

# Improving operative documentation in colorectal cancer surgery: synoptic notes pave the way forward

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## Key words

BCCA, surgical audit, synoptic operative reports.

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## Abstract

**Background:** Synoptic operative reports may improve reporting of key operative information. This study aimed to compare information included in synoptic reports with narrative notes following the introduction of a synoptic reporting system at a tertiary colorectal cancer referral centre.

**Methods:** A standardized synoptic template incorporating the operative fields in the Australasian Bi-National Colorectal Cancer Audit (BCCA) was introduced for colorectal cancer surgery at the host institution in 2017. Colorectal cancer patients were identified from a prospectively collected database to collate samples of synoptic and narrative operative reports for comparison. The primary outcome was reporting of colon and rectal cancer-specific quality measures. Synoptic reporting of quality measures by clinician grade and uptake of synoptic reporting were also measured.

**Results:** Five hundred and ninety-five operative reports were reviewed; 84% of all quality measures were included in synoptic reports and 43% in narrative reports describing colon cancer surgery ( $P < 0.001$ ). Synoptic reports describing rectal cancer surgery included 84% of quality measures with 40% reported in narrative reports ( $P < 0.001$ ). Reporting for most individual quality measures did not change depending on clinician experience. Synoptic reporting methods were used to document 80% of all colon cancer surgery and 84% of rectal cancer surgery.

**Conclusion:** Synoptic operative reports were superior to narrative reports in documenting quality measures. Synoptic reporting facilitates simultaneous data capture and bulk upload for audits including the BCCA. Development of synoptic operative reports standardized across Australasian colorectal cancer centres should be further investigated as a tool to facilitate collaborative audit and research.

## Introduction

Operative reports document perioperative processes and facilitate a high standard of patient care. Reports are written in either traditional narrative or synoptic form. Narrative operative notes, without structure to included content, are dictated or typed by the completing surgeon. Given their inherent subjectivity, narrative notes may favour notable details over routine elements, resulting in potential for omission of fundamental information.<sup>1</sup> This is especially relevant in colorectal cancer surgery, as reporting of quality measures is used to evaluate whether the quality of cancer patient care is consistent with the evidence-based standard.<sup>2,3</sup> Synoptic reports are alternatively used, which utilize computerized templates to mandate

reporting of key surgical factors, thereby promoting note completion and consistency.<sup>4</sup> By stipulating inclusion of pre-specified information, synoptic reporting constitutes an operative checklist, reducing omission of such factors and encouraging adherence to standard surgical techniques.<sup>5,6</sup> Additionally, synoptic reports ensure data collection directly from the operating surgeon, rather than requiring transcription by secondary data managers. For these reasons, there has been increasing interest for widespread adoption of synoptic reporting methods with the rationale of standardizing operative documentation and improving recording of essential information at the time of surgery.

In colorectal cancer surgery, there is an increasing body of evidence supporting the role of synoptic operative reporting methods

for documenting these key factors. Two recent systematic reviews including three studies examining information in reports for colorectal cancer surgery procedures found that overall and subsection completeness was higher in synoptic reports.<sup>7,8</sup> Observational evidence from several other studies has also shown superiority of bulk information capture by synoptic reports relative to their narrative counterparts.<sup>2,3,9,10</sup>

While the current evidence favours use of synoptic reporting for colorectal cancer procedures, their use has not been evaluated in Australasia. The aim of this study was to compare the information included in synoptic reports with narrative notes following the introduction of synoptic reporting at an Australasian tertiary colorectal cancer referral centre.

## Methods

### Bi-national colorectal cancer audit

The Colorectal Surgical Society of Australia and New Zealand (CSSANZ) established the Bi-National Colorectal Cancer Audit (BCCA) in 2007. The BCCA is a prospectively collected online database of colorectal cancer patient data instigated to monitor contemporary trends in colorectal cancer management and compare clinical outcomes against the standard of care.<sup>11</sup> Much of the information required is obtained from the operative note. At present these data are manually uploaded to the BCCA database.

### Colorectal synoptic note

In 2012, the Canterbury District Health Board (CDHB) introduced solutions committed to operative procedure excellence (scOPe), a perioperative management system licensed to the CDHB enabling prospective collection of patient information during inpatient admission.<sup>12</sup> Introduction of scOPe prompted a transition to typed narrative reports to improve efficiency and streamline the perioperative handover process.

Following this, the CDHB developed synoptic templates for reporting routinely performed procedures including abscess drainage, laparoscopic appendectomy and cholecystectomy. A standardized synoptic operative report for colorectal cancer surgery was successfully introduced in June 2017. The computerized template was developed by adapting key colon and rectal cancer-specific quality measures identified from, but not limited to, those required by the BCCA and consensus between colorectal surgeons.

Users writing the operative note select the appropriate option from a list of choices to complete each subsection. For several subsections, a free-text field is available for additional information. None of the template fields are mandatory and are omitted if no choice is selected. The final report is then generated from the selected options and automatically published to the electronic health record upon completion. The current iteration of the colorectal synoptic template used at the CDHB is shown in Table 1.

### Data extraction

Previous cancer treatment episodes from the local BCCA database were used to identify patient details and compile groups of narrative

**Table 1** Colon and rectal cancer-specific quality measures and response options for synoptic report

Quality measure	Response options
Presentation	Acute, elective
MDM	Yes, no
Tumour site	Caecum, ascending colon, hepatic flexure,
Investigations	transverse colon, descending colon
CEA	rectosigmoid, rectum upper third (>12 cm),
T†	rectum middle third (8-12 cm), rectum lower
N†	third (<8 cm)
M†	CXR, CT chest, CT abdomen-pelvis, MRI, EUS,
Intention of surgery	PET CT
Neoadjuvant	Number (µg/mL)
treatment†	0, 1, 2, 3, 4
Metastases	0, 1, 2
Resection	No, yes, unknown
Technique	Curative, palliative due to metastases, palliative
Operation modality	due to local invasion, curative gross resection
Antibiotics	of stage 4 disease
VTE prophylaxis	Short course RT, long course CRT,
Mobilization	chemotherapy, unknown
Ureter identified	Yes, no, unknown
Hypogastrics	R0, R1, R2
identified	Open, laparoscopic, hand-assisted, laparoscopic
Vessels taken	converted to open
Vessel control	Right hemicolectomy, extended right
Marginal vessel	hemicolectomy, left hemicolectomy, sigmoid
tested	colectomy, transverse colectomy, total
Anastomosis	colectomy, subtotal colectomy,
Oversewing of	proctocolectomy, high anterior resection (10.1–
anastomosis	15 cm), low anterior resection (6.1–10 cm),
Reconstruction	ultra-low anterior resection (0–6 cm), APR,
Location of	Hartmann's, coloanal, local excision, TAMIS/
reconstruction	TEMS, laparotomy only, other (specify)
Leak test	Yes, no
Donuts	TEDs, SCDs, LMWH
Blood loss	Splenic flexure mobilized, hepatic flexure
Drain	mobilized
Stoma	Yes, no, unknown
Synchronous organs	Yes, no, unknown
resected	Right, ileocolic, middle colic, IMA high, IMA low
	Ligated, stapled, hemolok, energy device, other
	Yes – adequate, no, unknown
	Stapled, hand-sewn
	No, reinforced, completely oversewn
	End to end, end to side, side to side, side to side
	(isoperistaltic), colonic pouch anal anastomosis,
	coloanal
	Extracorporeal, intracorporeal
	No, yes – no leak, yes – leak oversewn
	Intact, unsatisfactory
	Number (mL)
	None, abdominal tube drain, abdominal low
	suction drain
	None, already present, end ileostomy, loop
	ileostomy end colostomy, loop colostomy
	Yes, no

†only applicable to rectal cancer cases. CEA, serum carcinoembryonic antigen; CRT, chemoradiotherapy; CT, computerized tomography; CXR, chest x-ray; IMA, inferior mesenteric artery; LMWH, low molecular weight heparin; MDM, multidisciplinary meeting; PET CT, positron emission tomography/computed tomography; RT, radiotherapy; SCDs, sequential compression devices; TAMIS/TEMS, transanal minimally invasive surgery/transanal endoscopic microsurgery; TEDs, thromboembolus deterrent stockings; VTE, venous thromboembolism.

and synoptic operative reports. Reports for all colorectal cancer patients with operations completed between 1 January 2018 and 31 December 2020 were collated for the synoptic note group, with

those receiving an operation between 1 January 2013 and 31 December 2013 collated for the narrative note group. Narrative reports were specifically sampled from the period prior to the introduction of scOPe to include a sufficient proportion of both dictated and typed narrative reports.

**Table 2** Descriptive patient and operative factors

	Synoptic operative reports <i>N</i> (%)	Narrative operative reports <i>N</i> (%)
<b>Sex</b>		
Male	246 (50.1)	62 (59.6)
<b>Age at operation</b>		
<50 years	47 (9.6)	8 (7.7)
50–64 years	102 (20.8)	18 (17.3)
65–74 years	153 (31.2)	30 (30.2)
75–84 years	137 (27.9)	37 (35.6)
85+ years	52 (10.6)	11 (10.6)
<b>Urgency of admission</b>		
Elective	417 (84.9)	95 (91.3)
Acute	74 (15.1)	9 (8.7)
<b>Tumour location</b>		
Ascending colon	61 (11.8)	18 (16.7)
Caecum	63 (12.2)	10 (9.3)
Descending colon	36 (6.9)	3 (2.8)
Hepatic flexure	36 (6.9)	6 (5.6)
Rectosigmoid/sigmoid	122 (23.6)	27 (25.0)
Rectum lower third	87 (16.8)	18 (16.7)
Rectum mid third	39 (7.5)	6 (5.6)
Rectum upper third	21 (4.1)	6 (5.6)
Splenic flexure	0 (0.0)	4 (3.7)
Transverse colon	53 (10.2)	10 (9.3)
<b>Operation technique</b>		
Open	158 (32.2)	76 (73.1)
Laparoscopic	309 (62.9)	20 (19.2)
Hybrid	4 (0.8)	4 (3.8)
Conversion of laparoscopic	20 (4.1)	4 (3.8)
<b>Operation modality</b>		
Right hemicolectomy	149 (30.3)	29 (27.6)
Extended right hemicolectomy	33 (6.7)	7 (6.7)
Ileocolic resection	0 (0.0)	2 (1.9)
Left hemicolectomy	8 (1.6)	2 (1.9)
Sigmoid colectomy	0 (0.0)	4 (3.8)
High anterior resection	114 (23.2)	15 (14.3)
Transverse colectomy	0 (0.0)	1 (1.9)
Segmental colectomy	1 (0.2)	3 (2.9)
Ultra-low anterior resection	67 (13.6)	9 (8.6)
Abdominoperineal resection	33 (6.7)	11 (10.5)
Exenteration	2 (0.4)	0 (0.0)
Low anterior resection	38 (7.7)	6 (5.7)
Hartmanns	26 (5.3)	4 (3.8)
Total colectomy	6 (1.2)	7 (6.7)
Subtotal colectomy	8 (1.6)	0 (0.0)
Proctocolectomy	1 (0.2)	3 (2.9)
Other	5 (1.0)	2 (1.9)

Data from the collated operative reports were extracted manually for the narrative operative report group and electronically using scOPe for the synoptic note group. The grade of clinician completing the note was recorded, if known. Reports in both the narrative and synoptic groups were substratified into colon and rectal cancer subgroups to recognize the distinct differences in the management and applicable quality measures for these subgroups. Individual and overall reporting of cancer-specific quality measures (Table 1) in each operative note was then evaluated. Quality measures chosen for analysis were predetermined prior to the study and agreed by consensus between the authors. In the event of synchronous colon and rectal malignancies described in a single operative report the corresponding data were included for analysis in both subgroups.

Regulatory ethical approval from the host institution was sought with approval as a clinical audit granted.

## Outcomes

The primary outcome was reporting of colon and rectal cancer-specific quality measures. Secondary outcomes were reporting of quality measures by clinician grade in synoptic reports, and synoptic report use.

## Statistical analysis

Analysis of reporting for individual and overall reporting of quality measures was undertaken using Fisher's exact tests. Differences in overall reporting of quality measures stratified by clinician grade was determined using Pearson's Chi-squared tests. Statistical significance was considered at  $P < 0.050$  (two-tailed).

## Results

Four hundred and ninety-one synoptic operative reports and 104 narrative reports were collected in total. In the synoptic report group, 347 reports (71%) described procedures for colonic tumours, 137 (28%) procedures for rectal cancers, and seven (1%) treatments of synchronous colon and rectal cancers. In the narrative group, 74 (71%) reports described colon cancer surgery, 29 (28%) rectal cancer procedures and one report (1%) synchronous resection of colon and rectal malignancies. Fifty narrative reports were dictated, with the remaining 54 typed by the operating surgeon.

Of the 354 synoptic notes describing colon cancer surgery, 83 (23%) were completed by consultants, 180 (51%) by fellows, and 83 (23%) by trainee registrars. Four reports were completed by junior registrars (1%), with clinician grade unknown in four reports (1%). Of the 144 rectal cancer synoptic notes, 34 (24%) were completed by consultants. Fellows completed 96 (67%) reports, trainee registrars 10 (10%), and clinician grade was unknown in the remaining four (3%) reports. Junior registrars did not complete any synoptic reports in the rectal cancer subgroup.

## Patient demographics

Distribution of patient and operative factors in each report group are described in Table 2.

## Reporting in synoptic versus narrative notes

In colon cancer reports, reporting of quality measures was higher in synoptic reports for 25 of the 28 quality measures, with 21 reaching statistical significance (Fig. 1a). Differences were non-significant for perioperative antibiotic use (99% vs. 96%,  $P = 0.106$ ), vessels ligated (96% vs. 92%,  $P = 0.136$ ), anastomosis method (90% vs. 92%  $P = 0.828$ ), and anastomotic reconstruction (87% vs. 80%,  $P = 0.1442$ ). In rectal cancer reports reporting of individual quality measures was higher in synoptic reports for 29 of the 32 quality measures (Fig. 1b). Increased synoptic reporting of individual variables reached statistical significance for 26 quality measures, with synoptic reports having nonsignificantly higher reporting than narrative for colonic mobilization (72% vs. 53%,  $P = 0.082$ ), drain insertion (97% vs. 90%,  $P = 0.100$ ), and stoma formation (97% vs. 90%,  $P = 0.141$ ).

Overall reporting of quality measures was higher in synoptic reports, with 84% vs. 43% ( $P < 0.001$ ) for those describing colon cancer procedures, and 84% vs. 40% ( $P < 0.001$ ) for those describing rectal cancer surgery.

When stratified by clinician grade, differences in synoptic reporting of individual quality measures were non-significant for 19 of 28 quality measures in colon cancer reports and for 27 of 32 quality measures in rectal cancer reports. Overall reporting of quality measures differed marginally by grade and was highest among those completed by consultants at 87% in colon cancer procedures, and 88% in rectal cancer procedures. Trainees recorded the lowest overall reporting of quality measures in synoptic reports with 81% for colon and 75% for rectal cancer procedures. Reports completed by fellows included 83% of quality measures for colon and 83% for rectal cancer procedures. Colon cancer synoptic reports completed by junior registrars documented 83% of quality measures overall.

Uptake in synoptic operative report use is shown in Figure S1. Synoptic reporting methods were used to document 80% of all colon cancer surgery and 84% of rectal cancer surgery across 3 years.

## Discussion

This study comparing the information included in synoptic operative reports with narrative notes confirmed that synoptic reports were superior in the documentation of cancer-specific quality measures. This was corroborated by an impressive summary effect of 41% overall factors for colon cancer procedures and 44% for rectal cancer procedures, equating to documentation of an additional 11 quality measures for colon cancer reports and 13 for rectal cancer reports. Synoptic notes also enhanced reporting for most individual quality measures in both subgroups, while narrative reporting methods did not significantly improve reporting for any evaluated.

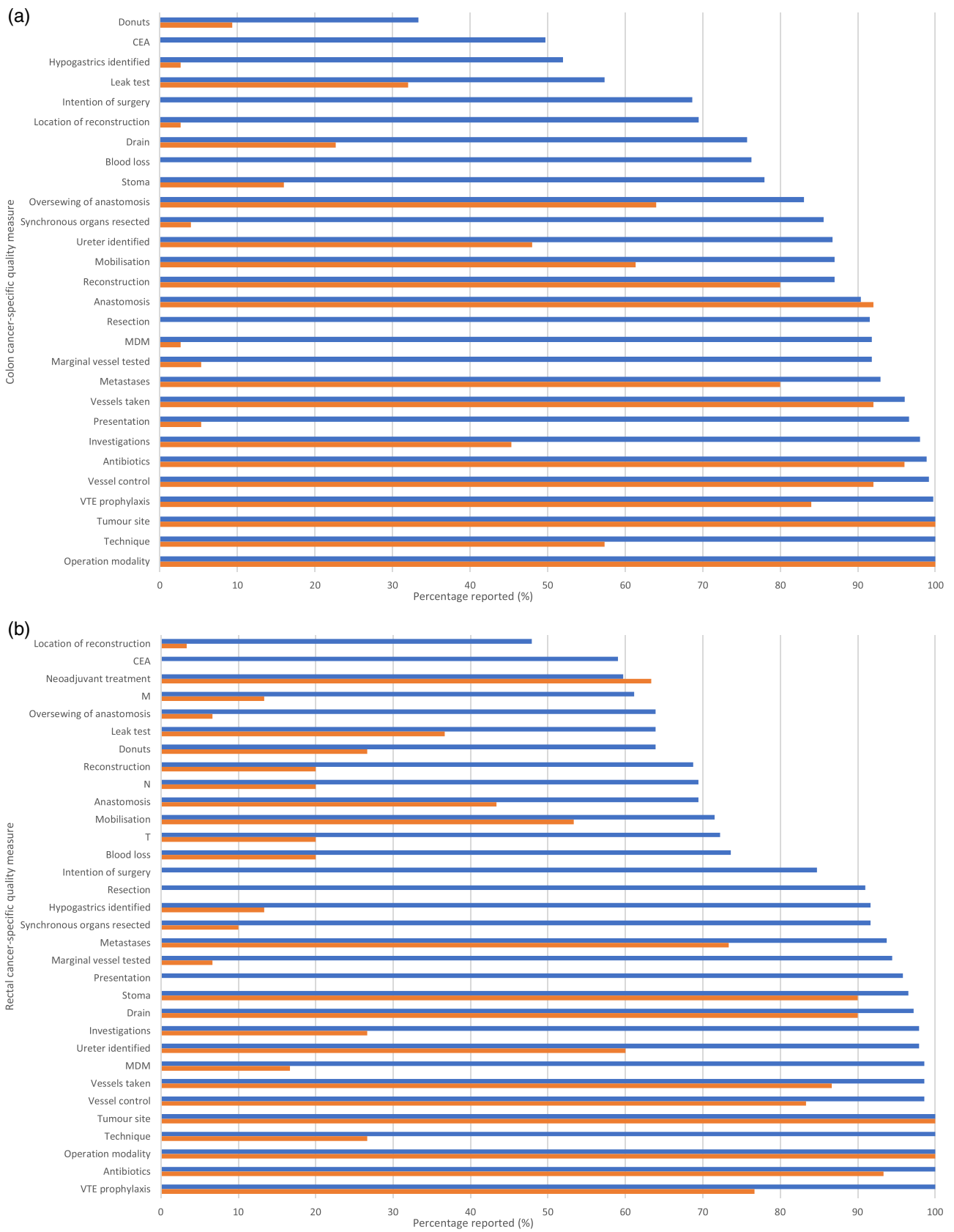
These observations are consistent with the results of international studies. Kanters *et al.* reported that synoptic notes contained 92% of rectal cancer report elements in contrast to narrative reports which included only 39%.<sup>9</sup> Other studies reported lower figures for rectal cancer reports, with documentation of between 54% and 76% of all elements for synoptic and 24–41% for narrative notes, although used differing checklists to develop their respective synoptic templates.<sup>3,10</sup> Among few studies validating synoptic reporting in colon cancer surgery, another study found that synoptic reporting of essential

information was 49–67% compared with narrative reporting of 24–43%, lower than the present study.<sup>2</sup> However, the lower percentages in these ranges were limited by analysing only three quality measures.<sup>2</sup>

Uptake of synoptic operative reporting was high, with mean use 80% for colon cancer surgery and 84% for rectal cancer surgery. This sustained uptake is consistent with high end-user satisfaction. However, synoptic reporting adherence was imperfect, possibly attributable to the proportion of acute procedures for which histological diagnosis was not confirmed. The overall trend in synoptic note use was stagnant, providing opportunity for further improvement in synoptic note adherence.

The conclusion that synoptic operative reports should be used routinely in colorectal cancer surgery is concordant with international guidelines. The Cancer Surgery Standards Program (CSSP), recently instituted by the American College of Surgeons (ACS) to develop tools to assist centre compliance with evidence-based practice, recently mandated synoptic reporting to safeguard surgical documentation in four critical areas throughout all cancer surgery, including colon resection for colon cancer.<sup>13</sup> The CSSP aims to reach 70% compliance with these synoptic reporting standards by 2023.<sup>14</sup> Comparatively, the ACS National Accreditation Program for Rectal Cancer (NAPRC) 2020 Rectal Cancer Standards outlined a similar mandate for rectal cancer surgery, including setting the target compliance rate at 95% for all rectal cancer resections.<sup>15</sup> Synoptic templates delineated in these NAPRC Rectal Cancer Standards are largely derived from the Rectal Cancer Surgery Best Practice Checklist developed by the American Society of Colon and Rectal Surgeons (ASCRS).<sup>15,16</sup> A notable goal for the CSSP, and presumably the NAPRC, is automation of data acquisition into the National Cancer Database, the largest cancer registry in the United States.<sup>14</sup>

Agreement and development of standardized colorectal synoptic notes is a vital first step towards widespread synoptic reporting implementation for all colorectal cancer surgery within Australasia. Evidently some factors, such as stoma or donut status, are not applicable universally to all colorectal cancer procedures, which likely necessitates development of separate colon and rectal cancer (or procedure-specific) synoptic templates to reflect this. Collaborative determination of the precise complement of quality measures, checklist criteria and universal surgical elements required for synoptic reports, which could involve a survey of colorectal surgeons or expert panel consensus, must additionally account for regional variations in practice, and differences in population and demographic factors. Several readily available resources could be used to develop such templates, including the elements required by the BCCA, the CSSP (for colon resection), and the NAPRC (for rectal cancer). Efforts to implement mandates for synoptic reporting within Australasian centres in accordance with international standards should then be pursued. This would enable the study of operative factors associated with development of postoperative complications, collection of morbidity and mortality data, and automated data upload to online databases such as the BCCA. Emphasis on key operative steps for trainee surgeons may improve knowledge and develop intraoperative decision-making skills. Several barriers to this vision include integration into a breadth of pre-existing electronic patient health record systems, additional financial costs and departure from the current norm of narrative reporting methods, particularly in rural or remote centres. Optimization of end-user satisfaction with inclusion of item definitions, and auto-population of preoperative information is also warranted.<sup>17</sup>



**Fig. 1.** (a) Synoptic and narrative reporting of colon cancer-specific quality measures. (b) Synoptic and narrative reporting of rectal cancer-specific quality measures. †MDM, multidisciplinary meeting; CEA, serum carcinoembryonic antigen; VTE, venous thromboembolism. ■ Synoptic; ■ Narrative.

There were several limitations of note in this study. A historical comparison of synoptic with narrative reports was performed, with the latter collected prior to the introduction of scOPe to allow sufficient inclusion of both dictated and typed narrative reports which may have differed in completeness owing to factors such as time to dictation, competing workload pressures or typing speed. Furthermore, reporting of individual quality measures in narrative notes was determined solely by the presence or absence of comment, rather than whether this information could be inferred (i.e., no stoma formation in a right-sided colonic resection with anastomosis). These limitations may have exacerbated differences in reporting of quality measures between narrative and synoptic reports, resulting in overestimation of the summary effect. The cohort of narrative reports reviewed was also significantly smaller than that for synoptic reports, owing to the fact the duration for note collection differed by 2 years. These factors may have conferred several biases due to differences in operating surgeons, and in the general techniques and operative modalities used, although the overall distribution of patient and operative factors between the patient groups were reassuringly comparable. Analysis of the narrative free-text component of the synoptic reports was not performed, a field often used to highlight the nuances of specific procedures, and denote distinguishing intraoperative features otherwise omitted from a standard synoptic note. With this being a retrospective comparison, the surgeons were not aware of audit at the time of completing the operative report, hence the results are more likely indicative of real-world use. However, uptake of colorectal synoptic operative reporting in a single centre may not necessarily be reflective of wider Australasia. End-user convenience and note utility were not measured in this study which are important parameters for future prospective evaluation.

This study confirmed that synoptic operative reports were superior to narrative reports for reporting of colon and rectal cancer-specific quality measures and reaffirms their role in fulfilling this purpose. These findings are consistent with international guidelines recommending synoptic operative documentation. The scope for synoptic reporting is broad with conceivable applications to other colorectal disease, including inflammatory bowel disease. Efforts to develop standardized synoptic operative reports for reporting colorectal cancer procedures should be instigated to reach concordance with international standards. This should include a specific focus in enhancing the quality of operative documentation among junior surgical staff. The results from this study confer exciting prospects for the betterment in the quality of care and clinical outcomes for colorectal cancer patients in Australasia and will serve as a useful starting point to facilitate future collaborative audit, innovation and research.

## Conflict of interest

None declared.

## Author contributions

**Jayvee Buchanan:** Conceptualization; data curation; formal analysis; investigation; methodology; project administration; writing – original draft; writing – review and editing. **Andrew McCombie:** Conceptualization; data curation; formal analysis; methodology; resources; software; writing – review and editing. **Saxon Connor:** Formal analysis; resources; supervision; writing – review and

editing. **Tim Eglinton:** Conceptualization; formal analysis; methodology; resources; supervision; writing – review and editing.

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## Supporting information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

**Figure S1** Percentage of all colon and rectal cancer surgery documented using colorectal synoptic operative template by year.