

TOTAL CHARGES FOR POST-OPERATIVE LEAK FOLLOWING LAPAROSCOPIC SLEEVE GASTRECTOMY

April Zambelli-Weiner, Ph.D., Elizabeth Brooks, Ph.D., Decision Driver Analytics, Inc., Asheville, NC; Robert Brolin, M.D., Bariatric Surgery Center of Excellence at University Medical Center of Princeton at Plainsboro; Eric S. Bour, M.D., Hillcrest Memorial Hospital of the Greenville Health System, Greenville, SC

INTRODUCTION

- Sleeve gastrectomy (SG) is gaining popularity as a primary bariatric procedure.
- Staple line leak is a serious, potentially life threatening complication of SG.
- Reports have shown that the rate of leak ranges from 1-5%. (Marquez et al. 2010; Knapps et al. 2013; Moon et al. 2005, Melissas et al. 2007; Sarkhosh et al. 2013)
- Although there are numerous publications regarding diagnosis and treatment of post SG leaks, there is little information regarding total hospital costs and charges of SG procedures that experience leaks

METHODS-1

- Inpatient data was obtained from Truven Analytics' Hospital Drug Database and included SG index hospitalization charges and any readmission charges in the following categories:
 - All Room and Board
 - OR & Recovery Room
 - Imaging
 - Laboratory Tests
 - Medical Supplies
 - Pharmacy
- Medical consultant charges were not included
- Hospital costs are estimated from hospital charges using the average overall or category-specific hospital cost-to-charge ratio calculated from a subset of inpatient hospitals providing cost information

RESULTS

- There were 63 leaks identified in the database of SG patients representing 1.30% of all eligible discharges (n=4,838)
- Three readmissions were discovered, two of which were characterized as leaks
- Total charge for leaks varied from \$29,500 to \$853,900
- Total charge for leaks varied by factors such as gender and age
- Mean total hospital charge for leak after SG was \$137,417 compared to the average cost of non-leak SG patients of \$43,966
- Major drivers of the charge differential between leak and non-leak patients were room and board, operating and recovery room, medical supplies and pharmacy
- Sepsis was a major modifier of hospital charges among SG patients with a leak
- Average hospital charges for patients with a diagnosis of sepsis (n=7) were \$432,810 compared to patients with a leak but without a diagnosis of sepsis (n=55) \$99,822

OBJECTIVE

The aim of this study is to investigate:

- The incidence of in-hospital post-SG leak events
- The incidence of leak-related hospital readmissions (to the same facility)
- Total costs and charges for leak vs. non-leak SG procedures
- Cost drivers for post-SG leak procedures

METHODS-2

- Inclusion criteria included:
 - Primary diagnosis of morbid obesity
 - Primary procedure of sleeve gastrectomy (ICD-9-CM 43.89 or 43.82)
 - Adult patient (age ≥ 18)
- 102 patients were excluded because of a secondary diagnosis of cancer
- Two groups were identified:
 - SG with leak
 - SG without leak
- Patients were randomized to an exploratory data set and an analysis data set (results presented here for analysis data set only)

Figure 1. Sample Size by SG Code

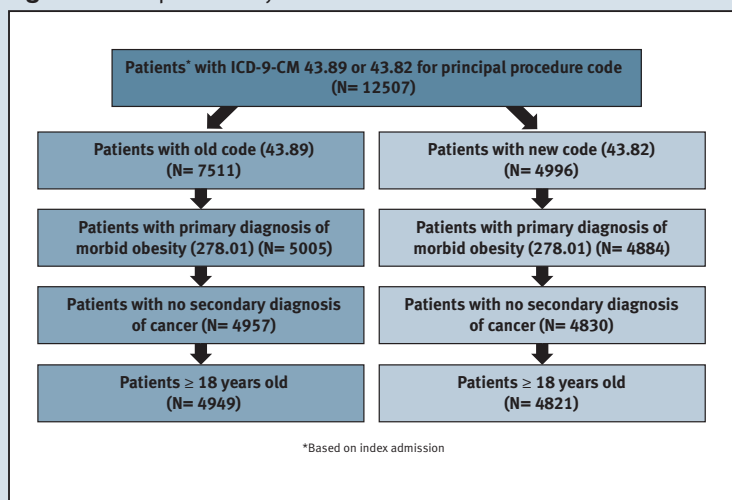


Figure 2. Average Hospital Charges With and Without Leak*

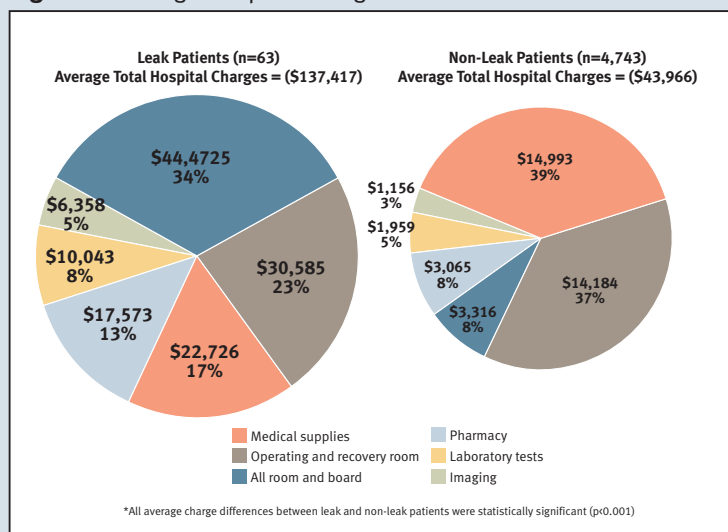


Table 1. Characteristics of SG Patients with Principal Diagnosis of Obesity in Analysis Data Set, by Leak Status

	Analysis Data Set (N=4838)				
	Leak (N=63)		No Leak (N=4775)		P-value
	n	% (range)	n	% (range)	
Gender					
Male	12	19.0%	1110	23.2%	0.432
Female	50	79.4%	3634	76.1%	0.542
Missing	1	1.6%	31	0.6%	0.312
Age, Years	44.6	[19-63]	45.1	[18-87]	0.999
Race					
White	10	15.9%	875	18.3%	0.624
Black	1	1.6%	210	4.4%	0.280
Asian/Pacific	0	0.0%	1	0.0%	0.911
American Indian	-	-	-	-	-
Hispanic	-	-	-	-	-
Other	0	0.0%	88	1.8%	0.283
Missing	52	82.5%	3601	75.4%	0.193
Length of Stay for Index Admission, Days					
	10.3	[1-78]	2.1	[1-30]	0.989
Principal Payer*					
Medicare	6	9.5%	129	2.7%	0.001
Medicaid	1	1.6%	191	4.0%	0.332
Title V	-	-	-	-	-
Other Government	1	1.6%	5	0.1%	0.001
Worker's Comp	0	0.0%	1	0.0%	0.911
Blue Cross	21	33.3%	1280	26.8%	0.248
Other Insurance	24	38.1%	1775	37.2%	0.883
Self	2	3.2%	158	3.3%	0.965
Other	0	0.0%	29	0.6%	0.537
No Charge	-	-	-	-	-
HMO	7	11.1%	1129	23.6%	0.020
Missing	1	1.6%	78	1.6%	0.312

*for terminal discharge

Table 2. Total charge modifiers for SG patients with and without leak

Variable	n	Leak (n=62) [‡]	p-value	n	No Leak (n=4743) [‡]	p-value
		\$, mean ± SD			\$, mean ± SD	
Gender						
Male	50	\$114,943 ± 144,959	0.021	3634	\$43,041 ± 26,741	< 0.001
Female	12	\$231,062 ± 182,569		1109	\$46,999 ± 25,914	
Age Group						
<25	4	\$68,150 ± 26,621	0.326†	285	\$38,470 ± 26,073	< 0.001†
26-35	9	\$95,703 ± 88,455		1027	\$41,312 ± 25,478	
36-45	22	\$185,952 ± 215,672		1375	\$43,847 ± 25,476	
46-55	14	\$108,290 ± 131,400		1285	\$45,703 ± 28,615	
56-65	13	\$136,843 ± 116,273		679	\$46,171 ± 25,128	
>65	0	-		92	\$51,885 ± 32,518	
Sepsis						
Yes	7.3	\$432,810 ± 257,136	< 0.001	0		
No	55	\$99,822 ± 90,423		4743	\$43,966 ± 26,600	NC
ICD-9-CM Primary Diagnosis Code[§]						
Old (43.89)	25	\$221,075 ± 210,270	< 0.001	2425	\$42,562 ± 27,334	< 0.001
New (43.82)	37	\$80,891 ± 69,215		2317	\$45,433 ± 25,740	

‡ 1 leak patient and 32 non-leak patients were missing cost information

† p-value for trend, non-parametric rank sum test

§ 1 non-leak patient had a secondary dx code of 43.89 or 43.82 and is included here

SD = standard deviation; NC = Not calculable

CONCLUSION

- Post SG leak is an expensive complication: total hospital costs and charges for leak patients were >3-times the cost and charges for non-leak patients
- Additionally, the impact of leaks on patients' quality of life, while not examined in this analysis, is clearly significant
- Staple line reinforcements have been shown to reduce post-SG leaks (Consten et al. 2004; Nguyen et al. 2005; Chiasson et al. 2010)
- Technical measures, such as staple line reinforcements, aimed at avoiding post-SG leaks represent an important opportunity for significant cost savings as well as improved patient outcomes
- The majority of leaks were diagnosed during the index admission or initial encounter. In the era of bundled care and capitation, preventing leaks is paramount to maximizing reimbursement and managing financial and legal risk

References

- Consten EC, Gagner M. Staple-line reinforcement techniques with different buttressing materials used for laparoscopic gastrointestinal surgery: a new strategy to diminish perioperative complications. *Surg Technol Int*. 2004;13:59-63. Review. PMID: 15744676.
- Chiasson PM, Burpee SE. Laparoscopic vertical sleeve gastrectomy: efficacy of using Bioabsorbable Seamguard. Abstract presented at the 25th Annual American Society for Metabolic & Bariatric Surgery Meeting (ASMBS); June 15-20, 2008; Washington, DC. *Surgery for Obesity & Related Diseases* 2008;4(3):332-333. Abstract P54.
- Knapps J, Ghanem M, Clements J, Merchant AM. A systematic review of staple-line reinforcement in laparoscopic sleeve gastrectomy. *JLS*. 2013 Jul-Sep;17(3):390-9. PMID: 24018075.
- Márquez MF, Ayza MF, Lozano RB, Morales Mdel M, Díez JM, Poujoulet RB. Gastric leak after laparoscopic sleeve gastrectomy. *Obes Surg*. 2010 Sep;20(9):1306-11. PMID: 20574787.
- Melissas J, Koukouraki S, Askoxylakis J, Stathaki M, Daskalakis M, Perisinakis K, Karkavitsas N. Sleeve gastrectomy: A restrictive procedure? *Obes Surg* 2007;17:57-62.
- Moon Han S, Kim WW, Oh JH. Results of laparoscopic sleeve gastrectomy (LSG) at 1 year in morbidly obese Korean patients. *Obes Surg* 2005;15:1469-75.
- Nguyen NT, Longoria M, Chalifoux S, Wilson SE. Bioabsorbable staple line reinforcement for laparoscopic gastrointestinal surgery. *Surg Technol Int*. 2005;14:107-11. PMID: 16525961.
- Sarkhosh K, Birch D, Sharma A, Karmali S. Complications associated with laparoscopic sleeve gastrectomy for morbid obesity: a surgeon's guide. *Can J Surg* 2013;56(5):347-352.



Poster presented at Obesity Week 2013;
November 11-16, 2013; Atlanta, GA
Reprinted with permission of the authors.