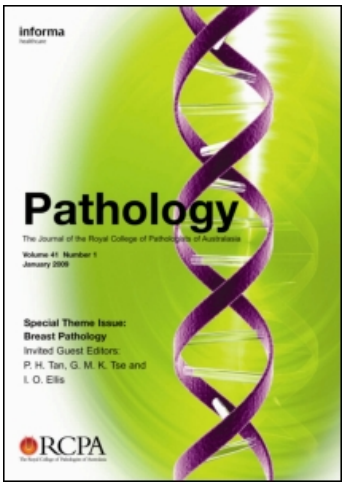

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Synoptic reporting improves histopathological assessment of pancreatic resection specimens

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Synoptic reporting improves histopathological assessment of pancreatic resection specimens

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Summary

Aim: We examined whether introduction of a standardised pancreatic cancer minimum data set improved the reporting of key pathological features across multiple institutions.

Methods: From seven different pathology departments that are members of the New South Wales Pancreatic Cancer Network, 109 free text reports and 68 synoptic reports were compared.

Results: AJCC stage could not be inferred from 44% of free text reports, whereas stage was reported in all 68 synoptic reports. In the free text reports 28 different names were used to designate margins. All margins were reported in only 12 (11%) of the free text reports compared with 64 (94%) of the synoptic reports ($p = 0.0011$). The presence or absence of lymphovascular or perineural invasion was reported in 72 (66%) and 92 (84%) of free text reports, respectively. In contrast, lymphovascular space and perineural invasion were reported in all synoptic reports ($p = 0.0011$ and $p = 0.0058$).

Conclusion: We conclude that synoptic reporting of pancreatic resections without any other intervention increases the information contained within histopathology reports. Therefore, the introduction of minimal data set synoptic reports is a simple and feasible mechanism to immediately improve reporting for pancreatectomy specimens.

Key words: Pancreatic cancer, Whipple resection, synoptic report, minimum data set.

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INTRODUCTION

Synoptic or structured reporting of surgical pathology specimens and/or the use of minimum data sets is thought to facilitate data collection from large cohorts and increase the accuracy, accessibility, completeness and uniformity of surgical pathology diagnosis. As a result, numerous professional bodies including the Royal College of Pathologists of Australasia (RCPA), the Royal College of Pathologists (RCP) and the College of American Pathologists (CAP) have supported synoptic reporting of major tumour types[1–3] and both the RCP and CAP have published suggested minimum data sets for all major tumour types.[2,3]

Whilst there are numerous reports of the success and value of synoptic reports across a range of tumour types,[4–6] there have been few studies that compare the performance of synoptic reports to traditional free text or narrative reporting. Despite being recommended for all major tumour types, synoptic reporting has only been studied and found to be superior to free text reporting for a limited number of tumours including colorectal carcinoma,[7–10] breast carcinoma[11,12] and melanoma.[13] Two recent studies have demonstrated an improvement in pathological assessment, particularly of resection margin status in Whipple resections, by altering dissection protocols so that serial axial slicing and liberal histopathological sampling is performed by an experienced pancreatic pathologist in conjunction with standardised reporting protocols.[14,15] However, the potential improvements that could be obtained simply through the introduction of a minimal data set synoptic report for pancreatectomy specimens have not been investigated.

METHODS

To address this deficiency we assessed whether the introduction of a standardised pancreatectomy synoptic report without any other intervention improved the reporting of key pathological indices for Whipple pancreatico-duodenectomy specimens. A minimum data set containing the information required to adequately characterise a resected Whipple pancreatico-duodenectomy specimen was formulated by two of the authors (AJG and JGK). It contains similar data points to the suggested minimum data sets endorsed by other groups including the CAP and RCP[2,3] and is outlined in Fig. 1. The minimum data set was circulated with brief explanatory notes to the institutions affiliated with the NSW Pancreatic Cancer Network (www.pancreaticcancer.net.au, accessed May 2008). The explanatory notes addressed each of the points in the minimum data set, serving as a reference to unambiguously define the nomenclature for

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Pancreatectomy Synoptic Pathology Report

Type of specimen:

Tumour
Tumour location:
Size of tumour:
Histologic type (WHO classification):
Histologic grade (TNM grading system):
Extra-pancreatic extension:
Small vessel (capillary/lymphatic) invasion:
Large vessel (vein/artery) invasion:
Perineural invasion:
Invasion of periuncinate neural plexus:

Margins (state distance if less than 1 mm):
Pancreatic neck:
Periuncinate soft tissue:
Posterior retroperitoneal:
Portal vein bed:
Bile duct:

Lymph Nodes
Main resection specimen (involved/total no.):
Separately received lymph nodes (involved/total no.):

Associated Pathology
Pancreatic intraepithelial neoplasia (state highest grade if present):
PanIN at pancreatic neck resection margin (state grade if present):
Pancreatitis:

Pathologic Staging (pTNM, AJCC 6th ed 2002)
Staged as: Pancreatic ductal carcinoma, Ampullary carcinoma or other (state which):
pT:
pN:
pM:
Overall stage:

Additional pathologic comments and findings in other resected specimens:

SUMMARY
Tumour type:
Tumour grade:
Tumour location:
Tumour size:
Lymph nodes:
Stage:
Involved margins (includes tumour less than 1 mm from margin):

FIG. 1 Minimum data set for synoptic report.

different margins for which several synonyms are currently in general use (Fig. 2–4) as well as stating the preferred grading (TNM) and staging systems [American Joint Committee on Cancer (AJCC) 6th edition 2002].[16]

This report was designed as a minimum data set and not a maximum or all inclusive data set. Therefore, pathologists were free to include other data and to approach macroscopic dissection and tumour sampling as they thought appropriate. Whilst the synoptic reports used may have varied slightly between different institutions due to their individual preferences, the minimum data set was identical.

Ethical approval was granted by the Human Research Ethics Committees at all participating institutions. The surgical pathology reports from 177 Whipple resection specimens from seven pathology departments that are part of the New South Wales Pancreatic Cancer Network (NSWPCN) were reviewed. Of these, 109 were traditional free text pathology reports (2002–2007) selected consecutively from the NSWPCN database, whereas 68 were reported synoptically (2005–2007) using the minimum data set. All pancreatic carcinomas, ampullary carcinomas and extrahepatic cholangiocarcinomas were eligible for inclusion provided a Whipple pancreatico-duodenectomy specimen was received. Metastatic tumours to the pancreas, pancreatic endocrine tumours and histologies other than carcinoma were excluded from the study.

The specific information required for the minimum data set was extracted from the 109 free text reports and compared with the minimum data set of the synoptic report. This included data which could confidently be inferred from the free text reports even if it were not explicitly stated. For example the tumour size was recorded if the macroscopic dimension of a lesion was given, even if there was no microscopic confirmation that this was the actual size of the tumour and not the combined size of tumour and surrounding fibrosis and chronic pancreatitis. Similarly, tumours were considered to have been staged if sufficient information was provided in the report to infer a TNM stage using the AJCC staging system (6th edition 2002)[16] even if the actual T, N or M stages were not explicitly stated. An individual margin was considered to be reported as clear if the report either explicitly stated that it was clear or if a reasonable inference from reading the report was that it was well clear. If the tumour was described as being close to a resection margin, but the distance to that margin was not specified, it was categorised as not reported.

If data points were not specifically recorded or could not confidently be inferred from the pathology reports, the original histology slides were reviewed by a pathologist (AJG or JGK) and this information was recorded separately. The data gathered from the free text reports was then compared with the synoptic reports. Confidence intervals for the difference in reporting rates were generated by the Miettinen–Nurminen method;[17] p values were generated by inverting the confidence intervals and corrected for multiple testing by Holm's step-up procedure.[18]

RESULTS

Tumour size, grade and stage

A summary of the results is presented in Table 1. The 109 free text reports originated from seven different institutions.

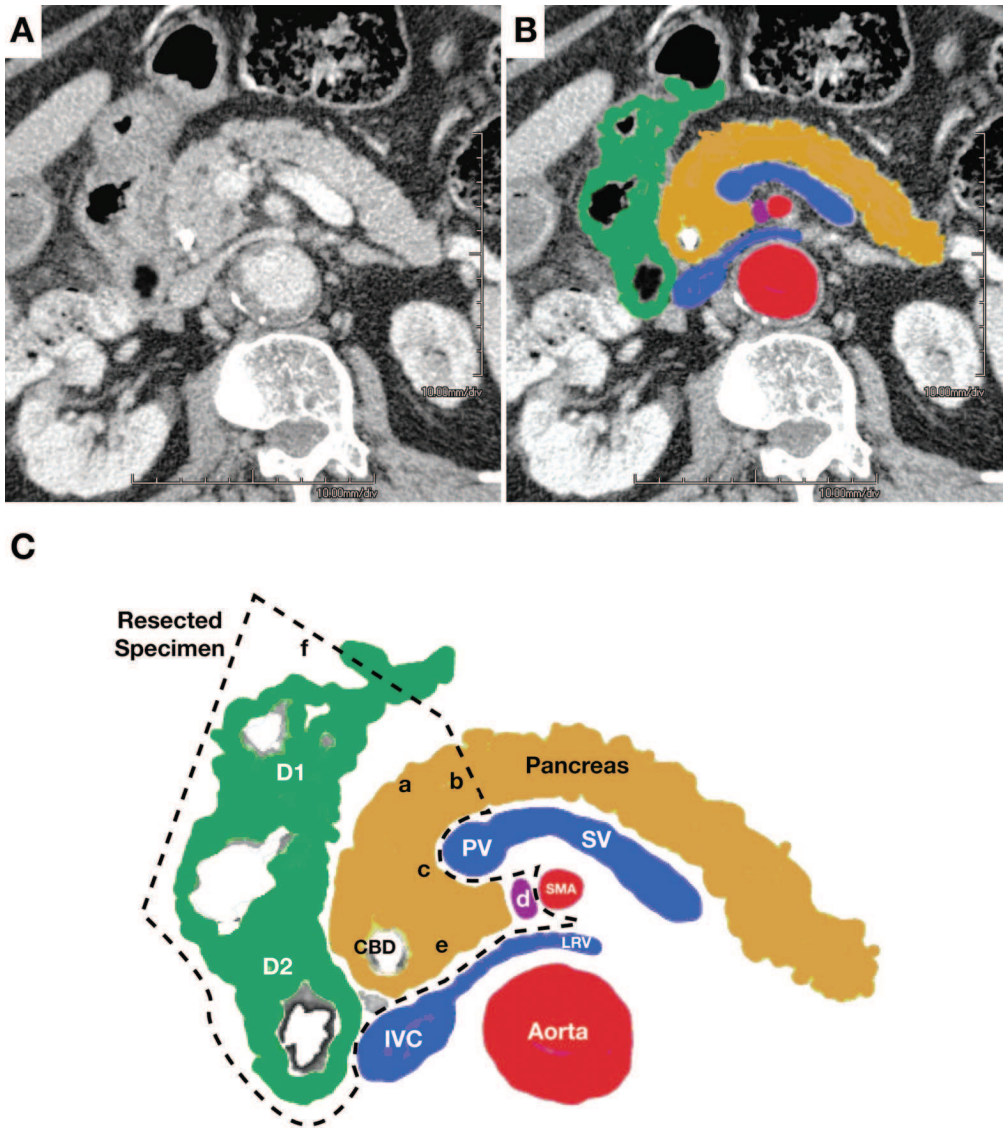

FIG. 2 (A) CT scan showing pancreas and surrounding structures. (B) Overlay highlighting anatomical structures of interest. (C) Diagram of resected pancreas. Uniform terms were selected for different resection margins, which actually represent a continuous circumferential margin around the resected specimen (dotted line). D1, first part of duodenum; D2, second part; PV, portal vein; SV, splenic vein; SMA, superior mesenteric artery; CBD, common bile duct; IVC, inferior vena cava; LRV, left renal vein. The terms illustrated in the cross sectional diagram are: (a) anterior margin, (b) neck margin, (c) portal vein bed, (d) periuncinate soft tissue margin, sometimes called the 'mesopancreas' as it represents fibrous tissue that connects the uncinate process to the SMA, (e) posterior margin and (f) bile duct margin.

The 68 synoptic reports originated from five different institutions. The two institutions which generated free text reports but not synoptic reports during the study period were low volume centres which provided a combined total of four (3.7%) of the free text reports but had not provided reports of either type after introduction of the minimum data set.

The size of the tumour was reported either macroscopically or microscopically in 104 (95%) of free text reports and 68 (100%) of synoptic reports. A tumour grade was given in 108 (99%) of free text reports and in all synoptic reports. However, only one free text report stated which grading system was used, whereas all synoptic reports used the TNM grading system.[16] The pathological stage could not be determined from information contained in 48 (44%) of the free text reports. This was due to tumour size not being reported in five cases, the presence or absence of extra-pancreatic growth not being reported in 37 cases and lymph node status not being reported in six cases. In contrast, all the synoptic reports explicitly stated the AJCC stage and/or the individual T, N and M components. Again, this difference was statistically significant ($p = 0.0112$).

Reporting of margins

All margins were reported in only 12 (11%) of the free text reports compared with 64 (94%) of the synoptic reports and this difference was statistically significant ($p = 0.0011$). The rate of reporting of individual margins varied from 33 to 86% for the free text reports compared with 96–97% for the synoptic reports. Amongst the 109 free text

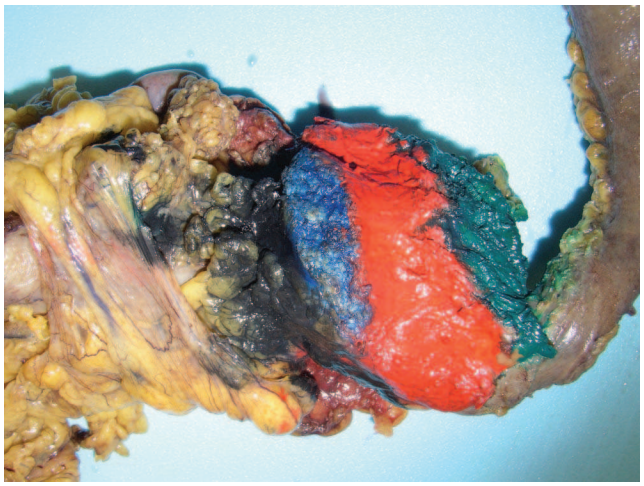

FIG. 3 A Whipple resection specimen viewed from the medial aspect. The black ink identifies the anterior capsule, the blue ink is at the neck margin, the red ink is at the superior mesenteric vein/portal vein bed and the green ink is on the periuncinate margin.

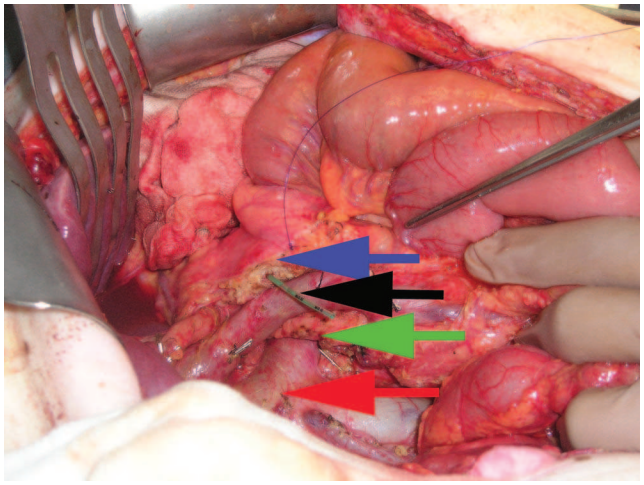

FIG. 4 Operative photograph with resection specimen removed. Pancreatic neck margin (blue arrow), portal vein bed (black arrow), periuncinate margin (green arrow), posterior margin (red arrow).

reports, 28 different names were used to describe the various margins of the resection specimens. The terms used for the margins comprised: peripancreatic soft tissue margin, deep margin, distal pancreatic margin, posterior pancreatic margin, medial margin, SMV bed, vascular bed, hepatic duct margin, pancreatic parenchyma margin, posterior vascular bed margin, superior soft tissue margin, superior pancreatic margin, proximal pancreatic margin, superior retroperitoneal margin, radial margin, lateral excision margin, supero-lateral excision margin, main pancreatic duct resection margin, postero-superior margin, soft tissue margin of the porta hepatis, left margin, inferior margin, non surgical margin, external margin, margin of pancreatic head, postero-inferior margin, vascular groove margin and pancreatico-duodenal fatty tissue margin.

Lymphovascular space and perineural invasion

The presence or absence of lymphovascular invasion was reported in 72 (66%) of free text reports. When the remaining 37 cases were reviewed, 10 (27%) were found to show lymphovascular space invasion. Similarly the presence or absence of perineural growth was reported in 92 (84%) and when the remaining 17 cases were reviewed a further seven (35%) were found to display perineural growth. In contrast, perineural growth and lymphovascular space invasion status was reported in all synoptic reports and these differences were statistically significant ($p = 0.0058$ and $p = 0.0011$).

DISCUSSION

A synoptic/structured format or the use of checklists/proformas have been shown to improve the quality of surgical pathology reports by increasing the yield of therapeutically or prognostically relevant information in colorectal carcinomas, breast carcinomas and melanomas.[7–13] We have demonstrated that simply introducing a synoptic report and explanatory notes without any other intervention increased the completeness of pathological information reported in Whipple resections and that this information has direct clinical relevance. In addition, accurate histopathology reporting underpins translational research studies.

A pathological stage was assigned in all synoptic reports examined but could not be assigned from the information included in 61 (56%) of free text reports. This was predominantly because extra-pancreatic extension was not reported (37 cases). Less commonly, it was because the size of the tumour was not given (5 cases) or the lymph node status was not stated (6 cases). Post-resection prognosis for pancreatic carcinoma is primarily determined by the anatomical extent of disease as reflected in the TNM staging[19–28] recently summarised by Compton *et al.*[29] Therefore, failure to stage patients adequately has the potential to significantly impact on patient care, or at least on estimations of prognosis. The presence of an explicitly stated pathological stage in all synoptic reports enhances their usefulness to clinical management. It is noteworthy that such basic prognostic information as tumour size was absent in five free text reports but included in all synoptic reports. Tumour size is well recognised as a crucial prognostic indicator in carcinoma of the pancreas[19,20,30] as well as being a key element in the staging system.[16]

The presence of both perineural invasion[31,32] and lymphovascular (i.e., small vessel) invasion[33] are poor prognostic indicators, but were not reported in 16% and 34%, respectively, of traditional free text reports, whilst they were reported in all synoptic reports assessed. Whilst our study was not designed to assess the accuracy of pathology reports, our findings show that it cannot be assumed that just because lymphovascular space invasion and perineural spread were not reported they were absent. Of cases in which lymphovascular space invasion was not commented on, 27% were found to be positive for vascular space invasion on slide review and the same was true for 35% of cases in which perineural spread was not reported.

TABLE 1 Comparison of free text and synoptic reports

	Free text ($n = 109$)	Synoptic ($n = 68$)	Difference (%)	95%CI (%)	p value
Size of tumour					
Size reported	104 (95%)	68 (100%)	4.6	−0.9–10.3	0.2294
Grade					
Grade reported	108 (99%)	68 (100%)	0.9	−4.5–5.0	0.4299
Specified grading system used	1 (1%)	68 (100%)	99.1	93.6–99.8	0.0011
Margins reported					
All margins reported	12 (11%)	64 (94%)	83.1	72.9–89.5	0.0011
Neck	89 (82%)	66 (97%)	15.4	6.5–24.3	0.0206
Periuncinate	36 (33%)	66 (97%)	64.0	53.2–72.8	0.0011
Posterior	63 (58%)	66 (97%)	39.3	28.7–49.2	0.0011
Portal vein bed	41 (58%)	65 (96%)	58.0	46.6–67.4	0.0011
Common bile duct	94 (86%)	65 (96%)	9.3	0.2–17.9	0.2294
Small vessel invasion					
Reported	72 (66%)	68 (100%)	33.9	25.7–43.3	0.0011
If not reported, present on review	10/37 (27%)	–			
Perineural invasion					
Perineural invasion	92 (84%)	68 (100%)	15.6	9.9–23.6	0.0058
If not reported, present on review	7/17 (35%)	–			
Pathological stage					
Pathological stage stated or could be determined from report	61 (56%)	68 (100%)	44.0	35.1–53.4	0.0112
T stage: deficient (no size)	5 (5%)	0	−4.6	−0.1–0.9	0.2294
T stage: deficient (extra-pancreatic spread not assessed)	37 (34%)	0	−33.9	−43.3 to −25.7	0.0011
N stage: deficient (node status not reported)	6 (6%)	0	−5.5	−11.5–0	0.2294

There is considerable evidence that traditional pathological reporting underestimates the rate of margin positivity in pancreatic carcinoma. In most studies the local recurrence rate of pancreatic cancer is between 67 and 86% despite an incomplete excision rate which varies between 30 and 40%.[34] The overall survival of patients in series with low incomplete excision rates does not differ from those in series with high incomplete excision rates.[34] Tumour cells harbouring the k-*ras* mutation typical of pancreatic carcinoma are found at the resection margin in 53% of pancreatic cancers thought to be completely excised by conventional histological assessment and this finding has prognostic significance.[35] Recently, a standardised approach to the macroscopic dissection of pancreatic resection specimens (axial slicing performed by an experienced pancreatic pathologist) has been shown to increase the number of Whipple resections reported as being incompletely excised from 45 to 59% by one group[14] and from 14 to 76% by another group.[15] This change was particularly significant for pancreatic carcinomas where one group demonstrated an increase in the incomplete excision rate from 53 to 85%, but was less significant for ampullary carcinomas and distal bile duct carcinomas.[14] By providing evidence that completeness of excision had prognostic significance only when the margins are so rigorously assessed as to result in high numbers of incomplete histopathological excisions, the authors conclude that traditional pathological reporting significantly underestimates the rate of positive margins.[14] Therefore, it has been suggested that a high rate of incomplete excisions may in fact be a marker of accurate pathology reporting of Whipple resections.[15,34] In this context it is interesting to note that the numbers of incomplete excisions in our series rose from 40% in the traditionally reported cases to 57% in the synoptically reported cases. Although this difference did not achieve statistical significance ($p = 0.1964$), there was a trend to an increase in the incomplete excision rate in synoptically reported cases. Interestingly, in the group of cases from one institution where the macroscopic examination was performed synoptically, requiring each margin to be assessed grossly and sampled histologically in a systematic manner, the rate of incomplete excision was as high as 67% in all Whipple resections and 76% in resections for pancreatic carcinomas. Axial slicing was not performed in any of the centres and there were no other prescribed changes to specimen processing or dissection. Therefore, it is reasonable to conclude that because a synoptic report focuses dissection and histological attention on margins, it may lead to a more accurate representation of the high rate of incomplete excision in Whipple resections. Whether this information actually improves clinical management is an issue which only ongoing studies will determine.

In conclusion, this study provides evidence that synoptic reporting of pancreatic resections without any other intervention increases the completeness, quality and accessibility of information provided in pathology reports. Whilst there still remains the practical problem of providing assistance and acknowledgement to the reporting pathologists, this study clearly demonstrates that the introduction of minimal data set synoptic reports into anatomical pathology departments is a very simple and feasible mechanism to improve reporting accuracy for pancreatectomy specimens.

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