PACT-UK (PAncreatic Cancer reporting Template–UK): a cross-specialty multi-institutional consensus panel development of a standardised radiological reporting proforma for pancreatic cancer

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ABSTRACT

Objective Appropriate staging of pancreatic cancer is essential to ensure patients are offered all treatment options. This multispecialty national collaborative consensus project aimed to develop a succinct radiological reporting template, using the concept of structured reporting, to allow a more standardised means of reporting pancreatic cancer and ultimately optimise both patient care and research protocol design.

Methods and analysis In stage one, a core group of stakeholders (oncologists, radiologists and surgeons) identified the current landscape of radiological reporting, including a blinded radiological validation study and a national survey of consultant HPB surgeons. Stage two used consensus panel development methodology to generate a provisional template draft. Stage three involved trialling the template across all UK HPB units, with feedback assisting the development of a final version of the template.

Results Stage one results identified a core dataset to develop a provisional template. Every UK Hepatopancreatobiliary (HPB) unit trialled this in clinical practice, leading to further refinements via consensus meetings. Ideal factors regarding tumour staging, extent of vascular involvement and response to systemic anticancer therapy were identified. This resulted in the generation of the PACT-UK (PAncreatic Cancer reporting Template–UK) template that is presented within the manuscript, as well as a user guide.

Conclusion This project has successfully produced the first consensus-driven radiological reporting template for pancreatic cancer, with the aim of its use becoming standard practice in the UK, while upcoming workshops facilitated by Royal College of Radiologists/British Society of Gastrointestinal and Abdominal Radiology will establish buy-in from radiologists at all HPB units. Plans for the use of PACT-UK within national audit and clinical trials are underway.

INTRODUCTION

There are approximately 10 500 cases of pancreatic cancer diagnosed every year in the

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ The appropriate radiological staging of pancreatic cancer is essential to ensure patients have the opportunity to access all treatment options.
⇒ In particular, the extent of tumour involvement with adjacent vasculature is imperative when making decisions regarding surgical resection or alternatively adopting a neoadjuvant chemotherapeutic approach.
⇒ Numerous radiological templates have been in existence; however, none represent a standardised proforma with national consensus for clinical and research utilisation.

WHAT THIS STUDY ADDS

⇒ Through consensus development in HPB units across the entire UK, this work has generated a uniquely standardised radiological reporting proforma for pancreatic cancer leading to national adoption in clinical practice with the aim of improving the delivery of patient care.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ The PAncreatic Cancer reporting Template–UK proforma has great potential for utilisation in national audits (including the upcoming National Pancreatic Cancer Audit), incorporation into national quality improvement projects (including the Pancreatic Cancer UK-led Optimal Care Pathway) and embedment within clinical trial protocols to ensure suitable classification of tumour stage prior to intervention.

UK and the prognosis remains devastating, with only 25% and 5% of patients surviving 1 and 5 years, respectively.[1] Despite numerous advancements in cancer therapeutics, the outlook has failed to improve significantly as compared with other malignancies, meaning

pancreatic cancer is due to surpass breast cancer as the third leading cause of cancer death by 2025.[2] The challenge in the management of pancreatic cancer is multifactorial, attributed to a combination of lack of effective screening, the heterogeneous genetic landscape giving rise to a high level of chemoresistance and late presentation of disease; with respect to the latter, patients unfortunately often present with locally advanced or metastatic disease, meaning potentially curative resection is only possible in 20% of cases.[3] When making multidisciplinary decisions regarding patient management, a number of elements require consideration, which may be broken down into local and distant factors. Locally, accurate analysis of tumour involvement with adjacent vasculature and organs is imperative to determine whether an R0 (negative margin) surgical resection can be achieved, which is known to incur the optimal prognosis.[4] Meanwhile, distant factors also necessitate close examination, most notably looking for the presence of metastases, such as the omentum, peritoneum and liver, which indicates the need for systemic anticancer therapy (SACT).

When considering non-metastatic cases of pancreatic cancer, classification of these tumours has typically fallen within three domains: resectable, borderline resectable and locally advanced.[5] Resectable tumours are clearly away from local vasculature, and as such current recommendation is to proceed straight to resection. The optimal management of each of the other two subgroups remains a point of debate owing to the lack of high-quality evidence supporting which approach is best; however, current practice tends towards the use of upfront/neoadjuvant SACT in an attempt to downstage disease, while concomitantly testing tumour biology, prior to potential resection, with or without vessel resection.[6]

As part of the investigative work-up of these patients, in-depth cross-sectional imaging is imperative to assist in optimal decision-making within the multidisciplinary team (MDT). Numerous radiological modalities are used, most commonly CT, MRI and endoscopic ultrasound; however, a dedicated pancreatic protocol CT has established itself as the gold standard for the initial assessment of pancreatic tumour resectability.[7]

The radiological reporting of pancreatic cancer is currently delivered through free-text reports, with local and distant elements of disease reported using a variety of descriptive terminologies. More recently, the concept of structured reporting (SR) has gained traction, with a number of other tumour types adopting standardised reporting templates.[8 9] SR is typically delivered in three separate tiers: first are simple headings, such as 'indication' or 'overall impression', and second 'itemised reporting' where specific organ/tumour detail is included in the examination findings subsection.[10] The last and probably most important tier is the use of standardised language to deliver consistent reporting. This is particularly pertinent in pancreatic cancer with respect to vascular involvement, as a number of descriptive terms exist within published guidelines,[5 11 12] with some uncertainty as to the difference

between them. Some associations have moved towards quantifying vessel involvement[12]; however, this is often not documented in reports.

A structured and consistent reporting template for pancreatic cancer will provide innumerable benefits. SR will ensure all relevant data points are included and reported upon to assist in optimal decision-making and improve MDT efficiency. Surgeons and oncologists will have all the necessary information from the report to assist in operative planning and assessment of treatment response in line with published guidelines. SR is also highly beneficial with respect to national audit and research implementation, clinical trial design and in general working towards more optimal patient selection and personalised treatment regimens.

In 2019, the National Cancer Research Institute (NCRI) formulated the UK localised pancreatic cancer framework document, highlighting areas of need at all stages of pancreatic cancer, with a particular emphasis on adequate staging and standardised classification. Subsequently, and with the support of multiple national associations including the RCR (Royal College of Radiologists), BSGAR (British Society of Gastrointestinal and Abdominal Radiology), RCSEng (Royal College of Surgeons of England), Association of Upper Gastrointestinal Surgery, PSGBI (Pancreatic Society of Great Britain and Ireland) and PCUK (Pancreatic Cancer UK), a collaborative consensus project was instigated, with a multi-institutional group of experts in pancreatic cancer, including radiologists, surgeons, oncologists and pathologists, with the aim of producing a new radiological reporting template for pancreatic cancer with all the aforementioned benefits.

METHODOLOGY
Core group conception and project planning
With the assistance of networks within the RCR, RCSEng, NCRI and PCUK, a core group of stakeholders was created in 2019 with representation from radiology, surgery, oncology and pathology, and from multiple HPB institutions (Leeds, Newcastle, Manchester, Glasgow, Birmingham, Bristol and Cambridge). An initial consensus meeting laid out the strategy towards template development and national implementation. This was planned in three stages: first, to establish the current landscape and perceptions of radiological reporting of pancreatic cancer in the UK. Second, to use observations from stage one to formulate a draft template. Lastly, to trial usage of the template in clinical practice with an extended group of users with the aim of incorporating feedback towards template refinements and optimisation. Regular virtual meetings facilitated the timely progress of the project, with a strong ethos towards interspecialty collaboration and repeated opportunities for feedback.

Stage one

This was conducted in two components—a radiological pilot study of current reporting practice and a survey of current opinion on desirable template core data points.

► The radiological arm of this stage aimed to review existing reporting templates known to the core group, and establish the pros and cons of each to help guide stage two work. Three templates were examined as demonstrated in online supplemental appendix 1: the USA-developed 'Beth Israel' template,[13] the trial-based Glasgow-developed PRECISION-PANC template[14] and the Newcastle-developed PROTRACT (PancReatic Tumour Radiological Assessment and ClassificaTion) template.[15] Ten CT pancreas image files, on tumours of a variety of stages, were shared anonymously via an online platform to 11 radiologists, who were asked to report each scan using all three templates and rate (on a scale of 1–10) usability, learning curve, layout and clinical relevance, and then provide an overall score.

► The survey of current opinion was conducted by means of an online proforma sent to all pancreatic surgeons registered on the PSGBI mailing list. Various questions were posed with respect to what features are deemed most important and relevant to clinical decision-making and surgical planning.

Stage two

In view of its emphasis on a multidisciplinary approach supported by data and research literature, consensus development panel methodology[16] was used to develop a first draft version of a radiological reporting template. Results and feedback from stage one were presented and discussed in a series of meetings coordinated by PCUK, with the aim of formulating a core dataset. A number of factors were also considered to ensure an optimal end product. Particular emphasis was placed on making the template concise, and with a clear structured layout for the purposes of interpretation and MDT efficiency. Information technology (IT) compatibility was also carefully considered, ensuring the ability to embed the template in commonly used reporting systems used within the National Health Service. Most importantly, the template was to be user-friendly to help embed it in routine radiology practice. With that in mind, a 'user guide' was also created.

Stage three

This phase involved trialling of the template on a national basis across all HPB institutions, with formalised feedback from radiology, surgery and oncology, and using this to make refined amendments towards a final version, with national body ratification. The project was advertised via all aforementioned supporting bodies and networks, resulting in a launch meeting of 75 stakeholders (41 radiologists, 27 surgeons and 7 oncologists). Following presentation of the first version of the template, clinicians were given a 6-month period to trial the template
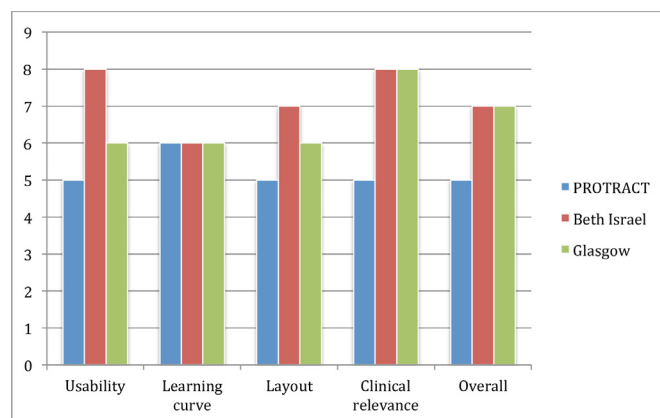
Figure 1 Ratings of various aspects of each template (Beth Israel, Glasgow and PROTRACT) used during the radiology pilot study. PROTRACT, PancReatic Tumour Radiological Assessment and ClassificaTion.

followed by a feedback survey. For all users, this concentrated on opinion with respect to layout, clinical relevance and effect on MDT efficiency including treatment decisions. For radiologists, this also included the learning curve, time taken to complete, timing of reporting and IT considerations. On completion of stage three, a final template was produced which is presented here, although with the view that ongoing consensus development would facilitate template amendments and refinements in future as guided by additional feedback and any additional surgical/oncological treatment approaches based on up-to-date published evidence. A poll was undertaken to decide on an appropriate name for the template, and plans put in place with respect to dissemination in both clinical and research practice, as well as providing practical training opportunities for radiologists.

Patient and public involvement

As part of the collaboration with PCUK, this project was ratified by the PCUK research team, with support from patient and public advocates within PCUK at the time of project conception. Particular support was expressed towards ensuring standardisation of radiological reporting across the country, thereby avoiding a 'postcode lottery' of patient management and ensuring all patients have the opportunity to access all appropriate treatment options according to the reported stage of their disease.

RESULTS

Radiology pilot study

Radiologists reported the 10 distributed CT scans using the three templates (Beth Israel, Glasgow and PROTRACT) and rated each of them, with the mean scores for each domain displayed in figure 1. In general, the Beth Israel performed marginally best overall five domains; however, a number of specific strengths of each template were identified for incorporation in our first draft.

Table 1 Surgeon survey results with respect to radiological features deemed most important and relevant to clinical decision-making and surgical planning

Question	Median	Range
On a scale of 1–5, how important is it to know…		
Exact CBD diameter if dilated	2	1–4
PD size	3	2–5
Whether there is local lymphadenopathy	5	2–5
Specific sites of local lymphadenopathy	4	2–5
Presence of venous collaterals	5	2–5
Duodenal involvement	3	1–5
Specific length of PV/SMV involvement	5	3–5
Specific length of SMA involvement	5	1–5
Presence of SMV tributary involvement	5	2–5
Involvement of 1st jejunal branch of SMA	5	2–5
Major vessel distortion/narrowing	5	3–5
Major vessel occlusion	5	3–5
Major vessel thrombosis	5	2–5
Compass position of vessel involvement	4	1–5
Presence of arterial atherosclerosis (without significant stenosis)	3	1–5
Presence of coeliac axis stenosis	4	2–5
Presence of SMA origin stenosis	4	2–5
Regarding degrees of involvement, would you prefer range or specific degrees?	Range (66%)	
How would you like range expressed?	90° increments (63%)	
Preferred layout	Tabular	

CBD, common bile duct; PD, pancreatic duct; PV, portal vein; SMA, superior mesenteric artery; SMV, superior mesenteric vein.

Surgeon survey
Following distribution of the survey to all surgeons on the PSGBI mailing list, a total of 38 responses were received. Results, including median scores of each response (range of options was 1–5), are displayed in table 1. Most notable agreement is highlighted in green, with a specific interest in more information regarding vessel involvement (length, associated distortion/occlusion/thrombosis), as well as approximately two-thirds of respondents more keen on a range of degrees of vessel involvement in 90° quartiles.

Draft template feedback
As part of stage two, a draft template was initially created, then trialled at multiple institutions during stage three. Feedback was then received from all users, which is summarised in figures 2 and 3. In general, radiologists were most content with the clinical relevance and reasonable quick learning curve (with the majority taking 5–10 min to complete); however, some issues with layout and usability were highlighted, the majority of which were due to IT issues (experienced in 50% of cases) which were subsequently addressed by the core radiology subgroup. Surgeons were again happy overall with the template, with most promisingly 83% finding it improved MDT efficiency, and 65% believing it to improve the ability to judge resectability and make treatment decisions. The most positive feedback was from the oncologists, with 100% of respondents stating the template improved the radiological reporting of treatment response.

Template finalisation
Following completion of stages two and three, via multiple drafts and subsequent utilisation of all the feedback received, a final version of the template was created, with a poll from all stakeholders resulting in this being named the PACT-UK template (PAncreatic Cancer reporting Template–UK). The tabular and plain text formats are displayed in online supplemental figure 1A,B, respectively.

There is great variation in radiology reporting systems nationally. Ideally, a tabulated format for the template would be used, which would be more visually appealing and potentially easier to complete. However, this would not be compatible with most current radiology reporting systems, which do not allow tables to be embedded. Instead, the template has been presented in a plain text format. This should make it compatible with any Radiology Information System (RIS). The template can be embedded as an autotext that can be inserted and filled for each patient. Each part of the template can be created as a separate autotext and only inserted into the report if relevant. Some radiology systems may allow certain features such as use of tables or drop-down choices of possible answers. The exact formatting of the template can be adapted in each centre with the help of the local radiology IT team. For specifically the Computerised RIS (CRIS), the application of simple text formatting is not obvious; therefore, specific guidance on how to optimally embed the template in CRIS is described in online supplemental appendix 2.

Template user guide
The template begins with a few general details, including what imaging has been reviewed, radiologists' initials and clinical details (although the latter two may be omitted if already included in the CRIS entry). A free-text summary of the key positive findings can be completed at this stage, for ease at MDT review and to ensure the positive findings are highlighted. This is optional and to be used at the reporting radiologist's discretion. If not necessary, it can be deleted.

Throughout the template, the square brackets after a 'yes' answer indicate extra detail is needed. In all questions, the 'no' option is placed before the 'yes'. This
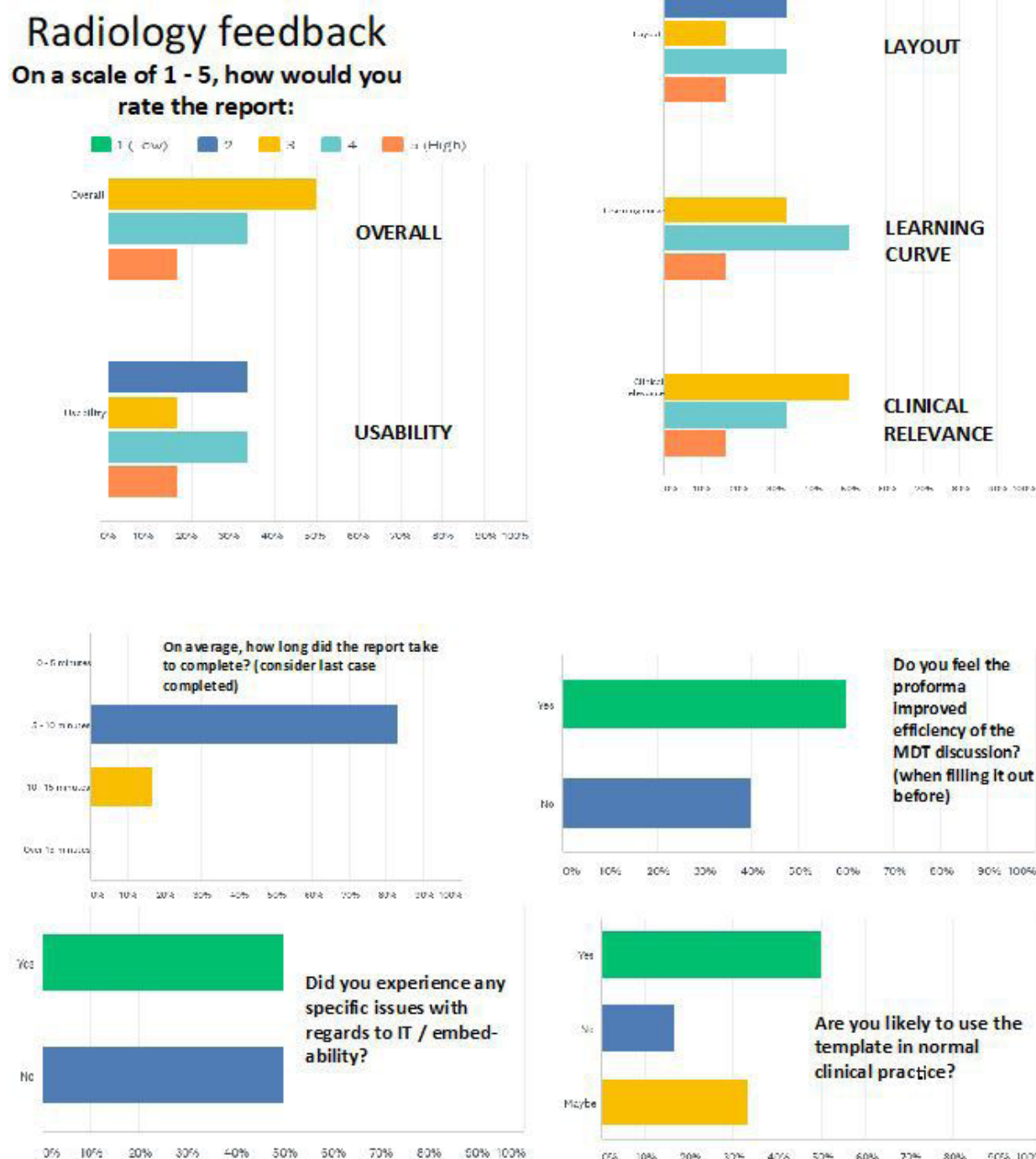
Figure 2 Feedback from radiologists regarding the clinical utilisation of the first draft of the PACT-UK template. IT, information technology; MDT, multidisciplinary team; PACT-UK, PAncreatic Cancer reporting Template–UK.

makes it slightly quicker to fill, as most answers will be 'no'—users can just highlight and delete everything after the word 'no'.

Any irrelevant parts/answers and all instructions in italics should be deleted to avoid cluttering up the final report.

Part A

This provides basic information for initial tumour staging. It is to be completed for all patients who are fit for any form of cancer treatment, including palliative chemotherapy. In a patient with clear metastatic disease, this is the only part that needs to be completed. Specific points are included below:

1. Details of the tumour:
   – Location in the pancreas.
   – Maximum diameter in millimetres if visible (in any plane), or if isodense and size cannot be estimated.
   – Any biliary involvement and if so, is it stented or unstented.
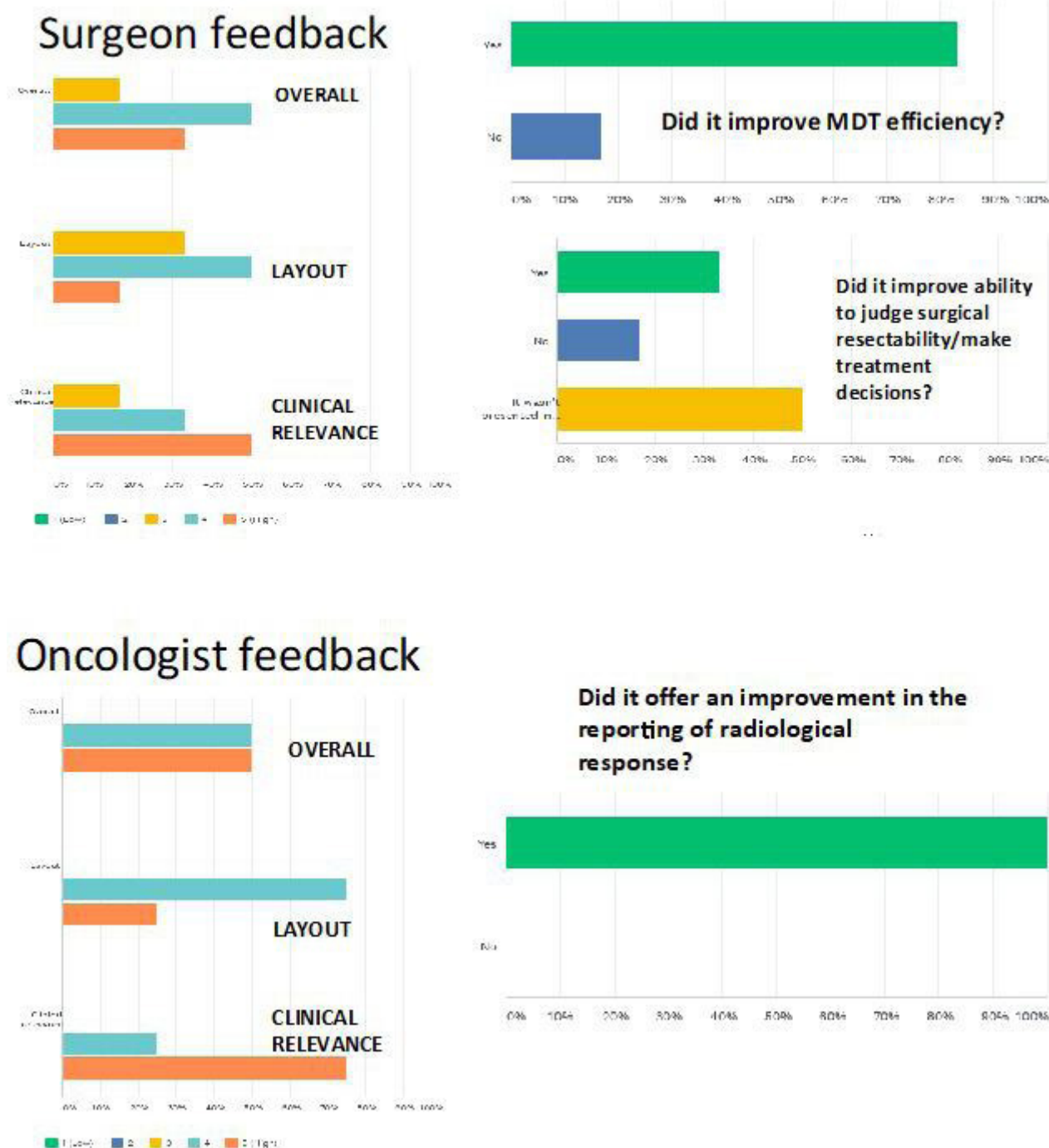
Figure 3 Feedback from surgeons and oncologists regarding the clinical utilisation of the first draft of the PACT-UK template. MDT, multidisciplinary team; PACT-UK, PAncreatic Cancer reporting Template–UK.

   – Pancreatic duct size in millimetres (a relevant detail for surgical planning and forming the pancreaticojejunostomy).

2. Any adjacent organ involvement (the duodenum has been specified, as involvement would contraindicate radiotherapy).

3. Any regional lymphadenopathy as defined by the current tumour, node, metastases (TNM) system; the suspected nodal site needs to be clear, particularly in those having treatment to ensure consistency when assessing subsequent response.

4. Any metastatic disease, specifying the location and giving a rough estimate of the volume of disease. This is helpful if chemotherapy is being considered to guide treatment, for example, there is a significant difference between a small liver metastasis versus a liver full of metastases. There may be a more indeterminate finding in which case that also needs to be documented.

5. The tumour type should be predicted as pancreatic ductal adenocarcinoma, ampullary, cholangiocarcinoma or other. This helps focus the report as to what kind of tumour pathology is involved and its associated

prognosis. If other, then the tumour type should be specified if possible.

6. The predicted TNM stage should be stated.

Part B

This provides detailed assessment of the local vessels. It should only be used for patients with no metastatic disease who are potential candidates for surgical resection (either as first-line treatment or following neoadjuvant therapy). For each involved vessel, the degree of contact should be stated in the first box (stating the range as 0–90°, 90–180°, 180–270° or 270–360°) and the presence of narrowing, occlusion or thrombosis in the second box. If there is no vessel narrowing, occlusion or thrombosis but only contact with the tumour, then simply state the degree of contact as above in the first box and leave the second box blank. Specific points are included below:

1. Give details of any variant vascular anatomy; variant hepatic arterial anatomy is the most common and usually the most vital for surgical planning.
2. Venous contact—document any venous contact stating the degrees of contact and if there is any narrowing, occlusion or thrombosis as detailed above. The vessels included are the portal vein (PV), superior mesenteric vein (SMV) and SMV tributaries.
   - For PV and/or SMV involvement, state the total length of contact in millimetres; the vessels are anatomically in continuity and length of contact should be assessed across both if necessary.
   - For other vein contact, specify the vessel (eg, splenic vein), and again state the degree and type of contact as appropriate.
   - Any jejunal or colic tributary involvement simply state no or yes.
   - Any venous collaterals if PV/SMV occlusion simply state no or yes.
3. Arterial contact—document any arterial contact stating the degrees of contact and if there is any narrowing, occlusion or thrombosis as detailed above. The vessels included are the superior mesenteric artery (SMA), common hepatic artery, coeliac axis, SMA branches and gastroduodenal artery (GDA). Specific points are included below:
   - If there is SMA contact, state the length of contact in millimetres.
   - Any jejunal or colic branch involvement simply state no or yes.
   - Any GDA involvement simply state no or yes.
   - Any other arterial contact should be detailed, including accessory/replaced vessels, specifying the vessel in the first box, the degrees of contact as per earlier sections in the second box and the type of involvement in terms of narrowing, occlusion or thrombosis as per earlier sections in the third box.
   - Assess the coeliac axis and SMA origins, giving details of any stenoses and likely cause (eg, due to atherosclerosis or median arcuate ligament compression) as this can impact surgery.

Part C

This is a free-text section for any additional findings that the reporting radiologist would like to include.

Part D

This section is only to be used for patients after neoadjuvant treatment for response assessment. This can be added as a separate autotext entry and is intended for comparison with the initial staging template completed prior to treatment. For each question, any change should be detailed in comparison with the initial staging examination. Specific points are included below:

► If there are definite new metastases, then the remaining questions do not need to be completed. If there are new findings that are indeterminate, then they should be specified and the remaining questions should be answered.
► The summary of the response (partial/stable/progression) is intended to be a subjective assessment based on the answers to the preceding questions, reflecting everyday practice. More formal response assessment criteria can be employed if the template is being used in a trial setting.

Additional specific technical considerations for embedding the template on CRIS are further outlined in online supplemental appendix 2.

DISCUSSION

Since the advent of the worldwide web in the early 90s and subsequent technological advancements, it was quickly recognised that radiological reporting methodology could be revolutionised with structured templates.[17 18] With subsequent technological advancements, it is only in the last decade or so that the concept of SR has gained real traction, and in the process demonstrating innumerable benefits.[10 19] The perceived advantages of SR have been shown to be accuracy/quality, retrievability (with respect to research implementation), accessibility, automatisation, facilitation of workflow, keeping the electronic patient record up to date, teleradiology information exchange between medical centres, ergonomics of the radiologist and the referring physician, financial benefits and education.[20] We believe the PACT-UK template fulfils many of these criteria, and there is certainly a palpable desire within the pancreatic cancer community for it.[21] Evidence exists to support the need for a structured radiological reporting proforma; a recent retrospective analysis of CT reports revealed 13% of reports failed to comment on PV involvement, while variant arterial anatomy and peritoneal/omental nodularity was only documented in 23% and 42% of cases.[22]

A move towards a different way of reporting may prove an obstacle to reporting radiologists given the time pressures in current clinical practice. Many radiologists appreciate the freedom of expression that a free-text report permits, and may find a 'box-ticking' exercise too restrictive. With this in mind, both the introductory section and part C

permit this function within the template. Furthermore, the study group is running workshops with the support of PCUK and BSGAR to demonstrate the template utility and address any user queries or concerns, and these will continue to run as the template is rolled out nationally. In addition, the hope would be, with advancements in IT software, that the template may evolve towards a more user-friendly tabular format with drop-down menus and colour coding to enhance functionality and provide more visual appeal.

Arriving at a consensus as to what core data points were included within the template was always going to be challenging, given the range in viewpoints as to what is deemed essential, while keeping the template succinct and not too laborious to complete. The consensus development panel methodology, with regular feedback from stakeholders across all involved specialties, resulted in mutually agreeable conclusions on the final dataset. However, this is with the additional philosophy that this is version 1, and the PACT-UK Study group will continue to meet and discuss any potential refinements in response to user feedback and new evidence-based research which highlights the need for the addition of novel data points deemed useful for tumour analysis and treatment decision-making.

With respect to decision-making regarding surgical resection, definitions of resectability have purposely not been used. They vary widely and from centre to centre depending on surgical experience and expertise. The purpose of the template is to document the findings in each case objectively in a consistent manner, but leave judgement on resectability for each centre to make within an MDT setting. Nonetheless, in response to survey results, relevant core data points for surgeons were carefully considered and included, particularly in part B. For example, the template includes variant anatomy and tributary involvement which are useful to know when approaching the tumour during mobilisation and resection phases of the procedure, while knowledge of coeliac origin stenosis permits this to be managed intraoperatively if median arcuate ligament syndrome is suspected.

With respect to vessel involvement, again the template did not aim to contradict published guidance regarding tumour classification (borderline/locally advanced). Nonetheless, the ultimate aim of surgical resection is to achieve a negative R0 margin, with subsequent improved prognosis.[4 23 24] It is well-known that margin positivity most often occurs on the adjacent vein or artery,[25] and as such this is the key area for examination in preoperative imaging assessment; therefore, the decision was made, again following consensus discussion and survey feedback, to narrow down the degree of vessel contact into 90° quartiles, to more accurately represent the extent of involvement and also help in assessing response to neoadjuvant therapy.

The fundamental purpose of post-treatment imaging in pancreatic cancer is to rule out the presence of disease beyond the loco-regional extent that may preclude resection.[26] This local response to treatment is often more pronounced in other cancer types, such as rectal cancer, but is more difficult to see and assess in pancreatic cancer. Following neoadjuvant treatment, tumour tissue in the pancreas can become fibrotic or there may be concomitant inflammation, both of which can simulate residual malignancy and make assessment of treatment response difficult.[27] An ideal appearance, concomitantly pulling away from the vessel with reduced degree of involvement, is not often seen with current treatments but it is hoped that if this is seen in a subset of patients, further analysis of the tumour behaviours in this cohort will support a more personalised approach to defining treatment strategies in the future. It should also be noted, however, that even if these levels of regression are not seen, it does not necessarily preclude resectional surgery.[28] This novel means of expressing vessel involvement can be subsequently analysed in a prospective validation study to determine its plausibility, impact on outcomes and clinical application in treatment decision-making.

From an oncology perspective, the detail regarding vascular and adjacent vessel involvement is also key in management planning. Baseline (pretreatment) and interval imaging is essential to assist in the assessment of predicted margin involvement, and the assessment of postoperative pathology and correlation with resection margin status is a key part of oncological 'mapping'.[29] Ultimately, it is the detail that matters when planning treatment and exact knowledge of adjacent structure involvement is imperative, because it can be used to help with detailed non-surgical treatment decisions, for example, in the delivery of high-precision radiotherapy, for example, stereotactic body radiotherapy, a high dose may be applied to the area of tumour–vessel contact, while protocols require treatment to be sculpted away from adjacent structures such as the duodenum.[24] Additionally, part D has been included as a standalone section to be included when assessing response to therapy, including all relevant tumour and disease detail to determine overall response and ultimately refine the assessment of tumour response to permit surgical resection.

We already know that imaging tends to underestimate vascular involvement.[30] This further adds weight to the need for high-quality imaging to permit an accurate and reliable radiological assessment. Dual-phase pancreas protocol CT is the examination of choice, allowing optimal definition and characterisation of any pancreatic abnormality. Pancreatic tumours are typically best seen during the late arterial phase (or pancreatic phase), being hypovascular compared with the background pancreatic parenchyma that has a rich blood supply appearing brighter compared with tumour tissue. An arterial phase is also better for assessing arterial involvement and identifying any arterial anatomical variants, both crucial for treatment planning. The portal venous phase is used to assess venous involvement and to identify metastatic disease. Recall for a dedicated pancreas protocol CT may be necessary if only a single portal venous phase has been performed in patients who are potential candidates for

Table 2 Suggested CT protocol considerations

Parameter	Details	Rationale
Section thickness	As thin as possible (<1 mm)	To allow reconstructions
Oral contrast agent	Negative agent (usually water)	Positive agent may cause artefact and compromise reformats/maximum intensity projection (MIP)
IV contrast agent	▶ High iodine concentration (300 mg/mL) ▶ 100–150 mL (ideally using weight-based volume) ▶ Injection rate 3–5 mL/s	To maximise tumour and vessel conspicuity
Scan acquisition timing (with bolus tracking timings provided in brackets)	▶ Pancreatic parenchymal phase at 35–50 s (18 s) ▶ Portal venous phase at 65–70 s (25 s) ▶ ±Unenhanced phase if pain	▶ Pancreatic parenchymal phase best for assessing primary tumour and arterial involvement ▶ Portal venous phase best for assessing venous involvement and metastatic disease ▶ Initial unenhanced phase can be added if history of pain to help identify calcified bile duct stones
Image reconstruction and display	▶ Axial 2–3 mm thickness ▶ Multiplanar reformats in the coronal plane at 2–3 mm thickness ▶ MIP or 3D volumetric thick sections for vascular evaluation (optional)	Helps improve accuracy of vascular assessment

3D, three-dimensional; IV, intravenous.

surgery where the additional information could alter management. Multiplanar reformats are very helpful for detailed vascular assessment and should be used routinely in patients who are potential surgical candidates. A suggested CT protocol is outlined in table 2. In patients with biliary involvement and jaundice, CT should be performed before any biliary or endoscopic intervention. Artefact from both plastic and metal stents can obscure small tumours. There is also a risk of developing pancreatitis, which can obliterate normal fat planes and reduce the ability to assess tumour–vascular relationships.

From a practical and implantation perspective, we believe some level of common sense is required as to when the PACT-UK proforma is completed, and ensure such a detailed report is not undertaken when it is not going to add anything to the management decision-making process. When fitness/performance status is clearly poor and no treatment will be offered, then it is recommended that the template does not need to be used. If patient fitness is not clear initially, then the template can be filled retrospectively after MDT discussion to provide the extra detail required in those who are subsequently deemed fit for cancer treatment. Ideally, the template is completed prior to MDT to improve case review efficiency; however, this can be institution dependent with respect to workload, case flow and practicalities of use. Part B, which provides the detailed vascular assessment and is the most time-consuming section to fill, should only be required for potential surgical candidates including those having neoadjuvant treatment where the extra detail will be of relevance; in practice, often only a small handful of patients in a typical pancreatic MDT require the section on vascular assessment (part B) to be completed.

Lastly, we strongly believe the PACT-UK proforma can prove invaluable in supporting research study protocols. As already alluded to, there is variation and ambiguity between the association statements regarding the difference between resectable/borderline/locally advanced disease.[5 11 12] Randomised controlled trials for pancreatic cancer are increasingly interested in the potential to downstage borderline/locally advanced disease, with a rigorous radiological analysis required to ensure patients are placed into the appropriate category/arm of the study. Furthermore, the reporting of response to treatment is essential in providing reliable outcome data. PACT-UK is an ideal tool to implement in trial design, and we hope this can be facilitated in current and prospective studies.

CONCLUSIONS
The PACT-UK Project represents the first ever UK-wide consensus development initiative to produce a standardised and structured radiological reporting template for pancreatic cancer. This will be invaluable in improving the consistency in documentation of tumour stage/classification, facilitating MDT efficiency, guaranteeing documented evidence of disease relevant to surgical planning and oncological treatment response, and optimising research trial protocols. With continual reassessment and evolution, the template will fluidly adapt and improve through future versions, while the national implementation will be facilitated through practical workshops with the support of national associations, and in the ultimate hope that PACT-UK will successfully deliver improved clinical care to patients with this devastating disease.

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