ELSEVIER

Surgery for Obesity and Related Diseases 14 (2018) 1442–1447

SURGERY FOR OBESITY AND RELATED DISEASES

Original article

Does the future of laparoscopic sleeve gastrectomy lie in the outpatient surgery center? A retrospective study of the safety of 3162 outpatient sleeve gastrectomies

Amit Surve, M.D.[a], Daniel Cottam, M.D.[a,*], Hinali Zaveri, M.D.[a], Austin Cottam, B.S.[a], LeGrand Belnap, M.D.[a], Christina Richards, M.D., F.A.C.S.[a], Walter Medlin, M.D., F.A.C.S.[a], Titus Duncan, M.D., F.A.C.S., F.A.A.C.S.[b], Karleena Tuggle, M.D.[b], Alberto Zorak, M.D.[b], Thomas Umbach, M.D. F.A.C.S., F.A.S.M.B.S.[c], Matthew Apel, M.D.[c], Peter Billing, M.D.[d], Josiah Billing, B.S.[d], Robert Landerholm, M.D.[d], Kurt Stewart, M.D.[d], Jedediah Kaufman, M.D.[d], Eric Harris, M.D.[d], Michael Williams, M.D. F.A.C.S.[e], Christopher Hart, M.D., F.A.C.S.[e], William Johnson, M.D., F.A.C.S.[e], Christy Lee, R.N., B.S.N.[e], Ciara Lee, M.B.S.C.R.[e], John DeBarros, M.D., F.A.C.S., F.A.S.M.B.S.[f], Michael Orris, D.O.[f], Bleu Schniederjan, M.D., F.A.C.S., F.A.S.M.B.S.[f], Bo Neichoy, M.D.[g], Aneesh Dhorepatil, M.B.B.S.[a], Samuel Cottam, C.N.A.[a], Benjamin Horsley, E.M.T.[a]

[a] *Bariatric Medicine Institute, Salt Lake City, Utah*
[b] *Peachtree Surgical & Bariatrics, Atlanta, Georgia*
[c] *Blossom Bariatrics, Las Vegas, Nevada*
[d] *Eviva, Shoreline, Washington*
[e] *Atlanta General and Bariatric Surgery Center, Johns Creek, Georgia*
[f] *East Valley Surgery Center, Tempe, Arizona*
[g] *PanHandle Weight Loss Center, Amarillo, Texas*

Received 19 February 2018; received in revised form 24 May 2018; accepted 29 May 2018

Abstract

Background: Laparoscopic sleeve gastrectomy (LSG) is a safe and effective procedure that can be performed as an outpatient procedure.

Objectives: The aim of the study was to determine whether same-day discharge LSG is safe when performed in an outpatient surgery center.

Setting: Outpatient surgery centers.

Methods: The medical records of 3162 patients who underwent primary LSG procedure by 21 surgeons at 9 outpatient surgery centers from January 2010 through February 2018 were retrospectively reviewed.

Results: Three thousand one hundred sixty-two patients were managed with enhanced recovery after surgery protocol and were included in this analysis. The mean age and preoperative body mass index were 43.1 ± 10.8 years and 42.1 ± 7.1 kg/m^2, respectively. Sleep apnea, type 2 diabetes, gastroesophageal reflux disease, hypertension, and hyperlipidemia were seen in 14.4%, 13.5%, 24.7%, 30.4%, and 17.6% patients, respectively. The mean total operative time was 56.4 ± 16.9 minutes (skin to skin). One intraoperative complication (.03%) occurred. The hospital transfer rate was .2%. The 30-day follow-up rate was 85%. The postoperative outcomes were analyzed based on the available data. The 30-day readmission, reoperation, reintervention, and

*Correspondence: Daniel Cottam, M.D., Bariatric Medicine Institute, 1046 East 100 South, Salt Lake City, UT 84102.
E-mail address: drdanielcottam@yahoo.com (D. Cottam).

https://doi.org/10.1016/j.soard.2018.05.027

emergency room visit rates were .6%, .6%, .2%, and .1%, respectively. The 30-day mortality rate was 0%. The total short-term complication rate was 2.5%.

Conclusions: Same-day discharge seems to be safe when performed in an outpatient surgery center in selected patients. It would appear that outpatient surgery centers are a viable option for patients with minimal surgical risks. (Surg Obes Relat Dis 2018;14:1442–1447.)

Keywords: Outpatient; In-patient; Ambulatory Setting; Same-Day Surgery Center; Sleeve Gastrectomy; Complication

Minimally invasive surgery (MIS) emerged in the 1980s as a safe and effective technique to meet the surgical needs of many patients [1–3]. The increasing application of MIS techniques has revolutionized bariatric surgery, significantly reducing postoperative pain, recovery time, and hospital stays with marked improvements in cosmetic outcome and overall cost-effectiveness [4]. The MIS technologic advances have not only given bariatric surgeons a new way to perform bariatric procedures, they have also enabled many of the elective procedures to be performed on an outpatient basis. The number of outpatient procedures has grown considerably in the United States since the early 1980s. Today, >80% of all surgical procedures are performed using minimally invasive techniques in an outpatient surgical setting [5]. Furthermore, the use of enhanced recovery after surgery (ERAS) protocols adds further benefits in the setting of MIS [6]. However, the outcomes of this combination on a large group of bariatric patients in an outpatient setting are still unknown.

In the current healthcare environment, bariatric surgery centers need to be cost-effective while maintaining quality. Many patients are choosing outpatient surgical weight loss procedures for convenience and costs [5]. Laparoscopic adjustable gastric banding, laparoscopic Roux-en-Y gastric bypass, and laparoscopic sleeve gastrectomy (LSG) have all been performed as an outpatient procedure in outpatient centers with 23-hour stay [7]. The SG accounts for nearly 52% (in-patient and outpatient) of bariatric procedures. There are several reports on the outcomes of LSGs that have been performed in an in-patient setting. However, there have been only a few reports on the outcomes of LSGs that have been performed in an outpatient setting [8–12].

The aim of the study was to evaluate the 30-day mortality, morbidity, readmission, reoperation, and reintervention rates to determine where LSG is safe when performed in an outpatient surgery center.

Methods

In this multi-institutional retrospective study, the medical records of 3162 patients who had undergone primary LSG procedure by 21 surgeons from January 2010 through February 2018 at 9 independent outpatient surgery centers were reviewed from each institution's prospectively collected database. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. This is a retrospective study, so formal consent is not required for this type of study.

The outpatient surgery centers are also known as ambulatory surgical centers, same-day surgery centers, 1-day surgery centers, or day-case surgery centers. These outpatient surgery center procedures do not require an overnight stay at the hospital. However, we preferred to use the term "outpatient surgery" over the other terms because there is no uniform definition worldwide. We defined "outpatient surgery" as involving a total stay at the outpatient surgery center of <8 hours and not requiring an overnight stay.

All the centers that were involved in the study had an informed consent process in place before the study that included a consent detailing the procedure, risks, and potential benefit.

Each center had its well-developed protocol for appropriate patient selection and a unique ERAS postoperative protocol. Patients were considered for an outpatient LSG if they were at least 18 years old and had a body mass index (BMI) >30 kg/m^2. The exclusion criteria included any previous bariatric surgery, age >55 years, BMI ≥55 kg/m^2, American Society of Anesthesiologists score ≥IV, and poorly controlled hypertension. Additionally, patients with procedures that potentially exceed 2 hours under anesthesia were also excluded (high BMI, revisions, large hiatal hernias with sleeve, etc.). All the patients were provided with the preoperative instructions that were specifically for an outpatient LSG. This included the morning of surgery, special tips, and after surgery instructions.

All LSG cases were performed in an outpatient surgery center. Each center had a transfer agreement with the nearby hospital. The surgical technique has been extensively described elsewhere [13]. The postanesthetic recovery scoring system was used to assess patient readiness for discharge from Phase I recovery and Phase II recovery. When patients were ambulatory with normal room-air saturation, were under optimal pain control, and were tolerating liquids, they would be discharged the same day.

We encouraged patients to return to the clinic 2 to 3 days later for intravenous fluid administration as surgeons' customary practice. The patients were not charged for this, but their insurance company was billed for intravenous fluid administration. If the patient was self-pay, this was included in their surgical fee. Aftercare included surgeon visits at 2 to 3 days; 1 week; 1, 3, 6, 9, 12, 18, and 24 months; and yearly thereafter.

The data collection was standardized across institutions. The following data were considered: (1) demographic data and co-existing conditions, including age, weight, BMI, and co-morbid conditions such as sleep apnea, type 2 diabetes, gastroesophageal reflux disease, hypertension, and hyperlipidemia; (2) intraoperative complications, which were defined as complications occurring during the procedure; and (3) short-term complications, which were defined as complications that occurred before discharge on the day of surgery or within 30 days of intervention. Also, complications were summarized with frequencies and percentages using the entire cohort of patients.

Preoperative characteristics, such as weight and BMI, were analyzed using descriptive statistics. The follow-up was limited to 30 days postprocedure. All patients who did not have a 30-day follow-up were contacted by research assistants by phone and asked about 30-day perioperative complications.

The surgeons participating in this study wholly or partially owned all surgical centers that participated in the study. In some instances, the surgeons were partial non-majority owners; in others, they were the sole owners.

Results

Three thousand one hundred sixty-two patients were identified. The study involved patients with a mean age of 43.1 ± 10.8 years and had 1524 (48.1%) to 1638 (51.8%) male to female ratio. The mean preoperative BMI and weight were 42.1 ± 7.1 kg/m^2 and 263.5 ± 53 lbs, respectively. Of the 3162 patients, preoperative co-morbidity data were available for 2057 patients. Of the 2057 patients, 14.4%, 13.5%, 24.7%, 30.4%, and 17.6% of patients had preexisting sleep apnea, type 2 diabetes, gastroesophageal reflux disease, hypertension, and hyperlipidemia, respectively (Table 1). All procedures were performed laparoscopically. The mean total operative time was 56.4 ± 16.9 minutes. An intraoperative complication, iatrogenic splenic injury occurred in 1 patient (.03%). Seven postoperative complications (.2%) such as cardiac symptoms, tachyarrhythmia, arrhythmias from premature ventricular contractions, renal insufficiency, low oxygen saturation, and 2 postoperative bleeds resulted in the transfer to hospital (Table 2). The 30-day follow-up rate was 85% and did not include patients who came back for intravenous fluid administration. Of the available data, the 30-day readmission, reoperation, reintervention, and emergency room visit rates were .6%, .6%, .2%, and .1%, respectively. The 30-day mortality rate was 0% (Table 2). The total short-term complication rate was 2.5% (Table 3). The most common short-term complications were gastric leak and abscess (.4%) and wound infection (.4%). The complete list of all complications within 30 days is depicted in Table 3. One patient had septic shock from the necrotic bowel of unknown cause 2 weeks after uneventful LSG surgery. The necrotic bowel was resected, and the patient made a full recovery. The most common reintervention within the first 30-days of the procedure was a computed tomography scan (Table 4). Of the 17 complications that required readmission, the leading cause of readmission was gastric leak and abscess (Table 4).

Table. 1
Demographic characteristics of patients who had undergone primary laparoscopic sleeve gastrectomy from January 2010 through February 2018.

Variable	Value
Patient, n	3162
Male/female, %	48.1/51.8
Age, yr*	43.1 ± 10.8
Weight, lbs*	263.5 ± 53
BMI, kg/m^2*	42.1 ± 7.1
IBW, lbs*	140.2 ± 20.9
EBW, lbs*	110.6 ± 59.3
Co-morbidity†	
Available data, n	2057
Sleep apnea, n (%)	297 (14.4)
T2D, n (%)	279 (13.5)
GERD, n (%)	509 (24.7)
HTN, n (%)	626 (30.4)
Hyperlipidemia, n (%)	364 (17.6)

BMI = body mass index; IBW = ideal weight; EBW = excess weight; T2D = type 2 diabetes; GERD = gastroesophageal reflux disease; HTN = hypertension.

* Values expressed as mean ± standard deviation.

† Of the 3162 patients, the preoperative co-morbidity data was available for 2057 patients. Of the 2057 patients, 14.4%, 13.5%, 24.7%, 30.4%, and 17.6% patients had preexisting sleep apnea, T2D, GERD, HTN, and hyperlipidemia, respectively.

Table. 2
Early surgical outcomes

Variable	Value
Total operative time, min*†	56.4 ± 16.9
Intraoperative complication, n (%)†	1 (.03)
Conversion to open, n†	0
Transfer to hospital, n (%)†	7 (.2)
30-d follow-up (%)†	85
30-d readmission, n (%)‡	17 (.6)
30-d reoperation, n (%)‡	18 (.6)
30-d ER visit, n (%)‡	4 (.1)
30-d reintervention, n (%)‡	9 (.2)
Death, n‡	0

ER = emergency room.

* Value expressed as mean ± standard deviation

† Values are calculated based on available data (3162 patients).

‡ Values are calculated based on available data (2688 patients).

Table 3
Postoperative complication within 30-days of intervention.

Variable	Value
Total complication, n (%)	68 (2.5)
Gastric leak and abscess, n (%)	12 (.4)
Wound infection, n (%)	11 (.4)
Nausea and vomiting, n (%)	7 (.2)
Postoperative bleed, n (%)	7 (.2)
DVT, n (%)	5 (.1)
Dehydration needing IV therapy, n (%)	4 (.1)
Low oxygen saturation, n (%)	4 (.1)
Arrhythmia, n (%)	2 (.07)
Abdominal pain of unknown etiology, n (%)	2 (.07)
Diarrhea, n (%)	2 (.07)
GERD, n (%)	2 (.07)
Constipation, n (%)	2 (.07)
Wound abscess, n (%)	1 (.03)
Splenic infarct, n (%)	1 (.03)
Cellulitis secondary to wound infection, n (%)	1 (.03)
Septic shock, n (%)	1 (.03)
Renal insufficiency, n (%)	1 (.03)
Stricture, n (%)	1 (.03)
Myocardial infarction, n (%)	1 (.03)
Dysphagia, n (%)	1 (.03)

DVT = deep vein thrombosis; IV = intravenous; GERD = gastroesophageal reflux disease.
Values are calculated based on available data (2688 patients).

Table 4
Thirty-day reintervention and cause of readmission and ER visit after outpatient LSG.

Variable	Event, n
30-d intervention	9
CT Scan	5
EGD	3
UGI	1
30-d readmission	17
Gastric leak and abscess	5
DVT	3
Arrhythmia	2
Wound abscess	1
Cellulitis secondary to wound infection	1
Renal insufficiency	1
Low oxygen saturation	1
Dehydration	1
Myocardial infarction	1
Stricture	1
30-d ER visit	**4**
Wound infection	1
Nausea	1
Dysphagia	1
Splenic infarct	1

ER = emergency room; LSG = laparoscopic sleeve gastrectomy; CT scan = computed tomography scan; EGD = esophagogastroduodenoscopy; UGI = upper gastrointestinal series; DVT = deep vein thrombosis.

We compared the demographic data between the groups that followed up (85%) and were lost to follow-up (15%). None of the demographic data (age, sex, BMI, and comorbidities) were statistically significant. A comparison was also made between different centers and their reported complication rates using a χ^2 test. There was no statistically significant difference between the different centers in terms of complications ($P = .378$).

Discussion

This is the first multi-institutional study on primary LSG at outpatient surgical centers. Additionally, this is the largest cohort studied on primary LSG at an outpatient surgery center. The results are consistent with conclusions from other studies that outpatient LSG can be safely performed with a low complication rate. Our readmission, reoperation, and reintervention rates after outpatient SG were similar to those of the same procedures performed during hospital admission [14–16].

This represents a potential change how bariatrics is delivered not only in the United States, but also across the world. Currently, the vast majority of procedures are done in hospitals. However, in the corresponding author's practice, fully 93% of patients would be categorized as low risk according to Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program Ambulatory Surgical Center (ASC) guidelines and could potentially be done in an ASC environment (if not outpatient then 23-hour stay).

In our cohort, we observed .2% of transfer to hospital and a readmission rate of .6%. This is comparable to the study published by Billing et al. [8] where they experienced .8% transfer rate and 3.6% admission rate in the cohort of 250 patients. Similarly, Whippey et al. [17] found a readmission rate of 2.6% after ambulatory surgery. A similar readmission rate was also seen after outpatient laparoscopic adjustable gastric banding surgery [18,19]. Moreover, it is important to note that no instances of mortality were seen in our or any of these studies. Our total short-term complication rate was 2.5%. This was consistent with the other outpatient LSG studies and with outpatient laparoscopic adjustable gastric banding studies [8,17–19].

The most common short-term complications seen in our cohort were gastric leak and abscess (.4%) and wound infection (.4%). These complications are also commonly seen after other bariatric in-patient procedures. Gold et al. [20] predicted that postoperative vomiting (odds ratio, 3.0) and type of anesthesia increases the likelihood of unanticipated admission to the hospital after outpatient surgery. The postoperative vomiting (.2%) was one of the most common complications seen in our study but was not responsible for higher readmission rate. However, this study was not designed to look into the details of the type of anesthesia, and thus we cannot predict if the type of anesthesia was responsible for the increased risk of readmission rate. This was one of the limitations of our study. Surgery lasting >1 hour, high American Society of Anesthesiologists classes, advanced age, and higher BMI have been pre-

dictors of unanticipated admission after outpatient surgery [17]. Age and BMI did not contribute to increased readmission rate in our cohort. Billing et al. [21] also concluded similar results that age and BMI do not reflect the worse outcomes after outpatient LSG procedure. Our mean total operative time was 56.4 ± 16.9 minutes, and it has been our policy to exclude procedures with anticipated operative time >2 hours for minimizing the postoperative complications and recovery time. We looked at complications in cases >1 hour. None of these patients was readmitted within the first 30 days after intervention. Thus, the length of surgery also did not play any role in increasing the readmission rate.

Outpatient centers have been praised for their potential to provide less expensive and faster services for low-risk surgical procedures. These centers also provide more locations that are convenient for patients and physicians as well. Apart from these known advantages, we believe that there could be a few more advantages if performed at an outpatient surgery center as opposed to hospital-based surgery.

Convenience

In-patient can be an uneasy setting, and most of the patients prefer outpatient SG as a convenient option as they can recover at their own home [7,8,18,22,23]. Second, for hospitals authorizing smaller surgical procedures to an outpatient setting, there is less stress on the operating room [23]. Apart from this, an outpatient facility has an easier time following a set schedule than a traditional operating room.

Shorter length of stay

Concerns have been raised that decreasing length of stay (LOS) may increase hospital readmissions and postdischarge resource utilization; however, studies demonstrate that an ERAS protocol shortens LOS without increasing complications or readmissions [24–26]. A recent study suggested that the short-stay bariatric surgery is a feasible and safe option [27]. They found when reducing the LOS by 2 days to 1, there was no statistically significant increase in the number of hospital readmissions, emergency department visits, or patient calls to the office. However, as this study did not involve outpatient bariatric procedures, they could not reach conclusions on the outcomes of the outpatient procedures. Khorgami et al. [28] evaluated the national cost of bariatric surgery to identify the factors associated with a higher cost. They found that one of the factors contributing to the cost variation of bariatric procedures was LOS. The hospital cost of laparoscopic Roux-en-Y gastric bypass and LSG increased linearly with the length of hospital stay resulting in doubling the cost of a procedure by staying 7 days. Shorter LOS results in modest financial saving to the health service. Additionally, the risk of unnecessary hospital-acquired conditions is lowered. The mean LOS in our study was 471.3 ± 78.5 minutes (7.8 ± 1.3 hr). In spite of the shorter LOS, the overall short-term complication rate was 2.5%, which was also similar to or lower than the reported in-patient short-term complication rates [29–32]. This results in major financial saving to the health services and reduces the risk of unnecessary hospital-acquired condition.

Some limitations are noteworthy. One of the limitations was preoperative co-morbidity data that were available for 65% patients. This was a retrospective study and follow-up is always lower retrospectively. Although the 30-day follow-up rate was 85%, there was no statistically significant difference in the demographic data between the groups that followed up and were lost to follow-up. This shows that the group that followed up is likely to be representative of the larger group of patients, allowing us to make conclusions with a lower follow-up rate. Retrospective studies are also limited by their ability to capture all complications, so the possibility exists that there are unrecorded complications. Additionally, although there were variations in the surgical technique, there was no statistically significant difference between the different centers in terms of complication rates ($P = .378$). All we can say is that for these patients, the site of surgery made no difference in surgical complications.

Another important limitation was the nonstandard use of ERAS protocols. Each center in our study used different ERAS protocols to achieve the same result. This raises the question of whether it was the ERAS protocols at each institution or simply good patient selection as exemplified by the overall low mean BMI across institutions. A third possible reason could be the centers managing expectations of patients. Meaning the centers told the patients that they would be going home on day 1; thus, they expected to go home then and it was not an issue.

Conclusions

LSG for select patients can be performed safely on an outpatient basis. The exact reasons for early discharge and low readmission rates have yet to be elucidated.

Disclosure

D.C., the corresponding author, reports personal fees and other from Medtronic outside the submitted work. All other authors have no conflicts of interest to declare.

Reference

[1] Mark MJ. Minimally invasive and robotic surgery. JAMA 2001;285(5):568–72.

[2] Reddick EJ, Olsen DO. Laparoscopic laser cholecystectomy: a comparison with minilap cholecystectomy. Surg Endosc 1989;3(3):131–3.
[3] Davis CJ, Filipi CJ. A history of endoscopic surgery. In: Arregui ME, Fitzgibbons RJ, Jr., Katkhouda N, McKernan JB, Reich H, editors. *Principles of laparoscopic surgery: basic and advanced techniques*. New York; Springer-Verlag NY Inc.; 1995:3–20.
[4] Hooper EA, Farhad B, Kim JJ. Bariatric surgery in elderly. In: Schauer PR, Schirmer BD, Brethauer S, editors. *Minimally invasive bariatric surgery*. 2nd edition. New York: Springer; 2015:411–6.
[5] Munnich EL, Parente ST. Returns to specialization: evidence from the outpatient surgery market. J Health Econ 2017;57:147–67.
[6] Małczak P, Pisarska M, Piotr M, et al. Enhanced recovery after bariatric surgery: systematic review and meta-analysis. Obes Surg 2017;27(1):226–35.
[7] Sasse KC, Ganser JH, Kozar MD, et al. Outpatient weight loss surgery: initiating a gastric bypass and gastric banding ambulatory weight loss surgery center. JSLS 2009;13(1):50–5.
[8] Billing PS, Crouthamel MR, Oling S, Landernholm RW. Outpatient laparoscopic sleeve gastrectomy in a free-standing ambulatory surgery center: first 250 cases. Surg Obes Relat Dis 2014;10(1):101–5.
[9] Garofalo F, Denis R, Abouzahr O, et al. Fully ambulatory laparoscopic sleeve gastrectomy: 328 consecutive patients in a single tertiary bariatric center. Obes Surg 2016;26(7):1429–35.
[10] Lalezari S, Musielak MC, Broun LA, Curry TW. Laparoscopic sleeve gastrectomy as a viable option for an ambulatory surgical procedure: our 52-month experience. Surg Obes Relat Dis 2018;14(6):748–50.
[11] Sippey M, Kasten KR, Chapman WH, Pories WJ, Spaniolas K. 30-day readmissions after sleeve gastrectomy versus Roux-en-Y gastric bypass. Surg Obes Relat Dis 2016;12(5):991–6.
[12] Badaoui R, Alami Chentoufi Y, Hchikat A, et al. Outpatient laparoscopic sleeve gastrectomy: first 100 cases. J Clin Anesth 2016;34:85–90.
[13] Cottam A, Cottam D, Roslin M, et al. A matched cohort analysis of sleeve gastrectomy with and without 300 cm loop duodenal switch with 18-month follow-up. Obes Surg 2016;26(10):2363–9.
[14] Sethi M, Patel K, Zagzag J, et al. Thirty-day readmission after laparoscopic sleeve gastrectomy—a predictable event? J Gastrointest Surg 2016;20(2):244–52.
[15] Hutter MM, Schirmer BD, Jones DB, et al. First report from the American College of Surgeons Bariatric Surgery Center Network: laparoscopic sleeve gastrectomy has morbidity and effectiveness positioned between the band and the bypass. Ann Surg 2011;254(3):410–20 discussion 420–2.
[16] Jambhekar A, Maselli A, Lindborg R, Kabata K, Tortolani A, Gorecki P. Readmission following laparoscopic sleeve gastrectomy. JSLS 2016;20(3):e2016 00064.
[17] Whippey A, Kostandoff G, Paul J, Ma J, Thabane L, Ma HK. Predictors of unanticipated admission following ambulatory surgery: a retrospective case-control study. Can J Anaesth 2013;60(7):675–83.
[18] Cobourn C, Mumford D, Chapman MA, Wells L. Laparoscopic gastric banding is safe in outpatient surgical centers. Obes Surg 2010;20(4):415–22.
[19] Elli EF, Masrur MA, El Zaeedi M, Galvani CA, Bozorgui N, Giulianotti PC. Four-year experience with outpatient laparoscopic adjustable gastric banding. Surg Obes Relat Dis 2013;9(5):693–5.
[20] Gold BS, Kitz DS, Lecky JH, Neuhaus JM. Unanticipated admission to the hospital following ambulatory surgery. JAMA 1989;262(21):3008–10.
[21] Billing P, Billing J, Kaufman J, Stewart K, Harris E, Landerholm R. High acuity sleeve gastrectomy patients in a free-standing ambulatory surgical center. Surg Obes Relat Dis 2017;13(7):1117–21.
[22] Odhiambo MA, Njuguna S, Onyango RW, Mulimba J, Ngugi PM. Utilization of day surgery services at Upper Hill Medical Centre and the Karen hospital in Nairobi: the influence of medical providers, cost and patient awareness. Pan Afr Med J 2015;22:28.
[23] Munnich EL, Parente ST. Procedures take less time at ambulatory surgery centers, keeping costs down and ability to meet demand up. Health Aff (Millwood) 2014;33(5):764–9.
[24] Keane C, Savage S, McFarlane K, Seigne R, Robertson G, Eglinton T. Enhanced recovery after surgery versus conventional care in colonic and rectal surgery. ANZ J Surg 2012;82(10):697–703.
[25] Wind J, Hofland J, Preckel B, et al. Perioperative strategy in colonic surgery; LAparoscopy and/or FAst track multimodal management versus standard care (LAFA trial). BMC Surg 2006;6:16.
[26] Khorgami Z, Petrosky JA, Andalib A, Aminian A, Schauer PR, Brethauer SA. Fast track bariatric surgery: safety of discharge on the first postoperative day after bariatric surgery. Surg Obes Relat Dis 2017;13(2):273–80.
[27] Rickey J, Gersin K, Yang W, Stefanidis D, Kuwada T. Early discharge in the bariatric population does not increase post-discharge resource utilization. Surg Endosc 2016;31(2):618–24.
[28] Khorgami Z, Aminian A, Shoar S, et al. Cost of bariatric surgery and factors associated with increased cost: an analysis of national inpatient sample. Surg Obes Relat Dis 2017;13(8):1284–9.
[29] Weiner RA, El-Sayes IA, Theodoridou S, Weiner SR, Scheffel O. Early post-operative complications: incidence, management, and impact on length of hospital stay. A retrospective comparison between laparoscopic gastric bypass and sleeve gastrectomy. Obes Surg 2013;23(12):2004–12.
[30] Bellanger DE, Greenway FL. Laparoscopic sleeve gastrectomy, 529 cases without a leak: short-term results and technical considerations. Obes Surg 2011;21(2):146–50.
[31] Hoyuela C. Five-year outcomes of laparoscopic sleeve gastrectomy as a primary procedure for morbid obesity: a prospective study. World J Gastrointest Surg 2017;9(4):109–17.
[32] Cottam D, Qureshi FG, Mattar SG, et al. Laparoscopic sleeve gastrectomy as an initial weight-loss procedure for high-risk patients with morbid obesity. Surg Endosc 2006;20(6):859–63.