Survey of rectal cancer MRI technique and reporting tumour descriptors in the United Kingdom: a multi-centre *blinded* audit

Introduction

Rectal cancer accounts for a third of colorectal cancer, which is the fourth commonest cancer in the UK[1]. Magnetic resonance imaging (MRI) is central to the management of rectal cancer by assessing additional features beyond tumour-node-metastasis (TNM) staging that help guide personalised patient treatment[2] . MRI identifies patients with locally advanced rectal cancer with poor prognostic imaging features including extramural venous invasion (EMVI), tumour deposits, and involvement of the mesorectal fascia (MRF) suitable for neoadjuvant treatments including chemoradiotherapy (CRT). These imaging features are prognostically significant, separating 'high' and 'low' risk patients, thereby guiding non-surgical and surgical decisions about the types, radicality and order or treatments[2–4].

Rectal cancer management varies globally, reflected in the different imaging protocols and reporting standards for rectal cancer MRI from European Society of Gastrointestinal and Abdominal Radiology (ESGAR)[5] and North American Society of Abdominal Radiology (SAR)[6]. For example, European guidelines sub-classify T3 tumour extra-mural invasion depth (T3a-d)[5] since rectal cancer T3b with ≤5mm extension (T3a or b) without MRF involvement can be considered for non-surgical treatment with curative intent or proceed straight to total mesorectal excision (TME) surgery, whereas North American guidelines do not subclassify T3 disease with most patients proceeding to CRT and surgery[7]. These differences in international consensus highlight controversies for initial staging of rectal cancer and may contribute to variation in clinical practice leading to regional inconsistency in treatment decisions.

We evaluated current practice and performance in a national multi-centre retrospective audit of protocols and reporting in primary staging of rectal cancer on MRI to assess the variance against standards based on ESGAR[5]and SAR[8]guidelines.

Methods

A national retrospective, multi-centre audit was co-ordinated by *BLINDED*. An open invitation to participate in this audit was distributed among *BLINDED* members working in NHS Trusts in the UK. Hospitals where radiologists reported across more than one site within the same Trust were counted as a single centre.

Audit standards were adapted by the investigators from the ESGAR[5]and SAR[8]guidelines. The audit included two components. The first collected details of the routine rectal cancer staging MRI protocol. Then MRI reports were assessed from centres in consecutive patients with histologically proven rectal adenocarcinoma (inclusive of confirmatory post-operative histology), and baseline pre-treatment staging MRI rectum. Post-treatment MRI reports, and patients with unconfirmed histology, pathology other than adenocarcinoma, or a tumour location other than the rectum (including distal sigmoid colon and anal canal) were excluded. An aspirational target of 10 case submissions per radiologist reporting MRI rectum at each centre and 30 per centre was requested. MRI examinations were performed between 1st March 2020 and 31st August 2021 inclusive. Staging information included in patient reports as assessed against a standard set of 18 key tumour descriptors to assess completeness[9].

RedCAP (Research Data Collection Service) was used as a secure portal for centres to submit anonymised data[10] (see supplementary material for data forms). Descriptive statistics were used to summarise the data, with cases with missing data excluded from the summary statistics and Chi-square test was used to test assess for differences in reported tumour descriptors between free-text and template reports (Microsoft Excel 365).

This work comprised of observational service evaluation without deviation from normal practice and in accordance with clinical governance guidelines. Formal research ethics committee approval was not required.

Results

24 UK centres (11 university teaching hospitals, 13 other centres), geographically spread across the UK (see Figure 1), submitted data for 924 patients reported by 78 radiologists. 3 patients had incomplete datasets for the tumour characterisation so 921 patients are included in the statistical analysis. The number of MRI reports per radiologist ranged from 1-47 (median 10). The number of radiologists reporting rectal cancer MRI at each centre ranged from 1-10 (median 5). In the preceding 12 months, all reporting radiologists attended the colorectal multi-disciplinary team (MDT) meeting in 13 of 24 centres (54.2%), while in eight centres (33.3%) 60-67% of reporting radiologists attended the MDT meeting and in three centres (12.5%), only 50% attended the MDT meeting.

Imaging protocols and patient preparation

70.8% of centres (17/24) exclusively used 1.5T MRI, 25.0% (6/24) used a combination of 1.5T and 3T and 4.2% (1/24) using only 3T. Routine spasmolytics were used in 12 centres (46.2%) with a higher proportion in centres using 3T MRI (5/7; 71.4%) compared to sites that used 1.5T (9/17; 52.9%) (p-value 0.2). MRI scan time varied between 20-50 mins (median 40.0, SD 8.1).

All centres used axial T2 and sagittal T2 sequences with orthogonal plans perpendicular to the tumour axis. A coronal T2 sequence was performed in 22 centres (91.6%) and an axial T1 sequence in 9 (37.5%). Diffusion weighted imaging was routinely used in 19 centres (79.1%) with 800s/mm^2 as the commonest high B-value in 10 (52.6%); 1000 s/mm^2 in 6 (31.6%); 1200s/mm^2 in 2 (10.5%); and 1400 s/mm^2 in 1 (5.3%).

Referral information

The location of the rectal tumour was included in the clinical history in 607 of 901 (67.4%) MRI referrals. The biopsy histology was documented in only 44 of 897 (4.9%) of referrals for MRI.

MRI reporting

Primary tumour location, size, and morphological features

While ‘basic’ descriptors of tumour location and length are reported in more than 90% of cases (see Table 1) the height of the tumour in the rectum was reported in a lower proportion compared to fixed landmarks (anorectal junction/puborectal sling in 62.2%, anal verge 85.8% and peritoneal reflection 64.9%). Furthermore, the radial location (82.5%), morphology (84.3%) and signal intensity (34.5%) are also not reliably reported. Interestingly there was no difference of reporting of the radial location when T1/2 tumours were compared to more advanced T3/4 tumours (223/268 (83.2%) compared to 499/601 (83.0%) respectively).

Table 1. *Tumour location, size, and morphological factors included in MRI reports.*

Location, size, and morphological feature	Yes (*n* (%))	No (*n* (%))
Tumour location specified?	*894/921* **(97.1%)**	*27/921* **(2.9%)**
Craniocaudal length of tumour reported?	*877/921* **(95.2%)**	*44/921* **(4.8%)**
Tumour morphology specified (i.e., sessile, polypoid, semi-annular, annular)?	*776/921* **(84.3%)**	*145/921* **(15.7%)**
Distance from ano-rectal junction / puborectalis sling reported?	*573/921* **(62.2%)**	*348/921* **(37.8%)**
Distance from anal verge reported?	*790/921* **(85.8%)**	*131/921* **(14.2%)**
Tumour relationship to peritoneal reflection specified?	*598/921* **(64.9%)**	*323/921* **(35.1%)**
Tumour T2 signal specified (e.g., intermediate soft tissue verses high signal mucinous)?	*318/921* **(34.5%)**	*603/921* **(65.5%)**
Tumour radial location in the bowel specified?	*760/921* **(82.5%)**	*161/921* **(17.5%)**
Is the rectal tumour imaged in a perpendicular plane to the long axis?	*768/795* **(96.6%)**	*27/795* **(3.4%)**

Primary tumour and resection margin status

While the tumour T staging is reported in 94.4%, all other tumour descriptors are reported in less than 90% of cases including depth and location of tumour invasion, tumour relationship to MRF or anal sphincter and pelvic floor (see Table 2). A criterion for defining a threatened MRF (e.g., <2 mm, or another measurement) was stated in 183/274 (66.8%) of reports. Furthermore, additional adverse features of EMVI and tumour deposits were commented on in 85.6% and 44.4% respectively.

Table 2. *Details of primary tumour and relationship to adjacent structures*

Primary Tumour		**Yes (n (%))**	**No (n (%))**
T-stage specified?		*869/921* **(94.4%)**	*52/921* **(5.6%)**
	T1	*55/869*	
	T2	*213/869*	
	T3	*453/869*	
	T4	*148/869*	
Depth of extra-mural invasion if T3 / T4 specified?		*451/570* **(79.1%)**	*119/570* **(20.9%)**
	T3a-d	*99/451*	
	Millimetres	*39/451*	
	Both	*313/451*	
Tumour radial location of extra-mural invasion if T3/T4 specified (i.e., anatomical or clock-face)		*447/540* **(82.8%)**	*93/540* **(17.2%)**
Relationship to other adjacent organs specified in T4 disease?		*112/132* **(84.8%)**	*20/132* **(15.2%)**
MRF		**Yes (n (%))**	**No (n (%))**
Is relationship of tumour to the MRF specified?		*732/921* **(79.5%)**	*189/921* **(20.5%)**
	Clear	*420/732*	
	Threatened	*116/732*	
	Involved	*196/732*	
Relationship of tumour to the MRF specified when the tumour was T3/T4		*500/601* **(83.2%)**	*101/601* **(16.8%)**
Criteria used for threatened MRF stated (< 2mm, other measurement)?		*183/274* **(66.8%)**	*91/274* **(33.2%)**
Location of MRF involvement mentioned (i.e., anatomical or clock-face description)?		*263/278* **(94.6%)**	*15/278* **(5.4%)**
Anal sphincter status		**Yes (n (%))**	**No (n (%))**
Relationship to levator, puborectalis, external or internal sphincters for low rectal tumours		*200/366* **(54.6%)**	*166/366* **(45.4%)**
		N/A	*555/921* **(60.3%)**
EMVI		**Yes (n (%))**	**No (n (%))**
Extra-mural venous invasion (EMVI) specified?		*788/921* **(85.6%)**	*133/921* **(14.4%)**
Tumour deposits		**Yes (n (%))**	**No (n (%))**
		*187/425 (***44.0%)**	*238/425* **(56.0%)**

Presence of meso-rectal tumour deposits (or N1c) specified?	N/A	*496/921* **(53.9%)**
N/A = not applicable.		

N- stage

The N-stage subcategories (i.e., N1a,b,c,N2a,b) were specified in the report in 842/921 (91.4%) of cases, with location and number of the malignant nodes where relevant in 422/505 (88.6%) and 283/498 (56.8%) of cases respectively. The relationship of the mesorectal nodes to the MRF was recorded in 204/483 (42.2%) of applicable cases.

Lymph node evaluation was assessed per radiologist in Table 3 describes the variation in methods of lymph node assessment across the reporting radiologists.

***Table 3**. Methods of lymph node assessment by radiologist*	
Different combinations of criteria used by reporters	***Reporters that use the criteria***
*Combined ESGAR**	*18/75* **(24.0%)**
Combined ESGAR and Chemical shift*	*16/75* **(21.3%)**
Combined ESGAR and Chemical shift, node signal*	*1/75* **(1.3%)**
*Combined ESGAR * and Node signal, node border*	*2/75* **(2.7%)**
Chemical shift and node signal, node border, node size	*5/75* **(6.7%)**
Chemical shift and node signal, node border	*3/75* **(4.0%)**
Chemical shift and node signal, node size	*2/75* **(2.7%)**
Node signal, border and size	*21/75* **(28.0%)**
Node Size	*1/75* **(1.3%)**
Node Signal	*1/75* **(1.3%)**
Node Signal, Node Size	*1/75* **(1.3%)**
None of the above criteria	*4/75* **(5.3%)**
*Combined ESGAR criteria include size AND Morphologic suspicious criteria: [1] round shape, [2] irregular border, [3] heterogenous signal).	

M-stage

The majority (584/921; 63.4%) were staged as M0 and 137/921 (14.9%) as M1 on any staging modality including CT, PET-CT, or MRI. In 21.7% (200/921) of cases the M stage was not provided. Subclassification (e.g., M1a, M1b, or M1c was recorded in 46/137 (33.6%) where distant metastatic disease was present. As expected the increasing T-stage of the primary corresponded to the M1 status; 0/39 (0%) of T1 tumours versus 6/157 (3.8%) T2 tumours, 83/364 (22.8%) T3 tumours and 44/126 (34.9%) of T4 tumours.

MRI Report Summary

A final summary of the key staging information (e.g., tumour location, TNM stage, EMVI, and MRF status) was included in 707/921 (76.8%) of reports.

Template reports versus free-text reports.

A reporting template was used by radiologists in 297 of 922 (32.2%) MRI reports. Across the 24 centres, 3 (12.5%) used template only reports, 8 (33.3%) used free-text only reports and the remaining 13 (54.2%) used a combination of free-text and template reporting. Highly significant differences in the majority of key tumour descriptors were observed compared to a free-text alternative (Table 4). There is no significant difference in reporting tumour location as well as 2 subdescriptors related to aspects of involved node location, and one subdescriptor for the position of MRF involvement.

Table 4: Key tumour descriptors and their inclusion on prose and template report styles

		Total number of free text reports including variable/total number of free text reports (%)	**Total number of template reports including the variable/total number of template reports (%)**	**Chi-square statistic**	**p-value**
Tumour	Location	602/624 (96%)	292/297 (98%)	1.80	0.18
	Craniocaudal Length	582/624 (93%)	295/297 (99%)	14.93	0.0001
	Distance from the anal verge	495/624 (79%)	295/297 (99%)	64.34	<0.0001
	Shape	483/624 (77%)	293/297 (98%)	66.90	<0.0001
	Radial location of wall involvement	475/624 (76%)	285/297 (95%)	53.53	<0.0001
	MRI signal	166/624 (27%)	152/297 (51%)	52.68	<0.0001
	Relationship to peritoneal reflection	327/624 (52%)	271/297 (91%)	131.62	<0.0001
	T stage	572/624 (92%)	297/297 (100%)	24.69	<0.0001
If ≥T3	Distance through	131/247 (71%)	182/185 (98%)	106.70	<0.0001

	muscularis propria				
MRF	MRF status	441/624 (71%)	291/297 (98%)	90.33	<0.0001
	Location closest to MRF	140/151 (93%)	123/127 (97%)	1.57	0.21
If ≥T4	Which organs involved	69/87 (79%)	43/45 (96%)	4.89	0.027
Nodes	Nodal status	551/624 (88%)	291/297 (98%)	22.82	<0.0001
	Location of involved nodes	284/344 (83%)	138/161 (86%)	0.58	0.45
	Mesorectal node relationship to MRF	141/330 (43%)	63/153 (41%)	0.049	0.82
EMVI	EMVI status	495/624 (79%)	293/297 (99%)	59.28	<0.0001
Metastases	Distant metastatic status	459/624 (74%)	262/297 (88%)	24.58	<0.0001
Overall predicted TNM stage		416/624 (67%)	291/297 (98%)	108.87	<0.0001
MRF- mesorectal fascia, EMVI- extra-mural venous invasion					

Considerable variation in key tumour descriptors included in reports were demonstrated between centres depending on the reporting format. Further differences existed between centres that used template reports, free-text reports, or a combination. Four key tumour descriptors were further analysed to examine the differences in inclusion between template and free-text alternatives (Fig. 2a-d.)

Discussion

This research confirms considerable variation in image acquisition and reporting of rectal cancer MRI between UK centres. While outcomes for rectal cancer have significantly improved in line with advances in surgical techniques, pre-operative therapies, and imaging modalities[11], important variations exist in radiological practice which have direct relevance to patient care and may contribute to variation in treatment decisions and outcomes.

It is clear that structured reporting templates substantially improve the quality of routine MRI reporting documentation for a majority of key tumour features in rectal cancer staging compared to free-text alternatives, which has been established in other research and this practice is preferred by treating clinicians[12–15]. However, a reporting template was only used in 32% of cases. In centres where some radiologists use template reports, but others use free text, the percentage inclusion of key tumour descriptors was higher when template reports were used, showing that a discrepancy exists in free text reports even where templates are employed by colleagues in arguably higher performing centres. Given the discrepancies that exist in report content, since key tumour descriptors substantially alter management decisions, radiologists should now consider adopting template reports into routine clinical practice and other national radiology organisations are adopting this approach[16,17].

Specific deficiencies in reporting tumour features could have a predictable clinical impact. For example, high tumour signal is only reported in 27% free-text and 51% template reports, despite mucinous adenocarcinoma being associated a worse prognosis, greater propensity for metastatic spread, and higher stage at diagnosis[18]. High signal mucinous nodal metastases are more difficult to detect on T2 sequences, which is easier on T1 but this sequence is only performed in 37.5% of centres; missed nodal metastases could lead to under staging and failure to offer neoadjuvant treatment.

Similarly, the description of the precise tumour position in relation to landmarks such as the anal verge, puborectalis and peritoneal reflection are missing in almost 40% of reports, which is important for surgical and radiotherapy treatment planning. The depth of tumour extension beyond the muscularis propria and presence of EMVI or tumour deposits are also key features deciding the risk of local recurrence or distant metastatic disease, which is particularly important for case selection with Total Neoadjuvant Therapy involving systemic chemotherapy with short course radiotherapy or CRT[19,20]. The involvement and description of involvement of the anal canal and pelvic floor in low rectal cancer is a further influential area impacting on decisions related to the extent of surgical resection.

Nodal staging is one of the most challenging and contentious components of pre-operative rectal cancer evaluation for most radiologists but it is still considered an important determinant of outcome and included in the most current guidelines[5]. Almost all radiologists specified an N-stage (98% of cases) and described the lymph node location in this audit however other substantial variations exist. Most used either ESGAR criteria alone (24%) or a modification including chemical shift (23%), as an additional criterion for the assessment of malignant nodes, previously shown to be a helpful predictor of malignant nodal status [21], but not included in the current ESGAR criteria. The number of involved lymph nodes, and their relationship to the MRF, was given in 57% and 42% of relevant cases respectively. According to the ESGAR consensus statement, node proximity to the MRF is only considered significant in those with extra-capsular spread, which confers a 20-30% risk of recurrence[22].

There are undoubted challenges keeping up to date with the proliferation of scientific literature in rectal cancer imaging and AJCC version 8 of TNM[23] presents specific challenges to radiologists interpreting MRI. This highlights the need for expert to identify and resolve areas of difficulty, with an international multidisciplinary group highlighting a need to improve the definition of involved pelvic structures indicating T4b tumour extension, advice on reporting nodes and tumour deposits as well as the diagnosis of lateral pelvic side wall nodes and the evaluation of anal canal involvement[22].

Important UK workforce and professional development challenges seem to contribute to this picture with only 50% of centres having radiologists reporting MRI that regularly attend a colorectal MDT. Previous Royal College of Radiologists (RCR) standards required radiologists to attend two-thirds of MDT meetings and a minimum of two radiologists allocated to each MDT meeting[24], but this may no longer be feasible because of other workload pressures or necessary because of the increasing size of MDTs. While some centres had 10 reporting radiologists, with some not attending MDT, smaller centres with only one or two radiologists may benefit from a more comprehensive MDT attendance and peer review of practice. These issues impact a radiologist’s educational opportunities to gain in depth understanding of current advances in rectal cancer treatment strategies and apply these to their routine work. It also raises important questions about which radiologist should report specialist examinations and how reporters get the necessary feedback on their work to allow them to maintain and improve their performance.

While the interpretation of findings is increasingly important and influential on treatment choices, the performance of the MRI scan is also diverse. The variation in scan time from 20-50 minutes is likely to be related to the field strength of the scanner, the number of sequences obtained, the incorporation of diffusion weighted imaging and the selected b-values, whether T1 sequences are performed and administration of antispasmodic. While SAR advises DWI and T1 sequences routinely the ESGAR guidelines do not[5]. There is no current consensus regarding the routine use of spasmolytics[25] which was reflected in our cohort. Where 3T scanners are used, ESGAR encourages spasmolytics, particularly for upper tumours (5) which may explain the increased spasmolytic use for 3T MRI in 71% of centres versus 53% using 1.5T only.

The audit has some limitations. The data entry was performed by contributing centres, and combined with the retrospective nature of the audit, makes it prone to selection bias despite the stipulation to include consecutive cases. Furthermore, the pre-defined audit template did not explore reasons behind some of the observed inconsistencies, for example, MRF status omission based on tumour location and involvement of the peritonealised rectum. In addition, the audit did not collect data on the information provided to clinicians at MDT, which may include additional tumour anatomic detail not stated in the original report, but which may have contributed to treatment decision making. However, the strengths of this work include the representation of diverse participating centres across the NHS in the UK and the depth of analysis or individual case-level data allowing a comparison of reporting performance between hospitals and radiologists.

In conclusion, this large, multi-centre audit has demonstrated considerable variation in the acquisition and reporting of rectal cancer MRI in the UK and areas of underperformance. Inclusion of key tumour descriptors in MRI reports, particularly in low rectal tumours, must be improved. Superior performance of structured reporting builds a strong case to standardise UK practice to optimise treatment decisions by developing national rectal cancer imaging standards. Further research should evaluate the professional barriers preventing adoption of consensus guidance in routine clinical practice.

Bibliography

1. World Cancer Research Fund. *Cancer Statistics Based on Combined Data from England, Scotland, Northern Ireland and Wales*.; 2022.
2. MERCURY Study Group. Diagnostic accuracy of preoperative magnetic resonance imaging in predicting curative resection of rectal cancer: prospective observational study. *BMJ*. 2006;333(7572):779. doi:10.1136/bmj.38937.646400.55
3. Benson AB, Venook AP, Al-Hawary MM, et al. Rectal Cancer, Version 2.2022, NCCN Clinical Practice Guidelines in Oncology. *J Natl Compr Canc Netw*. 2022;20(10):1139-1167. doi:10.6004/jnccn.2022.0051
4. Iafrate F, Laghi A, Paolantonio P, et al. Preoperative staging of rectal cancer with MR Imaging: correlation with surgical and histopathologic findings. *Radiographics*. 2006;26(3):701-714. doi:10.1148/rg.263055086
5. Beets-Tan RGH, Lambregts DMJ, Maas M, et al. Magnetic resonance imaging for clinical management of rectal cancer: Updated recommendations from the 2016 European Society of Gastrointestinal and Abdominal Radiology (ESGAR) consensus meeting. *Eur Radiol*. 2018;28(4):1465-1475. doi:10.1007/s00330-017-5026-2
6. Gollub MJ, Arya S, Beets-Tan RG, et al. Use of magnetic resonance imaging in rectal cancer patients: Society of Abdominal Radiology (SAR) rectal cancer disease-focused panel (DFP) recommendations 2017. *Abdominal Radiology*. 2018;43(11):2893-2902. doi:10.1007/s00261-018-1642-9
7. Horvat N, Carlos Tavares Rocha C, Clemente Oliveira B, Petkovska I, Gollub MJ. MRI of Rectal Cancer: Tumor Staging, Imaging Techniques, and Management. *Radiographics*. 2019;39(2):367-387. doi:10.1148/rg.2019180114
8. Kassam Z, Lang R, Bates DDB, et al. SAR user guide to the rectal MR synoptic report (primary staging). *Abdominal Radiology*. 2022;48(1):186-199. doi:10.1007/s00261-022-03578-2
9. Brown PJ, Rossington H, Taylor J, et al. Standardised reports with a template format are superior to free text reports: the case for rectal cancer reporting in clinical practice. *Eur Radiol*. 2019;29(9):5121-5128. doi:10.1007/s00330-019-06028-8
10. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)--a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform*. 2009;42(2):377-381. doi:10.1016/j.jbi.2008.08.010
11. Glynne-Jones R, Harrison M, Hughes R. Challenges in the neoadjuvant treatment of rectal cancer: balancing the risk of recurrence and quality of life. *Cancer Radiother*. 2013;17(7):675-685. doi:10.1016/j.canrad.2013.06.043
12. Lord AC, D'Souza N, Pucher PH, et al. Significance of extranodal tumour deposits in colorectal cancer: A systematic review and meta-analysis. *Eur J Cancer*. 2017;82:92-102. doi:10.1016/j.ejca.2017.05.027

13. Patel A, Rockall A, Guthrie A, et al. Can the completeness of radiological cancer staging reports be improved using proforma reporting? A prospective multicentre non-blinded interventional study across 21 centres in the UK. *BMJ Open*. 2018;8(10):e018499. doi:10.1136/bmjopen-2017-018499

14. Nörenberg D, Sommer WH, Thasler W, et al. Structured Reporting of Rectal Magnetic Resonance Imaging in Suspected Primary Rectal Cancer: Potential Benefits for Surgical Planning and Interdisciplinary Communication. *Invest Radiol*. 2017;52(4):232-239. doi:10.1097/RLI.0000000000000336

15. Sahni VA, Silveira PC, Sainani NI, Khorasani R. Impact of a Structured Report Template on the Quality of MRI Reports for Rectal Cancer Staging. *AJR Am J Roentgenol*. 2015;205(3):584-588. doi:10.2214/AJR.14.14053

16. Nougaret S, Rousset P, Gormly K, et al. Structured and shared MRI staging lexicon and report of rectal cancer: A consensus proposal by the French Radiology Group (GRERCAR) and Surgical Group (GRECCAR) for rectal cancer. *Diagn Interv Imaging*. 2022;103(3):127-141. doi:10.1016/j.diii.2021.08.003

17. Kassam Z, Lang R, Bates DDB, et al. SAR user guide to the rectal MR synoptic report (primary staging). *Abdom Radiol (NY)*. 2023;48(1):186-199. doi:10.1007/s00261-022-03578-2

18. Taylor FGM, Quirke P, Heald RJ, et al. Preoperative High-resolution Magnetic Resonance Imaging Can Identify Good Prognosis Stage I, II, and III Rectal Cancer Best Managed by Surgery Alone. *Ann Surg*. 2011;253(4):711-719. doi:10.1097/SLA.0b013e31820b8d52

19. Conroy T, Bosset JF, Etienne PL, et al. Neoadjuvant chemotherapy with FOLFIRINOX and preoperative chemoradiotherapy for patients with locally advanced rectal cancer (UNICANCER-PRODIGE 23): a multicentre, randomised, open-label, phase 3 trial. *Lancet Oncol*. 2021;22(5):702-715. doi:10.1016/S1470-2045(21)00079-6

20. Bahadoer RR, Dijkstra EA, van Etten B, et al. Short-course radiotherapy followed by chemotherapy before total mesorectal excision (TME) versus preoperative chemoradiotherapy, TME, and optional adjuvant chemotherapy in locally advanced rectal cancer (RAPIDO): a randomised, open-label, phase 3 trial. *Lancet Oncol*. 2021;22(1):29-42. doi:10.1016/S1470-2045(20)30555-6

21. Zhang H, Zhang C, Zheng Z, et al. Chemical shift effect predicting lymph node status in rectal cancer using high-resolution MR imaging with node-for-node matched histopathological validation. *Eur Radiol*. 2017;27(9):3845-3855. doi:10.1007/s00330-017-4738-7

22. Lambregts DMJ, Bogveradze N, Blomqvist LK, et al. Current controversies in TNM for the radiological staging of rectal cancer and how to deal with them: results of a global online survey and multidisciplinary expert consensus. *Eur Radiol*. 2022;32(7):4991-5003. doi:10.1007/s00330-022-08591-z

23. Weiser MR. AJCC 8th Edition: Colorectal Cancer. *Ann Surg Oncol*. 2018;25(6):1454-1455. doi:10.1245/s10434-018-6462-1

24. Brown PJ, Rossington H, Taylor J, et al. Radiologist and multidisciplinary team clinician opinions on the quality of MRI rectal cancer staging reports: how are we doing? *Clin Radiol*. 2019;74(8):637-642. doi:10.1016/j.crad.2019.04.015

25. Taylor A, Wilkins S, Gelber N, et al. The effect of anti-spasmodic administration on the accuracy of magnetic resonance imaging staging of rectal cancer. *ANZ J Surg*. Published online January 4, 2023. doi:10.1111/ans.18252

Figure Legends:

Figure 1: Map of the UK with red pins to mark the site of centres from which data was submitted. A blue pin denotes three independent centres within Greater London that submitted data. There is a notable spread throughout the UK including centres in Wales and Scotland and across England.

Figure 2A: Bar Chart illustrating variation in reporting EMVI status by centre comparing template reports and free text reports.

Figure 2B: Bar Chart illustrating variation in reporting tumour relationship to the mesorectal fascia (MRF) by centre comparing template reports and free text reports.

Figure 2C: Bar Chart illustrating variation in reporting tumour relationship to the peritoneal reflection by centre comparing template reports and free text reports.

Figure 2D: Bar Chart illustrating variation in reporting depth of tumour invasion through muscularis propria in T3 or T4 tumours by centre comparing template reports and free text reports.