Development and Implementation of a Consensus-Derived Synoptic Operative Report for Roux en Y Gastric Bypass Surgery

by

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A Thesis submitted to the Faculty of Graduate Studies of

The University of Manitoba

in partial fulfilment of the requirements of the degree of

MASTER OF SCIENCE

Department of Surgery

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Acknowledgements

I would like to acknowledge those who contributed most to facilitating the completion of this thesis. First, to the University of Manitoba General Surgery Residency Discretionary Fund and the University of Manitoba Minimally Invasive/Bariatric Surgery Fellowship Fund for their financial support of this project. To Dr Atul Sharma for his instruction and assistance with planning and reviewing the statistical analysis. To Hal Loewen at the Neil John MacLean Library for performing the literature review. To my co-investigators: Dr Michael Mullan, Dr Jennifer Metcalfe, Dr Jason Park, Dr Christopher Andrew, Dr Ahmed Abou-Setta, and Dr Krista Hardy for their insight and assistance with completing this project and subsequent publications. Thank you to my advisory committee members: Dr Lawrence Gillman, Dr Justin Rivard, Dr José François, and Dr Andrew McKay for their guidance and feedback during this process. To my family, John and Seamus for their unwavering support and for putting up with me through the long hours dedicated to completing this thesis. And finally, to my supervisor, Dr Ashley Vergis. This project would not exist nor would I be as successful without your drive, encouragement, mentorship, and support.

For Seamus, who inspires me to be better every day

Abstract

Background

Operative reports (OR) are critical documents in the medical record but are often poor quality. Synoptic reporting (SR) is a potential solution. This has never been assessed in bariatric surgery. The objective was to design and trial a SR for Roux en Y gastric bypass (RYGB), a common bariatric procedure.

Methods

Systematic review and meta-analysis of comparative studies on SR and narrative reporting (NR) was conducted. A Delphi group developed quality indicators (QIs) for RYGB OR based on these findings. A national needs assessment and audit was then performed and a RYGB SR was subsequently designed and prospectively trailed against NRs.

Results

Meta-analysis found SRs more complete and efficient than NRs. Seventy-five QIs were established and found bariatric ORs of mediocre quality. RYGB SR was more complete for all items compared to NRs (>99% vs 64%).

Conclusion

SR for RYGB is superior to NR and should be implemented into clinical practice across Canada.

Introduction

Quality assessment and improvement has been an increasingly prominent focus in healthcare in the past two decades. For surgical patients, the operative report plays a central role in this process. Critical information on the processes of care that occur in the operating room are documented in the operative report and thus mandate close evaluation. Recent literature has implicated narrative operative reporting as an area of weakness(1-23). Narrative operative reports are dictated reports that sequentially outline the steps and findings of an operative procedure in a descriptive fashion. The responsible surgeon or their delegate generates these reports at the end of the operation based on their recollection of the procedure performed. Suggested weaknesses in this format include exclusion of critical operative steps or details and over inclusion of non-pertinent elements(1-23). Poor documentation can significantly affect the care of the surgical patient(17). An accurate depiction of the events occurring at the index procedure can influence the diagnosis and management of post-operative complications, the candidacy for adjuvant treatments, the need for subsequent investigations, and the coordination of care amongst involved health care providers.

Bariatric surgery is experiencing a rapid global expansion in the numbers of procedures performed over the past two decades(24, 25). Roux en Y gastric bypass is one of the most common bariatric procedures performed(25). The rapid evolution of this field mandates evaluation of its operative care and operative documentation is an important component of that appraisal. This evaluation is a

key process to ensuring the quality of care provided to these patients. Currently, minimal investigation into operative reporting for bariatric procedures has occurred. Review of the literature revealed only one published assessment of operative reporting for bariatric surgery(14). This report was flawed by a lack of established criteria against which to properly critique these reports.

Synoptic reporting has been suggested as a solution to the limitations of narrative reporting in several areas of medicine including pathology, radiology, and surgery(1-16, 18, 26, 27). These investigations have predominantly touted superior quality in terms of completion of essential items, resulting in a more comprehensive document. In surgery, this has predominantly been tested in surgical oncology and has never been evaluated for bariatric procedures. This is despite the increasing prominence of bariatrics in the general surgical world.

The broad objective of this project was to determine if the quality of operative reporting for bariatric surgery could be improved using a synoptic operative reporting format. This investigation was laid out as a four-stage process. First, a thorough and systematic review of the literature on synoptic operative reporting was required to understand the extent of the problem and the potential benefits of this novel reporting format in surgery. Second, a validated tool for the appropriate assessment of current and future operative reports was developed. This ensures common, consensus-based criteria against which all operative reports can be graded. Third, justification and establishment of need for improved

reporting in bariatric surgery was required. Thus, a survey assessing the current climate of operative reporting in bariatric surgery was carried out to expose areas of weakness and guide the appropriate interventions to follow. Finally, the groundwork established in the initial stages was used to develop and trial a synoptic report proposed to improve the quality of reporting for bariatric surgery.

Chapter 1 - Systematic Review of the Literature

Article 1

Advancement in the Quality of Operative Documentation: A Systematic Review and Meta-Analysis of Synoptic Versus Narrative Operative Reporting

Stogryn S, Metcalfe J, Hardy K, Abou-Setta AM, & Vergis A
(Submitted for publication)

Abstract

Background

The operative report is a vital document for the surgical patient and central to quality assessment processes for surgical care. Despite this, data suggests that traditional narrative operative reports are often of poor quality. Synoptic reporting has emerged as a means to improve this document and has shown promise across multiple investigations.

Methods

A comprehensive systematic review of the literature was performed including comparative studies evaluating synoptic versus narrative operative reports. The primary outcome of interest was completion of predetermined critical elements for an operative report. Secondary outcomes considered were reliability, efficiency, quality, and cost measures. Meta-analysis was performed where sufficient data was available. A quality analysis was performed on all included source articles using the Newcastle-Ottawa scale (NOS).

Results

Of the 1471 citations identified in the literature search, 16 studies met final inclusion criteria. The mean NOS was 7.09 out of 9 (+/- SD 1.73). Meta-analysis demonstrated that synoptic reporting was significantly more complete than narrative reporting (SMD 1.70, 95% CI 1.13 to 2.26; I^2 98%; 14 studies; 2874 reports) suggesting that this format outperforms narrative reporting in terms of completeness. The time to complete the operative report was significantly shorter with synoptic reporting (mean difference -0.86, 95% CI -1.17 to -0.55; 6 studies;

891 reports). All other secondary outcomes evaluated favoured the synoptic reporting format.

Conclusion

This systematic review and meta-analysis suggests that synoptic reporting platforms outperform traditional narrative reporting in terms of completeness of critical items and time required to complete it. This reporting format should be incorporated into surgical practice.

Introduction

Quality assurance and improvement is a prominent focus in health care. Quality indicators have been established to identify and assess areas of need to enhance quality of care with the subsequent goal of improved patient outcomes and reduced system costs(9, 28, 29). The data derived from these measures can be used as means for comparison, to inform intervention strategies, and provide benchmarks for performance and accountability(9).

Surgical care represents a significant portion of our current health care system and continues to grow in all economic environments(30). Recent estimations suggest that the global burden of surgical procedures is 312.9 million operations per annum, a rate more than double that of the yearly global birth rate(31). Major morbidity complicates 3-16% of major surgical procedures in developed countries, with even higher rates seen in the developing world(31). Almost half of these complications are preventable and may be due to simple errors or

inaccurate documentation(31). The World Health Organization (WHO) has identified surgical safety as a prominent global public-health concern and stresses the importance of quality of care improvement efforts(31, 32).

Several large-scale quality improvement initiatives have led to significant advancements in global perioperative morbidity and mortality rates. The WHO Surgical Safety Checklist and the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) are examples of this(28, 29, 32, 33). Most quality assessment is achieved by collecting data from medical records using regular audits. This is typically abstracted from the patient chart and in particular, the operative report for surgical patients (9, 10, 34). This report is a vital document. It details important processes of care that occur in the operating room. However, appropriate and accurate operative reporting has been identified as a significant area of weakness in surgical patient care(15, 16, 23, 34, 35). Poor documentation can potentially compromise care, especially in circumstances of perioperative complications(17). The documented surgical and anatomical information can be essential to the diagnosis of, and subsequent management decisions for, these complications(15, 17). Thus, the operative report has the potential to significantly impact patient care.

Traditional narrative operative reporting has been found to be of poor quality in several investigations(1-3, 6, 7, 9, 10, 13-18, 36, 37). Many details that are

critical to subsequent clinical decisions are frequently not documented or are inaccurate(1-3, 6, 7, 9, 10, 13-18, 36, 37).

Standardized operative reports, or synoptic reports, have subsequently emerged. Modern synoptic reports are computerized, template-based and procedure-specific reports. These reports offer the potential for dramatic improvement in report rates of essential operative quality indicators(1-3, 6, 7, 9-11, 13-18, 36, 37). Recent studies in this field are promising, claiming impressive completion rates, enhanced accuracy and efficiency(1-3, 6, 7, 9-11, 13-18, 36, 37). However, the majority of evidence on synoptic reporting is derived from small studies, many of which are retrospective in nature. To date, no comprehensive review has been published comparing synoptic operative and traditional narrative reporting.

The objective of this systematic review and meta- analysis is to identify and critically appraise studies comparing synoptic operative and traditional narrative reporting protocols for patients undergoing surgery.

Methods

A systematic review was performed using the Methodological Expectations of Cochrane Intervention Reviews guidelines(38). These results are reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines(39). The roles of review team members are listed in Appendix 1. The following null hypothesis was tested: There is no

difference in completeness of pertinent operative report items between synoptic and narrative operative reports. The protocol was registered with the International Prospective Register of Systematic Reviews (PROSPERO reg# 42016029485) prior to the commencement of the review.

Search strategy and study selection

The search strategy can be reviewed in Appendix 2. Using a meticulous search strategy developed by a professional health science librarian, we searched Medline (Ovid), Embase (Ovid), Cochrane Central (Wiley), Scopus (Elsevier), CINAHL (EBSCOhost), and Web of Science Core Collection (Thompson Reuters); search last updated in June 2017. A combination of controlled vocabulary (e.g. Medical Records) and keyword queries (e.g. synoptic) were used. Further, a series of keyword strategies were created to access literature using the terms: “synoptic” and “record*,” “report*,” and “narrative*” to ensure that all relevant studies were captured. Forward and backward searches were done on all articles selected in the review. Hand searches of all included study reference lists were also performed. We did not limit searches by language, date of publication, or publication status.

Two independent reviewers evaluated the search results for consideration of inclusion. If the citations met the broad inclusion criteria then the full-text publication was retrieved and reviewed independently by the two reviewers. All disagreements were settled by discussion and consensus.

Eligibility Criteria

All comparative studies evaluating synoptic reports versus narrative reports were included. Surgeons or their delegates generated the operative reports. These were produced after performing any surgical intervention where a report would be required to document the procedure in the medical record. Only studies comparing a synoptic operative report format to a traditional narrative operative report were included. A synoptic operative report was considered any reporting platform employing a standardized format for the procedure including computerized and non-computerized reporting templates. Narrative operative reports were considered those that are either dictated or written ad lib without a standardized format. The following outcomes were of interest to this review:

Primary outcome

Completeness: defined as a percentage score for completion of pre-determined list items that have been identified as pertinent to the documentation for the evaluated procedure.

Secondary outcomes

1. Reliability: defined as a measure of consistency of documentation for the evaluated platform of the study (e.g. interrater/ interobserver agreement).
2. Efficiency: defined as the time required to complete the report of interest or time for the report to be entered in the medical chart.

3. Quality: defined as a predetermined measure of quality of the documentation not including completeness. Accuracy, validity, and error rates were considered quality measures for this review.
4. Cost: defined as a measure of cost per operative note.

Data Extraction

Both assessors used pre-determined data extraction sheets when performing independent, blinded data extraction. All data for included studies was then reviewed by the primary investigator and assessed for errors and discrepancies. Data was then collated for statistical analysis.

Statistical analysis

All analyses were conducted using Review Manager (RevMan v5.3, The Nordic Cochrane Center, The Cochrane Collaboration, Copenhagen, Denmark), and Microsoft Excel (Excel v14, Microsoft Corp., Redmond, WA, USA). Pooled continuous data was expressed as standardized mean differences (SMD), with 95% confidence intervals (CI), using a random-effects model. All tests of statistical inference reflect a 2-sided α of 0.05. When meta-analysis was not possible, outcome variables were reported by narrative description.

Study Quality

Two reviewers assessed all included studies for their methodological quality using the Newcastle-Ottawa Scales. These scales assess the quality of case-

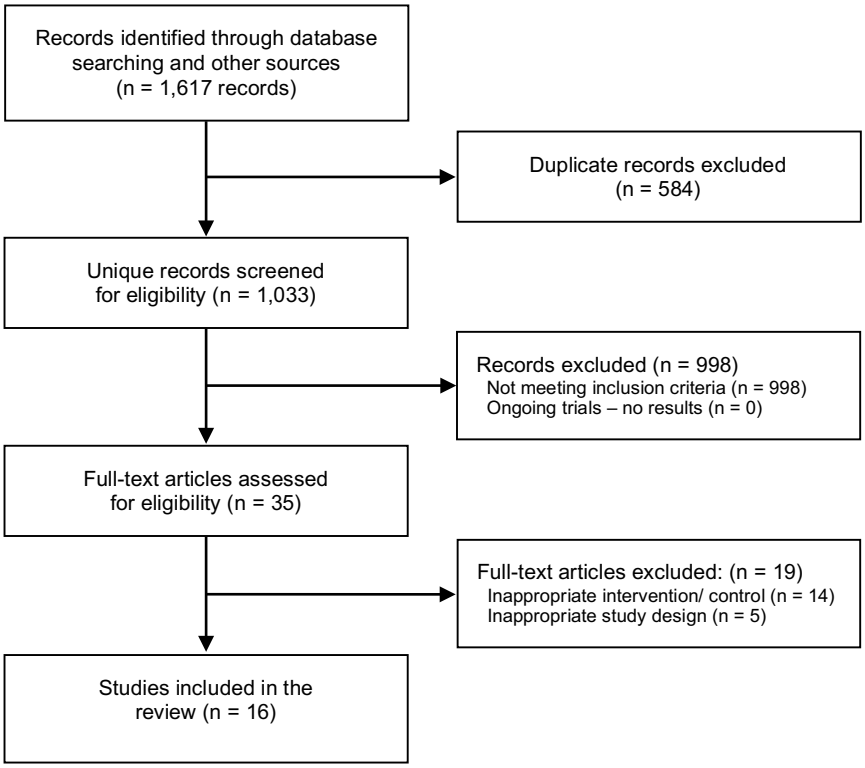
controlled and cohort studies. All disagreements on methodological quality scores were settled by discussion and consensus.

Results

Search results

1471 citations were identified through database searches and an additional 146 citations from the forward and backward searches (Figure 1). No additional references were identified through hand searches. Thirty-five publications were considered for full text review and 16 met the final inclusion criteria.

Figure 1. Modified PRISMA flow-chart



A total of 2760 reports were evaluated from the included studies. 1417 narrative operative reports were compared to 1343 synoptic operative reports (Table 1).

The number of participants in each study ranged from 20 to 336. One study did not report the number of participants (*Gardner, Gyne Onc 2009*) (4). The included studies were diverse in both the format of the synoptic reports tested, and in the surgical procedures on which they were used. The literature was predominantly North American with only 2 studies from the United Kingdom (11, 18). None of the included studies were randomized in nature; all were either cohort or case-controlled studies. The majority of included studies were performed prospectively with only three studies having data collected entirely retrospectively(7, 11, 14).

Table 1. Study Characteristics

ID	Country	N	Study Type	Intervention	Procedure	NOS # Stars
Chambers, Surgery 2009	Can	180	Prospective Cohort with Retrospective Control	SR vs NR	Thyroidectomy	9
Cowan, Am Soc Derm Surg 2007	USA	110	Prospective Cohort	SR vs NR	Mohs Microsurgery	6
Edhemovic, Ann Surg Oncol 2004	Can	80	Prospective Cohort with Retrospective Control*	SR vs NR	Anterior Resection, Abdominal Perineal Resection	7
Gardner, Gyne Onc 2009	USA	-	Prospective Cohort with Retrospective Control	SR vs NR	Gynecological Surgery (Unstated)	4
Gur, Arch Surg 2012	USA	120	Prospective Cohort	SR vs NR	Breast Conserving Surgery, Mastectomy, Sentinal Lymph Node Biopsy, Axillary Nodal Dissection	7
Harvey, Surgery 2007	Can	221	Prospective Cohort	SR vs NR	Laparoscopic Cholecystectomy	7
Hoffer, Int J Med Inform 2012	Can	189	Retrospective Case Control	SR vs NR	Radical Nephrectomy, Partial Nephrectomy	6
LaFlamme, AMIA 2005 Symposium	USA	336	Prospective Cohort	SR vs NR	Caesarian Sections, Tubaligation, Total Abdominal Hysterectomy, Vaginal Hysterectomy, Laparoscopic Tubaligation	7

Maniar, Ann Surg Oncol 2014	Can	160	Prospective Cohort with Retrospective Control	SR vs NR	Colon Resections	8
Maniar, J Surg Oncol 2015	Can	194	Prospective Cohort with Retrospective Control	SR vs NR	Low Anterior Resection, Abdominal Perineal Resection, Total Colectomy, Hartmann resection, Exenteration	9
Nicopoullos, J Obs Gyne 2003	UK	274	Retrospective Case Control	Operative note proforma vs NR	Caesarian Sections	7
Parikh, J Surg Research 2007	USA	196	Retrospective Case Control	Dictation template vs NR	Roux en Y Gastric Bypass, Laparoscopic Gastric Band, Bariatric Revision Surgery	4
Park, J Am Coll Surg 2010	USA	214	Prospective Cohort with Retrospective Control	SR vs NR	Pancreatectomy (Whipple, Central, Distal)	9
Paterson, Health Inf J 2015	Can	20	Prospective Cohort	SR vs NR	Spinal Cord Injury Surgery	5
Stogryn, Surg Endo 2017 (*in press)*	Can	208	Prospective Cohort	SR vs NR	Laparoscopic Roux en Y Gastric Bypass	9
Thomson, Int J Surg 2016	UK	258	Prospective Cohort with Retrospective Control	Operative note proforma vs NR	Laparoscopic Cholecystectomy	9

*Control group not actually specified if retro- or prospective
SR – synoptic report
NR – narrative report
NOS – Newcastle-Ottawa Scale
USA – United States of America
Can- Canada
UK – United Kingdom

Study Quality

The mean Newcastle-Ottawa score of the included studies was 7.06 (out of 9) +/-

SD 1.73 (Table 1).

Primary outcome

Synoptic reporting was significantly more complete than narrative reporting (SMD 1.70, 95% CI 1.13 to 2.26; I^2 98%; 14 studies; 2874 reports). This suggests that this format outperforms narrative reporting in terms of completeness. The three studies with the most pronounced interventional effect were identified as contributing significantly to the observed heterogeneity: *Maniar, J Surg Oncol 2015, Park, J Am Coll Surg 2010, and Stogryn, Surg Endo 2017(10, 13, 15)*. When these studies were removed from pooled analysis, the I^2 was reduced to 67% and the summary effect still remained significant (SMD 0.84, 95% CI 0.68 to 1.00) (Figure 2). Subgroup analyses were performed in multiple ways to investigate the source(s) of the heterogeneity. Unfortunately, the source of the heterogeneity from these studies was not identified. A funnel plot was created to assess for publication bias. This demonstrated a significant risk of publication bias in the included studies (Figure 3).

Figure 2. Meta-analysis of Completeness of Synoptic versus Narrative Operative Reports

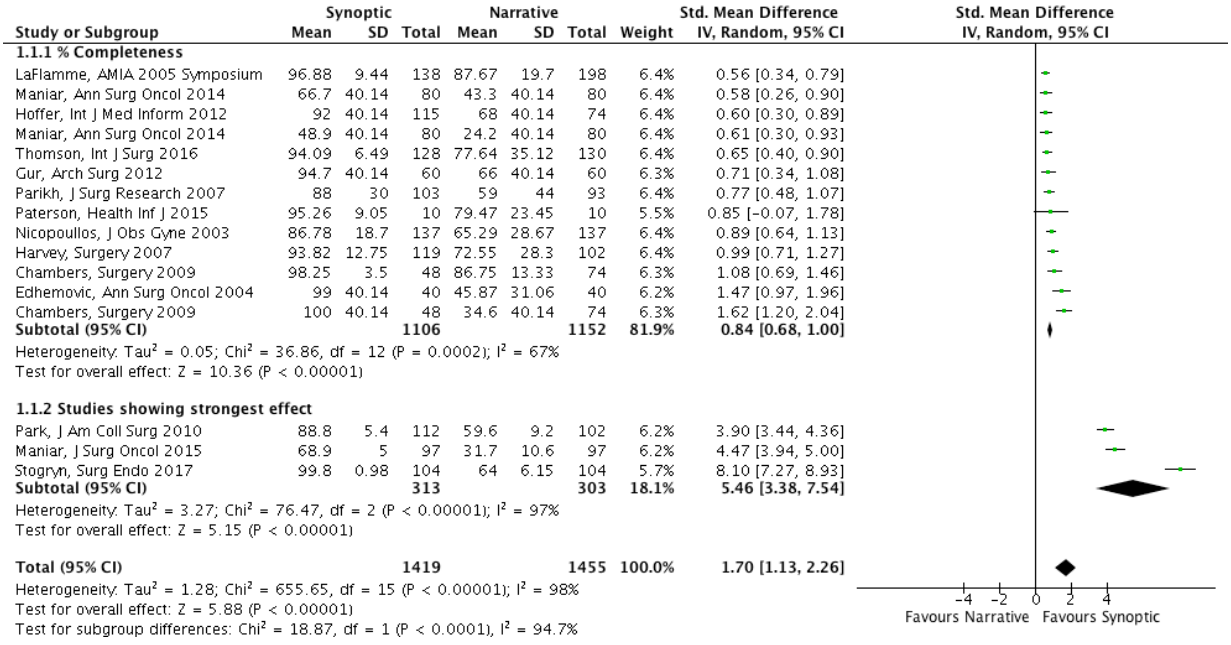
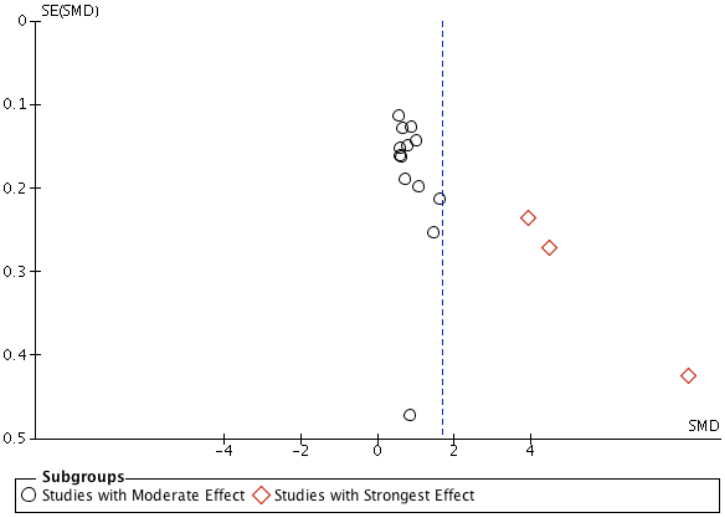


Figure 3. Funnel Plot of Included Studies for Completeness of Synoptic versus Narrative Operative Reports

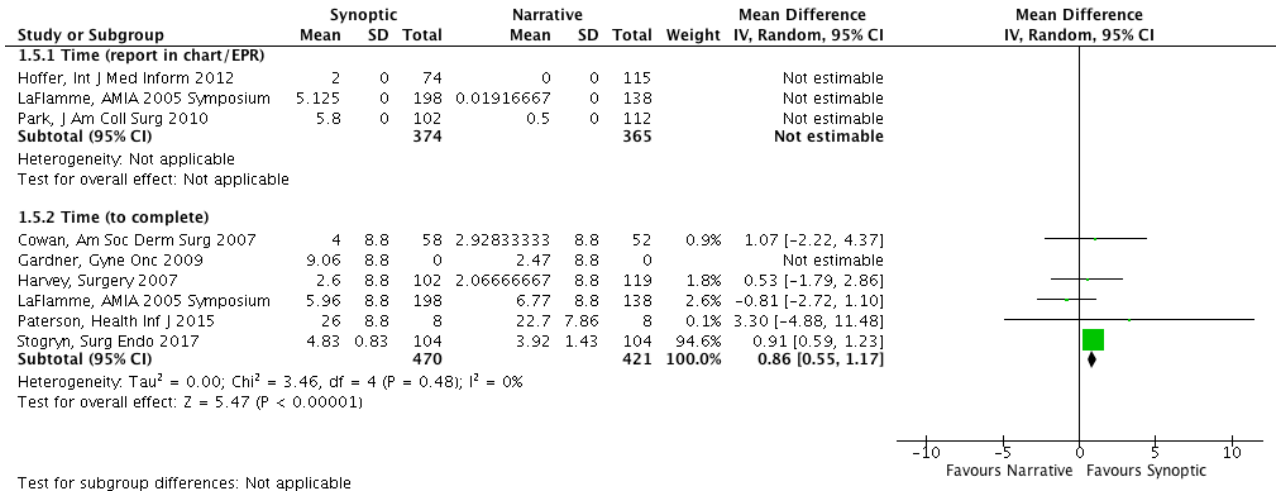


Secondary Outcomes (Table 2)

The time to complete the operative report was significantly shorter with synoptic reporting (SMD -0.86, 95% CI -1.17 to -0.55; 6 studies; 891 reports) (Figure 4). Additional efficiency and cost-effectiveness measures were reported amongst the included studies but could not be meta-analyzed due to sparse data, heterogeneous reporting, and missing data elements. When reported, they generally favoured synoptic reporting.

Table 2. Secondary Outcomes				
Outcome or Subgroup	**#Studies**	**#Participants**	**Statistical Method**	**Effect Estimate**
Inter-rater Reliability	4	943	Mean Difference (95% CI)	0.35 [0.09, 0.62]
Efficiency				
Time to complete (min)	6	891	Mean Difference (95% CI)	-0.86 m [-1.17, -0.55]
Time to report in chart/EPR (days)	3	550	Mean Difference	-4.14 d
Time to edit (sec)	1	110	Mean Difference	-159.5 s
Time to sign (days)	1	110	Mean Difference	-20.6 d
Time to verified report in chart/EPR (hours)	1	336	Mean Difference	-373.53 h
Quality				
Accuracy	1	208	Mean Difference (95% CI)	40.60% [38.54, 42.66]
Critical Error (% of op notes)	1	110	Mean Difference	32.13%
Error Rate (% of op notes)	1	110	Mean Difference	75.26%
Errors (# errors/note)	1	110	Mean Difference	1.65 errors
Validity	1	208	Mean Difference (95% CI)	3.40% [2.02, 4.78]
Cost ($/note)	2	72	Mean Difference	-$8.27

Figure 4. Efficiency Outcomes Synoptic versus Narrative Operative Reports



Discussion

This is the first systematic review and meta-analysis assessing the value of synoptic operative reporting over traditional narrative reporting methods. The results demonstrate that synoptic operative reporting significantly outperforms narrative reporting in terms of completeness of predetermined critical items and timeliness of report completion. This implies improved quality documentation of surgical details and improved communication of critical operative elements amongst care providers. This has the potential to enhance the quality of care delivered to patients.

Surgical safety is a priority public health issue branded by the WHO(31, 32). Entwined in this global initiative is the quality monitoring and improvement movement. Data suggests that a significant proportion of surgical complications are preventable and arise from simple errors, including inaccuracies in

documentation(28-33). Improving the quality of operative reports can therefore be extremely helpful in furthering this initiative. The completeness of synoptic reports has been shown to be superior. Furthermore, the electronic format lends itself more easily to data collection and interpretation. These reports have the potential to be electronically linked with quality monitoring and improvement databases providing a powerful research tool. This allows real-time data collection on the processes of care that occur for surgical patients within the operating room. This added advantage reduces time for data collection and cost of dedicated staff to perform it.

Quality improvement plans are ideally based on accurate and up-to-date data, which this platform should provide(28, 29, 33). On a regional level, this format affords ready access to relevant operative and anatomical information for care providers. This permits informed clinical decisions. This is especially pertinent in oncologic surgery where eligibility for and coordination of adjuvant treatments are often reliant on key operative information. This is also vital to the management of postoperative complications, where details of the index procedure can critically influence the approach to diagnosis and treatment of the surgical patient (15, 17).

Other advantages described herein include higher inter-rater reliability, improved efficiency, and decreased cost of the synoptic platform compared with narrative reports. Enhanced reliability implies a more consistent operative report between users and thus a more consistent quality of the documentation. Reduced time to

complete synoptic reports and their expedited availability in the medical record allows prompt access to operative information. This is beneficial for patients and care providers especially in the instance of surgical complications occurring in the first few post-operative days. Dictated reports are often unavailable for several days due to transcription times. Additionally, reduced completion time improves efficiency for attending and trainee surgeons during the course of their busy day. With the added advantage of reduced costs (-$8.27/note), a synoptic platform has the potential for significant gains for the healthcare system in general.

Synoptic operative reporting is not without disadvantages. The most notable criticism being that many surgeons feel synoptic reports are difficult to read and do not capture the true “flavour” of an operation and subtle details given their lack of descriptive detail. This can be addressed by providing free text sections where the surgeon can elaborate on any subtle features of the procedure they feel pertinent to document. For the trainee surgeon, there are perceived educational limitations to this format as well. Program directors expressed concerns that synoptic reports provide less educational value than narrative reports (19). This includes the perception that trainees do not have to demonstrate the same knowledge and familiarity with the procedure and that this format discourages independent thinking with respect to the procedure performed (19). Perhaps synoptic reporting robs the trainee of this valuable cognitive task analysis tool. That is, the act of recalling and describing the details of the procedure after the

fact, provide essential reflection, analysis, and consolidation of knowledge of the procedure (40). One suggested approach to mitigate this would be to allow the trainee to dictate an operative report whilst the staff surgeon generates a synoptic report for the official medical record(41, 42). This would allow an opportunity for cognitive task analysis as well as one for feedback to be provided the trainee. Buy-in from surgeons and trainees may prove difficult as this would require an added step for surgical documentation as well as added time for review and feedback.

Strengths of this review

This review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines(39). This included a comprehensive literature search involving multiple databases, hand, and grey literature searches using an *a priori* protocol. Published and unpublished data were subsequently included in the review to limit publication bias. Additionally, meta-analysis was able to be performed on the primary outcome of interest.

Limitations of this review

There are several limitations to this systematic review. First, no randomized controlled trials were able to be identified on synoptic operative reporting. As such, the level of evidence is limited to observational studies; several of which are entirely retrospective in nature. This is a common limitation in the surgical literature(43). The included studies in this review are diverse both in the formats

of synoptic reports employed and also the procedures on which they were tested. The reference scales, checklists, and items used to evaluate completeness and quality were also extremely variable. Even so, the methodological quality assessment performed suggests that the included publications are of moderate-high quality. The design of this systematic review aimed to mitigate the risk of publication bias, through a search of the grey literature and inclusion of non-published studies. However, there was a high risk of publication bias for our primary outcome. In addition, there was a high degree of statistical heterogeneity (I^2 98%) identified that could not be linked to a single confounding factor.

An additional limitation is that the primary authors compared reports and not the surgeons producing them. As such, a single surgeon potentially produced any number of reports. Similarly, cross-over may have occurred between groups where a surgeon could have completed the same number of synoptic and narrative reports which were then compared in a hierarchical fashion. Without adjustment, this can produce a unit of analysis error; overestimating the significance of the intervention. Finally, despite the overall advantages of synoptic reporting described in this review, it is impossible to determine the degree of this effect and most importantly, its effect on patient outcomes. It seems intuitive that improving the quality of operative documentation is beneficial to patients and the health care system in general, but it is difficult to determine the relevant outcomes and how to quantify them. Investigation may be possible in the future if synoptic reports become linked with surgical outcomes databases.

Conclusions

Clinical recommendations

The systematic review of the literature suggests that synoptic operative reporting conveys multiple advantages over the traditional format for operative documentation:

1. Meta-analysis suggests synoptic reporting is superior in terms of completeness of required operative report quality indicators.
2. Multiple efficiency analyses performed suggest that synoptic reporting is more time efficient.
3. Reliability measures assessed in the literature demonstrate a trend towards synoptic reporting being more reliable than traditional reports.
4. Varied quality analyses performed on reviewed studies suggest synoptic reporting is of higher quality than narrative reporting.
5. Limited cost analyses suggest an advantage with synoptic reporting.

As such, further efforts should be undertaken to establish and incorporate synoptic operative reporting into surgical practice.

Research recommendations

The end result of quality improvement initiatives is to improve patient outcomes. It is intuitive that improving the quality of communication and documentation would improve patient care however, literature on its effect on outcomes is lacking. Additionally, future studies should look further than just completeness as the quality metric. Other outcomes should be included such as, accuracy,

efficiency, and cost analyses. Quality analyses pertinent to the user of operative reports such as readability could also be evaluated using previously validated scoring systems(34). These analyses were scarce within the current literature and thus deficient in this review. It is unclear what the optimal study format would be to more thoroughly evaluate the benefits of this novel approach to operative reporting. Randomized controlled trials are considered the epitome of investigative research however; this question may not lend itself well to be evaluated in this fashion. A multi-centre cluster trial is a potential approach to avoiding the logistical difficulties of a randomized controlled trial for this intervention. This would include randomizing groups of surgeons at different centres performing the same procedures to either narrative or synoptic formats. However, a well-designed prospective cohort study would likely still be best suited to this question, accepting that some biases will remain.

Appendix 1. Roles of Systematic Review Team Members

Stogryn – Primary investigator, protocol development, literature review, data extraction and analysis, manuscript writing and editing.

Metcalfe – Literature review, data extraction, manuscript editing

Hardy – Manuscript editing

Abou-Setta – Protocol development, data analysis, manuscript editing

Vergis – Protocol development, manuscript editing

Appendix 2. Search Strategy

OVID Medline Search

1. exp Medical Records/
2. synoptic.ti,ab.
3. 1 and 2
4. (record* or report* or narrative*).ti,ab.
5. 2 and 4
6. 3 or 5

Note. phrase preceeded by "exp" and followed by a slash = exploded subject heading, (i.e., exp "Medical Records/"); .ti.ab. = title word and abstract search in OVID); * = truncation (i.e., record* would capture record, records, recorded, etc.)

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Chapter 2 - Establishing Quality Indicators for Bariatric Surgery Operative Reporting

Chapter 1 described a systematic review of the surgical literature confirming that the quality of narrative operative reports is poor and described a clear advantage to the synoptic operative reporting system(1-23) . The modern synoptic reporting format includes a tailored, procedure-specific, operative report template that is generally completed on a computerized platform. Meta-analysis of the primary outcome confirmed far superior completion rates of critical elements for each surgical procedure and secondary findings suggest enhanced efficiency, accuracy, and cost.

Bariatric surgery has seen rapid global expansion with the ongoing obesity pandemic; becoming one of the most common elective surgical procedures performed in the United States(24, 25, 28). The quality of bariatric operative care must therefore be reviewed and an appraisal of operative reporting is critical to this evaluation. Operative reporting has not been comprehensively evaluated in bariatric surgery. However, validated quality indicators for bariatric surgery operative reports were required prior to embarking on this endeavour. These were necessary for a thorough audit of operative reports and to subsequently be the basis for a high-quality synoptic report. In chapter 2, the development of consensus-based quality indicators for a Roux en Y gastric bypass is described.

Article 2

Development of Consensus-Derived Quality Indicators for Laparoscopic Roux en Y Gastric Bypass Surgery

Stogryn S, Park J, Hardy K, Vergis A
Surg Obes Relat Dis. 2017 Feb;13(2):198-203

Abstract

Background

Synoptic operative reporting (SR) is a solution to the poor quality of narrative reports (NR).

Objectives

To develop operative report quality indicators (QI) for Roux en Y gastric bypass (RYGB) in order to generate validated parameters by which these reports can be evaluated and improved.

Methods

A Delphi protocol was used to determine QIs for RYGB reporting. Bariatric surgeons across Canada were recruited along with key physician stakeholders to participate via a secure web-based platform. Participants initially submitted potential QIs. These were grouped by theme. Items were rated on 9-point Likert scales in subsequent rounds. Scores of 70% or greater were used for inclusion consensus and 30% or less denoted exclusion. Elements scoring 30-70% were re-circulated by runoff in subsequent rounds to generate the final list of QIs.

Results

4 community and 4 academic bariatric surgeons were invited representing all provinces performing RYGB. The 4 multidisciplinary invitees included: 1 minimally invasive/acute care surgeon, 1 tertiary abdominal radiologist, 1

gastroenterologist performing advanced endoscopy, and 1 general surgeon with expertise in SR. Round 1 achieved an 83.3% (10/12) response and identified 91 potential items for consideration. Round 2 had a 100% response and 69 items reached inclusion consensus. The 3rd round achieved a 100% response and resulted in 75 QIs reaching final inclusion consensus.

Conclusions

This study established consensus-derived multidisciplinary QIs for RYGB operative reports. This will allow further assessment of the quality of NRs and afford the development of a SR that may ameliorate identified deficiencies.

Introduction

Quality in healthcare is often measured by means of established quality indicators (QI). This can occur in one or all of three domains: structure, process, and outcomes[1]. Operative reporting represents an essential QI for documenting in the surgical patient's medical record. It serves to record the rationale and details of the procedure for medico-legal purposes and is important for the co-ordination of care between surgeons, multidisciplinary physicians, and allied staff. Additionally, these reports play an important role in quality assurance and improvement, research, and billing[1-3]. As well, documenting procedural details is critically important for the treating surgeon especially when faced with post-operative complications or the subsequent need for procedures. This is

especially important in the rapidly growing field of bariatric surgery where the Roux en Y gastric bypass (RYGB) is the most common procedure[4-6]. RYGB is a complex procedure that involves multiple steps that may lead to significant variations in the final operative anatomy. These details are especially important in the context of surgical complications where the differential diagnosis and management can differ substantially depending on the approach in the index operation. Furthermore, these patients are often physiologically intolerant to diagnostic or treatment delays so the ready availability of a high-quality operative report is of vital importance to their care.

Traditionally, operative reports take the form of a narrative note dictated by the responsible surgeon or their delegate after completion of the procedure. This delineates the indications of the procedure and provides a sequential depiction of the operative findings and conduct. Despite its importance, the current literature suggests that the overall quality of these narrative reports is poor[1, 2, 7-19]. These reports frequently exclude fundamental operative details, while often excessively describing trivial aspects[11]. A sentinel study evaluating operative dictations for rectal cancer found that narrative reports include only 45.9% consensus-derived QIs and that the most important elements concerning the laparotomy and tumour resection were only 33.5 – 47.5% complete[9]. Similarly, a more recent study evaluated the documentation rates of quality of care items for colorectal cancer, which similarly described insufficient reporting rates in narrative reports[13]. Limited evidence has comparably suggested substandard quality of bariatric

surgery dictations[19], but a lack of validated or consensus-derived QIs for bariatric surgery reporting makes it difficult to adequately assess these documents systematically. Moreover, a lack of bariatric surgery-specific QIs may also hamper efforts to improve reporting quality. Our objective was to develop consensus derived QIs for the laparoscopic RYGB operative report.

Methods

University of Manitoba health research ethics board approval was obtained prior to the commencement of this study.

A Delphi process involving a nation-wide sample was used to determine consensus-derived QI's for the RYGB operative report. Four Community and 4 academic bariatric surgeons from across Canada were identified through membership with the Canadian Association of Bariatric Physicians and Surgeons (CABPS) and recruited to participate via email. At least one representative bariatric surgeon from each province performing RYGB in Canada was included. Additionally, selected non-bariatric surgeon stakeholders were recruited based on skill-set and interest in the area. This multidisciplinary group included: 1 academic minimally invasive/acute care surgeon, 1 tertiary abdominal radiologist, 1 academic gastroenterologist proficient in the endoscopic management of bariatric complications, and 1 general surgeon with expertise in synoptic reporting. All recruits participated via a secure web-based platform (SurveyMonkey platinum edition 101 Lytton Avenue Palo Alto, CA 94301) and informed consent was obtained.

Participants submitted potential QIs for a RYGB in the first survey round using an open-ended questionnaire with suggested domains. These items were then assessed and grouped by theme. All proposed items were circulated in subsequent rounds and rated on a 9-point Likert scale for inclusion with comments permitted in free text fields[20]. For consensus, a score of 70% (mean score 6.3) or greater indicated inclusion of an item and 30% (mean score 2.7) or less denoted exclusion. Elements ranging from 30 - 70% consensus were re-circulated by runoff in subsequent rounds to generate the final list of quality indicators[20].

Results

All twelve recruited physicians consented to participate. In total, three rounds of surveys were required to establish consensus (see Figure 1). The initial round achieved an 83.3% (10/12) response rate and identified 91 potential QIs for consideration under 9 suggested domains. The second round survey had a 100% (12/12) response with 69 of the 91 proposed items reaching consensus for inclusion. No elements were excluded. The remaining 22 items were then re-circulated. The third round achieved a 100% (12/12) response and resulted in 6 additional items being included. This resulted in 75 QIs reaching final inclusion consensus (see Table 1).

Figure 1 – Flow diagram of the Delphi process to establish consensus-derived quality indicators for a Roux en Y gastric bypass operative report.

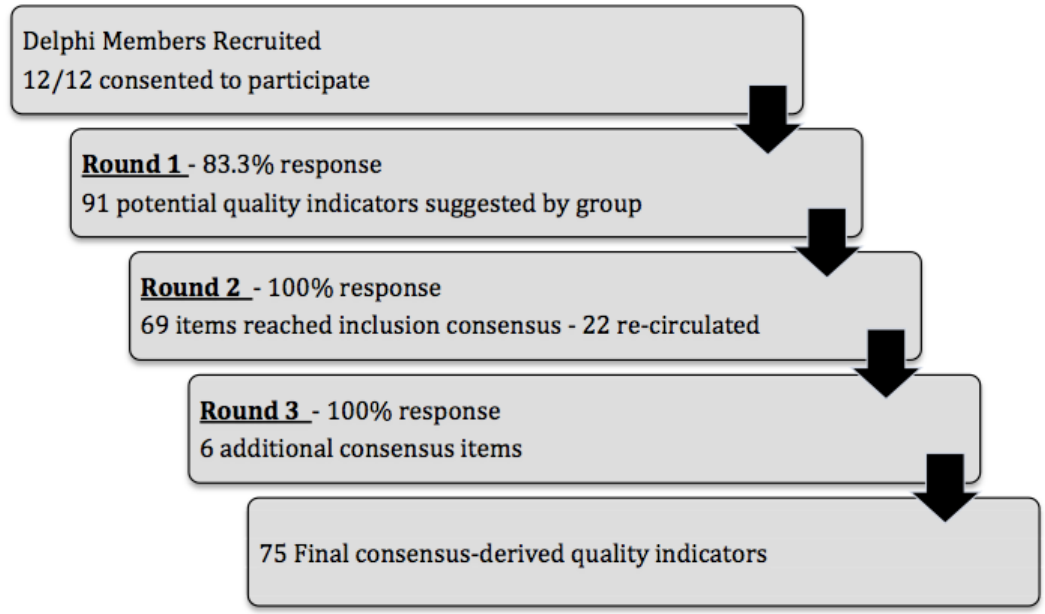

Figure 1

Table 1 - Quality Indicators for RYGB Operative Report		
Domain	**# Items**	**Quality Indicators**
Demographics	12 items	Procedure date Report date Reported by Pre/post-operative diagnosis Procedure planned/performed Mesenteric defects closed Attending Surgeon First Assistant Second Assistant Anesthesia
Patient Details	8 items	Patient Name Patient Age/Sex Height (cm) Pre-operative weight (kg) Pre-operative BMI (kg/m2) Comorbidities Additional GI conditions Previous abdominal surgeries
Pre-operative Events	5 items	Pre-operative diet type Pre-operative diet duration Weight loss on diet (kg) Weight post diet (kg) Pre-operative Endoscopy
Operative Details	13 items	Additional procedures performed Pre-operative Antibiotics Thromboprophylaxis

		Sequential Compression Devices Compress Stockings Skin Preparation Type Time-out performed Patient position Pneumoperitoneum Pneumoperitoneum complication Final port placement Laparoscopy findings Omental division
Small Bowel Division Details	3 items	Small bowel division stapler Biliary length (cm) Roux length (cm)
Entero-enterostomy Details	7 items	Number of entero-enterostomy staplers Type Entero-enterostomy Staplers Closure technique Closure suture/method Closure staplers Anti-obstruction stitch Mesenteric closure
Gastrojejunostomy Details	14 items	Gastrojejunostomy position Length of pouch (cm) Bougie type/size Number of gastric pouch staplers Type gastric pouch staplers Use of clips on pouch Anastomotic technique Anastomotic Staplers Closure Sutures/Method Hand-sewn anastomotic sutures Closure staplers Leak test Gastroscopy Peterson's space closure
Closure Details	10 items	Port/skin closure Skin closure Intra-operative complications Location complication Unexpected findings/events Sponge/instrument count Drains placed EBL (cc) Operative time (h:min) Pathological/microbiology specimen
Post-operative Details	3 items	Post-operative condition Post-operative DVT prophylaxis Additional information/notes (free text)

BMI – Body Mass Index
GI - Gastrointestinal
EBL – Estimated Blood Loss
DVT – Deep Vein Thrombosis

Discussion

Bariatric surgery is an important area in which to assess current standards of operative reporting, or lack there of, due to the rapid growth of this field [4-6]. As such, the general surgeon will see increasing numbers of patients who have undergone RYGB in their elective and emergency practices. When surgical complications arise, the correct diagnosis and application of appropriate and expedient management is critical. Furthermore, bariatric patients can be difficult to examine due to their body habitus, and may not present with the same objective signs as the non-obese population. These patients are also physiologically intolerant to delays in management, which can precipitously lead to avoidable morbidity and mortality. Accurate knowledge of the procedural anatomy and perioperative events is therefore critical to the treating surgeon. Surgical complications often arise within the first few days post bariatric procedure, which highlights the importance of expedient access to the operative note, especially where treating physician is not the responsible surgeon.

This is of particular concern given the rise of medical tourism. Many patients now travel out of their local jurisdiction seeking bariatric surgery. This is due to several factors including prolonged wait lists, local cost, or insurance coverage. The wait time for bariatric surgery in Canada averages 5 years[21]. The majority of medical tourism programs do not offer coordinated, long term post-bariatric surgical care. This results in the bulk of post-operative complications being treated in the

patients' home location[22]. Although difficult to measure, a conservative estimate suggests that 12,800 Canadians travel abroad for bariatric surgery annually[23]. With observed complication rates and estimated medical costs in returning bariatric medical tourists, this amounts to approximately $50 million per year[22, 23]. A further issue is the lack of operative documentation in these circumstances as many patients are not in possession of an operative report, the reports are of poor quality, or they are uninterpretable due to language barriers. A common means of standardizing the items mentioned in the operative documentation within the bariatric surgery field would therefore be of distinct value to this population's care, not only locally, but also in medical tourist destinations.

Traditional narrative reporting has been criticized for poor inclusion, unreliable quality, as well as being inaccessible in the immediate post-operative period[1, 2, 7-19]. This has been confirmed via a national survey of Canadian bariatric surgeons who reflected a need for improvements on the current standard of operative reporting in this field[24]. One group has evaluated the quality of operative dictations in bariatric surgery and reported superior documentation of quality measures with standardized operative report templates[19]. However, the QIs used in this study were not established with the intent of evaluating operative documentation[19, 25]. Prior to embarking on quality improvement for documentation in bariatric surgery, quality assessment must be performed. This requires a validated tool for the assessment of operative reports in order to identify areas of weakness and subsequently implement strategies for improvement. The QIs developed herein provide a method to which adherence

can be measured and fed back in a meaningful way[25]. Unlike those used in prior investigations[19, 25], the QIs developed here for the RYGB operative report are specific to the quality of that document. These QI's are distinct from those developed for bariatric surgical care in general where the operative report, as a whole, may be in itself considered a QI for these patients' overall care.

These are the first comprehensive, standardized QIs for bariatric operative reporting in the literature. This study uses previously described and robust methodology to establish consensus-derived QIs for a RYGB report[20]. Having representative academic and community bariatric surgeons from each province performing RYGB in Canada is a strength of this investigation. This aims to avoid bias towards the perspective of any one setting or for a particular location's preference in technique or reporting philosophy. Additionally, consensus established by experts in the field and key stakeholders establishes content validity of the quality indicators. Content validity describes a process that determines if the test contains a representative sample of content domains to be measured. This can include having an expert panel review and select the items to be included. Additionally, the high survey response rate ensures a multidisciplinary approach by including the opinions of invited key stakeholders. The group included a tertiary care abdominal radiologist who uses operative notes to discern unusual anatomical findings on imaging or in the setting of radiographic workup of suspected operative complications. Such complications include anastomotic leaks, strictures, or abdominal pain/potential bowel

obstruction. An advanced endoscopic gastroenterologist, who is a valuable local resource for endoscopic management of bariatric surgical complications, was also involved. Additionally, we included two general surgeons in the Delphi group. One surgeon practices minimally invasive techniques and is the chief of the acute care surgery service where complications of bariatric surgery are often first encountered. The other general surgeon has extensive experience in developing synoptic reports and measuring outcomes[2, 13, 14, 26]. This multidisciplinary group ensured a breadth of perspectives were considered while establishing these benchmark criteria for RYGB operative notes.

Although consistent with other investigations, this was a relatively small Delphi group for the development of these QIs. This group may also not be representative of all opinions internationally. However, the group was inclusive and considerate of different practice settings and expertise.

The future application of these QIs is to evaluate current operative reports for RYGB given the perceived need for improvement[24]. An additional use would be in the design of a synoptic operative report for RYGB. Synoptic reporting has gained popularity over the past decade as a solution to the poor quality of dictated narrative notes. These template-based reports have demonstrated superiority to narrative reports for quality and completeness across several domains in surgery. This has been evident in surgical oncology where thorough

and complete documentation of oncologic findings and procedural details are essential to decisions on adjuvant treatment and care of the patient[2, 8-14]. However, this format has never been comprehensively evaluated in bariatric surgery. The aim would be to develop a layout similar to previously successful platforms, such as the WebSMR developed in Canada[8, 9, 27].

Conclusions

This study has established multidisciplinary consensus-derived quality indicators for RYGB operative reports. This information will allow further assessment of the quality of existing documentation and will afford the development of mechanisms that may ameliorate any identified deficiencies.

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Chapter 3 - Assessing the Need for Improvement in Bariatric Operative Reporting

In chapter 2 the development of quality indicators specific for a laparoscopic Roux en Y gastric bypass (RYGB) was described. Seventy-five quality indicators specific for a RYGB operative report were established through a multidisciplinary approach using a Delphi method for establishing consensus. Data suggests that the quality of operative reports are poor in general and this has been similarly suggested, but not comprehensively assessed in bariatric surgery(1-23).

The next objective was to gauge the current climate of operative reporting in the bariatric surgery using the newly established quality indicators. An assessment of need was first required to gain an understanding of the presence and perception of the issue, the degree of its effect, and detect specific areas for intervention. A confirmatory audit of a baseline set of bariatric operative reports adds further evidence to the need for improvement in this area. In chapter 3, a national survey of bariatric surgeons provides a focused needs assessment for operative reporting in bariatric surgery. Furthermore, an audit of operative reports for RYGB is described using the quality indicators established in chapter 2.

Article 3

Bariatric Operative Reporting: Quality Assessment and Perceptions Among Bariatric Surgeons

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Surg Obes Relat Dis. 2017 Mar;13(3):429-435

Abstract

Background

Our objective was to evaluate the perceptions of Canadian bariatric surgeons regarding the quality of operative reporting in bariatric surgery and the potential need for improvement. Additionally, we aimed to assess opinions on the quality and prospective utility of synoptic operative reporting for bariatric surgical procedures.

Methods

A survey was distributed via a secure web-based platform to identified active bariatric surgeons across Canada. Our aim was to have representation from every province currently performing bariatric surgical procedures. Demographic information was gathered including current training and practice patterns. A modification of the validated Structured Assessment Format for Evaluating Operative Reports (SAFE-OR) was used to evaluate the quality of narrative dictations for bariatric surgery on anchored 5-point Likert scales. This was additionally used to assess synoptic operative reports. Free text fields were provided to allow elaboration on opinions and feedback. Comments were collated and reported as themes.

Results

Thirty-four bariatric surgeons were invited to participate. Seventy-one percent (24/34) completed the survey with representation of community and tertiary care

surgeons across Canada. The most commonly performed procedures were roux-en-Y gastric bypass (RYGB) and sleeve gastrectomy (SG) (96.0% and 100.0% respectively). 70.8% currently perform a traditional narrative operative report. The weighted average SAFE-OR score for narrative dictations by bariatric surgeons was neutral (27.9/40). Twelve percent had experienced situations where inaccurate operative reporting had led to poor patient care. Opinions consistently reflected a need for an immediately generated, standardized, template-based report to improve the quality and accessibility of operative documentation. The group agreed that synoptic reports would improve operative reporting for bariatric surgery (weighted average 3.3/5).

Conclusion

This survey demonstrated a perception of mediocre quality of narrative dictations that could potentially lead to poor patient care. There is desire to create a high-quality, validated, synoptic operative report to address these shortcomings.

Introduction

Quality assessment (QA) and improvement have been a predominant focus in surgery over the past decade. However, the scope and solutions to these issues can be difficult to measure. Quality improvement (QI) in healthcare is generally carried out by means of assessing the process of care and establishing quality indicators as markers of clinical outcomes. This decreases the time burden and expense of measuring long-term patient outcomes over time[1]. For example,

initiatives such as the American College of Surgeons (ACS) National Surgical Quality Improvement Program (NSQIP) evaluate quality indicators to give prospective feedback on performance and allow for intervention. This program and similarly, the implementation of the World Health Organization (WHO) Sugical Safety Checklist (SSC), have resulted in reduced morbidity and mortality in centers in which they have been adopted[2-5].

Operative reporting is a critical element of the surgical patient's record and may serve as a useful source of data on the processes of care and quality indicators of surgery that take place within the operating room. However, reliable data must be abstracted for the report to be of meaningful value[1,6]. Currently, the standard practice is for the responsible surgeon or delegate to generate a narrative report where steps of the operative procedure, indications, and surgical rationale are described in detail. These reports, however, have come under scrutiny regarding quality, especially with respect to incomplete or inaccurate documentation of critical information[7-11,1,12-18]. Narrative reports have been evaluated in several surgical fields such as surgical oncology where the recommendation of subsequent adjuvant treatment is reliant on operative findings and documentation of complete resection. Newer, standardized formats for operative documentation, like synoptic reporting and templates, have been suggested as superior in terms of consistency and completeness[6-17]. This implies a potentially more robust source of data for QA and QI strategies.

To date, no comprehensive investigation has evaluated the climate of operative reporting in bariatric surgery despite it being one of the most rapidly growing surgical fields[19]. These are generally comorbid patients undergoing technically complex surgical procedures. Thus, accurate and timely documentation is required. This is especially important in the face of post-operative complications where diagnostic and treatment delays can be devastating.

The objective of this study is to evaluate the perceptions of bariatric surgeons regarding the quality of operative reporting in bariatric surgery and determine if there is potential need for improvement.

Methods

Ethics

University of Manitoba institutional research ethics approval was obtained prior to the commencement of this study.

Survey

A survey was distributed via a secure web-based platform (SurveyMonkey platinum edition 101 Lytton Avenue Palo Alto, CA 94301) to identified active bariatric surgeons across Canada. The aim was for representation from every province and territory currently performing laparoscopic bariatric surgical procedures in Canada. Consent was obtained from each participant at the start of the survey. Demographic information was gathered including training and

practice patterns of current bariatric surgeons. A modification of the validated Structured Assessment Format for Evaluating Operative Reports (SAFE-OR)[6] global rating scale was used to evaluate the impression of the overall quality of narrative dictations in bariatric surgery by attending surgeons. This tool provides a validated framework based on nine domains to score reports on anchored 5-point Likert scales. This was additionally used to assess perceptions of the quality of synoptic operative reports and gauge their potential to improve surgical documentation in this specialty. Free text fields were provided to allow participants to elaborate on opinions and feedback. Comments were collated and reported as themes, see Figure 1.

Figure 1 - Modified Structured Assessment Format for Evaluating Operative Reports (SAFE-OR) form used to evaluate the quality of operative reporting[6].

1. Readability of Dictation				
1 Dictation is difficult to read and disorganized with incoherent flow	2	3 Dictation is relatively easy to read but at times lacks flow	4	5 Dictation is easy to read and well organized with coherent flow
2. Description of Operative Indications				
1 Description of preoperative course or indications is not included	2	3 Preoperative course and indications are described but lack details or inaccurate	4	5 Dictations includes a complete description of preoperative course & indications for specific procedures performed
3. Inclusion of Operative Steps				
1 Dictation is incomplete with many important steps missing	2	3 Dictation includes most important steps but some detail is missing	4	5 Dictation is comprehensive and includes all important steps of the bariatric procedure
4. Description of Operative Findings				
1 Operative findings described are irrelevant or omitted completely	2	3 Operative findings are described but some relevant detail is lacking	4	5 Operative findings are presented in a relevant and detailed fashion
5. Succinctness of Dictation				
1 Dictation is unnecessarily long with excessive inclusion of extraneous detail or truncated & lacking important elements	2	3 Dictation is relatively concise and inclusive with some extraneous detail included	4	5 Dictation is concise but inclusive with exclusion of extraneous detail
6. Clarity of Dictation				
1 Description of included steps are vague and unintelligible	2	3 Description of included steps are relatively clear and intelligible	4	5 Description of included steps are clear and complete

7. Knowledge of Procedure/Anatomy

1	2	3	4	5
Dictation shows lack of understanding of the procedure and relevant anatomy		Dictation shows a reasonable understanding of the procedure and relevant anatomy		Dictation demonstrates a full understanding of the procedure and relevant anatomy

8. Reproducibility of Operative Procedure

1	2	3	4	5
Recreation of operative events would be impossible from the dictation		Readers could recreate events using own knowledge to fill in gaps		Readers would have a complete understanding of operation and could recreate the bariatric procedure step by step

OVERALL QUALITY

1	2	3	4	5
Generally unacceptable dictation with major deficiencies		Acceptable dictation overall with some room for improvement		Excellent dictation with quality consistent with that expected of high quality operative documentation

Quality Audit

A retrospective audit of local narrative operative reports for Roux en Y gastric bypasses (RYGB) was then performed. This audit was completed to objectively evaluate the quality of bariatric operative reporting in order to correlate any needs identified in the survey. The reports were selected at random from RYGB performed by all surgeons over the time frame between 2011-2015 at the Manitoba Centre for Metabolic and Bariatric Surgery in Winnipeg, Manitoba. This publically funded bariatric surgery program was established in 2010, employs 4

bariatric surgeons, and currently performs approximately 200 RYGB per year. This timeframe was selected to reflect a well-established bariatric program and not be confounded by learning curve or significant practice adjustments over time. Quality of the narrative reports was evaluated using consensus-derived quality indicators for a RYGB operative report established through a national Delphi process[20]. The list is comprised of 75 individual items in a checklist format under 9 subheadings. Items were marked as “1” for present, “0” for absent, and “N/A” for not applicable elements[7]. Total present items were tallied and a percent completeness score was calculated. “Not applicable” elements were excluded from the total[7]. Subsection analyses were additionally performed to identify recurrent areas of strength and weakness.

Results

Survey Results - Demographics

Thirty-four Canadian bariatric surgeons were identified and invited to participate in the web-based survey. Seventy one percent (24/34) completed the survey. Representation of academic, community, and tertiary care surgeons from all provinces performing bariatric surgery in Canada was achieved. Of the responding surgeons, 88.5% were male, and the majority were young (23.1% 25-35 years old and 53.9% 36-45 years old) with 0% being over the age of 65 years. All respondents had completed residency training in Canada and 92.3% had completed fellowship training (70.8% in Canada, 25.0% in USA). Seventy-five percent of the fellowships were focused in minimally invasive and bariatric surgery, 16.7% minimally invasive surgery, and 4% in each trauma

surgery/critical care and bariatric surgery. Ninety-two percent of participants routinely perform minimally invasive bariatric surgery as part of their surgical practice representing varied proportions of their clinical time, see Figure 2. Most participants are high volume RYGB surgeons; 44% performing between 100-150 bypasses per year and 28% between 50-100. The remaining 28% complete <50 bypasses per year or only perform surgical assists. Respondents similarly endorsed practicing in an assortment of hospital settings, see Figure 3.

Figure 2. Percentage of Clinical Time Performing Bariatric Surgery

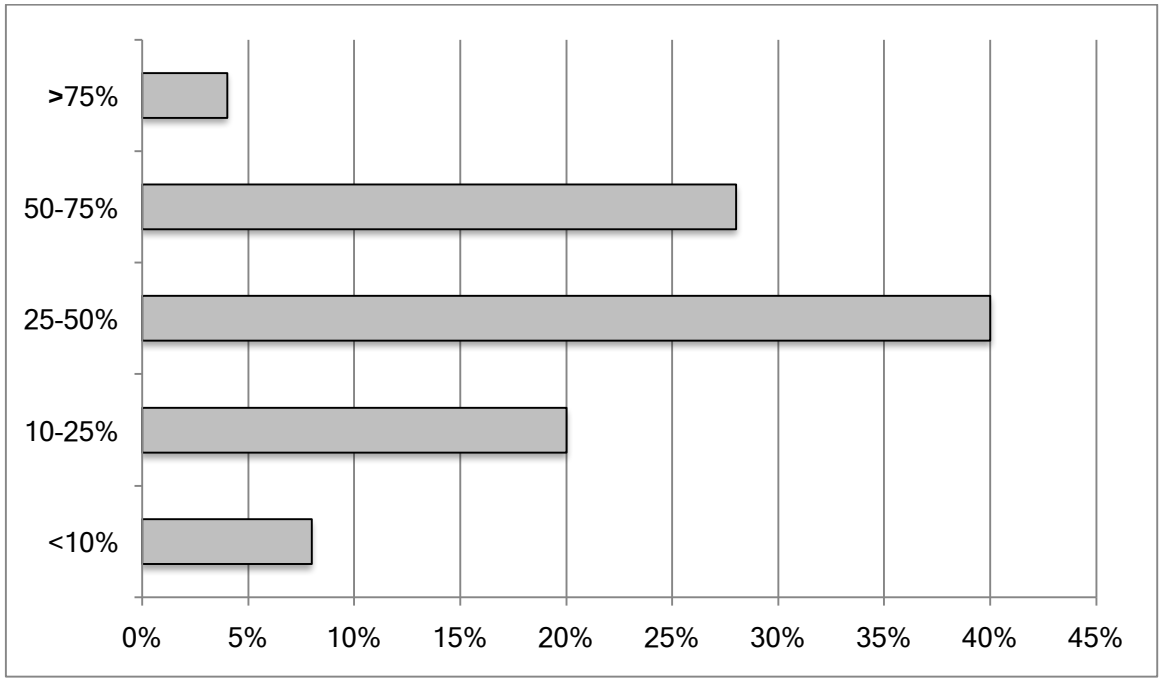

Figure 2. Breakdown of the percentage of clinical time spent performing bariatric surgery by participating bariatric surgeons in this survey.

Figure 3. Practice Setting of Participants

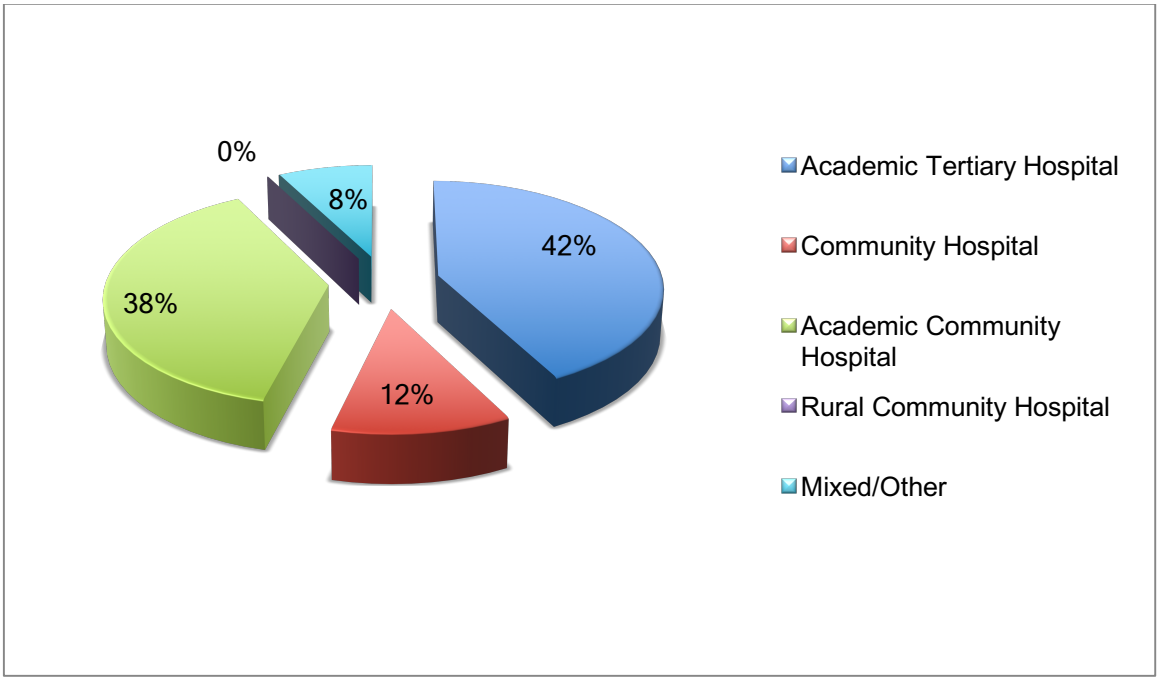

Figure 3. Breakdown of the practice settings represented by the participants.

Survey Results – Operative Reporting

The most commonly performed procedures by the participating surgeons are RYGB and sleeve gastrectomy (SG) (96.0% and 100.0% respectively). 70.8% currently perform a traditional narrative operative report and 20.8% perform a narrative operative report from a template. The weighted average SAFE-OR score on narrative dictations for bariatric procedures was mediocre (27.9/40). The lowest scoring items were the "description of indications" (2.9/5) and "succinctness" (3.3/5), see Table 1. Twelve percent of respondents acknowledged experiencing a situation where inaccurate operative reporting had led to poor patient care. Examples provided all revolved around post-operative complications when incomplete and inadequate notes led to difficulty

understanding relevant anatomy or being unaware of important intraoperative findings such a cirrhosis, splenomegaly, and adhesions. Additionally, there was much frustration relayed regarding managing post-operative complications in patients having bariatric surgery performed out of province or country who return with either incomplete operative documentation or non-English reports.

Table 1. SAFE-OR[a] Scores for Bariatric Surgery NRs[b] vs SRs[c]

Headings	Attending Surgeons (Weighted Average /5)	SR for any surgical procedure (Weighted Average /5)
Readability of Dictations	3.83	2.81
Description of Indications	2.88	3.88
Inclusion of Operative Steps	3.88	3.75
Description of Operative Findings	3.48	3.50
Succinctness	3.32	3.75
Clarity	3.60	3.13
Knowledge of Procedure/Anatomy	-	-
Reproducibility of Operative Procedure	3.48	3.50
Overall Quality	3.44	3.19
TOTAL SCORE	27.9 /40	27.5 /40

[a] **SAFE-OR** – Structured Assessment Format for Evaluating Operative Reports[6]
[b] **NR** – Narrative Operative Report
[c] **SR** – Synoptic Operative Report

Sixty-four percent of participants had previously read and interpreted a synoptic operative report. Overall the SAFE-OR scores for synoptic operative reports were similar to narrative reports (27.5/40). However, synoptic reports were perceived as superior than narratives for the descriptions of “operative indications” and “succinctness” (Table 1). Synoptic reports scored poorly in “readability” and

"clarity" scores (2.88/5 and 3.13/5 respectively) which reflects the free text criticism that synoptic reports can be difficult to read and can often inadequately relay the overall essence of a case. Opinions however, consistently reflected a desire for an immediately generated, standardized, template-based report to improve the quality and accessibility of operative documentation. The group agreed that synoptic reports would be beneficial to improving operative reporting for bariatric surgery (weighted average 3.3/5). Finally, feedback suggested the reproducible nature of bariatric procedures lends an inherent suitability to a synoptic format.

Quality Audit

The report audit was performed on 42 dictations by attending bariatric surgeons. All surgeons were equally represented. Overall completeness of the reports was mediocre at 62.0% +/- SD 6.61% (mean 46.5/75 items). The 9 subsections of quality indicators were analyzed and showed the most complete sections were "small bowel division details" and "entero-enterostomy details" at 96.8% and 76.2% respectively. Very poor performance was noted for "patient details", "pre-operative events", and "post-operative details" at 41.1%, 32.4%, and 31.7% respectively. A summary of the quality analysis is listed in Table 2. Interestingly, these findings are consistent with the reflected weaknesses by attending surgeons from the national survey.

Table 2. Completeness of NR[a] from Retrospective Audit		
Subsection	#Items	NR[a] completion (mean% +/- SD)
Overall	**75**	**62.0 +/- 6.6**
Team Demographics	12	67.1 +/- 16.6
Patient Details	8	41.1 +/- 14.2
Pre-operative Events	5	32.4 +/- 21.6
Operative Details	13	57.0 +/- 19.7
Small Bowel Division Details	3	96.8 +/- 32.3
Entero-enterostomy Details	7	76.2 +/- 14.0
Gastrojejunostomy Details	14	69.0 +/- 12.6
Closure Details	10	61.2 +/- 18.9
Post-operative Details	3	31.7 +/- 24.4

[a]**NR** – Narrative Operative Report

Discussion

Multiple groups have demonstrated that traditional methods for conveying the rationale and conduct of surgery are inadequate across specialties[7-11,1,12-18]. This is the first comprehensive review of the current perceived status of operative reporting in bariatric surgery. This is important as this is a rapidly growing field involving complex procedures on medically and surgically complicated patients.

This national survey demonstrated a perception that the overall quality of these reports is poor. This would be in keeping with objective assessments of narrative reports in other fields of surgery including general surgery, gynecology, urology, and orthopedics [21,15,11,22,9,7,10,13,14]. Areas of perceived weakness from the survey were in the “description of indications” and “succinctness” of the reports. This is consistent with prior criticisms of missing clinical detail and inclusion of superfluous elements in narrative reports [7]. The indications for any prescribed procedure are of importance not only for the ongoing care of the

patient but for medical-legal purposes as well. Additionally, these items are crucial for billing and research purposes[12,6]. The best overall performing domains in our survey, “inclusion of operative steps” and “description of operative findings”, still demonstrated significant room for improvement (mean scores 3.88/5 and 3.48/5 respectively). Overall, it seems bariatric surgeons feel they are failing at producing functional operative documentation.

The audit performed on narrative reports for RYGB further confirmed the flaws of this form of documentation. The overall completeness of the reports was 62%. This finding is consistent with a prior study evaluating the quality of operative reporting in bariatric surgery where the mean completion rate of their intraoperative quality indicators was 59%[18]. However, the performance in both studies is superior overall to many of the completion rates described in the surgical oncology literature. For example, Edhemovic et al. described their narrative reports contained only 45.9% of their specified data elements[7]. This is likely due to the reproducible nature of bariatric procedures. This may lead to better recall and subsequent reporting of critical elements by surgeons performing these procedures regularly. Of note, documentation of important procedural details such as the biliary and roux limb lengths (small bowel division details) and details regarding the formation of the entero-enterostomy were the most complete in our review at 96.8% and 76.2%. These were closely followed by description of the gastrojejunostomy specifics at 69% complete. This conflicts with prior investigations suggesting the most complete elements were arguably

items of lesser importance such as hospital and patient data, anesthetist and surgeon information, approach, and closure details[7]. However, this quality audit did demonstrate that the team demographic details and hospital details were similarly complete at 67%.

Interestingly, the audit findings corroborated the opinions reflected in our survey. The perceived overall quality of bariatric narrative operative reports was mediocre which was confirmed in this audit when grading them against established quality indicators. The most poorly scoring items in the survey included the description of the indications for the procedure, whereas descriptions of the operative steps and intra-operative findings were felt to score reasonably well. This is verified by the audit results showing only 41% completion of patient details and a 32% completion for description of the pre-operative events. The “patient details” subsection in the audit incorporated items such as the patient’s height, weight, body mass index, and comorbidities; all of which were independently considered important quality indicators by Maggard et al[28]. The “pre-operative events” included a description of the type and duration of the pre-operative diet as well as the measured weight lost on the diet. These would all be elements commonly included in the “description of indications” for the procedure in a dictated operative note. Items that would fall under “operative steps” and “operative findings” would correlate with higher scoring subsections on the audit such as the “operative”, “small bowel division”, “entero-enterostomy”, and “gastrojejunostomy details” (57%, 97%, 76%, 69% completion rates respectively).

This investigation further substantiates the need to improve operative reporting in general and is one of the first confirming this in the field of bariatric surgery. The question that follows would be how to improve upon this practice. Some have suggested the solution is to design and implement operative templates or synoptic operative reports as a means of standardization and improving quality[7,9,21,29,10,11,13,14,12,22,30,17,15,16,18,26]. The overall opinions endorsed by survey participants were that synoptic reporting is a potentially good solution to improve documentation in bariatric surgery. However the overall quality scores from the survey did not suggest superior results compared to narrative reports. This observation likely stems from the poor readability and clarity of synoptic reports perceived by respondents. This was endorsed by free text commentary suggesting that synoptic documents are difficult to decipher, lack procedural and descriptive flow, and are often missing details regarding the subtleties of unusual or unique parts of the case. There was, however, a desire expressed to develop a standardized, template-based report for bariatric surgery. Features expected of an ideal synoptic report included a simple, user-friendly and time efficient format that would generate a concise, readable report that follows procedural flow and incorporates all critical elements of the procedure without inclusion of extraneous details. This requires consensus on the critical elements of such an operative report. This has been demonstrated at our institution and will serve useful for future investigation of synoptic reporting in bariatric surgery[20].

Conclusion

This evaluation of bariatric surgeons demonstrated a perception of unacceptable quality of narrative dictations that could potentially lead to poor patient care. This quality was further confirmed by poor performance of audited narrative reports for validated quality indicators for RYGB. There is desire to create a high quality, validated, synoptic operative report to address these shortcomings.

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Chapter 4 – Development and Prospective Assessment of a New Synoptic Operative Report for Roux en Y Gastric Bypass Surgery

The national survey of bariatric surgeons from chapter 3 confirmed that the current state of operative reporting in bariatric surgery is mediocre and at times has led to poor patient care. The audit of RYGB operative reports similarly reflected this using the consensus items from chapter 2. Reported limitations of narrative reporting from chapter 3 reflected those in the literature. This includes frequently missed depiction of pertinent operative steps and findings (Description of laparotomy and details of the resection for oncologic procedures) and over inclusion of arguably less important details such as, hospital information, team demographics, and closure details(1-23).

A plan was then formulated to create an intervention to enhance the quality of bariatric operative reports based on newly established need as determined in chapter 3. The validated quality indicators established by the national Delphi group in chapter 2 provide the foundations upon which to develop and test a novel synoptic report for bariatric surgery. Synoptic reporting has shown potential to advance reporting in several areas of surgery(1-16, 18). This format was similarly identified as a potential solution in the national needs assessment survey of Canadian bariatric surgeons (17). Synoptic reporting had not been previously investigated in bariatric surgery. In chapter 4, a novel synoptic report for a Roux en Y gastric bypass is developed and prospectively trialled against narrative operative reports.

Article 4

Synoptic Operative Reporting: Assessing the Completeness, Accuracy, Reliability, and Efficiency of Synoptic Reporting for Roux en Y Gastric Bypass

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Surg Endosc. 2017 Sep 15. (Epub ahead of print)

Abstract

Objective

Synoptic reporting (SR) is one solution to improve the quality of operative reports. However, SR has not been investigated in bariatric surgery despite an identified need. SR for RYGB was developed using quality indicators (QIs) established by a national Delphi process. The objective of this study is to assess the completeness, accuracy, reliability, and efficiency of synoptic versus narrative operative reports (NR) in Roux-en-Y gastric bypass (RYGB).

Methods

A NR and SR were completed on 104 consecutive RYGBs. Two evaluators independently compared the reports to QIs. Completeness and accuracy measures were determined. Reliability was calculated using Bland-Altman plots and 95% limits of agreement (LOA). Time to complete SR and NR was also compared.

Results

The mean completion rate of SR was 99.8% (+/-SD 0.98%) compared to 64.0% (+/-SD 6.15%) for NR ($t=57.9$, $p<0.001$). All subsections of SR were >99% complete. This was significantly higher than for NR ($p<0.001$) except for small bowel division details ($p=0.530$). Accuracy was significantly higher for SR than NR (94.2% +/-SD 4.31% versus 53.6% +/-SD 9.82% respectively, $p<0.001$). Rater agreement was excellent for both SR (0.11, 95% LOA -0.53 to 0.75) and

NR (-0.26, 95% LOA -4.85 to 4.33) (p=0.242), where 0 denotes perfect agreement. SR completion times were significantly shorter than NR (3:55min +/- SD 1:26 min and 4:50min +/-SD 0:50min respectively, p=0.007).

Conclusion

The RYGB SR is superior to NR for completeness and accuracy. This platform is also both reliable and efficient. This SR should be incorporated into clinical practice.

Introduction

Synoptic reporting (SR) has gained recognition over the past decade as a method to improve the quality of dictated narrative reports (NR). This format has been shown to be an effective advancement on reporting in several areas of medicine, most notably in pathology, radiology, and surgery[1-18]. These fields have historically relied on narrative dictations to convey vital patient health information in the medical record. However, the quality of NR has been criticized for lacking critical clinical elements and not meeting minimum established report and system based quality standards [1, 2, 4-14, 16-19]. Multiple groups over more than a decade have investigated means by which these reports can be improved. None however, have proven to be successful in sustaining long-term meaningful improvement [20].

Synoptic operative reporting has become popular in several surgical disciplines, especially surgical oncology. Modern SR generally involves a computerized,

procedure-specific, template based report. This helps to ensure pertinent elements are recorded in a more standardized fashion and generates a document that can be available for immediate use. This is particularly imperative in complex cases where subsequent treatment decisions and eventual outcomes are contingent upon processes employed at the index procedure. Conversely, SR may be easiest to implement for simpler procedures, especially ones with repetitive steps and few variations.

The number of bariatric procedures performed worldwide has increased due to the obesity pandemic[15, 21]. Both bariatric and general surgeons will see an increasing number of post-operative bariatric surgery patients in elective and emergency situations as a result. Timely access to a complete and accurate depiction of the final operative anatomy and intra-operative events is vital when surgeons are faced with complications. This is especially important within the first post-operative days when complications typically arise and dictated NRs may not yet be available. SRs offer an opportunity to record and present this information in a timely and standardized fashion. The Roux en Y Gastric Bypass (RYGB) is a commonly performed bariatric procedure globally[15, 21]. Even though these operations are complex, they are largely reproducible, often following the same well-defined steps. This feature makes them inherently suitable for SR.

Limited evidence suggests that the quality of NRs in bariatric surgery is poor [16,22]. One survey found a poor overall perception of reporting quality amongst bariatric surgeons[23]. Moreover, twelve percent of bariatric surgeons experienced situations where inaccurate or incomplete reports had resulted in

poor patient care[23]. Indeed, bariatric surgeons have expressed interest in a procedure specific SR to improve documentation in this field [23]. We have recently reported positive results for bariatric synoptic reporting from a retrospective pilot study. However, no comprehensive prospective investigation has evaluated synoptic reporting for bariatric surgery [22].

The primary outcome in this study was to prospectively compare the completeness, validity, and accuracy between SR and NR for RYGB operative reporting. Secondary measures include reliability, efficiency, and an external comparison analysis.

Methods

Ethics

The University of Manitoba Health Research Ethics Board and Victoria General Hospital Ethics Board approved this study prior its commencement.

Synoptic Report

The SR was developed on an electronic platform using previously established RYGB operative report quality indicators[25]. This included 75 consensus-derived items established through a multidisciplinary, 3-round Delphi process. The elements were separated under 9 subheadings as previously described[25]. Synoptic reports were stored in a secured electronic database (Figure 1).

Figure 1. Synoptic Report for RYGB

VICTORIA GENERAL HOSPITAL
Winnipeg, Manitoba

Victoria General Hospital **Operative Report**

Patient name: Jane Doe	**Birth date November 16, 1956**
MRN XXXX	**Health #: XXXX**

DEMOGRAPHICS

Procedure date:	November 16, 2016
Report date:	November 16, 2016
Reported by:	Dr X
Pre-operative diagnosis:	Class IV Obesity
Post-operative diagnosis:	Class IV Obesity
Procedure planned:	Laparoscopic Roux en Y Gastric Bypass
Procedure performed:	Laparoscopic Roux en Y Gastric Bypass (100cm anti-colic anti-gastric Roux Limb)
Mesenteric defects closed:	Peterson's Space & Entero-enterostomy
Attending Surgeon:	Dr X
First Assistant:	Dr Y
Second Assistant:	None
Anesthesia:	General Anesthesia

PATIENT DETAILS

Patient Age:	59
Patient Sex:	Female
Height (cm):	159.0
Pre-operative weight (kg):	128.2
Pre-operative BMI (kg/m2):	50.7
Comorbidities:	Type II Diabetes, Hypertension, Asthma
Additional/GI conditions:	None
Previous abdominal surgeries:	Laparoscopic Cholecystectomy, Total Abdominal Hysterectomy

PRE-OPERATIVE EVENTS

Pre-operative diet type:	"Diabetic Very Low Calorie Diet"
Pre-operative diet duration:	3 weeks
Weight loss on diet (kg):	10.2
Weight post diet (kg):	128.2
Pre-operative EGD:	Yes - Normal

OPERATIVE DETAILS

Additional procedures:	None
Pre-operative Antibiotics:	Cefazolin 2g IV
Thromboprophylaxis:	Heparin 5000U subcutaneous
Sequential Compression Devices:	Yes
Compression Stockings:	No
Skin Preparation Type:	Chlorhexidine & Alcohol
Time-out performed (SSC):	Yes
Patient position:	Supine
Pneumoperitoneum method:	Veress needle
Pneumoperitoneum complication:	None
Port placement:	12mm disposable - RUQ, 5mm disposable- midline, 12mm disposable - LUQ, 5mm reuseable – L Lateral, 5mm epigastric incision (Nathanson Liver Retractor)
Laparoscopy findings (free text):	Few adhesions to lower abdominal wall at Pfannensteil incision
Omental division:	Yes – bipolar device

SMALL BOWEL DIVISION DETAILS

Small bowel division stapler:	60mm vascular (biliary limb clipped for identification)
Biliary limb length (cm):	50cm
Roux limb length (cm):	100cm

ENTERO-ENTEROSTOMY DETAILS

# EE Staples:	1
Type EE Staplers:	60mm vascular
Closure technique:	Sutured
Closure suture/method:	Running, 3-0 Vicryl
Closure staplers:	None
Anti-obstruction stitch:	Yes
Mesenteric closure:	Yes – Running, 0 Silk

GASTROJEJUNOSTOMY DETAILS

GJ position:	Anti-colic, anti-gastric
Length of Gastric Pouch (cm):	6cm
Bougie (type/size):	Gastric lavage tube, 34 French
# Gastric Pouch Staplers:	3
Type Gastric Pouch Staplers:	45mm vascular, 60mm vascular, 60mm vascular

Use of Clips: pouch:	None
Anastomotic technique:	Linear Stapled
Type Anastomotic Staplers:	30mm vascular
Closure Sutures:	Transverse, Running in 2 Layers, 3-0 Vicryl
Hand Anastomosis Sutures:	N/A
Type Closure Staplers:	N/A
Leak test:	Yes – No Leak (Air)
Gastroscopy:	Not performed
Petersons Space closure:	Yes – running, 0 Silk

CLOSURE DETAILS

Port closure:	None
Skin closure:	Subcuticular suture, 4-0 Vicryl
Intra-operative Complications:	None
Location of Complications:	N/A
Unexpected Findings/Events:	None
Sponge/Instrument Count:	Correct
Drains placed:	None
Estimated Blood Loss (cc):	Minimal
Operative time (h:min):	1:51
Pathology/Microbiology Specimen:	None

POST OPERATIVE DETAILS

Post-operative Condition:	Stable to Post Anesthesia Care Unit
Post-operative Thromboprophylaxis:	Dalteparin 5000U Subcutaneous Daily
Additional information (free text):	Roux limb was initially under slight tension when it was brought up to form the GJ anastomosis. We lengthened our division of the small bowel mesentery using a bi-polar device. The anastomosis was then tension-free.

Report Date: Surgeon Electronic Signature

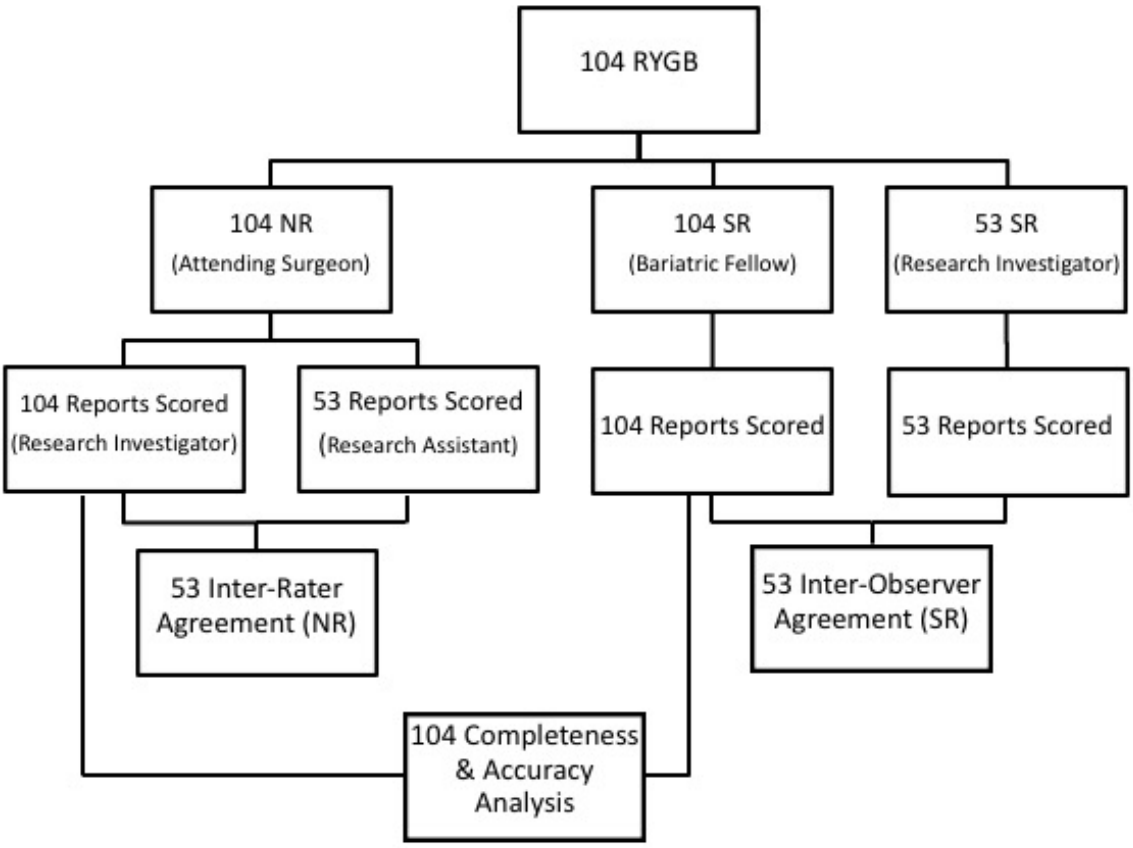
MRN – Medical Record Number
PHIN – Personal Health Identification Number
BMI – Body Mass Index
GI – Gastrointestinal
EGD – Esophagogastroduodenoscopy
RUQ/LUQ – Right/Left Upper Quadrant
L – Left
EE – Entero-enterostomy
GJ – Gastrojejunostomy
GIA – Gastrointestinal Anastomosis

Inclusion/Exclusion Criteria

A prospective cohort of consecutive RYGB procedures performed at the Centre for Metabolic and Bariatric Surgery (CMBS) in Winnipeg, Canada was included in the study. Procedures abandoned due to intra-operative considerations or conversions to other bariatric procedures (e.g., sleeve gastrectomy) were excluded. The CMBS is a publically funded, multidisciplinary, bariatric surgery program that was established in 2010. It employs 4 fellowship trained bariatric surgeons and currently performs approximately 240 RYGB per year, representing approximately 95% of the annual caseload.

A NR and a SR were concurrently and independently completed on all RYGB for the study period. No information was pre-populated into the SR. The NR was utilized as the official permanent operative record in the patients' chart. The attending staff surgeon completed the NR and the bariatric surgery fellow completed the SR for each case. Both individuals were present for the entirety of the procedure. The fellow was a qualified and previously practicing general surgeon. One hundred reports were required in each group to show a 20% difference in completeness (power=0.8, 2-tailed α=0.05). A research investigator, a Masters level senior surgical trainee, completed an additional SR on a subgroup of patients to facilitate inter-observer agreement analyses (Figure 2). This investigator was present for all cases, completed the additional SR independently, and had no communication with the surgeons or fellow. The research investigator performed data extraction on all NRs and a research assistant extracted data from an additional subgroup to allow for assessment of inter-rater agreement. Participating surgeons were blinded to the quality indicators and the results of the research investigators SR for this prospective study.

Figure 2. – Flow Diagram of Methodology



RYGB – Roux en Y Gastric Bypass
NR – Narrative Operative Report
SR – Synoptic Operative Report

Primary Analysis

Three distinct but related terms were defined for this investigation:

Completeness

Completeness was defined as the presence or absence of previously established quality indicators for a RYGB operative report. This list includes 75 items in a checklist format [25]. Items were recorded as dichotomous variables: “1” for those described in the report, “0” for items absent from the report, or “N/A” for

elements not applicable to the case[2]. Percent and total item completion scores were tabulated for all reports excluding “N/A” items from the total[2]. Percent and total completeness scores were compared between the NR and SR cohorts for difference of means using paired-samples t tests with a two-tailed alpha. Statistical significance was an alpha of 0.05.

Validity

Whereas completeness shows whether an indicator is present or not, validity reports the degree to which the item recorded is factual or true. A validity analysis was performed for all SRs and NRs comparing concordance between selected quality indicators recorded in the operative notes to those in the patient’s medical chart. The medical chart was chosen for comparison as it is the gold standard data source for audit purposes at the study institution. Items selected for the validity analysis were determined *a priori* and included those pre-, intra-, and post-operative items that were consistently obtained from pre- and intra-operative nursing notes, anesthesia records, and the pre-operative patient assessment provided by the bariatric clinic (Table 1). Items were recorded as “1” for concordant and “0” for discordant between the report and the chart. Percent validity was calculated against the 42 total selected items. The mean validity scores were compared between cohorts using paired-samples two-tailed t test. Statistical significance was an alpha of 0.05.

Table 1. Validity items and data source

Data Source		
Nursing (Preoperative and Intraoperative)	Bariatric Clinic	Anesthesia
DEMOGRAPHICS Procedure date Report date Pre-operative diagnosis Post-operative diagnosis Procedure planned Procedure performed Attending Surgeon First Assistant Second Assistant Anesthesia **PATIENT DETAILS** Patient Age Patient Sex **PRE-OPERATIVE EVENTS** Weight loss on diet (kg) Weight post diet (kg) **OPERATIVE DETAILS** Additional procedures Sequential Compression Devices Compression Stockings Skin Preparation Type Time-out performed (SSC) Patient position **SMALL BOWEL DIVISION DETAILS** Small bowel division stapler **ENTERO-ENTEROSTOMY DETAILS** # EE Staples Type EE Staplers Closure technique **GASTROJEJUNOSTOMY DETAILS** # Gastric Pouch Staplers Type Gastric Pouch Staplers Type Anastomotic Staplers Gastroscopy **CLOSURE DETAILS** Sponge/Instrument Count Drains placed Estimated Blood Loss (cc) Operative time (h:min) Pathology/Microbiology Specimen	**PATIENT DETAILS** Height (cm) Pre-operative weight (kg) Pre-operative BMI (kg/m2) Comorbidities Additional/GI conditions Previous abdominal surgeries	**OPERATIVE DETAILS** Pre-operative Antibiotic Thromboprophylaxis **GASTROJEJUNOSTOMY DETAILS** Bougie (type/size) **POST OPERATIVE DETAILS** Post-operative Condition

Accuracy

The vast majority of the literature in synoptic reporting analyzes completeness and only one study reports validity[10]. Accuracy was defined as an item being both present and valid. The mean accuracy scores were compared between cohorts using paired-samples two-tailed t test. Statistical significance was an alpha of 0.05.

Secondary Analyses

Reliability

The subgroup of patients with two independently completed SRs was evaluated for reliability between users. The NRs for the same patients were similarly evaluated between two raters (Figure 2). Reliability was calculated using Bland-Altman plots and 95% limits of agreement (LOA). This plots the mean difference between two rater scores against the mean scores. This generates a plot where "0" indicates perfect agreement[26]. Bland-Altman scores were compared between cohorts using two-tailed paired-samples t tests for difference of means.

Efficiency

Time to complete the SR and NR was compared as a measure of feasibility (or usability) of the new platform. All participating surgeons NRs and the participating fellow SRs were timed in a standard manner while completing their respective reports. Each participant had a minimum of 5 times recorded. The times were measured after an initial adjustment period to allow for the learning curve using the SR platform. Mean times were compared with two-tailed independent-samples t tests. Time to transcription was also analyzed for the NR cohort. Time was measured in days from date of dictation to transcription.

External comparison

An additional completeness audit was performed retrospectively on the SR and NR cohorts using previously validated quality indicators for bariatric surgery

developed by Maggard, *et al*[24]. This was performed to account for potential bias as the SR was designed using the same quality indicators used to score the reports. Fifty consecutive SRs and NRs were selected from the study cohort and evaluated against the operative quality indicators (pre-op antibiotics, intra-op IV fluids, exploration of abdomen, cholecystectomy due to gallbladder pathology, positioning, leak test, Peterson's space closure, small-bowel mesentery defect closure, SCD's, anticoagulation), selected patient measurements (height, weight, BMI) and and obesity-related comorbidities (pre-diabetes, diabetes, hypertension, dyslipidemia, OSA, venous stasis ,OA, quality of life)[24]. Items were recorded as dichotomous variables and statistical analyses were performed as described above.

Results

104 patients underwent RYGB during the study period (September 2015 to March 2016). There were no missing reports or missing data. The majority of patients were female (82.7%), had a mean age of 46.2 years, and class III obesity (mean body mass index 42.9kg/m^2), see Table 2. Only 3.8% of cases were considered "revisional" bariatric procedures. All revisional cases had previous laparoscopic gastric bands removed prior to the RYGB.

Table 2. Study Demographics	
Variable	**Mean (+/- SD)**
Age (years)	46.2 (7.7)
Female (%)	82.7
Body Mass Index (kg/m^2)	42.9 (5.0)
No prior abdominal surgery (%)	33.1
Revisional RYGB (%)	3.8
Procedures Performed by:	**Percentage (%)**
Surgeon 1	35.6
Surgeon 2	36.5
Surgeon 3	17.3
Surgeon 4	10.6

RYGB – Roux en Y Gastric Bypass
SD – Standard deviation

Primary Analysis

Completeness

The SR had a mean completion rate of 99.8% (+/-SD 0.98%) versus 64.0% (+/-SD 6.15%) for NR ($t=57.9$, $p<0.001$) when compared to the 75 established items. All subsections of the SR were >99% complete and significantly higher than the NR ($p<0.001$) except for small bowel division details which did not reach significance ($p=0.530$), see Table 3. The most complete subsections for the NR were the small bowel division, entero-enterostomy details, and team demographics followed by the gastrojejunostomy details (99.0%, 84.0%, 71.9%, and 69.8% respectively). The worst performing subsections for the NR were the post-operative details (36.3%), pre-operative events (41.2%), and patient details (47.0%).

Table 3. Completeness of SR versus NR				
Subsection	#Items	SR completion (mean% +/- SD)	NR completion (mean% +/- SD)	p value
Overall	**75**	**99.8 +/- 0.98**	**64.0 +/- 6.15**	**<0.001**
Team Demographics	12	99.8 +/- 1.6	71.9 +/- 13.4	<0.001
Patient Details	8	99.4 +/- 3.2	47.0 +/- 14.9	<0.001
Pre-operative Events	5	99.6 +/- 2.8	41.2 +/- 21.7	<0.001
Operative Details	13	100 +/- 0	57.9 +/- 17.8	<0.001
Small Bowel Division Details	3	99.7 +/- 3.3	99.0 +/- 9.8	0.530
Entero-enterostomy Details	7	99.9 +/- 1.4	84.0 +/- 9.2	<0.001
Gastrojejunostomy Details	14	99.8 +/- 1.6	69.8 +/- 4.6	<0.001
Closure Details	10	99.8 +/- 2.0	58.5 +/- 15.6	<0.001
Post-operative Details	3	100 +/- 0	36.3 +/- 24.6	<0.001
Completeness of SR versus NR – Bariatric QIs (Maggard *et al*)				
Overall	**21**	**57.3 +/- 6.45**	**36.0 +/- 7.83**	**<0.001**
Patient Measurements	3	98.7 +/- 9.43	38.0 +/- 28.58	<0.001
Comorbidities	8	15.3 +/- 14.79	5.8 +/- 9.52	<0.001
Intra-operative	10	78.4 +/- 4.68	59.6 +/- 15.11	<0.001

SR – Synoptic operative report
NR – Narrative operative report
SD – Standard deviation
QI – Quality indicator

Validity

Validity scores were higher for the SR than the NR with mean scores of 94.2% (+/- SD 4.31%) for the SR compared to 90.8% (+/- SD 5.75%) for the NR, p<0.001).

Accuracy

Accuracy scores were also significantly higher for the SR than the NR (mean

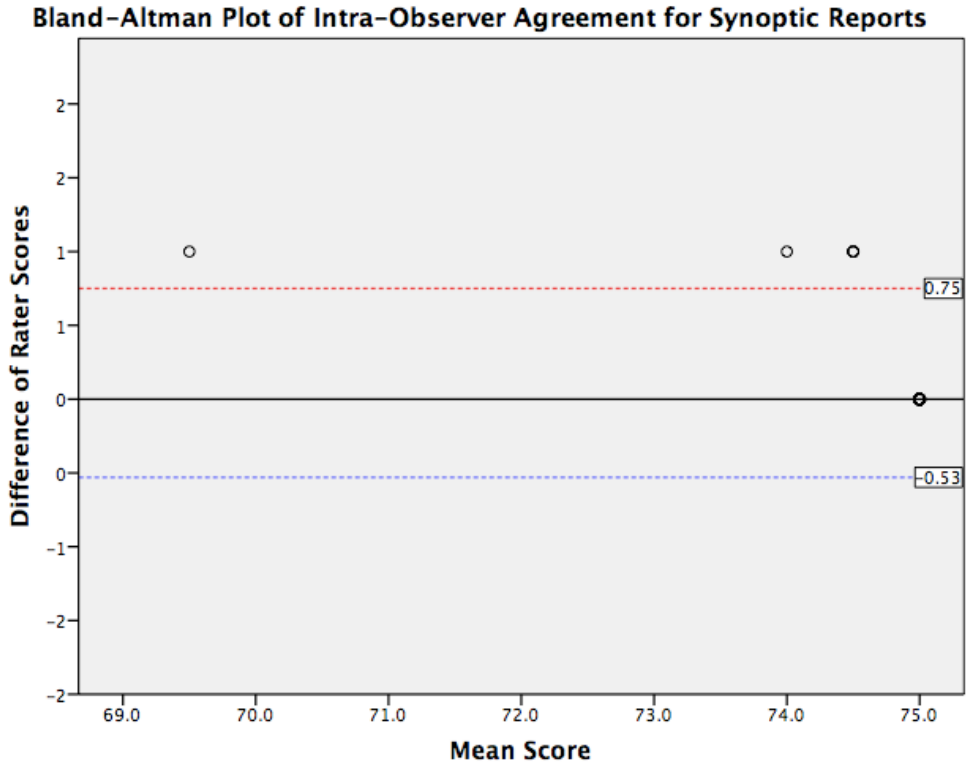
94.2% +/-SD 4.31% versus 53.6% +/- SD 9.82% respectively, p<0.001).

Secondary Analyses

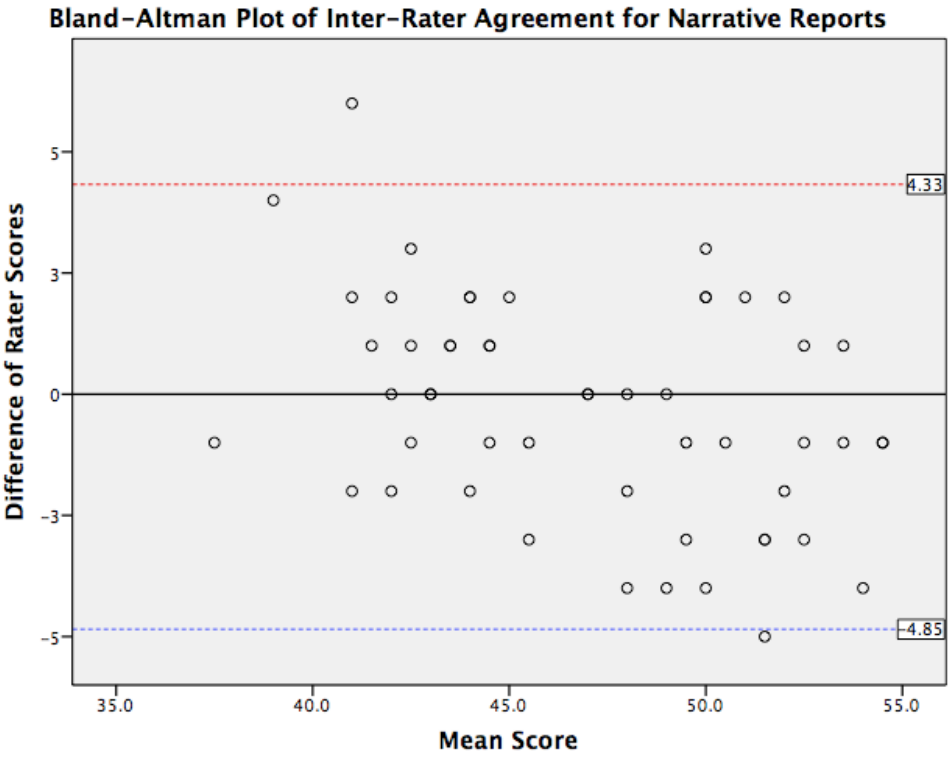
Reliability

Inter-observer agreement for the SR was excellent with a Bland-Altman score of 0.11(95% LOA -0.53 to 0.75). Inter-rater agreement for NR was similarly high with a score of -0.26 (95% LOA -4.85 to 4.33). Agreement scores between NR and SR were not statistically significant (p=0.242). See Figure 3. For Bland-Altman scores, 0 denotes perfect agreement.

Figure 3. Reliability



A.



B.

A. Synoptic Reports, **B.** Narrative Reports * Dashed lines represent 95% Limits of Agreement

Efficiency

The mean completion times for SR were significantly shorter (3:55min +/-SD 1:26min) compared to the NR (4:50min +/-SD 0:50min, p=0.007) representing a 19% reduction in mean time spent completing the operative reports. The mean transcription time for the NR was 5.19 days +/- SD 4.44 days (range 0-17 days). The SR was immediately generated upon completion.

External comparison

The SR had an overall completion rate of 57.3% compared to NR's 36.0% (p<0.001) when using the previously and independently developed indicators

[24], see Table 3. Completion rates for the intra-operative items were greater for the SR (78.4%) compared to the NR (59.6%, $p<0.001$).

Discussion

This investigation is the first analysis of synoptic operative reporting in bariatric surgery. It is also one of the only investigations in synoptic reporting to comprehensively assess accuracy and efficiency. Similar to other surgical fields, narrative reporting for RYGB is of questionable quality in terms of inclusion of elements required to adequately document the structure and processes of care for these patients in the operating room. These findings are also consistent with previous results suggesting that NRs are of poor quality in bariatric surgery[16, 22-23]. Importantly, the quality indicators used herein were specifically designed as benchmark criteria for the RYGB operative report itself [25].This is in contrast to prior investigation [16, 24]. These quality indicators were previously validated at our institution [25].

Prior evidence suggests that the most critical components of the operative report, such as the description of the laparotomy and resection, were the most poorly described in NRs[2]. Interestingly, details of the laparoscopy were also poorly described for the RYGB NR (“operative details”) at 57.9% completion[2, 16]. The main components of the operative conduct however, were the most complete (“small bowel division”, “entero-enterostomy”, and “gastrojejunostomy details” at 99.0%, 84.0%, and 69.8% respectively). This reflects similar rates in other bariatric series[16, 23] but contrasts the surgical oncology literature[2]. This likely

relates to the reproducible nature of these steps in bariatric procedures. Surgeons regularly performing RYGB may be less likely to omit critical steps in their dictations. The “pre-operative events” category, including the diet type, duration, and weight loss as well as the “patient details” subsection containing obesity-related comorbidities and BMI, had low completion rates for NR (41.2% and 47.0% respectively). This is consistent with prior evidence[2, 23]. Pre-operative patient information is essential to include in an operative report. The indications for the procedure justify its performance and are important to other caregivers and medico-legally for the responsible surgeon.

This SR format produced consistently superior completion rates to the NR with all subsections having >99% completion. This electronic platform allows for mandatory-fill items and immediately generates a report that is available to all caregivers. Although the information in the NR appears valid if it is included, the SR also shows the advantage of superior accuracy. This indicates that this SR is not only a more complete report, but is also correct and congruent with the documentation from clinic, nursing, and anesthesia services. This is important to the integrity of the medical record and confers benefit to quality assurance and research endeavors [20, 27]. The RYGB SR facilitates this. The sophistication of data analysis could be further enhanced if the SR were linked with outcomes databases on local or national levels. The information from the SR would permit cross-referencing of complications to intra-operative events. For example, one could compare internal hernia rates to mesenteric and Peterson’s space closure rates. This would facilitate institution of intra-operative quality improvement

strategies to address areas of identified weakness. Our group is actively validating quality indicators for other bariatric procedures, including sleeve gastrectomy, so that the benefits of SR can be realized across multiple operations.

There are potential barriers that should be addressed so that RYGB synoptic reporting may be implemented and accepted broadly. A recent study investigated the multi-level factors that influenced the implementation of a synoptic reporting system across several domains in Nova Scotia, Canada. The most influential factors were stakeholder involvement, management of the change process, respected colleague champions, and specific attributes of the innovation[28]. Managing the change process included educating users about the SR. This teaching outlined the advantages and value of the SR and how it fits in with the overall care of the target patient group[28]. The superior accuracy, completeness, and efficiency of the RYGB SR are convincing and may translate into improved patient care. Unfortunately, this outcome may be difficult to measure. As described previously [25], well respected stakeholders for RYGB operative reporting from multiple regions and practice settings were involved in the development of the SR items. This ensures a breadth of perspectives were included which should improve usability across disciplines. The nationwide input also implies local champions which may accelerate this platforms adoption [25]. Interestingly, Urquhart *et al* found that nearly all surgeons indicated that their trust and respect for their colleague champions were the most influential factors in their acceptance of the SR[28]. Finally, attributes of the SR itself are important

to its acceptance. A simple, user-friendly format was identified as an ideal feature of a SR to bariatric surgeons[23]. This feedback was carefully considered in the SR design to ensure ease of use. The SR is additionally more efficient than the traditional dictation with input times reduced by 1 minute on average. This confers an advantage to the time-constrained surgeon. Additional time savings will be translated to the healthcare system as an immediately available report would preclude the need for transcription services (mean 5.19 days to transcribe). This also provides cost savings. De Orio suggested that computerized templates for operative reports could result in a 77% or $98,755 reduction in transcription costs for an average 300 bed hospital per year[29]. SRs have also been suggested to be a valuable tool for teaching residents[4, 19]. This format improved not only the quality of resident-generated operative reports but also helped to improve understanding of the procedures reported[4]. Furthermore, Novitsky *et al.* suggested that errors and inaccuracies in resident NRs are as high as 28% and resulted in an estimated 9.7% ($18,200) reduction in reimbursement[30]. The improved completion rates and accuracy of the RYGB SR could consequently provide an incentive to academic surgeons working in a teaching environment. Additionally, the investigated SR does afford the opportunity for free text/dictation for non-standard components of the procedure that may be encountered. These could include steps faced in revisional bariatric procedures, such as adhesions or non-standard anatomy, or additional procedures, such as concurrent cholecystectomy. The SR is a flexible platform designed with a modular format. This allows for modification of the order of steps

undertaken in the procedure to account for stylistic differences between surgeons and would permit the addition of synoptic reports for concurrently performed procedures such as a cholecystectomy are template ‘add-ons’ specific to revisional procedures.

Despite the clear advantages of the SR, this study does have some limitations. The most apparent bias is that the items used to evaluate report quality are those used in the template development. This inherently advantages the SR. Others have suggested this is a significant weakness in the literature on synoptic reporting in general [7, 8]. Those groups however have also demonstrated superiority of the SR using externally validated rating scales [7, 8, 16]. In order to account for this bias an additional quality analysis was performed in this study using externally validated quality indicators [16, 24]. These items were developed as structural and process-based quality measures for overall bariatric surgical care but did include some items applicable to an operative report[24]. This further confirmed the superiority of SR with completion rates of their intra-operative elements of 78.4% versus 59.6% for NRs. Not surprising, the completeness of the SR was lower than in the primary analysis. However, those for the NR were quite similar. The completion rates of the NR were also almost identical to those reported by Parikh *et al* of 58% using the same quality indicators[16]. This suggests, as others have reported, an intrinsic overall quality issue in NR format. This should dissuade criticism of the SR’s viability due to the ‘bias’ in its design. Another potential confounder is a possible improved performance of NR during the study period due to attending awareness of report evaluations or potential

knowledge of the indicators. This could increase the chance of a type II error indicating there is no difference between the two formats as it should favor the NR. However, the overall completion in this series of 64.0% is similar to that reported in a retrospective audit of NRs from 2011-2015 recently performed at our institution of 62.0% using the same quality indicators and participating staff [23]. This completion rate is also comparable to that reported by Parikh, et al of 58% using externally developed quality indicators[16]. This suggests that this bias would minimally influence the results of the study if present. It is also possible that the differences in results were driven by the individual completing the report rather than the form of reporting. This is most relevant to the SR as having only one individual, the fellow, complete the report could drive increased compliance and accuracy. However, this is unlikely to be a significant confounder as the subset of SR's completed by the research fellow showed excellent inter-observer agreement. This suggests that the quality indicators reported are dependent on the SR format itself rather than the individual administering it. Finally, the SR has not been compared to the NR for readability or global quality ratings such as Structured Assessment Format for Evaluating Operative Reports[20]. This is currently planned as a follow up study to this investigation.

Conclusion

The RYGB SR is superior to NR for inclusion of accepted quality indicators and accuracy. Additionally, this platform is both reliable and efficient to use. We recommend that the RYGB SR be incorporated into clinical practice.

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Conclusion

Healthcare continues to increasingly emphasize quality improvement initiatives. Quality assessment of the current overall state of operative reporting is concerning(1-23). Repeated evaluations warn that the quality of narrative reporting is poor, especially in terms of completeness of critical elements required for essential communication and coordination amongst providers involved in surgical patient care(1-23). The literature on synoptic reporting consistently suggests that this is a superior reporting format(1-16, 18). Systematic review of the literature and meta-analysis performed demonstrated significantly improved completeness of quality indicators for those reports. In addition, this has been shown to be a more time efficient reporting format; saving the busy surgeon or their delegate precious time in the course of their practice. Varied quality analyses reviewed including accuracy, validity, and error rates have also suggested the synoptic format is superior. This reliable format simplifies interpretation for the reader by ensuring consistency between users and by standardizing reports to ensure clarity of language and format used. Limited cost analyses have been performed in the literature but all suggest a cost savings. Synoptic reporting precludes the need for transcription services and thus should counterbalance the upfront cost of its implementation(29). Despite the evident advantages of synoptic reporting, this format was untested in bariatrics, one of the most rapidly growing fields in surgery(24, 25). Established quality indicators for an operative report for bariatric surgery also did not exist.

Quality indicators are a prerequisite to a meaningful appraisal of operative reports and would be useful for developing a synoptic report.

A multidisciplinary, national Delphi group established the first quality indicators in the literature for a Roux en Y gastric bypass(30). Seventy-five quality indicators met final consensus across 3 rounds with very high response rates(30). A national needs assessment suggested that the perception amongst bariatric surgeons is that the quality of operative reports in bariatric surgery is mediocre(17). An audit of Roux en Y gastric bypass narrative reports using the 75 quality indicators confirmed their inadequacy with a mean completion rate of 62% (17). Bariatric surgeons also recounted situations where poor operative reporting was felt to have led to poor patient care and synoptic reporting was acknowledged as a potential solution to this issue(17).

The prospective trial of a novel synoptic report based on the Roux en Y gastric bypass quality indicators confirmed the dominance of this format. The synoptic report was significantly more complete than its narrative counterpart with completion rates greater than 99% for all items. This was also confirmed against externally validated criteria. In addition to completeness, this format was shown to be more valid, accurate, and time-efficient. Reliability assessment confirmed a high inter-rater agreement. To summarize, this design confers a higher quality, reliable document, and in a shorter time frame(15).

This thesis shows that synoptic reporting should be implemented into clinical bariatric surgery practice given its broad benefits. The advantages of this format have been indicated in all areas of surgery in which it has been tested and thus may have broader benefits than just bariatrics.(1-23).

Future endeavours include developing synoptic reports for other bariatric procedures. A synoptic report for a sleeve gastrectomy, another widely performed bariatric procedure, is currently under development. The eventual goal is for a design that would be a user-friendly, intellegible, computerized platform that is linked with the electronic medical record. Auto-fill patient demographic information and mandatory-complete fields would ensure that all necessary information is captured in a streamlined fashion. This document could be automatically uploaded in the electronic patient record once completed for immediate distribution and use. The reported items could also be linked to the prospective provincial outcomes database for bariatric surgery. This database includes all bariatric surgery patients and is used for quality monitoring and improvement initiatives in this province. This would allow for up-to-date and accurate operative information to be linked with patient outcomes and provide a powerful research and quality-monitoring tool. This also precludes the need for data collection personnel for this particular dataset; at an additional cost savings.

The most influential barriers to implementation suggested are stakeholder involvement, management of the change process, respected colleague

champions, and specific attributes of the innovation(31). As such, a multidisciplinary group of key stakeholders were involved in the development of this synoptic report. This same group was comprised of respected academic and community bariatric surgeons and associated stakeholder specialties. Nationally distributed representatives involved in the synoptic report's development could additionally become local champions for cross-Canada implementation. The synoptic report is designed to be simple, user-friendly, and time efficient. Common criticisms suggest they can be difficult to read and lack the subtleties to describe the general "flavour" of a procedure. This was taken into consideration with the design of this report. It was devised with attention to procedural flow. The final product would have a modular format allowing the surgeon to tailor the order of the fields to their particular operative style. Eventually this will allow addition of synoptic reports for additional procedures (eg. cholecystectomy) performed at the time of the gastric bypass. Free text fields provided also allow the surgeon to delineate unanticipated events or subtle details felt pertinent to include. This design combined with the advantages described should be convincing to those hesitant to the change. Reducing reporting errors by trainee surgeons should additionally entice academic surgeons with reduction of billing losses(32).

From an educational perspective, there are advantages and disadvantages to synoptic reporting. The literature would suggest this format may be helpful to more junior trainees by helping them to learn the steps of the procedure(5, 23).

This format also allows residents to improve their performance and create more comprehensive reports for the medical record. The drawback to the trainee surgeon is that this format perhaps deprives the student of an important cognitive task analysis tool. That is, that the process of reflection, consolidation, and organization of the recalled events required to generate a complete and well-described report, are critical to the learning process of the procedure itself. Synoptic reporting may also deprive the resident of an opportunity for feedback. However, programs continue to fail residents in appropriate training in operative dictation despite their recognition of the importance of this skill(5, 33, 34). There are potential solutions to the limitations of synoptic reporting for the learner. This could include an initial period where the junior resident completes the synoptic report with the surgeon to help learn the steps. Once familiar with the procedure, the trainee could dictate the report while the surgeon completes the synoptic for the official record. This would allow the trainee to use synoptics to their learning advantage and still allow for a process of reflection as well as provide an opportunity for feedback between the attending and resident.

Finally, realistic barriers relevant to the Canadian healthcare system are cost and privacy issues. An upfront cost of the software development and implementation of this system is very real. However, the long-term cost should be offset by the reduced transcription costs and increased efficiency of this platform(29). Health information privacy in a newly implemented computerized program is an additional issue to consider. Close consultation with electronic health experts

during the development and implementation of this platform will be required to ensure security of health information contained within reports.

Synoptic reporting for Roux en Y gastric bypass surgery is superior to traditional narrative operative reporting in quality measures and efficiency. A marketable platform should be developed with efforts to mitigate the limitations of this reporting format through alterations in design. This novel system should subsequently be integrated into clinical practice in bariatric surgery across the country.

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Appendices

Appendix 1: Needs Assessment Survey

Thank-you for accessing this needs assessment survey as part of the study: Development and Implementation of a Consensus-Derived Synoptic Operative Report for Bariatric Surgery. This study is being conducted by Dr Ashley Vergis and Dr Shannon Stogryn from the University of Manitoba. This survey is designed to gain an understanding of the current climate in operative reporting and your opinion on its existent quality and need for improvement. Your feedback will be collected through an online survey. It should take approximately 5-10 minutes to complete.
Your participation is voluntary. You are not required to provide any personal identifiers such as your name or contact details. Your participation and feedback is important to us and will be pivotal to the success of this study. If you have any questions regarding the surveys or project, please do not hesitate to contact Dr Ashley Vergis at [redacted] or [redacted] and page Dr Vergis or Dr Shannon Stogryn at
[redacted] or [redacted] This study has been approved by the University of Manitoba Health Research Ethics Board.

ONLINE SURVEY CONSENT DISCLOSURE STATEMENT

1. I consent to participate * in this survey
Yes
No

Demographics

2. Are you male or female?
Male
Female

3. What is your age?
25 - 35 years
36 - 45 years
46 - 55 years
56 - 65 years
> 65 years

4. Where did you complete your residency training?
Canada

USA
International (Commonwealth)
Other International (please specify)

5. Did you undertake fellowship training?
Yes
No

6. If yes, where did you undertake your fellowship training?
Canada
USA
International (Commonwealth)
Other International (please specify)

7. In which subspecialty was your fellowship training?
Bariatrics
Minimally Invasive Surgery
Minimally Invasive Surgery/Bariatrics
Other (please specify)

8. Where do you currently practice?
Academic Tertiary Centre
Community Hospital
Academic Community Hospital
Rural Community Hospital
Mixed/Other (please specify)

9. How long have you been in practice?
< 5 years
5 - 15 years
16 - 20 years
> 20 years

Practice Characteristics

10. Do you routinely perform minimally invasive bariatric surgery as part of your practice?
Yes
No
3
11. What percentage of your clinical time do you spend doing bariatric surgery?
< 10%
10 - 25%
25 - 50%
50 - 75%

> 75%
12. Which bariatric procedure do you perform? (Select all that apply)
Laparoscopic Roux-en-Y Gastric Bypass
Laparoscopic Sleeve Gastrectomy
Laparoscopic Biliopancreatic Diversion with Duodenal Switch
Laparoscopic Gastric Banding
Mini Gastric Bypass
Gastric Plication
Revisional Bariatric Surgery
Other (please specify)

13. Which bariatric procedure do you perform the most frequently? (Please rank all that apply)
Laparoscopic Roux-en-Y Gastric Bypass
Laparoscopic Sleeve Gastrectomy
Laparoscopic Biliopancreatic Diversion with Duodenal Switch
Laparoscopic Gastric Banding
Mini Gastric Bypass
Gastric Plication
Revisional Bariatric Surgery
Other (as listed above)

14. Approximately how many Laparoscopic Roux-en-Y Gastric Bypasses do you perform per year?

15. How do you currently report your operative reports?
Narrative operative dictation
Narrative operative dictation from a template
Synoptic operative report (paper)
Synoptic operative report (electronic)
Other (please specify)

Narrative Operative Reporting - Attendings

16. Several domains have been suggested to be important characteristics of high-quality operative reports
(see below).

Of the narrative reports for bariatric surgery that you have reviewed produced by attending surgeons, please rate the following:

1. Readability of Dictation

1	2	3	4	5
Dictation is difficult to read and disorganized with incoherent flow		Dictation is relatively easy to read but at times lacks flow		Dictation is easy to read and well organized with coherent flow

2. Description of Operative Indications

1	2	3	4	5
Description of preoperative course or indications is not included		Preoperative course and indications are described but lack details or inaccurate		Dictations includes a complete description of preoperative course & indications for specific procedures performed

3. Inclusion of Operative Steps

1	2	3	4	5
Dictation is incomplete with many important steps missing		Dictation includes most important steps but some detail is missing		Dictation is comprehensive and includes all important steps of the bariatric procedure

4. Description of Operative Findings

1	2	3	4	5
Operative findings described are irrelevant or omitted completely		Operative findings are described but some relevant detail is lacking		Operative findings are presented in a relevant and detailed fashion

5. Succinctness of Dictation

1	2	3	4	5
Dictation is unnecessarily long with excessive inclusion of extraneous detail or truncated & lacking important elements		Dictation is relatively concise and inclusive with some extraneous detail included		Dictation is concise but inclusive with exclusion of extraneous detail

6. Clarity of Dictation

1	2	3	4	5
Description of included steps are vague and unintelligible		Description of included steps are relatively clear and intelligible		Description of included steps are clear and complete

7. Knowledge of Procedure/Anatomy

1	2	3	4	5
Dictation shows lack of understanding of the procedure and relevant anatomy		Dictation shows a reasonable understanding of the procedure and relevant anatomy		Dictation demonstrates a full understanding of the procedure and relevant anatomy

8. Reproducibility of Operative Procedure

1	2	3	4	5
Recreation of operative events would be impossible from the dictation		Readers could recreate events using own knowledge to fill in gaps		Readers would have a complete understanding of operation and could recreate the bariatric procedure step by step

OVERALL QUALITY

1	2	3	4	5
Generally unacceptable dictation with major deficiencies		Acceptable dictation overall with some room for improvement		Excellent dictation with quality consistent with that expected of high quality operative documentation

24. Of the narrative reports for bariatric surgery that you have reviewed produced by trainees, please rate the following:

1. Readability of Dictation

1	2	3	4	5
Dictation is difficult to read and disorganized with incoherent flow		Dictation is relatively easy to read but at times lacks flow		Dictation is easy to read and well organized with coherent flow

2. Description of Operative Indications

1	2	3	4	5
Description of preoperative course or indications is not included		Preoperative course and indications are described but lack details or inaccurate		Dictations includes a complete description of preoperative course & indications for specific procedures performed

3. Inclusion of Operative Steps

1	2	3	4	5
Dictation is incomplete with many important steps missing		Dictation includes most important steps but some detail is missing		Dictation is comprehensive and includes all important steps of the bariatric procedure

4. Description of Operative Findings

1	2	3	4	5
Operative findings described are irrelevant or omitted completely		Operative findings are described but some relevant detail is lacking		Operative findings are presented in a relevant and detailed fashion

5. Succinctness of Dictation

1	2	3	4	5
Dictation is unnecessarily long with excessive inclusion of extraneous detail or truncated & lacking important elements		Dictation is relatively concise and inclusive with some extraneous detail included		Dictation is concise but inclusive with exclusion of extraneous detail

6. Clarity of Dictation

1	2	3	4	5
Description of included steps are vague and unintelligible		Description of included steps are relatively clear and intelligible		Description of included steps are clear and complete

7. Knowledge of Procedure/Anatomy

1	2	3	4	5
Dictation shows lack of understanding of the procedure and relevant anatomy		Dictation shows a reasonable understanding of the procedure and relevant anatomy		Dictation demonstrates a full understanding of the procedure and relevant anatomy

8. Reproducibility of Operative Procedure

1	2	3	4	5
Recreation of operative events would be impossible from the dictation		Readers could recreate events using own knowledge to fill in gaps		Readers would have a complete understanding of operation and could recreate the bariatric procedure step by step

OVERALL QUALITY

1	2	3	4	5
Generally unacceptable dictation with major deficiencies		Acceptable dictation overall with some room for improvement		Excellent dictation with quality consistent with that expected of high quality operative documentation

33. Of the narrative operative dictations that you have dictated/read for laparoscopic bariatric surgery, how would you rate the timeliness of the report?

Excessive delays in receiving reports
Short delays in receiving reports
Consistently very timely

34. Have you experienced a situation where poor operative reporting has led to poor patient care?
Yes
No

35. If yes, please provide an example.

36. Apart from the domains assessed above, how do you feel narrative operative reports could be
improved? Please list.

Synoptic Operative Reports

37. Have you ever read or interpreted a synoptic operative report?
Yes
No

Synoptic Operative Reports

38. Of the synoptic operative reports (non-bariatric surgery) that you have reviewed, please rate the following:

1. Readability of Dictation

1	2	3	4	5
Dictation is difficult to read and disorganized with incoherent flow		Dictation is relatively easy to read but at times lacks flow		Dictation is easy to read and well organized with coherent flow

2. Description of Operative Indications

1	2	3	4	5
Description of preoperative course or indications is not included		Preoperative course and indications are described but lack details or inaccurate		Dictations includes a complete description of preoperative course & indications for specific procedures performed

3. Inclusion of Operative Steps

1	2	3	4	5
Dictation is incomplete with many important steps missing		Dictation includes most important steps but some detail is missing		Dictation is comprehensive and includes all important steps of the bariatric procedure

4. Description of Operative Findings

1	2	3	4	5
Operative findings described are irrelevant or omitted completely		Operative findings are described but some relevant detail is lacking		Operative findings are presented in a relevant and detailed fashion

5. Succinctness of Dictation

1	2	3	4	5
Dictation is unnecessarily long with excessive inclusion of extraneous detail or truncated & lacking important elements		Dictation is relatively concise and inclusive with some extraneous detail included		Dictation is concise but inclusive with exclusion of extraneous detail

6. Clarity of Dictation

1	2	3	4	5
Description of included steps are vague and unintelligible		Description of included steps are relatively clear and intelligible		Description of included steps are clear and complete

7. Knowledge of Procedure/Anatomy

1	2	3	4	5
Dictation shows lack of understanding of the procedure and relevant anatomy		Dictation shows a reasonable understanding of the procedure and relevant anatomy		Dictation demonstrates a full understanding of the procedure and relevant anatomy

8. Reproducibility of Operative Procedure

1	2	3	4	5
Recreation of operative events would be impossible from the dictation		Readers could recreate events using own knowledge to fill in gaps		Readers would have a complete understanding of operation and could recreate the bariatric procedure step by step

OVERALL QUALITY

1	2	3	4	5
Generally unacceptable dictation with major deficiencies		Acceptable dictation overall with some room for improvement		Excellent dictation with quality consistent with that expected of high quality operative documentation

46. Apart from the domains assessed above, how do you feel synoptic operative reports could be
improved? Please list.

Synoptic Operative Reports

47. Synoptic operative reports have been suggested to be superior to narrative reports in several areas of surgery for quality, completeness, and timeliness. Do you agree that a synoptic report could improve operative reports in bariatric surgery?

Strongly Disagree
Neutral
Strongly Agree

48. If you disagree, why? Please list.

49. Do you have any general comments regarding operative dictations or synoptic reports?

50. If you were developing an ideal synoptic operative report for bariatric surgery, what would be the key features you would like to see? (eg. Simple format, sequence of events in order to facilitate flow, time efficient, etc). Please list.

Thank you so much for your participation in the Bariatric Operative Reporting: Perceptions of Quality Amongst Canadian Bariatric Surgeons survey! Your feedback is greatly appreciated.

Appendix 2: Delphi Survey Round 1

Thank-you for accessing the survey for the study: Development and Implementation of a Consensus-Derived Synoptic Operative Report for Bariatric Surgery. This study is being conducted by Dr Ashley Vergis and Dr Shannon Stogryn from the University of Manitoba. This survey is designed to develop consensus-derived quality indicators for a Roux en Y gastric bypass (RYGB). Our aim is to develop and pilot a validated synoptic operative reporting system for use in RYGB surgery with the goal of improved communication of operative details. Your feedback will be collected through an online survey. It should take less than 10 minutes to complete. This will be one in a series of surveys for a modified Delphi protocol. Your participation is voluntary. You are not required to provide any personal identifiers such as your name or contact details.
Your participation and feedback is important to us and will be pivotal to the success of this study. If you have any questions regarding the surveys or project, please do not hesitate to contact Dr Ashley Vergis at [redacted] or [redacted] and page Dr Vergis or Dr Shannon Stogryn at [redacted] or [redacted] This study has been approved by the University of Manitoba Health Research Ethics Board.

ONLINE SURVEY CONSENT DISCLOSURE STATEMENT

1. I Consent to participate in this survey
Yes
No

Thank you for your participation in this survey.

Welcome participants! The following items have been assembled by the Winnipeg working group of surgeons as potential themes to include in an operative report for a Laparoscopic Roux-en-Y Gastric Bypass (RYGB). Your opinion is requested to establish consensus on the importance of items based on the below themes
to include therein in order to determine the quality indicators for this procedure.

Please provide a list of individual items which should be included under each heading in a high quality operative report for a Laparoscopic RYGB.

2. Team Demographics (ie procedure date/surgeon, etc):

3. Patient Demographics (eg BMI/gender, etc):

4. Preoperative Events/Prep (eg weight loss/diet, etc.):

5. Intra-Operative Procedure Details:

6. Post-operative Details/Plan (eg Estimated blood loss/plan, etc):

7. Are there any headings you feel are missing? If so, please list.

8. If you suggested an additional heading, please list items which should be included under this heading.

Thank you so much for your participation in the modified Delphi survey (Round 1)! Your feedback is greatly appreciated.

Appendix 3: Delphi Survey Round 2

Thank-you for accessing the survey for the study: Development and Implementation of a Consensus-Derived Synoptic Operative Report for Bariatric Surgery. This study is being conducted by Dr Ashley Vergis and Dr Shannon Stogryn from the University of Manitoba. This survey is designed to develop consensus-derived quality indicators for a Roux en Y gastric bypass (RYGB). Our aim is to develop and pilot a validated synoptic operative reporting system for use in RYGB surgery with the goal of improved communication of operative details. Your feedback will be collected through an online survey. It should take 5 - 10 minutes to complete. This will be one in a series of surveys for a modified Delphi method. Your participation is voluntary. You are not required to provide any personal identifiers such as your name or contact details.
Your participation and feedback is important to us and will be pivotal to the success of this study. If you have any questions regarding the surveys or project, please do not hesitate to contact Dr Ashley Vergis at [redacted] or [redacted] and page Dr Vergis or Dr Shannon Stogryn at [redacted] or [redacted]
This study has been approved by the University of Manitoba Health Research Ethics Board.

ONLINE SURVEY CONSENT DISCLOSURE STATEMENT

1. I Consent to participate in this survey
Yes
No

Introduction

Thank you again for participating in our study and for the excellent response to the Round 1 survey! The items presented in the below survey have been generated from your responses in Round 1. The aim of this round is to gauge the group's opinion on whether each suggested item should be included in the final list of quality indicators for a high-quality, comprehensive operative report for RYGB. For each item listed under the original headings, please rate your level of agreement or disagreement that it be included in the final list of quality indicators for a RYGB. This final list will be used to generate our synoptic operative report. Thank you!

Team Demographics

2. Team Demographics (ie procedure date/surgeon, etc):
Please rate your level of agreement that each suggested quality indicator be included in an operative
report.

1-Strongly Disagree
2
3-Disagree
4
5--Neither Agree or Disagree
6
7-Agree
8
9-Strongly Agree

Items:
Procedure date
Procedure time (of day)
Hospital
Dictation Date
Dictated by
Surgeon
Fellow (if present)
Trainee (ie. resident and year of training)
First assitant (define as surgeon/fellow/resident/family physician/physician assistant)
Second assistant, if present (spec as per first assist)
Anesthesia
Preamble about consent

3. Do you have any comments regarding the above items? (Please list)

Patient Demographics

4. Patient Demographics (eg BMI, gender, etc):
Please rate your level of agreement that each suggested quality indicator be included in an operative report.

1-Strongly Disagree
2
3-Disagree
4
5--Neither Agree or Disagree
6
7-Agree
8

9-Strongly Agree

Items:
Name
Age
Sex
DOB
PHIN
Pre operative diagnosis:
Class II/III obesity
Post operative diagnosis
Preoperative height/weight
Preoperative BMI (current):
___Kg/m2
Comorbidities
ASA score
Additional clinical
information/gastrointestinal
conditions
Previous abdominal
surgery/bariatric
surgery/incisions
Body shape -
i.e. pear/central obesity

5. Do you have any comments regarding the above items? (Please list)

Preoperative Events/Preparation

6. Preoperative Events/Prep (eg weight loss, diet, etc):
Please rate your level of agreement that each suggested quality indicator be included in an operative report.

1-Strongly Disagree
2
3-Disagree
4
5--Neither Agree or Disagree
6
7-Agree
8
9-Strongly Agree

Weight loss attempts prior

Pre-operative diet type
Pre-operative diet duration (weeks)
Compliance with diet
Weight loss on diet
Weight pre and post diet
Inclusion of prehabilitation
Pre-operative OGD

7. Do you have any comments regarding the above items? (Please list)

Intra-operative Procedure Details

8. Intra-operative procedure details:
Please rate your level of agreement that each suggested quality indicator be included in an operative report.

1-Strongly Disagree
2
3-Disagree
4
5--Neither Agree or Disagree
6
7-Agree
8
9-Strongly Agree

Procedure planned
Procedure performed
Additional procedures performed - anticipated/unanticipated
Pre-operative antibitoics: type, dose, route
Thromboprophylaxis: type, dose, route
Sequential Compression Devices (SCD's): Yes/no
Compression stockings: yes/no
Skin prep: type
Time out performed
Patient position
Pneumoperitoneum: Hassan/Veress

Pneumoperitoneum:
complications
Port types
Final port placement:
(including liver retractor)
Type of liver retractor
General laparoscopy
findings
Omental division:
Yes/no/method
Biliary limb length
Roux limb length

9. Entero-* enterostomy details

1-Strongly Disagree
2
3-Disagree
4
5--Neither Agree or Disagree
6
7-Agree
8
9-Strongly Agree

# of Stapler
firings/brand/colour
Closure technique
(stapled, sutured)
Closure: stapler
(firings/brand/colour)
Closure: suture and
method
(running/interrupted)
Anti-obstruction stich:
yes/no, suture type
method
Mesenteric closure:
yes/no, suture type
method

10. Gastrojejunostomy Details:

1-Strongly Disagree
2
3-Disagree
4
5--Neither Agree or Disagree
6
7-Agree
8
9-Strongly Agree

Anti/retro colic
Size of pouch (length,
sizer/bougie/width)
# of Stapler firings/brand/colour:
Use of clips on pouch: yes/no/location
Anastomotic technique: handsewn,
linear stapled, circ stapled
Suture and method
(running/interrupted/transverse/vertical/#
of layers) if applicable
Circular/linear stapler/size/brand (if
applicable):
Leak test: yes/no
Leak test: Method(s)/satisfactory/leak
Use of gastroscopy or not

11. Intra-opeative procedure * details continued:

1-Strongly Disagree
2
3-Disagree
4
5--Neither Agree or Disagree
6
7-Agree
8
9-Strongly Agree

Petersons space closure:
yes/no/suture type/method
Port closure
Skin closures
Intraop complications:
iatrogenic injury, leak,

bleeding, stapler misfire, transfusion
Other adverse events (with free text if yes)
Additional procedures - chole/hernia/other
Sponge and instrument counts
Any drains placed

12. Do you have any comments regarding the above items? (Please list)

Post-Operative Details/Plan

13. Post operative details/plan (eg estimated blood loss, plan, etc):
Please rate your level of agreement that each suggested quality indicator be included in an operative report.

1-Strongly Disagree
2
3-Disagree
4
5--Neither Agree or Disagree
6
7-Agree
8
9-Strongly Agree

Estimated Blood Loss
Operative time (skin to skin)
Pathologic/Micro bio Specimens
Free text (additional/unusual findings, events, procedures performed)
Post-operative condition
Transfer location - Ward/PACU/OSA/ICU
Expected length of stay
Care as per bariatric surgery postop clinical pathway

Use of Telemetry/Oximtery
Medicine Consult Pending
Potential anticipated complications and prevention plan
Post-operative DVT Prophylaxis
Use of post-operative antibiotics
Follow up plan

14. Do you have any comments regarding the above items? (Please list)
Additional Items

15. Do you feel that any important quality indicators for a RYGB are missing from this survey?
Yes
No

16. If yes, please list below.

Thank you so much for your participation in the modified Delphi survey (Round 2)! Your feedback is greatly appreciated.

Appendix 4: Delphi Survey Round 3

Introduction

Thank you again for participating in our study! The items presented in the below survey are those that did not reach consensus in the Round 2 survey. The aim of this round is to gauge the group's final opinion on whether each item should be included in the final list of quality indicators for a high-quality, comprehensive operative report for Roux en Y Gastric Bypass. For each item listed, please rate your level of agreement or disagreement for its inclusion. This final list will be used to generate our synoptic operative report. Thank you!

1. Team Demographics (ie procedure date/surgeon, etc):
Please rate your level of agreement regarding inclusion of the suggested quality indicators

1-No
2-Neutral
3-Yes

Procedure time (of day)
Preamble about consent

2. Patient Demographics (eg BMI, gender, etc):
Please rate your level of agreement regarding inclusion of the suggested quality indicators.

1-No
2-Neutral
3-Yes

ASA Score
Previous abdominal surgery/bariatric surgery
Body shape (gynecoid/android)

3. Preoperative Events/Prep (eg weight loss, diet, etc):
Please rate your level of agreement regarding inclusion of the suggested quality indicators.

1-No
2-Neutral
3-Yes

Prior weight loss attempts
Pre-operative diet type
Pre-operative diet duration (weeks)
Compliance with diet
Weight loss on diet (if accurate information available)
Weight pre diet

Weight post diet
Inclusion of prehabilitation
Pre-operative OGD

4. Intra-operative procedure details:
Please rate your level of agreement regarding inclusion of the suggested quality indicators.

1-No
2-Neutral
3-Yes

Type of liver retractor used

5. Post operative details/plan (eg estimated blood loss, plan, etc):
Please rate your level of agreement regarding inclusion of the suggested quality indicators.

1-No
2-Neutral
3-Yes

Expected length of stay
Care as per bariatric surgery post op clinical pathway
Use of telemetry/oximetry
Medicine consult pending
Potential anticipated complications and prevention plan
Post-operative DVT prophylaxis
Use of post-operative antibiotics
Follow-up plan

6. Do you have any comments regarding the above listed items? (Please list)

Thank you so much for your participation in the Delphi Survey (Round 3)! Your feedback is greatly appreciated.

Appendix 5: Delphi Item Scoring Sheet

Patient ID: ☐ yes ☐ no

DEMOGRAPHICS

Procedure date: ☐ yes ☐ no _____

Report date: ☐ yes ☐ no

Reported by: ☐ yes ☐ no

Pre-operative dx: ☐ yes ☐ no

Post-operative dx: ☐ yes ☐ no

Procedure planned: ☐ yes ☐ no

Procedure performed: ☐ yes ☐ no _____

Mes defects closed: ☐ yes ☐ no

Attending Surgeon: ☐ yes ☐ no _____

First Assistant: ☐ yes ☐ no _____

Second Assistant: ☐ yes ☐ no _____

Anesthesia: ☐ yes ☐ no

PATIENT DETAILS

Patient Age: ☐ yes ☐ no _____

Patient Sex: ☐ yes ☐ no _____

Height (cm): ☐ yes ☐ no _____

Pre-op weight (kg): ☐ yes ☐ no _____

Pre-op BMI (kg/m2): ☐ yes ☐ no

Comorbidities: ☐ yes ☐ no _____

Addit/GI conditions: ☐ yes ☐ no _____

Prev abdo surgeries: ☐ yes ☐ no _____

PREOP EVENTS

Pre-op diet type: ☐ yes ☐ no

PreOp diet duration: ☐ yes ☐ no

Wt loss on diet(kg): ☐ yes ☐ no

Wt post diet (kg): ☐ yes ☐ no

Pre-op OGD: ☐ yes ☐ no

OPERATIVE DETAILS

Addit procedures: ☐ yes ☐ no

Pre-op Abx : ☐ yes ☐ no _____

Thromboprophylaxis: ☐ yes ☐ no _____

SCDs: ☐ yes ☐ no _____

Compress Stockings: ☐ yes ☐ no

Skin Prep Type: ☐ yes ☐ no _____

Time-out performed: ☐ yes ☐ no _____

Patient position: ☐ yes ☐ no _____

Pneumoperitoneum: ☐ yes ☐ no

Pneumo complication: ☐ yes ☐ no

Port placement: ☐ yes ☐ no

Laparoscopy finding: ☐ yes ☐ no

Omental division: ☐ yes ☐ no

SM BOWEL DIVISION

Sm bowel division: ☐ yes ☐ no _____

Biliary length (cm): ☐ yes ☐ no

Roux length (cm): ☐ yes ☐ no

ENTERO-ENTEROSTOMY

Ent/Ent Staples: ☐ yes ☐ no _____

Ent/Ent Staplers: ☐ yes ☐ no _____

Closure technique: ☐ yes ☐ no

Closure sut/method: ☐ yes ☐ no

Closure staples: ☐ yes ☐ no

Anti-obstruc stitch: ☐ yes ☐ no

Mesenteric closure: ☐ yes ☐ no

GASTROJEJUNOSTOMY

GJ position: ☐ yes ☐ no

Length of pouch(cm): ☐ yes ☐ no

Bougie: ☐ yes ☐ no

G Pouch Staplers: ☐ yes ☐ no _____

G Pouch Staplers: ☐ yes ☐ no _____

Use of clips: pouch: ☐ yes ☐ no

Anast technique: ☐ yes ☐ no

Anast Staplers: ☐ yes ☐ no

Closure Suture: ☐ yes ☐ no

Hand Anast Suture: ☐ yes ☐ no

Closure Staplers: ☐ yes ☐ no

Leak test: ☐ yes ☐ no

Gastroscopy: ☐ yes ☐ no

Petersons closure: ☐ yes ☐ no

CLOSURE

Port closure: ☐ yes ☐ no

Skin closure: ☐ yes ☐ no

IntOp complications: ☐ yes ☐ no

Location complicat: ☐ yes ☐ no

Unexpect find/event: ☐ yes ☐ no

Sponge/instr count: ☐ yes ☐ no _____

Drains placed: ☐ yes ☐ no _____

EBL (cc): ☐ yes ☐ no

Operat time (h:min): ☐ yes ☐ no _____

Path/micro specimen: ☐ yes ☐ no _____

POST OP DETAILS

PostOp condition: ☐ yes ☐ no

PostOp DVT prophyl: ☐ yes ☐ no

Additional info: ☐ yes ☐ no