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Advancement in the quality of operative documentation: A systematic review and meta-analysis of synoptic versus narrative operative reporting

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ABSTRACT

Background: The operative report is vital for patients and central to surgical quality assessment. Narrative operative reports are often poor quality. Synoptic reporting can improve documentation. The objective was to identify and appraise studies comparing synoptic and narrative operative reporting.
Data sources: A systematic review of the literature was performed. The primary outcome was completion of critical elements for an operative report. Additional secondary outcomes were measured. Meta-analysis was performed where possible. Quality analysis was performed using Newcastle-Ottawa Scale (NOS).
Results: 1471 citations were identified; 16 studies included. Mean NOS was 7.09 out of 9 (+/−- SD 1.73). Meta-analysis demonstrated that synoptic reporting was significantly more complete (SMD 1.70, 95% CI 1.13 to 2.26; I^2 98%). Completion time was shorter with synoptic reporting (mean difference −0.86, 95% CI -1.17 to −0.55). Secondary outcomes favoured synoptic reporting.
Conclusions: Synoptic reporting platforms outperform narrative reporting and should be incorporated into surgical practice.

Introduction

Quality assurance and improvement is a prominent focus in health care. Quality indicators are used to identify, assess, and enhance quality of care while improving patient outcomes and reducing system costs.[1–3] The data derived can be used for comparison, to inform intervention strategies, and provide performance and accountability benchmarks.[1]

Surgical care represents a significant portion of our health care system and continues to grow.[4]

Most quality assessment is achieved by collecting data from medical record audits; typically abstracted from the patient chart. For surgical patients, this includes the operative report which is a vital document,[1,5,6] detailing important processes of care occurring in the operating room. Appropriate and accurate operative reporting has been identified as a significant area of weakness in surgical patient care.[6–10] Poor documentation can compromise care, especially in circumstances of perioperative complications.[11] Documented surgical and anatomical information within an operative report can be essential to the diagnosis of, and management decisions for these complications.[9–11] The operative report thus has the potential to significantly impact patient care.

Traditional narrative operative reporting has been found to be of poor quality; details critical to clinical decisions are frequently undocumented or inaccurate.[1,5,9–21] These reports are typically dictated by the surgeon or their delegate in a step-by-step fashion after the operation has been performed.

Standardized operative reports, or synoptic reports, have subsequently emerged. Modern synoptic reports are computerized,

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template-based and procedure-specific reports, offering the potential for dramatic improvement in report rates of essential operative quality indicators.[1,5,9–22] As opposed to narrative reports, these tend to be reported in a point form style. Recent studies report impressive completion rates, enhanced accuracy, and efficiency.[1,5,9–12] The majority of evidence on synoptic reporting is derived from small studies, many of which are retrospective. No comprehensive review has been published comparing synoptic operative and traditional narrative reporting.

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

Materials and methods

A systematic review was performed using the Methodological Expectations of Cochrane Intervention Reviews guidelines[23]; results were reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines.[24] The roles of review team members are listed in the Online Resource 1. The null hypothesis tested was: 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.

The search strategy is given in Online Resource 2. Medline (Ovid), Embase (Ovid), Cochrane Central (Wiley), Scopus (Elsevier), CINAHL (EBSCOhost), and Web of Science Core Collection (Thompson Reuters) were searched using a search strategy developed by a professional health science librarian; last updated June 2017. A combination of controlled vocabulary and keyword queries were used. A series of keyword strategies were created to access all relevant 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. Hand searches of all included study reference lists were performed. Searches were not limited by language, date of publication, or publication status.

Two independent reviewers evaluated the search results for consideration of inclusion. Citations meeting the broad inclusion criteria had the full-text publication retrieved and reviewed independently by the two reviewers. Disagreements were settled by discussion and consensus.

Only studies comparing a synoptic operative report format to a traditional narrative operative report were included. Surgeons or their delegates generated the operative reports; produced after performing surgical interventions where a report would be required to document the procedure in the medical record. 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 were dictated or written ad lib without a standardized format.

The primary outcome was completeness; defined as a percentage score for completion of pre-determined list items identified as pertinent to the documentation for the evaluated procedure. Secondary outcomes included (1) Reliability; defined as a measure of consistency of documentation for the evaluated platform of the study (e.g. interrater/inter-observer 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, and (4) Cost; defined as a measure of cost per operative note.

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

Two reviewers assessed all included studies for methodological quality using the Newcastle-Ottawa Scale (NOS). These scales assess the quality of case-controlled and cohort studies. Disagreements were settled by discussion and consensus.

Results

Search results

Database searches identified 1471 citations with forward and backward searches providing an additional 146 resulting in a total of 1617 titles (Fig. 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.

A total of 2760 operative reports were evaluated in the included studies. A total of 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.[25] 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 (2 studies from the United Kingdom).[21,22] 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; only three studies collected data entirely retrospectively.[17,20,22]

Study quality was assessed; mean Newcastle-Ottawa score 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), suggesting this format outperforms narrative reporting in terms of completeness. Three studies with the most pronounced interventional effect were identified as contributing significantly to the observed heterogeneity[5,9,19]; when removed from pooled analysis, I^2 decreased to 67% and the summary effect remained significant (SMD 0.84, 95% CI 0.68 to 1.00) (Fig. 2). Subgroup analyses were performed to investigate the source(s) of the heterogeneity but was not identified. A funnel plot was created and demonstrated a significant risk of publication bias (Fig. 3).

Secondary outcomes (Table 2)

Pooled analysis on the time to complete the operative report was shorter for synoptic reporting (SMD -0.86, 95% CI -1.17 to −0.55; 6 studies; 891 reports). The forest plot and confidence intervals however, suggest that this did not reach statistical

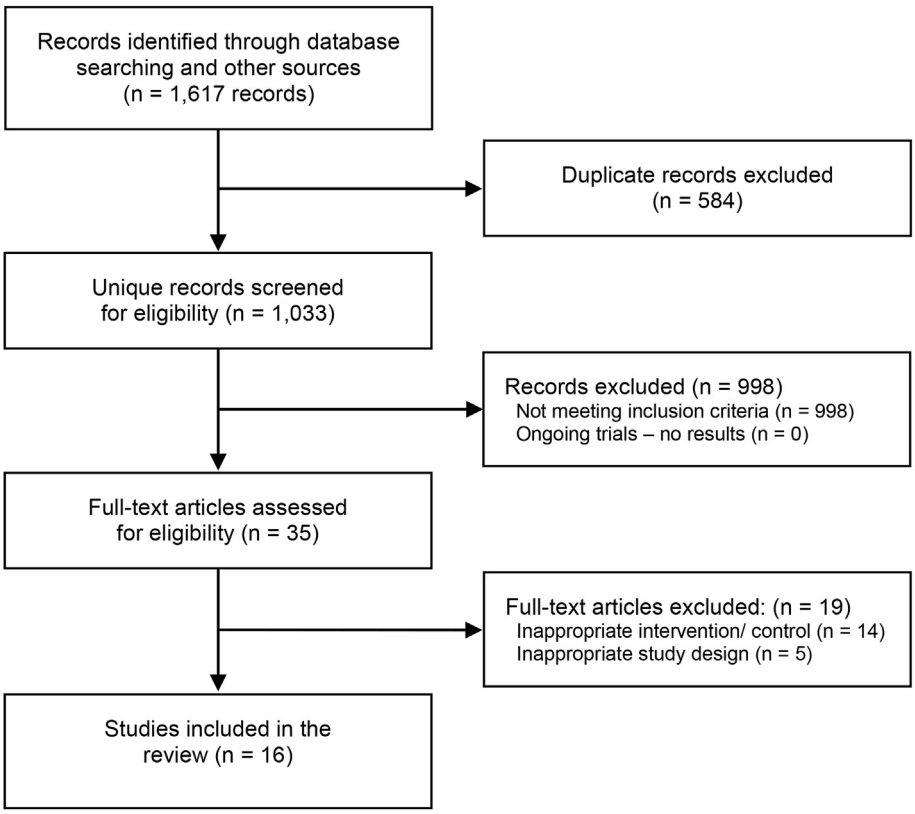

Fig. 1. Modified PRISMA flow-chart.

significance (Fig. 4). Efficiency, quality, reliability, and cost-effectiveness measures were reported amongst the included studies and all demonstrated a trend towards favouring synoptic reporting (Table 2). Scarcity of data, heterogeneous reporting, and missing data elements prevented meta-analysis of these outcomes with the majority stemming from solitary studies. Inter-rater reliability was reported in 4 included studies with 943 reports. The reliability for synoptic reporting was favoured compared to narrative operative reporting. Several unique and varied measures of quality were reported in the included studies including accuracy, validity, and several types of error rates. All analyses favoured the synoptic platform. The cost data reported are from 2 source studies and suggest a cost savings of $8.27/note with synoptic reporting. These analyses are based solely on transcription costs and on an assumption of no cost for the synoptic platform.

Discussion

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

Quality improvement plans require accurate and up-to-date data.[2,3,28] Synoptic reports have been shown to be more complete than narrative ones. The electronic format facilitates ease of data collection and interpretation with the potential for electronic linkage with quality monitoring and improvement databases. This could provide a powerful research tool. Advantages include real-time data collection and reduced data collection time with the cost of the associated dedicated staff. Some may feel that this addition to a data-overloaded system is unreasonable. However, a thorough and complete synoptic operative report provides a succinct platform with consolidated relevant patient data. This also decreases extraction time by eliminating the need to review multiple data sources.

Synoptic operative reporting potentially affords ready access to relevant operative and anatomical information for care providers, permitting informed clinical decisions, and is especially pertinent in oncologic surgery where eligibility for, and coordination of, adjuvant treatments are reliant on key operative information. This is also vital to the management of postoperative complications, where details of the index procedure influence the approach to, diagnosis, and treatment of the surgical patient.[9,11]

Individual studies reported additional advantages including higher inter-rater reliability, improved efficiency, decreased cost, and error rates for the synoptic platform. Enhanced reliability implies more consistent reporting between users and more consistent quality of documentation. Reduced completion time improves efficiency for surgeons. The reduced time to complete synoptic reports and their expedited availability in the medical record allows prompt access to operative information. This benefits patients and care providers especially when surgical complications occur in the first few post-operative days. Typically, dictated reports are unavailable for several days due to transcription times. Potentially reduced costs (-$8.27/note) with a synoptic platform combined with its improved efficiency has the potential for enhancing healthcare system delivery.

Synoptic operative reporting does have disadvantages however. Many surgeons feel synoptic reports are difficult to read and do not

Table 1
Study characteristics[1, 2].

ID	Country	N	Study Type	Intervention	Procedure	NOS # Stars
Chambers, Surgery 2009[13]	Can	180	Prospective Cohort with Retrospective Control	SR vs NR	Thyroidectomy	9
Cowan, Am Soc Derm Surg 2007[14]	USA	110	Prospective Cohort	SR vs NR	Mohs Microsurgery	6
Edhemovic, Ann Surg Oncol 2004[12]	Can	80	Prospective Cohort with Retrospective Control*	SR vs NR	Anterior Resection, Abdominal Perineal Resection	7
Gardner, Gyne Onc 2009[25]	USA	–	Prospective Cohort with Retrospective Control	SR vs NR	Gynecological Surgery (Unstated)	4
Gur, Arch Surg 2012[15]	USA	120	Prospective Cohort	SR vs NR	Breast Conserving Surgery, Mastectomy, Sentinal Lymph Node Biopsy, Axillary Nodal Dissection	7
Harvey, Surgery 2007[16]	Can	221	Prospective Cohort	SR vs NR	Laparoscopic Cholecystectomy	7
Hoffer, Int J Med Inform 2012[17]	Can	189	Retrospective Case Control	SR vs NR	Radical Nephrectomy, Partial Nephrectomy	6
LaFlamme, AMIA 2005 Symposium[26]	USA	336	Prospective Cohort	SR vs NR	Caesarian Sections, Tubaligation, Total Abdominal Hysterectomy, Vaginal Hysterectomy, Laparoscopic Tubaligation	7
Maniar, Ann Surg Oncol 2014[1]	Can	160	Prospective Cohort with Retrospective Control	SR vs NR	Colon Resections	8
Maniar, J Surg Oncol 2015[5]	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[22]	UK	274	Retrospective Case Control	Operative note proforma vs NR	Caesarian Sections	7
Parikh, J Surg Research 2007[20]	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[19]	USA	214	Prospective Cohort with Retrospective Control	SR vs NR	Pancreatectomy (Whipple, Central, Distal)	9
Paterson, Health Inf J 2015[27]	Can	20	Prospective Cohort	SR vs NR	Spinal Cord Injury Surgery	5
Stogryn, Surg Endo 2017[9]	Can	208	Prospective Cohort	SR vs NR	Laparoscopic Roux en Y Gastric Bypass	9
Thomson, Int J Surg 2016[21]	UK	258	Prospective Cohort with Retrospective Control	Operative note proforma vs NR	Laparoscopic Cholecystectomy	9

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

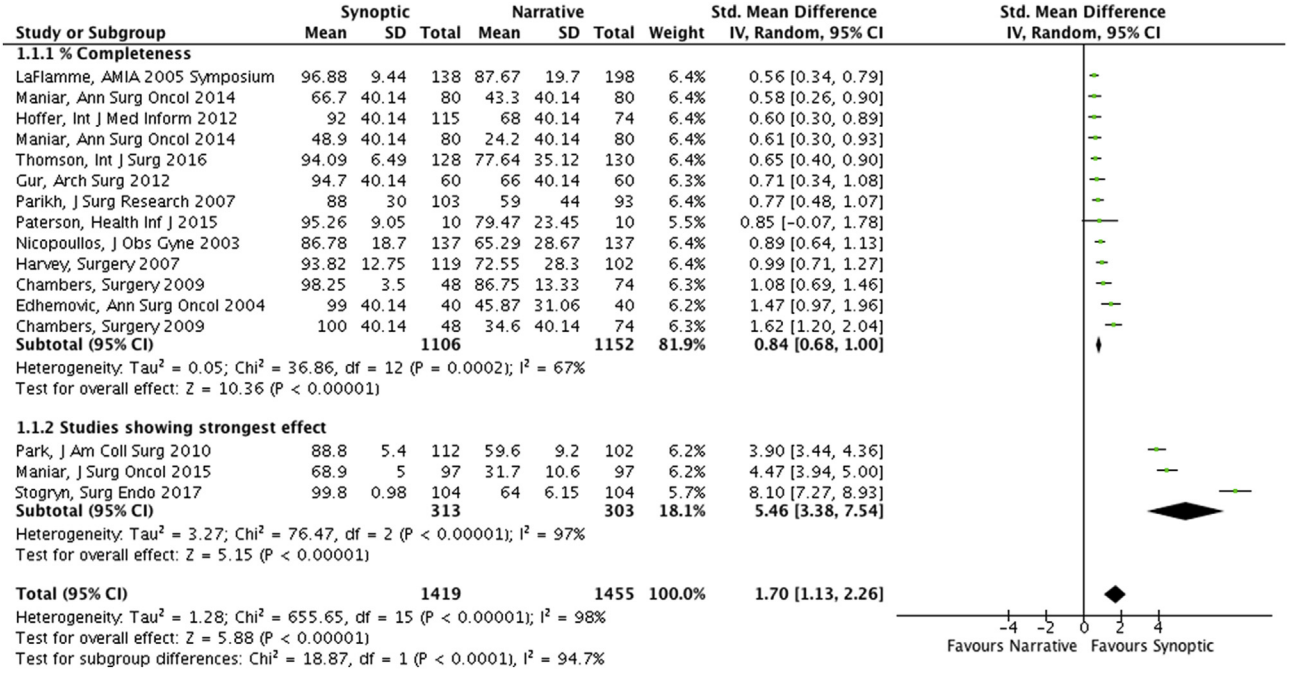

Fig. 2. Meta-analysis of completeness of synoptic versus narrative operative reports.

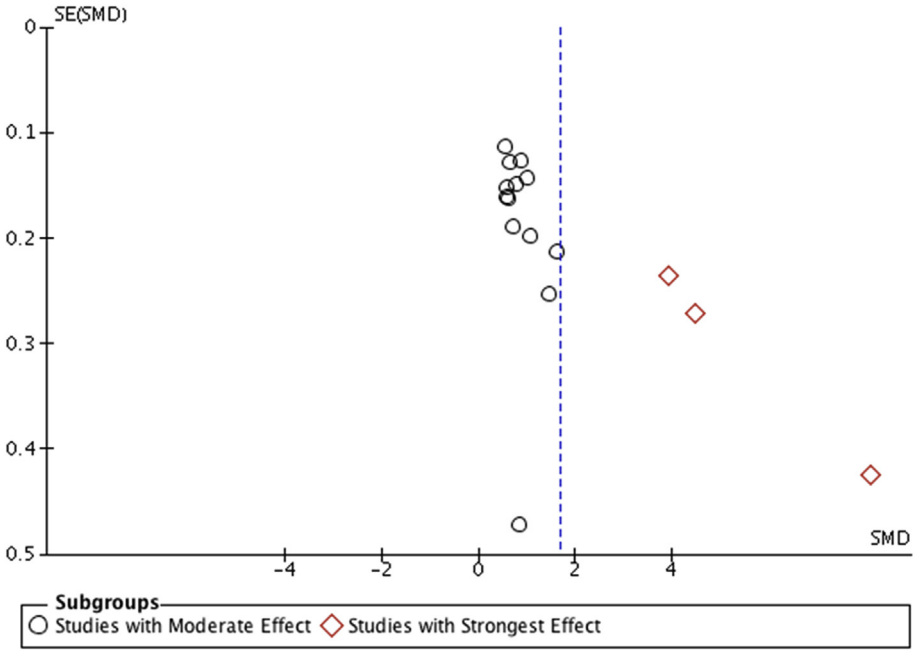

Fig. 3. Funnel plot of included studies for completeness of synoptic versus narrative operative reports.

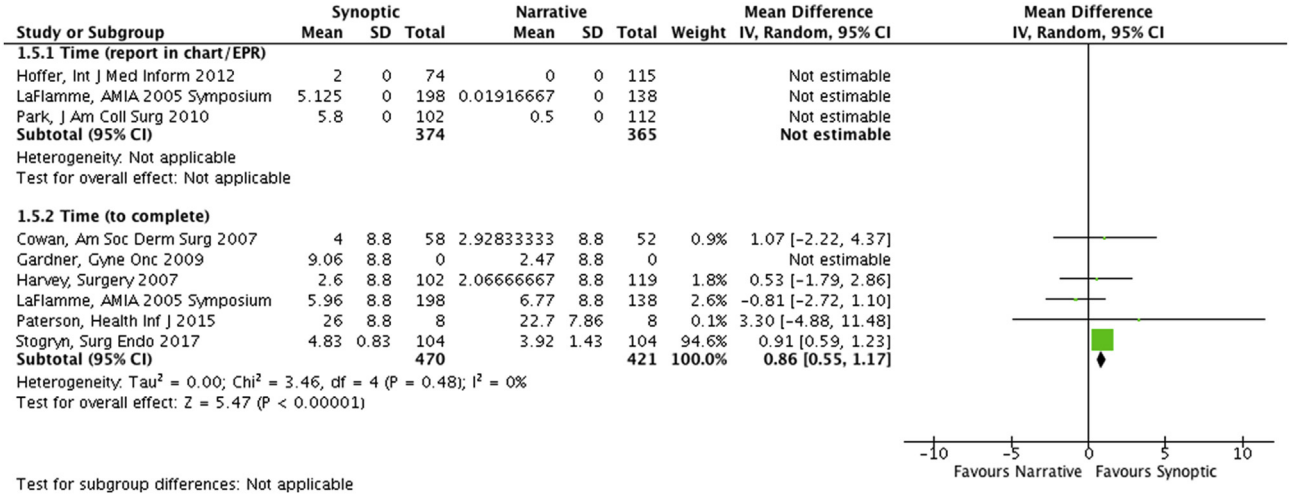

Fig. 4. Efficiency outcomes synoptic versus narrative operative reports.

Table 2
Secondary Outcomes – Synoptic vs Narrative Operative Reports.

Outcome or Subgroup	#Studies	#Participants	Statistical Method	Effect Estimate – SR vs NR
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

SR - Synoptic Report.
NR - Narrative Report.

capture the true "flavour" of an operation with their lack of descriptive detail. A potential solution is to allow for free text sections for surgeon to elaborate on subtle features of the procedure pertinent to document when needed.

For the trainee surgeon, there are perceived educational limitations to this format. Program directors expressed concerns that synoptic reports provide less educational value than narrative reports,[29] including the perception that trainees do not have to demonstrate the same knowledge and familiarity with the procedure and that it discourages independent thinking with respect to the procedure performed.[29] Perhaps synoptic reporting robs the trainee of this valuable cognitive task analysis tool; 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.[30] One suggested approach to mitigate this is to allow trainees to dictate an operative report whilst the staff surgeon generates a synoptic report for the official medical record.[31,32] The opportunity for cognitive task analysis and feedback would be provided to the trainee. Buy-in from surgeons and trainees may prove difficult as it requires an added step for surgical documentation and 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,[24] including 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. Meta-analysis was performed on the primary outcome of interest. A methodological quality analysis was performed on all included studies and demonstrated a moderate to high quality for all included investigations.

Limitations of this review

There are several limitations to this systematic review. No randomized controlled trials on synoptic operative reporting were identified. 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.[32] The studies included in this review are diverse, both in the formats of synoptic reports employed and the procedures on which they were tested. The reference scales, checklists, and items used to evaluate completeness and quality were 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. There was also a high degree of statistical heterogeneity (I^2 98%) identified that could not be linked to a single confounding factor.

Improved completion rates with the synoptic platform may purely reflect the number of pre-determined items required for inclusion. As such, an increasing number of items deemed necessary for a complete report would likely result in decreased completion rates for a narrative dictation comparatively. Narrative reports must be spontaneously generated from memory; lacking prompts provided by a template. However, if these items are considered critical for inclusion in a report, this is an additional argument for the use of a template-based platform.

All secondary outcomes with the exception of time to complete the report, were not able to be meta-analyzed. Data for these outcomes were extremely heterogenous and mostly based on solitary studies. Conclusions derived from this data should therefore be limited. Similarly, the cost data was derived from only two studies and were based on rudimentary analyses including only transcription costs and assuming no cost for the synoptic platform or its implementation and maintenance. A more comprehensive cost analysis would be required in order to truly understand the cost benefit of this new platform.

An additional limitation is that the primary authors of the included studies compared reports, not the surgeons producing them. Thus, a single surgeon potentially produced multiple reports. Similarly, cross-over may have occurred between groups producing synoptic and narrative reports which were then compared in a hierarchical fashion. Without adjustment, significance of the intervention could be overestimated. Finally, despite the overall advantages of synoptic reporting described, it is impossible to determine the degree of this effect, especially on patient outcomes. It seems intuitive that improving the quality of operative documentation would benefit patients and the healthcare system, but it is difficult to determine relevant outcomes and quantification methods. Future investigation may be possible if synoptic reports become linked with surgical outcomes databases.

Conclusions

This systematic review suggests that synoptic operative reporting conveys multiple advantages over the traditional format for operative documentation. Meta-analysis suggests synoptic reporting improves completeness of required operative elements. Multiple efficiency analyses performed suggest synoptic reporting is more time efficient. Assessment of reliability measures demonstrated a trend towards improved reliability with synoptic reporting. Varied quality analyses suggest synoptic reporting is of higher quality. Limited cost analyses suggest an advantage with synoptic reporting. Further efforts should be made to establish and incorporate synoptic operative reporting into surgical practice.

Conflicts of interest

The authors have no conflicts of interest to disclose.

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Conflicts of interest

None of the authors have any competing interests to declare. This paper has been presented by podium at SAGES.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.amjsurg.2019.05.003.

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