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BYPASSING BARIATRIC COSTS AND CUTTING RATES OF SURGICAL SITE INFECTION

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ABSTRACT

The Bariatric Program at The Ottawa Hospital Civic Campus (TOH-CC), which was designated as a Bariatric Centre of Excellence (BCoE) on February 10, 2017, has identified and implemented key changes in order to be more cost-efficient while providing patients with world-class care. The Bariatric Comprehensive Unit-Based Safety Program (CUSP) team modified its surgical technique and has been successful in not only reducing the cost per case but also in substantially decreasing the rates of surgical site infections (SSIs).

The Bariatric CUSP team, evaluated current practices, identified an area for improvement, and successfully implemented an alternative surgical technique. The team has, as a result, reduced its SSI rate from 8% to 1%, in 2 years, and has saved over $250,000 (26 per cent) in costs per year during this period.

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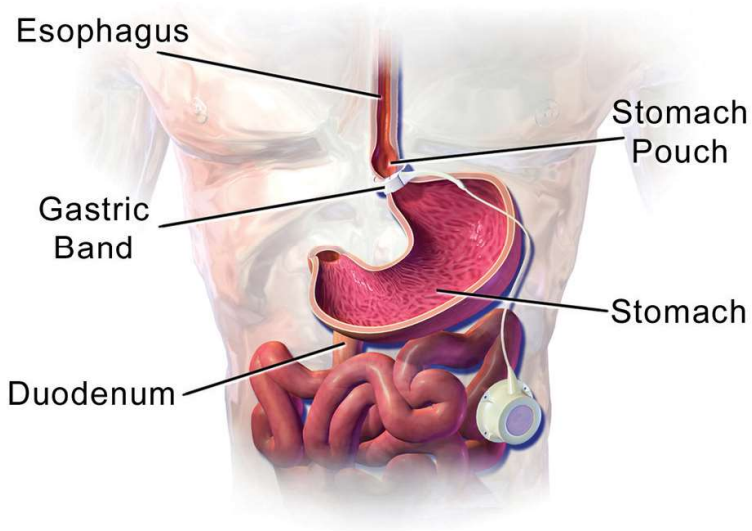
INTRODUCTION

Bariatric surgery is a weight loss procedure and there are three common methods used to achieve this weight loss:

1) Reduce the size of the stomach by applying an adjustable band around the stomach. This procedure is called a gastric band procedure and is more commonly known as a "lap band". An adjustable silicone band is placed around the upper portion of the stomach to create a small pouch (See Figure 1).
2) Reduce the size of the stomach by completely removing a large portion of the stomach. This procedure is called a sleeve gastrectomy and involves the excision of about 70% of the stomach to leave behind a narrow tube-like stomach pouch (See Figure 2); or
3) Re-route the small intestine to a small stomach pouch. This procedure is called a roux-en-y gastric bypass and involves a small part of the stomach being used to create a new stomach pouch (roughly the size of an egg) that can hold about 15-50mL. The smaller stomach is then connected directly to the middle portion of the small intestine (jejunum). The rest of the stomach and the upper portion of the small intestine (duodenum – where most calorie and nutrient absorption takes place) are both

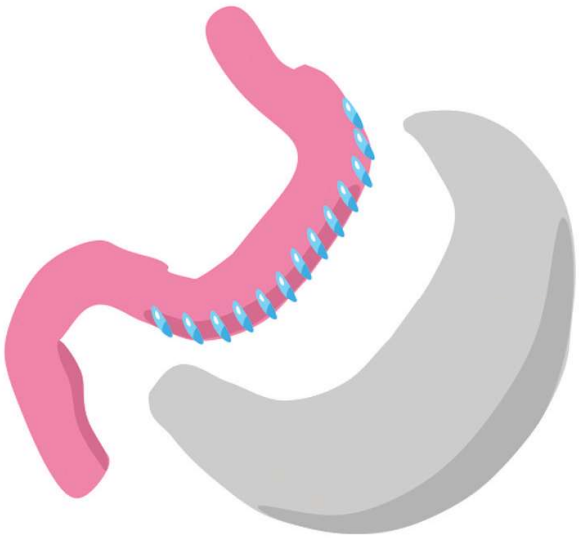
Figure 1.



Bruce Blaus (Blausen.com staff)

Gastric Band: *This photo illustrates placement of the adjustable band around the stomach, drastically decreasing the size of the stomach pouch. (Accessed by the author at Wikimedia Commons, Oct 10, 2017)*

Figure 2.



By: Lina Wolf © https://magenverkleinerung.tips

Sleeve Gastrectomy: *This photo illustrates the large portion of the stomach (pictured here in grey) that is completely removed. The staple line is pictured here in blue. (Accessed by the author at Wikimedia Commons, Oct 10, 2017)*

bypassed. The new connection to the stomach is called a roux-en-y limb because the duodenum limb and the new limb from the stomach connect together in the shape of a Y (See Figure 3). A roux-en-y is a combination of restriction (limiting the amount of food that can be ingested) and malabsorption (decreasing the amount of intestine available for nutrient absorption). This results in not only reduced food intake, but also reduced calorie and nutrient absorption.[1,2]

At TOH-CC, the laparoscopic sleeve gastrectomy and the laparoscopic roux-en-y gastric bypass procedures are performed regularly. The Bariatric Program started at TOH-CC in 2009. That first year, there were two bariatric surgeons who performed 150 procedures total. Each surgeon was able to do two cases per bariatric day and the average length of each procedure was 3-5 hours. In the early stages, there was a learning curve for everyone – not only the surgeons, but also the nursing staff, anesthesia team and patient care attendants.

Today, there are four bariatric surgeons who perform laparoscopic roux-en-y gastric bypass procedures as well as laparoscopic sleeve gastrectomies. Each surgeon is now routinely performing three cases in a day, and the hospital has four designated bariatric days per week. The average length for each procedure is now 1.5 – 2 hours.

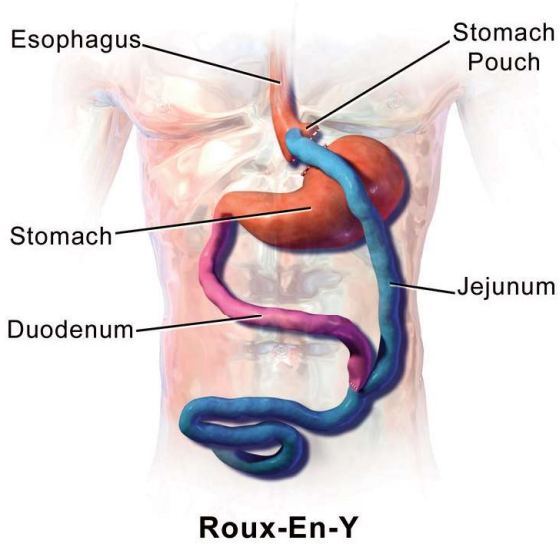
The Bariatric Program has since increased the amount of cases every year and at the end of the 2016 fiscal year they completed 537 bariatric procedures (compared with 150 in 2009). The goal for the 2017-2018 fiscal year is to be able to conduct up to 550 bariatric procedures.[3]

PROCEDURES AND TECHNIQUES:

The bariatric surgery set up is standardized at TOH-CC when it comes to equipment and steps of the procedure. There are only a few slight variations

Figure 3.

By: Bruce Blaus (Own work)



Roux-en-y: *This photo illustrates the connection from the new stomach pouch to the jejunum, bypassing the stomach and duodenum. (Accessed by the author at Wikimedia Commons, Oct 10, 2017)*

among the surgeons, such as their preference on suture length or type of suture, but otherwise, each of the surgeons performs the procedure the same way.

The technique that the bariatric surgeons at TOH-CC chose to use for roux-en-y gastric bypass procedures when the program started was the circular stapler technique. This technique involves using an EEA stapler and a corresponding EEA orvil to complete the anastomosis between the new stomach pouch and the jejunum (gastrojejunostomy).

Circular stapler technique:

To perform a laparoscopic roux-en-y gastric bypass, using this technique, the surgeon requires a combination of sutures and single use staplers. The stapler that they chose to use was the EEA 25mm XL stapler (the circular stapler in the circular stapler technique) (See Figure 4). Along with the EEA they were using the corresponding size of EEA orvil (See Figure 5). In addition, the surgeons were also using the Endo GIA XL stapler with a variety of different stapler cartridge reloads (See Figure 6). The cost of all these single use items for each roux-en-y procedure was $1,984.65.

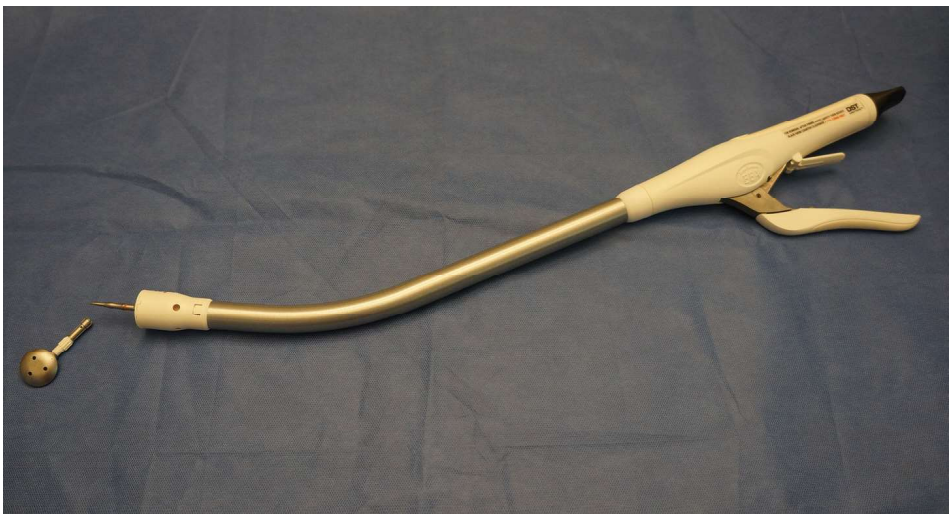
When it comes time during the procedure to complete the gastrojejunostomy using the circular stapler technique, the EEA orvil and EEA stapler are used. The orvil device is a combination of a silver circular anvil that is connected to a 90 cm long delivery tube. The EEA orvil is inserted into the mouth and lowered down through the oesophagus until it reaches the stomach pouch. When the orvil is in place, the delivery tube is disconnected, by cutting the suture string away. The delivery tube is then removed from the patient by pulling it out through one of the trocars. One of the laparoscopic trocars is removed and that incision is enlarged to allow the EEA stapler to be inserted through one of the port site incisions. The EEA and anvil are then joined together and the EEA stapler is fired. The EEA is removed from the patient and the trocar is reinserted for the rest of the procedure. To note, the EEA comes into contact with the inside of the stomach and small intestine and, as it is removed, it comes into contact with the abdominal wall and skin.[4]

When you consider the steps, it is clear that there is a high risk of infection with this technique. The orvil, which enters through the mouth (a non-sterile area, full of bacteria), passes through the patient's body and exits through the skin at what is called the "extraction site". This extraction site puts the patient at a higher risk for developing a surgical site infection (SSI).

Several other factors may also contribute to the development of an SSI. Studies have shown that the bariatric population is at a higher risk of getting a surgical site infection. Obesity alone is an important risk factor for developing a SSI post-op. Many bariatric patients present with diabetes, which is another comorbidity that puts these patients at higher risk.[5]

Figure 4.

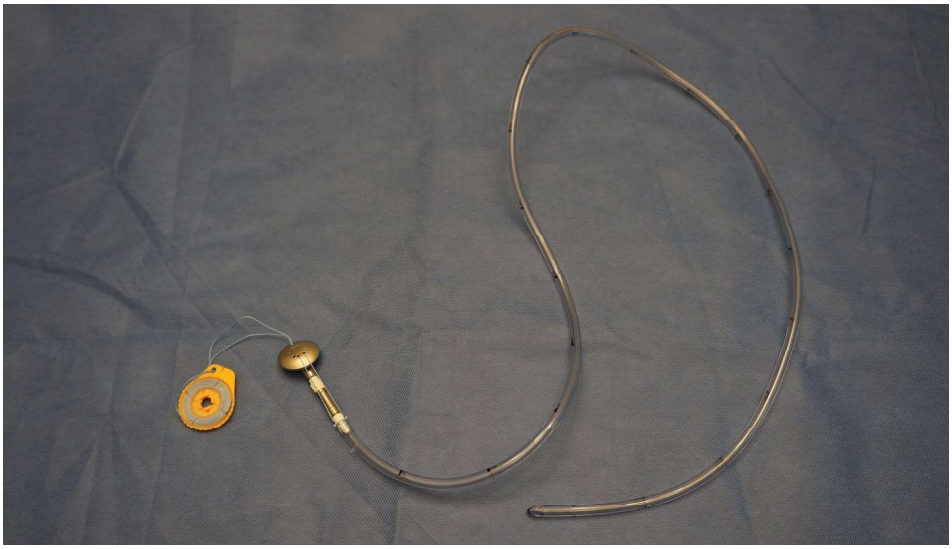
By: C. Baker



EEA 25mm XL Stapler with anvil

Figure 5.

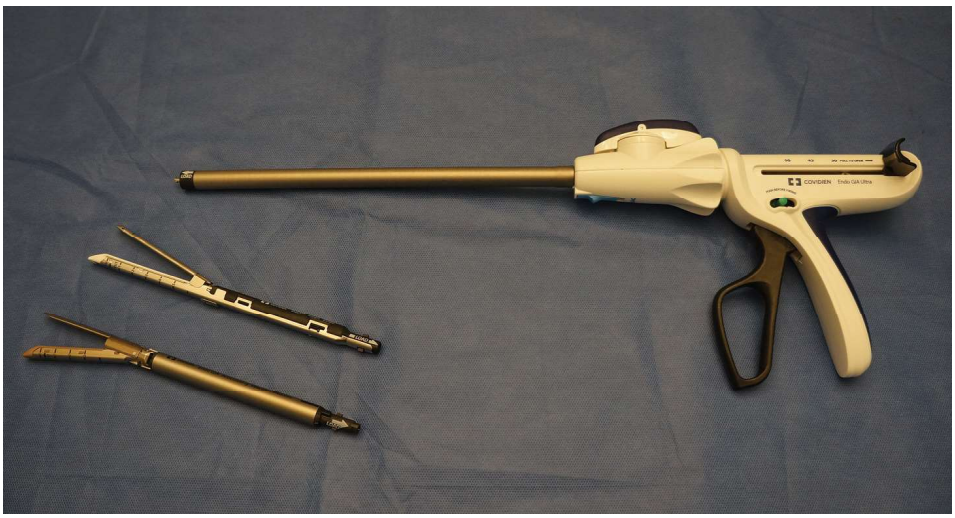
By: C. Baker



EEA 25mm XL Orvil and delivery tube

Figure 6.

By: C. Baker



Endo GIA XL Stapler and 2 Endo GIA cartridge reloads

INCENTIVE FOR CHANGE:

In 1999 the National Surgical Quality Improvement Program (NSQIP) was launched by the US Department of Veterans Affairs.[6] This program was described as one that "can be used by participating institutions to evaluate their own patient outcomes and quality indicators, make valid, informative comparisons to other sites, and set targets for improvement."[6] The goal of the program was to measure and improve the quality of surgical care. Three hospital sites in British Columbia were the first Canadian hospitals to join NSQIP in 2006.[6] In 2013 TOH joined NSQIP and formed CUSP (Comprehensive Unit-based Safety Program) teams to tackle the problem of surgical site infections. TOH now has 23 CUSP teams.[3] The teams are multidisciplinary including nurses, surgeons, anaesthesiologists, educators, clinical care leaders, and management. Two major issues that the Bariatric CUSP group discussed and decided to focus on were cost (to try to lessen the strain on the hospital budget) and SSI rates. Initial data from NSQIP showed that approximately 12% of bariatric patients at TOH-CC were developing a post-op SSI.[A,8]

A few changes that were rolled out corporately, within TOH, were pre-warming patients before surgery and administering the appropriate antibiotics before surgery. These initiatives came from the Canadian Patient Safety Institute, which outlines in Safer Healthcare Now some resources and interventions for healthcare quality improvement.[7] The Bariatric CUSP team introduced a few changes specific to the roux-en-y gastric bypass procedure. Those

[A] This data is based on a 10% sampling, as that is how many bariatric patients were being captured in NSQIP from 2010-2015. The NSQIP semiannual report did not separate bariatric surgery from general surgery in its data collection.

After these initial changes the SSI rate for this procedure at TOH-CC dropped to approximately 8% for the 2014-2015 fiscal year.[8]

changes included:

1) Correct dosing and timely administration of pre-op antibiotics;
2) Use of anti-microbial dressings;
3) Using a wound protector at the extraction site;
4) Wiping instruments/trocar with proviodine;
5) Irrigating the extraction site with proviodine solution;
6) Segregating dirty instruments; and
7) Performing a glove change (surgeon only) during the procedure (after the EEA orvil is removed from the patient).

After these initial changes the SSI rate for this procedure at TOH-CC dropped to approximately 8% for the 2014-2015 fiscal year.[8] But the group decided that it could do even better!

In searching the scientific literature, looking for ways to decrease SSI rates, Dr. Amy Neville, the Medical Director for the Bariatric Program at TOH-CC, found evidence to show that SSI rates were higher for circular stapler and lowest for linear stapler.[9,10] So, the Bariatric CUSP group decided to make the change.

Linear stapler technique:

To perform a laparoscopic roux-en-y gastric bypass, using this technique, the surgeon requires a combination of sutures and single use staplers; however, with this technique the surgeon will use a straight reload on the Endo GIA stapler and suturing to complete the gastrojejunostomy instead of the EEA stapler. The linear stapler technique uses the same Endo GIA Stapler as the circular stapler technique, as well as a combination of stapler cartridges. This technique no longer involves the use of the circular stapler (which is too large to fit through the trocars), the orvil to extract from the surgical site, or any direct contact between the stapler and skin during surgery.

The single use items used for the linear technique include the Endo GIA XL Stapler, and a variety of 6 stapler cartridges per case. The total for these items, per case, is $1,474.00.

The cost of staplers for the circular technique was $1,984.65/case and the cost for the new linear technique is $1,474.00/case. That's a difference of $510.65/case. And if we consider that 537 procedures were completed in the 2016/2017 fiscal year, that adds up to a total of $274,219.05 saved per year at TOH-CC.

Following the change to the linear stapler technique the SSI rate dropped dramatically. As of the end of the 2016/2017 fiscal year the SSI rate was at 1%, which is quite an improvement from the SSI rate of 8% in 2014/2015.[B,11]

FURTHER IMPROVEMENTS:

The bariatric group was able to use some of the savings toward the purchase of knee high sequential compression devices (SCDs). These SCDs are now used on every patient undergoing a roux-en-y or sleeve gastrectomy procedure. The use of SCDs was identified as a standard of practice through the Metabolic and Bariatric Surgery Accreditation and Quality improvement program:[12]

"The American College of Surgeons (ACS) and the American Society for Metabolic and Bariatric Surgery (ASMBS) combined their respective national bariatric surgery accreditation programs into a single unified program to achieve one national accreditation standard for bariatric surgery centers, the Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program (MBSAQIP).

MBSAQIP works to advance safe, high quality care for bariatric

[B] Since July 2016, TOH has moved toward a procedure-targeted method of data collection and now 100% of bariatric cases are captured in MBSAQIP.

The change in practice in the Bariatric Program at TOH-CC is just one example of how a small change can have a big impact.

surgical patients through the accreditation of bariatric surgical centers. A bariatric surgical center achieves accreditation following a rigorous review process during which it proves that it can maintain certain physical resources, human resources, and standards of practice. All accredited centers report their outcomes to the MBSAQIP database."[12]

As a result of TOH-CC Bariatric Program's commitment to high standards of practice, and a commitment to quality improvement, it received recognition from MBSAQIP, on February 10, 2017, by being fully accredited as a Centre of Excellence. TOH-CC was only the third site in Canada to attain this status.[13]

Another change initiated within the General Surgery and Bariatric CUSP group was becoming more transparent with regards to the cost of items. The group put together a list of frequently used single-use items such as staplers, cartridges, alternate energy devices, sutures, etc. and listed the cost of each item. This list is now posted in the two designated General Surgery rooms as a reference for the surgeons and nursing staff. This list has proven to be helpful in allowing for cost-savings during some cases as it allows the surgeon to choose to alter a technique slightly in order to use a less expensive piece of equipment.

The Colorectal CUSP group, at TOH, was inspired by the success of the Bariatric CUSP team in decreasing their SSI rates, so they too are working hard to decrease SSIs in colorectal surgery. Several changes have been implemented over the last few years, such as segregating instruments that have come into contact with the lumen of the bowel (bowel isolation technique), using antimicrobial dressings, and some gown and glove practice changes, etc. This group has recently implemented 2 new protocols including wound irrigation and using wound protectors during open bowel procedures. They continue to look for new ways to improve their practice, keep costs low, and provide their patients with quality care.

CONCLUSION

The Operating Room is an ever-changing environment. New techniques and ways of performing surgery are developed all the time. The change in practice in the Bariatric Program at TOH-CC is just one example of how a small change can have a big impact. By saving the hospital over $250,000 per year and dropping the SSI rate down to only 1%, the Bariatric program succeeded in not only minimizing the strain on hospital funding, but also in immensely improving the quality of care provided to patients.

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