver disease. Medicaid and Medicare fared less well.

INTRODUCTION

Super-obese patients with Body Mass Index (BMI) >50 suffer increased weight-related medical problems, and surgical management is complex.[1] For these patients, bariatric surgery best improves health through weight loss. While restrictive procedures, such as Roux-en-Y gastric bypass (RYGB), adjustable gastric band, and sleeve gastrectomy all yield excellent weight loss, for the super-obese, frequently outcomes are sub-optimal with these approaches.[2] For many super-obese, then, the combined restrictive and mal-absorptive effects of bilio-pancreatic bypass/duodenal switch (DS) have made it a viable option.[3] Nevertheless the limited physiologic reserve of these heaviest patients makes every clinical insight important to successful outcomes.

Previous studies have reported variation in weight and in the incidence of obesity co-morbidities by health insurance status among morbidly obese patients. .[1,4] However, whether or not these insurance-related differences in body mass, and in the occurrence of obesity co-morbidities in pre-operative medical patients translate into outcomes disparities after bariatric surgery in the super-obese has not been investigated. The objective of the present study was to identify variation in clinical outcomes according to health insurance carrier following DS.

METHODS

With the approval of the Surgical Review Corporation Data Access Committee and the IRB of Our Lady of Lourdes Medical Center, Camden, NJ, this study evaluated pre-operative and follow-up data at 2, 6, 12, 18 and 24 months after surgery from the Surgical Review Corporation's BOLD database on 1,681 morbidly obese patients who underwent DS between

June 1, 2007 and December 31, 2010. [5] Data was evaluated retrospectively in four groups: Medicaid (n=138), Medicare (n=313), Private (n=1171) and Self Pay (n=59).

Weight, weight loss, BMI and the percentage frequency of obesity co-morbidities were obtained from BOLD, including hypertension (HTN), angina, congestive heart failure (CHF), peripheral vascular disease (PVD), pulmonary hypertension (PHTN), obstructive sleep apnea (OSA), obesity hypoventilation syndrome (OHS), asthma, abdominal hernia, panniculitis, cholelithiasis, gastroesophageal reflux disease (GERD), liver disease, stress urinary incontinence, diabetes mellitus, gout, dyslipidemia, polycystic ovarian syndrome (PCOS), pseudotumor cerebri, back pain, lower extremity edema and musculoskeletal pain, mental health diagnoses, impaired functional status, depression, psychological impairment, alcohol use, substance abuse, tobacco use and support group attendance.

Continuous variables were analyzed using ANOVA with treatment in the model. Pair-wise comparisons were performed on the least squares means of the treatments calculated from the ANOVA model to find differences in the treatment groups. Distribution of obesity co-morbidities was examined by a general linear model with treatment in the model and modified for binomial distribution to account for dichotomous variables. Pair-wise comparisons for Medicaid, Medicare, Private and Self Pay versus each other were made by Chi-squared equation at each time interval.[6]

RESULTS

There were 1220 women and 461 men. Pre-operative BMI was 56+-10, 54+-12, 51+-9, and 50+-9 for Medicaid, Medicare, Private, and Self-Pay, respectively ($p<0.01$), weight was 158+-34, 152+-38, 148+-31, and 140+-32, respectively ($p<0.05$), and age was 39+-9, 51+-12, 43+-11, and 48+-12, respectively ($p<0.01$). The numbers of evaluable patients at preoperative

baseline, 6, 12 and 18 months were as follows: Medicaid 138, 85, 53 and 24, Medicare 313, 108, 54 and 29, Private 1171, 793, 462 and 160, Self-Pay 59, 34, 23 and 9.

Weight and weight loss varied only at 18 months with Self-Pay lowest and Medicare highest ($p < 0.035$). At 24 months weight loss was 69 ± 21 , 62 ± 24 , 62 ± 19 , and 75 ± 29 kg for Medicaid, Medicare, Private, and Self-Pay, respectively, and BMI was 30 ± 6 , 31 ± 8 , 29 ± 5 , and 29 ± 4 . Variations in BMI were not statistically significant.

Results for obesity co-morbidities following DS are displayed in Table I and Table II. Variations in the frequency of PVD, PHTN, substance abuse, tobacco use or support group attendance were not statistically significant. Gout and depression varied significantly only at 2 months, as did psychological impairment and mental health diagnosis at 2 and 24 months.

Hypertension, angina, CHF, OSA, abdominal hernia, panniculitis, cholelithiasis (2, 6 and 12 months), GERD (2 and 12 months), stress urinary incontinence, diabetes, back pain (6 and 12 months), lower extremity edema (2, 6 and 12 months) and musculoskeletal pain (2, 6 and 12 months) were lowest ($p < 0.05$) in the Private insurance group. Of these, angina, CHF and OSA persisted lowest through 24 months. Private was not the highest in any co-morbidity..

With Self-Pay, OHS, cholelithiasis (18 and 24 months), GERD (18 months), pseudotumor cerebri, back pain (2 and 18 months), lower extremity edema (18 months), musculoskeletal pain (18 months) and impaired functional status were lowest. Angina (18 and 24 months), CHF, asthma, panniculitis, liver disease, stress urinary incontinence (2 and 18 months), dyslipidemia, PCOS and alcohol use were highest ($p < 0.05$). Angina, CHF and panniculitis persisted highest through 24 months. Self-Pay alcohol use nearly doubled and liver disease increased five-fold, while changing little in Medicaid, Medicare, or Private.

Medicare had the highest rates of abdominal hernia (18 and 24 months), pseudotumor cerebri and musculoskeletal pain (12, 18 and 24 months). Hernia and musculoskeletal pain remained highest through 24 months. Medicare asthma and PCOS were lowest.

In Medicaid, hypertension, angina (2, 6 and 12 months), OSA, abdominal hernia (2, 6 and 12 months), cholelithiasis, GERD, stress urinary incontinence (6 and 12 months), diabetes, back pain, lower extremity edema and impaired functional status were highest. OSA remained highest through 24 months. Medicaid had lowest rates of dyslipidemia and alcohol abuse.

DISCUSSION

This investigation identifies significant variations in outcomes according to health insurance status among super-obese patients who underwent DS. Weight loss and BMI results were excellent for all insurance types. BMI and the frequency of PVD, pulmonary hypertension, substance abuse, tobacco use or support group attendance did not vary. Private insurance patients had superior resolution of thirteen obesity co-morbidities and were worst in none. Self-Pay angina, CHF, asthma, panniculitis, liver disease, stress urinary incontinence, dyslipidemia, PCOS and alcohol use were highest, while weight loss, OHS, cholelithiasis, GERD, pseudotumor cerebri, back pain, lower extremity edema, musculoskeletal pain and impaired functional status were lowest. Medicare patients resolved only asthma and PCOS better than the other insurance groups, and had the highest rates of abdominal hernia, pseudotumor cerebri and musculoskeletal pain. Medicaid patients were highest in eleven obesity co-morbidities and fared best only in resolving dyslipidemia and alcohol use. Our review of the literature reveals that these variations in outcomes following DS according to health insurance carrier have not been reported previously, and are significant findings of this study.

Medicaid, Medicare, Private and Self-Pay all experienced significant weight loss after DS in this study, accompanied by clinically and statistically significant resolution of many obesity comorbidities. This is consistent with the prior body of work demonstrating bariatric surgery's efficacy in weight loss and in resolution of weight-related medical problems.[7]

Private patients benefitted most from DS in the present study. Thirteen cardio-pulmonary, abdomen and hepatobiliary, endocrine, and somatic obesity co-morbidities were resolved most frequently by Private patients. Private was not last in any category. BMI did not vary significantly among the four insurance types, consistent with Durkin's finding that pre-operative financial status did not predict weight loss after bariatric surgery.[8] It is likely, therefore, that factors other than weight loss enabled the Private population to benefit so well from DS. Balduf et al found that patients with private health insurance understood better the risks of obesity and of bariatric surgery than did subscribers to government carriers.[9] From this one might expect that Private insurance patients would embrace Support Groups but attendance did not vary significantly. Thus, the mechanisms of the Private response to DS are not clear from the data.

Self-Pay fared second to the Private group in co-morbidity resolution, including cholelithiasis, GERD and several somatic conditions. However, Self-Pay patients failed at the highest levels in resolving angina, CHF, asthma, panniculitis, liver disease, stress urinary incontinence, dyslipidemia, PCOS and alcohol use. While it may be inferred that Self-Pay might respond to DS better than Private due to assumed better financial status [9], this was not supported by the results, consistent with Balash's data.[10] Weight was not an influence, as BMI did not vary. Factors other than these therefore, might explain the sub-optimal success of Self-Pay after DS. Previous reports have identified high incidences of drug and alcohol abuse after bariatric surgery, as morbidly obese patients substitute for their former eating disorders.

(12) Interestingly, in the present analysis, Self-Pay alcohol use nearly doubled and liver disease increased five-fold, while changing little in Medicaid, Medicare, or Private. One might speculate that increased alcohol intake and possibly liver disease resulting could have contributed to blunting the beneficial effects of DS in Self-Pay patients. Further investigation is needed.

In spite of their younger age, excellent post-DS weight loss, and BMI reduction, Medicaid patients had the greatest persistence of eleven major cardio-pulmonary, abdominal/hepatobiliary, endocrine, somatic, and psychological/social obesity co-morbidities. Medicaid resolved only dyslipidemia best, and had the lowest alcohol use. These results both parallel and contrast Alexander et al's report wherein HTN, diabetes, OSA, and dyslipidemia were resolved better among commercial insurance patients than in Medicaid.[11] Superior Medicaid resolution of dyslipidemia in the present study may relate to younger age and less established disease. Why Medicaid responded least to DS, however, is not clear from the data. As Medicaid is needs-based, Balduf et al's finding that higher income patients use more educational resources related to bariatric surgery may apply.[9] The literature and the present findings suggest that more concentrated pre- and post-DS diet, exercise, and psychological intervention might improve outcomes for Medicaid super-obese patients.

Medicare boasted the greatest weight loss and highest resolution of abdominal hernia, musculoskeletal pain and pseudotumor cerebri, but had the highest asthma and PCOS. The present study's findings are consistent with Alexander et al's report of decreased resolution of diabetes, HTN, OSA and dyslipidemia in Medicare versus commercial insurance.[11] Our review of the literature identifies this investigation as the first to compare Medicare to other carriers after DS. One might speculate from the data that with increasing age, there is an associated increase in obesity-related disease burden related to the years that one has been

morbidly obese, much as the pack-years concept is active for smoking related illnesses.

There are several limitations to this study. Firstly, the limits of a retrospective analysis of a prospectively collected database apply. Secondly, only clinical definitions were used in BOLD. Thus, for example, liver disease was diagnosed clinically, without biopsy. Thirdly, after 12 months, analyses had reduced statistical power due to declining follow-up visits. Finally, having to group the BOLD sub-categories of severity for obesity comorbidities together for statistical robustness precluded a more in-depth evaluation of these conditions.

Outcomes after DS among super-obese patients vary widely by health insurance status. Private achieved the greatest overall health improvement. Self-Pay benefits were countered by failed resolution of other co-morbidities. In Self-Pay, highest alcohol use plus liver disease invite further investigation. Medicare experienced highest weight loss and asthma and PCOS resolution, but fared poorest with abdominal hernia development, musculoskeletal pain and pseudotumor cerebri. Medicaid resolved the least co-morbidities yet had the least dyslipidemia. These findings may enable bariatric surgeons to fine-tune peri-operative DS management toward individualizing care and thereby improving outcomes for the super-obese.

REFERENCES

1. Raisdana B, Slotman G. Cardiopulmonary, Metabolic, and Hepatobiliary Dysfunction Varies by Insurance Status in the Mega-Obese. *Crit Care Med.* 2014;41(15, Suppl.):542.
2. Neff, KJ, Olbers, T and le Roux, CW. Bariatric surgery: the challenges with candidate selection, individualizing treatment and clinical outcomes. *BMC Med.* 2013;11(8).
3. Hess DS, Hess DW, Oakley RS. The biliopancreatic diversion with the duodenal switch: results beyond 10 years. *Obes Surg.* 2005;15(3):408–16.

4. Blair K, Slotman G. Health Insurance Carrier Does Matter: Clinically Significant Variation in Weight-Related Diagnoses for Medicaid vs Medicare vs Private Insurance vs Self Pay in 83,059 Morbidly Obese Patients. *Am J Gastroenterol*. 2013;108:S473-4.
5. DeMaria EJ, Pate V, Warthen M, Winegar DA. Baseline data from American Society for Metabolic and Bariatric Surgery-designated Bariatric Surgery Centers of Excellence using the Bariatric Outcomes Longitudinal Database. *Surg Obes Relat Dis*. 2010;6(4):347-55.
6. SAS/STAT(R) 9.22 User's Guide, 2009 The SAS Institute, Cary, NC.
7. Chang SH, Stoll CR, Colditz GA. Cost-effectiveness of bariatric surgery: should it be universally available? *Maturitas*. 2011 Jul;69(3):230-8.
8. Durkin AJ, Bloomston M, Murr MM, Rosemurgy AS. Financial status does not predict weight loss after bariatric surgery. *Obes Surg*. 1999 Dec;9(6):524-6.
9. Balduf LM, Kohn GP, Galanko JA, Farrell TM. The impact of socioeconomic factors on patient preparation for bariatric surgery. *Obes Surg*. 2009 Aug;19(8):1089-95.
10. Balash PR, Wilson NA, Bruns NE, Luu MB, Francescatti AB, Maroulis B, Autajay KM, Myers JA. Insurance status and outcomes in laparoscopic adjustable gastric banding. *Surg Laparosc Endosc Percutan Tech*. 2014 Oct;24(5):457-60.
11. Alexander JW, Goodman HR, Martin Hawver LR, James L. The impact of medicaid status on outcome after gastric bypass. *Obes Surg*. 2008 Oct;18(10):1241-5.
12. King WC, Chen J, Mitchell JE, et al. Prevalence of alcohol abuse disorders before and after bariatric surgery. *JAMA*. 2012;307(23):2516-2525