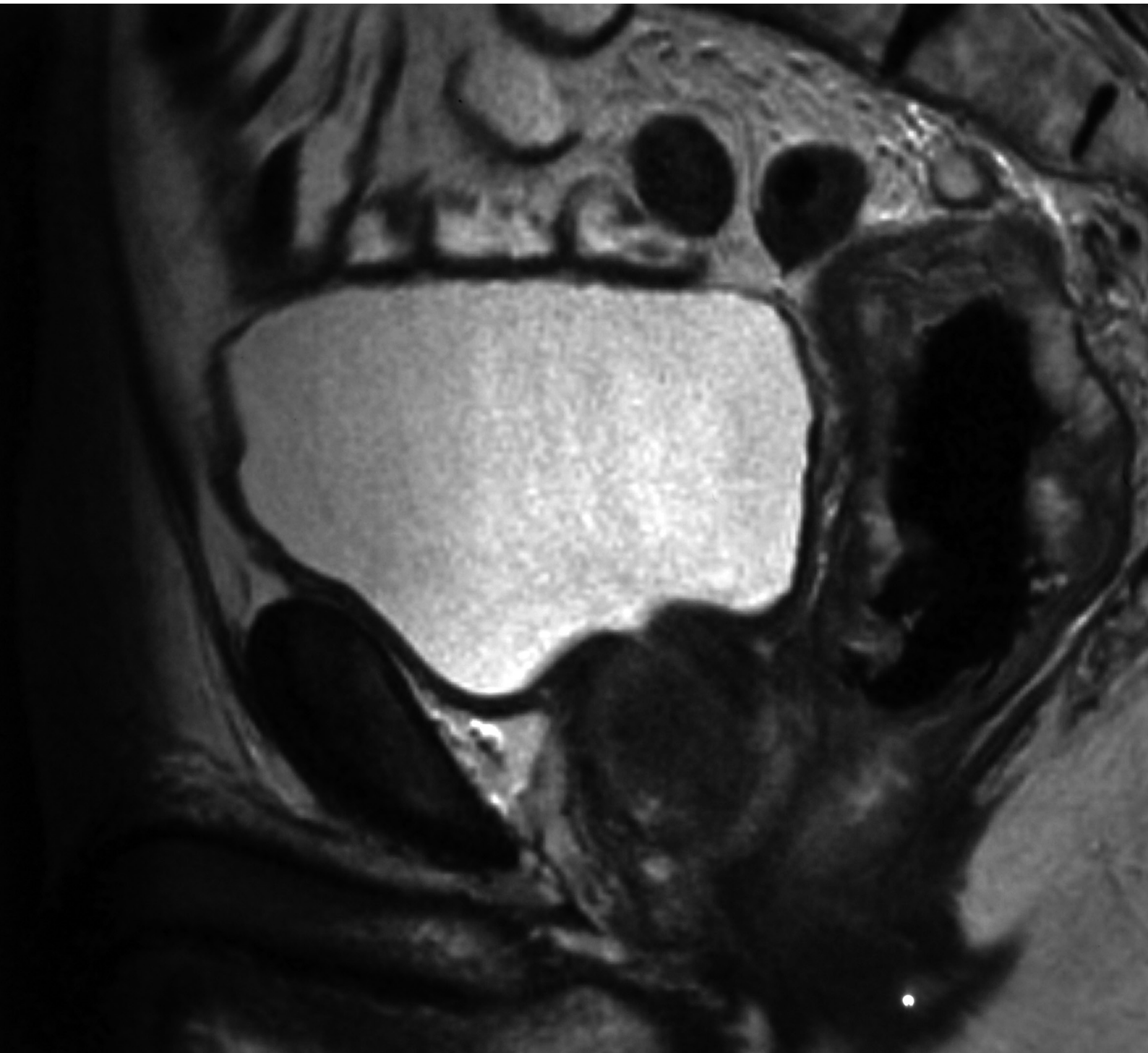
National Bowel Cancer Audit Report 2011



This Annual Report contains data from the 2009/10 reporting period, which covers patients with a diagnosis date from 1 August 2009 to 31 July 2010. Data from Wales covers the period 1 April 2009 to 31 March 2010.

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The National Bowel Cancer Audit Annual Report 2011 is available to download at www.ic.nhs.uk/bowelreports

Prepared in partnership with:

The Association of Coloproctology of Great Britian and Ireland (ACPGBI) is the professional body that represents UK colorectal surgeons. ACPGBI provided a clinical interpretation of the data analysed in the 2011 Annual Report.

The Royal College of Surgeons of England (RCS) is an independent professional body committed to enabling surgeons to achieve and maintain the highest standards of surgical practice and patient care. The RCS carried out the analysis of the data for the 2011 Annual Report.

The NHS Information Centre for health and social care (The NHS IC) is England's central, authoritative source of essential data and statistical information for frontline decision makers in health and social care. The NHS IC managed the publication of the 2011 Annual Report.

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The clinical direction and writing of the report was undertaken by Paul Finan from the ACPGBI with contributions from Jason Smith and Jeff Stamatakis.

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Foreword

Welcome to the 2011 Annual Report for the National Bowel Cancer Audit (NBCA) – all you need to know about UK bowel cancer treatment in one easy document. The Project Team need to be congratulated on their achievement - the biggest, most up to date and detailed account of bowel cancer management in Europe.

You might be reading this because you have a personal or family interest in bowel cancer and you want to know what's happening out there. Well NBCA has found that overall, 60 per cent of patients with bowel cancer will require a major surgical resection. Laparoscopic operations or telescope operations are possible for 30 per cent of patients in whom the cancer is surgically removed. Even better the overall 30 day mortality from surgery has now fallen to 3.7 per cent. All of these improving trends are a tribute to both UK Colorectal practice and to the careful analysis of the NBCA team.

And if you are reading this because you treat patients with bowel cancer – well done again. Trust participation 100 per cent, 28,000 cases submitted – 89 per cent ascertainment for England and 97 per cent for Wales. There can be no doubt that NBCA is now embedded in the Colorectal Cancer MDT of every Trust in England and Wales, an established part of UK colorectal oncological practice.

Areas for improvement do exist. We all know that when we treat patients with bowel cancer, we are often operating on the elderly and the infirm; it follows that risk adjustment is critical to our understanding of outcomes. Six key variables are used for risk adjustment, (age, sex, Dukes' stage, ASA grade, surgical urgency and procedure name). A continuing problem is that while our case ascertainment is getting better, we are still not supplying NBCA with the all the variables required for risk adjustment, especially ASA grade. And yet at the beginning of every surgical procedure we perform, the theatre checklist asks the anaesthetist what the patient's ASA grade is. The point being that we know the ASA grade for every patient we operate on - but this information is not consistently getting back through the MDT upload to NBCA. So in these days of funnel plot scrutiny, your unit cannot afford to have its activity uploaded without the data required for risk adjustment. Make sure that the Colorectal Lead scrutinises your unit's NBCA upload so that the ASA of each patient is included - don't become an outlier just because of poor data.

Where for 2012?

Well more of the same – more cases, more accurate, more timely and ultimately more focussed. Post-operative morbidity, emergency care and the treatment of low rectal cancer remain topics of considerable interest. There is no question that through NBCA, the UK is delivering audited colorectal outcomes of increasing quality. But the key as always remains you the clinician and your MDT, as complete data is the key to this continuing success. So next time your finger presses the diathermy hand switch or you reach for the stapling gun or the trocar – think case ascertainment, think risk adjustment (especially ASA grade) – think NBCA.

Nigel Scott
President ACPGBI

Executive Summary

This annual report of the National Bowel Cancer Audit (NBCA) contains data collected on patients with a diagnosis date between 1 August 2009 and 31 July 2010 - the reporting period 2009/10.

There continues to be an overall increase in submitted cases with over 28,000 cases recorded. Again, this year case ascertainment has been calculated using contemporaneous Hospital Episode Statistics (HES) data and Welsh Cancer Registry data.

Data quality in several areas has improved markedly and this is referenced in the main findings. A separate data completeness report has been circulated to all submitting units to highlight areas of improved data completeness and to illustrate where data fields are not being completed. There are several areas where firm conclusions cannot be made because of missing data.

This year the algorithms developed last year have been applied again to refine the submitted data, to remove duplicate tumour records and to minimise the effect of "missing data".

As other methods are developed for the gathering of population-based data on patients with bowel cancer, it is the view of the Project Team that the data set for the national audit needs to be refined, be flexible and concentrate on clinical aspects of care which are not readily available from these other sources. Linkage of data sets is now possible and has been used for the first time within the Audit to look at post-operative mortality in those cases submitted to the Audit as compared with those that did not appear. HES linked audit data was used for this and appears within this 2011 report. Further analyses, looking at returns to theatre, emergency admission, and permanent stomas following surgery for rectal cancer will appear in a supplementary report scheduled for publication next year. Last year it was stated that the national audit should identify bespoke audit projects but, at the same time, use the systems and networks that have allowed the Audit to achieve the widespread coverage observed over recent years. We have identified several areas where an in-depth audit would be of value and hope that these will appear in the 2012 or 2013 audit reports.

Paul Finan
Clinical Lead,
National Bowel Cancer Audit

Main Findings

- Trust participation is 100 per cent.
- Using the HES and Welsh Cancer Registry data case ascertainment has been calculated to be 89 per cent for English Trusts and over 97 per cent for Health Boards from Wales (an increase from 74.7 per cent and 80 per cent respectively when compared with the 2010 Annual Report).
- Data completeness for the six variables now used for the risk-adjusted modelling for post-operative mortality has shown a marked improvement over the past three years rising from 64 per cent to 74.6 per cent. Overall data completeness for Welsh Health Boards remains high.
- The proportion of cases discussed at a Multi Disciplinary Team (MDT) has risen to over 97 per cent (from 83.7 per cent in the 2009 report) and, where stated, 80 per cent of cases were seen by a nurse specialist.
- There has been no difference in age distribution nor in distribution by site as compared with previous reports.
- Some form of surgical procedure was performed in 75 per cent of cases and a major resection was undertaken in 60 per cent of patients. Urgent or emergency surgery was more common in colonic (28 per cent) than rectal surgery (12.5 per cent), no difference being noted as compared with the 2010 report.
- Laparoscopic procedures continued to increase with nearly 30 per cent of cases being completed laparoscopically. The mode of surgery however was not stated in 12 per cent of cases.
- The overall 30-day post-operative mortality continued to fall, and was 3.7 per cent but higher mortality rates were seen again in urgent and emergency cases. The overall 90-day post-operative mortality was 5.6 per cent. Differences were again noted between Networks and Trusts, even after adjusting for patient characteristics.
- Several variables in surgically resected cases were missing with Dukes' stage missing in about 8 per cent, American Society of Anesthesiologists (ASA grade) in 18 per cent and Confidential Enquiry into Postoperative Deaths (CEPOD) category of operation in 5 per cent.
- In rectal cancer cases there was evidence of the use of magnetic resonance imaging (MR imaging) in over 80 per cent of cases.
- The reporting of pathological variables has improved. Where noted, positive circumferential margins were seen in 9 per cent of cases but the variable was missing in 40 per cent of cases. It is likely that this is not a failure to report within a Trust, from the pathology department, but a failure to submit the data to the Audit.
- Reported abdominoperineal excision of rectum (APER) rates are affected by the denominator but the observation of 25.4 per cent of major resections for rectal cancer being an APER is a realistic figure. Variation between Networks and Trusts exists.

Recommendations

- Trusts should continue to review their audit data and, using both this report and the recently distributed data completeness reports, ensure that accurate and complete data is being submitted to the national audit. Where the data is seen to be missing this should prompt corrective action and further discussion so that accurate comparative feedback can be of value.
- It is vital that MDTs should arrive at an accurate integrated staging of as many cases of bowel cancer as possible. Following a major resection the pathological stage should be recorded in 100 per cent of cases. Where there is no surgery this is very often due to advanced, disseminated disease and can be allocated to modified Dukes' D stage. Only in cases of local excision or polypectomy, or where no procedure has been undertaken because of patient preference or associated co-morbidities, would a full stage be unavailable.
- It is vitally important that radiological evidence of distant metastatic disease is reported as this has a major effect on observed outcomes and contributes to the integrated clinic-pathological stage.
- Pathologists should continue to report and ensure accurate uploading of the minimum data set of the Royal College of Pathologists. The current recommendation from the Royal College of Pathologists is to use TNM version 5. This TNM stage can be modified in the light of clinical or radiological evidence of metastatatic disease to give a "modified", integrated stage.
- Although there are now other population-based data sets in existence the Audit continues to contribute to the national cancer data repository and many of the clinically determined variables requested are not available through other sources eg ASA grade, urgency of operation and Dukes' stage. MDTs are encouraged to continue the improved submission of such data items.
- Post-operative mortality continues to fall but the higher mortality observed in urgent and emergency surgical cases should prompt measures to convert cases of obstruction to an elective procedure whenever possible.
- Complications following surgical resection are poorly reported and these should be recorded and submitted to the Audit.
- Post-operative death is uncommon. The six risk adjustment variables outlined in this report and those that were used in the 2010 report should be recorded in all cases. MDTs are encouraged to discuss all deaths and consider whether they were expected or unexpected and, if unexpected, were they due to avoidable or unavoidable factors.
- It is suggested that an in-depth audit of post-operative deaths should be undertaken in collaboration with the Association of Coloproctology of Great Britain and Ireland.
- With the inception of the Low Rectal Cancer National Development Programme (LOREC), all MDTs should consider revision of the protocols for the use of pre-operative radiotherapy in cases of rectal cancer and ensure that full discussion of the surgical options in rectal cancer, including the risk of a permanent stoma, is a part of the pre-operative counselling for all patients.
- As more comparative information becomes available to MDTs, from a variety of sources, there should be regular discussions at a local level to ensure that complete data is submitted to the Audit and any perceived outlying status is investigated promptly. This may involve local audits, review of submitted data, and in-depth analysis using case notes.
- As laparoscopic techniques become more commonly employed, the current National Institute for Health and Clinical Excellence (NICE), guidance should be encouraged.

NICE guidance states that laparoscopic surgery (including laparoscopically assisted surgery) is recommended as an alternative to open surgery for people with colorectal cancer if: both laparoscopic and open surgery are suitable for the person and their condition.

1. Introduction

The National Bowel Cancer Audit (NBCA) has now been in existence for more than twelve years and, in that time, has seen major changes in the management of this common disease. Multi-disciplinary teams exist in all Trusts and their decision making process is reflected in the Audit. The use of cross sectional imaging to help stage the disease, together with better recording of pathological stage, both TNM and Dukes', has led to improved recording of the modified Dukes' stage or an integrated clinico-pathological stage. This surely has to be the goal within all MDTs and, in the future, may well be a necessity as MDTs inform the cancer registration process.

Surgery remains the treatment of choice and hence major changes in surgical care are likely to be reflected in improvements in outcomes of patients with colorectal cancer. The increased uptake of laparoscopic surgery seen in the last three reports reflects well, not only on surgeons' adoption of new techniques but also the central funding made available to support the National Training Programme for Laparoscopic Colorectal Surgery (LAPCO) training initiative. Other initiatives within surgery are likely to be reflected in improved outcomes, length of stay, morbidity and even peri-operative mortality.

Our results, when compared with similar developed countries, remain under scrutiny. Late presentation of the disease may be the reason why almost 40 per cent of patients do not receive major surgical resection of their primary disease. Our resection rates certainly lag behind reported series from Australia, Canada and the Scandanavian countries and the Audit, with its much improved case ascertainment rates and linkage to other information data sets, is likely to assist in explaining this surprising observation.

Late presentation and advanced disease are also features that lead to acute admission and urgent/emergency surgery. Careful scrutiny of the mortality figures within the 2011 Annual Report point to the need to explore even further the management of cases presenting in this manner. Only time, audit and clinical trials will reveal the value of colonic stenting in the management of malignant large bowel obstruction. Similarly optimisation of patients, presenting both electively and as an emergency, is required if we are to further improve outcomes. This year we have looked at 90-day mortality as well as 30-day post-operative mortality. Such comparative information may further inform clinical teams, both surgical and non-surgical, in their efforts to achieve successful interventions in patients who are often elderly and with associated co-morbidities.

Over the past twelve years the Audit has, to a degree, been a data gathering exercise and has suffered from the criticism that there were biases when compared with population-based data. This year the Audit has used Hospital Episode Statistics (HES) linked data to inform the clinical community of the value of such linkage whilst, at the same time, illustrating the value of clinical input via the Audit. It is our intention to produce a supplementary report in the middle of next year to further demonstrate the value of linked data.

The 2010 Annual Report noted the emergence of cancer intelligence and information as a priority following the firm lead from the National Clinical Director for Cancer within the Cancer Reform Strategy. Improving Outcomes: A Strategy for Cancer (January 2011) underscores the role of national clinical audits in helping to drive up service quality. The National Bowel Cancer Audit has to be seen to work within this framework and not in competition. Clinical teams continue to provide important information which is not captured either in cancer registry data or through HES, and the successful registration of all Trusts and continuing upward trend observed in case ascertainment, will contribute to this effort. At the same time the Audit will need to become more focussed on in-depth audits of aspects of care in the future. This remains the aim of the Project Team as the data set is revised. Flexibility within the audit system to collect different items, depending on the focus of the Audit, is essential and the platform for collection and submission for analysis has to be simple, efficient and thereby clinically relevant as well as informative.

2. Methods

2.1 Data collection

The Audit includes all NHS Trusts in England and Health Boards in Wales. In addition, two Trusts from Northern Ireland, two hospitals from the Republic of Ireland and data from three Health Boards in Scotland have reported patients to the Audit. However, the data provided from Scotland, Northern Ireland and the Republic of Ireland was in different formats to the data from England and Wales so has been analysed separately. The analysis of the data from Scotland, Northern Ireland and the Republic of Ireland can be viewed on the National Bowel Cancer Audit reports page.

All patients with a diagnosis of bowel cancer admitted for the first time to a NHS Trust in England or Health Board in Wales are eligible for inclusion in the Audit. This 2011 Annual Report includes patients in England diagnosed between 1 August 2009 and 31 July 2010 and patients in Wales diagnosed between 1 April 2009 and 31 March 2010. Data is also available from the previous two audits and comparisons are made across years for certain key statistics. All participating trusts submit their data via the Open Exeter system, as described at www.ic.nhs.uk/bowel. The Welsh data is submitted directly from the CANISC system to the Open Exeter system. Data from Scotland, Northern Ireland and the Republic of Ireland is sent to the NHS Information Centre (The IC), via Secure File Transfer, for inclusion in the annual report.

2.2 Data cleaning

Multiple records

The data set that is collected through the Open Exeter system consists of separate tables on characteristics of the patient, the tumour, the treatment, and the follow-up of the patient, which are linked using a unique patient identifier.

Table 2.1 demonstrates that there remains a considerable issue with multiple tumour and treatment records being entered into the Open Exeter System for the same patient. This is, if anything, more of an issue in this year's audit compared with 2010, and there is much more of an issue with multiple treatment records than multiple tumour records. Some of these multiple records are conflicting, for example 1.4 per cent of patients have more than one different surgical procedure and 0.8 per cent of patients have more than one different diagnostic code for the site of their cancer.

Table 2.1
Distribution of multiple records per patient record on unique identifier

	Number	%
Total number of patients reported	**28,260**	
One tumour record, one treatment record	18,356	65.0
One tumour record and no treatment record	1,643	5.8
One tumour, multiple treatment records	7,515	26.6
Multiple tumours, no treatment record	13	0.0
Multiple tumours, 1 treatment record	102	0.4
Multiple tumours, multiple treatment record	631	2.2

It was assumed that these multiple tumour and multiple treatment records involved the same tumour episode if their dates fell within a period of two years. If that was the case an algorithm developed by the Project Team was applied to reconcile potentially conflicting information between the multiple records.

Multiple tumour records

If multiple tumour records were available, a second tumour diagnosed within two years was considered a duplicate record, irrespective of the tumour site. Second tumours diagnosed more than two years after a first tumour were considered to be separate cancers.

If a second tumour record was present that was diagnosed within two years, the earliest date of diagnosis and the most advanced or most severe results was taken from the available records. In cases where there was conflicting information about tumour site, this was resolved by choosing the site that was compatible with available treatment information; if no treatment record was available, the most distal site was chosen.

Multiple treatment records

In case of conflicting information on treatment information, the most recent date and the value that reflected the most advanced or severe results was taken. Procedures and treatments were assumed to have been carried out if they were recorded in at least one of the multiple treatment records. In case of conflicting information about the surgical procedure, the procedure selected was the one that was most compatible with the site recorded in the tumour record.

Determining Dukes' stage

Modified Dukes' staging is supplied directly to the Audit by the participating Trusts. This reported Modified Dukes' stage was updated based on information that could be derived from the data in the following way:

- Patients who had major surgery were considered to have Dukes' stage A if the T-stage was reported to be T1 or T2 and the nodes were reported to be negative
- Patients who had major surgery were considered to have Dukes' stage B if the T stage was reported to be T3 or T4 and the nodes were reported to be negative
- Patients who had major surgery were considered to have Dukes' stage C if the nodes were reported to be positive.
- If any of the fields, including pre-operative staging fields, indicated that a patient had distant metastases, patients were considered to have Dukes' stage D
- In case of conflicting staging information, the most advanced stage was adopted.

Throughout this report, Dukes' stage refers to this derived Dukes'. Pathological Dukes' is not used in this report's analysis.

2.3 Case ascertainment

Case ascertainment is expressed as the proportion of patients reported to the Audit out of all patients admitted for the first time to the participating units with a date of diagnosis of bowel cancer within the audit period.

The Hospital Episode Statistics (HES), the administrative database containing records of all admission to English NHS Trusts, was used to estimate the denominator of this proportion. The corresponding Welsh Cancer Registry data was used for Wales. A patient was considered to be admitted for bowel cancer if a bowel cancer diagnosis was coded (C18, C19 or C20 according to the International Classification of Diseases 10th Revision) in the first diagnosis field. It was assumed that it was a first admission if no other records could be identified since 1 January 2004 with a bowel cancer diagnosis in any of the diagnostic fields.

Case ascertainment is also reported at trust and cancer network level for England, and at country level for Wales. However, if hospitals within a Trust are part of different Cancer Networks, case ascertainment is reported at hospital level.

Case ascertainment could only be reported for the three Health Boards in Scotland, and the two Trusts in Northern Ireland who submitted their data. These are presented in a separate report on the National Bowel Cancer Audit reports page. Only two hospitals in the Republic of Ireland submitted data and case ascertainment could not be produced because of a lack of denominator data.

2.4 Linkage to Hospital Episodes Statistics data

Patients residing in England in this year's audit were linked to HES records using their NHS numbers. 82 per cent of patients in the Audit could be linked to HES. HES data were used to compare mortality and case-mix of patients submitted and not submitted to the Audit. Audit data linked to HES data allows the possibility of exploiting HES data for items not available in the Audit as well as information that is not well recorded in the Audit, such as returns to theatre and complications. This will be the subject of the supplementary report planned for mid-2012.

2.5 Data completeness

Data completeness is defined as the proportion of patients with complete data items on all six of the variables sex, ASA grade, Dukes' stage, age, urgency of operation, and type of procedure, as these are the variables that are used for risk adjustment when comparing post-operative mortality between Networks and Trusts. Data completeness is assessed in patients who underwent major surgery, because only in these patients could the six data items be expected to be complete. Completeness of data entry in other areas of the Audit is mixed and is receiving attention by the Project Team. Data completeness reports have been sent to each Trust and these not only provide feedback on the data submitted but will also be used to point to areas that need to be addressed in individual Trusts if the Audit is extended to look at other aspects eg complications.

Just as for case ascertainment, data completeness is reported at cancer network level and at trust/hospital level.

2.6 Handling missing data

The linked data set did not allow the distinction between patients who had not undergone a surgical procedure and those for whom the data item was missing. This problem was addressed by searching for any information that indicated that a patient had undergone a surgical procedure (eg number of excised nodes, circumferential margins, post-operative complications). Patients with missing data on type of surgery, but information indicating that they had undergone surgery were entered into the category "other procedure". If such information could not be found, we had to assume that they had not had a surgical treatment.

Similar issues arose for diagnostic and staging procedures. For example, it is reported that a CT or MRI scan was carried out if there was information about the patient's results from the scan or a date of scan. Otherwise it was assumed that no scan had been carried out.

2.7 Statistical Analysis

Most results reported in this audit report are descriptive. The results of categorical data items are reported as percentages (%). The denominator of these proportions is in most cases the number of patients for whom the value of the data item was non-missing.

Results are typically grouped by cancer network and/or trust/hospital. England's 28 Cancer Networks were used in the analyses, and compared to Wales as a whole. The results for Wales are reported according to where the multidisciplinary team who discussed the patients' management were located, rather than by trust/hospital.

Funnel plot
Funnel plots are used to compare the 30-day/90-day mortality after major surgery between networks or between trusts/hospitals. The mortality for each network or for each trust or hospital is plotted against the total number of patients who had major surgery. The "target" mortality is specified as the average mortality in all patients in the Audit who had major surgery. The "limits of acceptable performance" depend on the target mortality and the number of patients having major surgery; mortality estimates have greater uncertainty when estimated from fewer patients. Results are considered "acceptable" if they are not statistically significantly different from the target at a 0.05 level (represented by the inner funnel limit, which is a threshold for an "alert") or at a 0.002 level (represented by the outer funnel level, which is a threshold for an "alarm"). This implies that 95 per cent of the trusts or hospitals are expected to be within the inner funnel limit and 99.8 per cent within the outer funnel limit, if they are all performing according to the target. In this report, those networks, trusts or hospitals with results outside the outer funnel limit are considered as potential outliers.

Adjusted mortality results
Multivariable logistic regression was carried out to estimate risk-adjusted 30-day/90-day mortality for patients undergoing major surgery. All trusts or hospitals had at least 80 per cent data completeness on date of surgery. The logistic regression model included the patients' sex, age, ASA grade, Dukes' stage, procedure, and urgency of operation. Patients with missing date of surgery were excluded, and multiple imputation was used to fill in any missing information on the six risk factors. Amongst patients undergoing major surgery, 18 per cent were missing ASA grade, 8 per cent Dukes' stage and 5 per cent surgical urgency. Virtually all patients were complete on sex, all were complete on age, and by definition of major surgery, all patients were complete on procedure.

The adjusted mortality was estimated using indirect standardisation. The observed number of deaths for a trust or hospital was divided by the number expected on the basis of the logistic regression model. The adjusted mortality was then estimated by multiplying this ratio by the average mortality in all patients included in the analysis.

All statistical analyses were performed using Stata version 11.

3. Trust participation, case ascertainment and data completeness

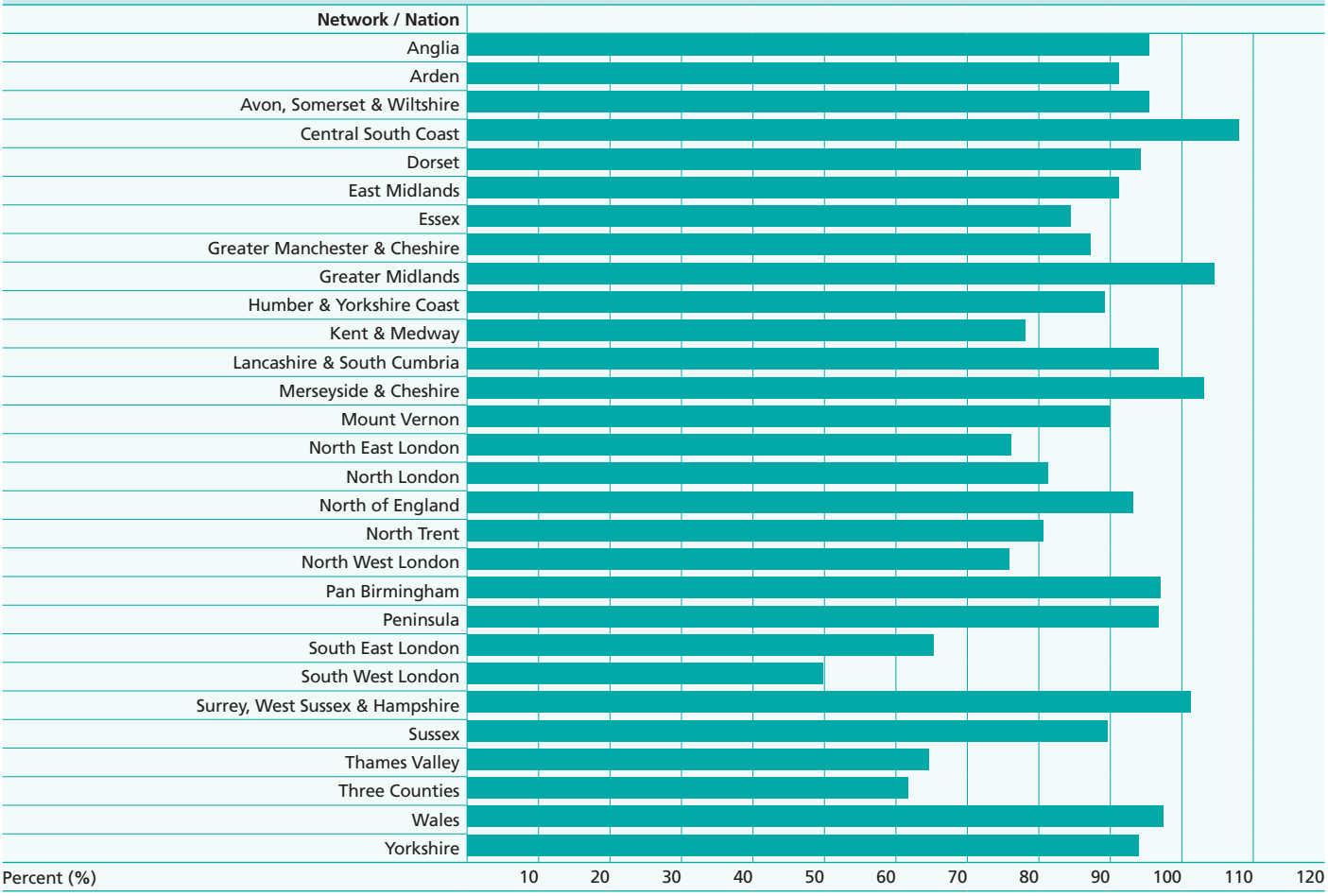
Overall case ascertainment this year was 89 per cent for England and 97 per cent for Wales. Table 3.1 shows that case ascertainment in England has increased markedly over the last three audit years. However, there is substantial variation in case ascertainment by Network, with 4 Networks ascertaining fewer than 70 per cent of cases, 7 ascertaining fewer than 80 per cent of cases, and 4 Networks ascertaining more that 100 per cent of cases identified in HES. Variation between trusts is also large, as detailed in Appendix 1, with 11 Trusts ascertaining fewer than 50 per cent of cases, 25 Trusts ascertaining fewer than 70 per cent of cases and 13 Trusts ascertaining more than 120 per cent of cases. All Trusts, with the exception of Guy's & St Thomas' NHS Foundation Trust supplied more than ten cases, although individual case ascertainment varied. The overall case ascertainment in the 2011 report, at 89 per cent however, is clearly the result of an enormous amount of hard work within all Trusts and they are to be congratulated. The results of case ascertainment by Network are shown in Figure 3.1.

In noting the excellent case ascertainment of 97 per cent for Wales, which was high when compared with Networks in England, only 4 of 28 achieving similar levels to that achieved in Wales, there is concern that such efforts insert a negative bias because of the comprehensive nature of both the case ascertainment and the level of data completeness. In Section 6 we see, from HES-linked data, that cases not ascertained within the National Bowel Cancer Audit have, on average, higher observed post-operative mortalities. This is despite the fact that non-ascertained cases have similar prognostic factors to those in the Audit. This implies that networks/nations with high case ascertainment, such as Wales, will tend to have higher observed and adjusted post-operative mortality than those with lower case ascertainment, a factor which may contribute to Wales featuring as a potential outlier on adjusted 90-day mortality rates. The conclusion has to be that the observed rates in Wales are a true reflection of the post-operative mortality and that under-reporting by English Trusts remains a confounding factor which needs to recognised, and resolved.

Table 3.1
Case ascertainment in England by year

	2007-08	2008-09	2009-10
Patients identified in HES	28,143	28,304	29,577
Patients identified in the audit	19,248	22,257	26,251
% case ascertainment	**68**	**79**	**89**

Figure 3.1
Case ascertainment by cancer network/nation



Completeness of data items remains a cause for concern, with a quarter of patients undergoing major surgery having no information on at least one of the six items included in the model for risk adjustment: age, sex, Dukes' stage, ASA grade, surgical urgency and procedure name. Within these 6 items, ASA grade is by far the most incomplete, with missing information in 18 per cent of patients undergoing major surgery; Dukes' stage and surgical urgency are missing in 8 per cent and 5 per cent respectively, whilst sex and age are virtually all complete. These six risk adjustment variables were investigated for data completeness as they are vital for comparison between organisations and are shown in Figure 3.2, but data quality and completeness is clearly vital throughout all audit analyses, and other items are even more incomplete. See the tables throughout Section 4 for overall percent missing in individual items. It was possible to determine the survival status at 30 days and 90 days of over 99 per cent of patients who underwent major surgery.

Figure 3.2
Percentage of patients undergoing major surgery with complete data on the 6 items used in risk adjustment, by network/nation

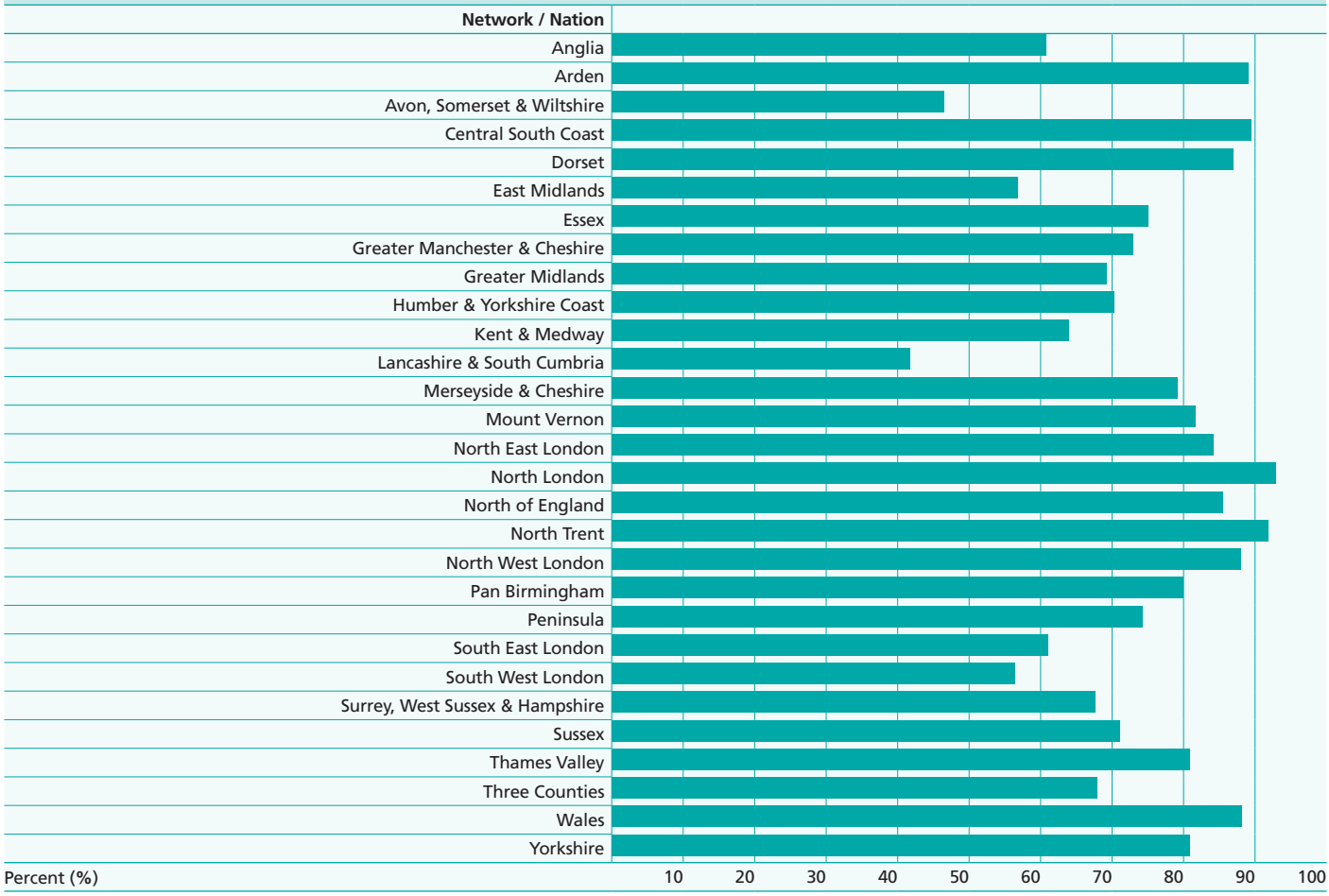


Table 3.2
Data completeness in patients undergoing major surgery by year of the audit

	2007-08		2008-09		2009-10	
	Number	%	Number	%	Number	%
Total patients undergoing major resection	13,173		14,755		17,161	
Complete data on 6 key items	8,431	64.0	10,654	72.2	12,801	74.6
Incomplete data on 6 key items	4,742	36.0	4,101	27.8	4,360	25.4

Like case ascertainment, data completeness varies widely between Networks, with only one Network achieving greater than 90 per cent data completeness, and 11 out of 28 Networks having less than 70 per cent data completeness on these 6 items (Figure 3.2). Again, there is substantial variation in data completeness between trusts (Appendix 1). Twenty-four trusts had less than 50 per cent data completeness on these 6 items.

Note that data completeness is measured differently this year, as the proportion of cases with complete data on all six of these items, meaning that last year's report of data completeness is not comparable to that reported here. However, in Table 3.2 data completeness according to this new definition is reported by year of audit data, and it is clear that data completeness on these 6 items has improved markedly year on year.

4. Audit Results

Audit population

In total 28,260 diagnoses of bowel cancer were submitted to the Audit in England and Wales this year, slightly more were male than female, and nearly 60 per cent were over the age of 70 (Table 4.1). Table 4.1 shows that over 75 per cent of these patients were treated surgically and about 60 per cent were reported to have had major surgery. Just under two-thirds of patients were diagnosed with colon cancer, nearly one-third with rectal cancer, and the remaining 5 per cent of patients were diagnosed with rectosigmoid cancer.

Table 4.1
Characteristics of all patients with bowel cancer included in the current audit report

		Number	%
Total number of reported cases		**28,260**	
Total number of surgically treated cases		**21,306**	**75.4**
Total number of major resections		**17,161**	**60.7**
Sex	**Male**	16,017	56.7
	Female	12,239	43.3
	Missing (% of total)	4 (0.0%)	
Age group	**<65 yrs**	7,875	27.9
	65-74 yrs	8,654	30.6
	75-84 yrs	8,508	30.1
	85+ yrs	3,223	11.4
Cancer Site	**Colon**	17,748	63.1
	Rectosigmoid	1,591	5.7
	Rectum	8,773	31.2
	Unknown (% of total)	148 (0.5%)	

Table 4.2 allows us to compare the characteristics of patients by site of cancer. Rectal cancer patients were more likely to be male and tended to be younger. Rectal cancer patients also tended to have a lower stage of cancer than patients with colon cancer; specifically they were more likely to have a cancer that was confined to the wall of the bowel than colon cancer patients. The median age of rectal cancer patients was 70 compared to 73 in patients with cancer of the colon.

Table 4.2
Characteristics of 28,112 patients with a known cancer site

		Colon		Rectosigmoid		Rectal	
		Number	%	Number	%	Number	%
Total patients per cancer site		**17,748**		**1,591**		**8,773**	
Sex	**Male**	9,369	52.8	957	60.2	5,605	63.9
	Female	8,375	47.2	634	39.8	3,168	36.1
	Missing (% of total)	4 (0.0)		0		0	
Age-group	**<65 yrs**	4,390	24.7	472	29.7	2,963	33.8
	65-74 yrs	5,445	30.7	491	30.9	2,673	30.5
	75-84 yrs	5,698	32.1	471	29.6	2,299	26.2
	85+ yrs	2,215	12.5	157	9.9	838	9.6
Dukes'	**A**	1,771	12.8	206	17.1	1,495	24.7
	B	4,831	34.8	349	29	1,518	25.1
	C	3,789	27.3	317	26.4	1,617	26.7
	D	3,482	25.1	331	27.5	1,416	23.4
	Missing (% of total)	3,875 (21.8)		388 (24.4)		2,727 (31.1)	
Liver metastasis	**Liver metastasis**	2,258	18.7	236	23.4	931	14.9
	Normal Liver	9,102	75.2	708	70.1	4,955	79.6
	Liver uncertain	737	6.1	66	6.5	342	5.5
	Missing (% of total)	5,651 (31.8)		581 (36.5)		2,545 (29.0)	

Management of patients

Patients with colon cancer were more likely to be treated surgically than rectal cancer patients; this figure was 79 per cent for colon cancer patients and 68 per cent for rectal cancer patients (Table 4.3) and possibly reflects the alternative treatment options that exist for rectal cancer. Amongst patients who underwent surgery, patients with colonic cancer were also more likely to have had a major resection (83 per cent) when compared with those who had rectal cancer (75 per cent). More surgically treated patients with rectal cancer underwent a local excision or non-resectional procedure (14 per cent) as compared with those with colon cancer (7 per cent). Again, this reflects the ability to perform local procedures more easily on rectal cancer than colonic lesions. The difference in surgical management between colon and rectal cancer patients is mostly amongst patients with Dukes' stage D, who are much more likely to undergo major surgery if their cancer is of the colon. This is almost certainly a result of the increased proportion of colonic cancer cases presenting with acute surgical problems as compared with rectal cancer and the need to perform some form of surgical intervention despite the advanced nature of the disease. Forty-five per cent of colon cancer patients with Dukes' stage D disease have major surgery compared to only 23 per cent of those with metastatic rectal cancer. In all other stages of disease colon cancer patients are only slightly more likely to undergo major surgery than rectal cancer patients. We have not recorded, within the audit, surgery for metastatic disease but this is clearly an area which has received increased attention in recent years with good outcomes and long-term survival in carefully selected patients.

Table 4.3
Description of management of the 28,112 patients with known cancer site

		Colon		Rectosigmoid		Rectal	
		Number	%	Number	%	Number	%
Total patients per cancer site		**17,748**		**1,591**		**8,773**	
Patients undergoing surgery		**13,962**		**1,194**		**6,002**	
Discussed at multi-disciplinary team meeting	**Yes**	16,980	97.1	1,517	97.2	8,431	97.6
	No	514	2.9	43	2.8	207	2.4
	Missing (% of total)	254 (1.4)		31 (1.9)		135 (1.5)	
Seen by clinical nurse specialist	**Yes**	11,062	80.9	1,031	84.2	5,612	86.9
	No	2,608	19.1	194	15.8	846	13.1
	Missing (% of total)	4,078 (23.0%)		366 (23.0%)		2,315 (26.4%)	
Had CT scan*	**Yes**	14,677	82.7	1,326	83.3	7,401	84.4
	No	3,071	17.3	265	16.7	1,372	15.6
Surgery type	**Major resection**	11,585	83	947	79.3	4,483	74.7
	Local excision	437	3.1	40	3.4	379	6.3
	Non resectional procedure	515	3.7	87	7.3	477	7.9
	Other procedure	1,425	10.2	120	10.1	663	11
	No surgery (% of total)	3,786 (21.3%)		397 (25.0%)		2,771 (31.6%)	
Urgency of operation	**Elective**	7,473	57.3	753	66.1	3,911	69.7
	Scheduled	1,866	14.3	139	12.2	999	17.8
	Urgent	1,883	14.4	129	11.3	525	9.4
	Emergency	1,810	13.9	118	10.4	174	3.1
	Missing (% of total)	930 (5.2%)		55 (3.5%)		393 (4.5%)	
	No surgery (% of total)	3,786 (21.3%)		397 (25.0%)		2,771 (31.6%)	
Laparoscopy	**Open**	7,673	65.1	637	63.2	3,245	64.7
	Laparoscopic then open	287	2.4	28	2.8	171	3.4
	Laparoscopic converted to open	407	3.5	41	4.1	159	3.2
	Laparoscopic completed	3,424	29	302	30	1,440	28.7
	Missing (% of total)	2,171 (12.2%)		186 (11.7%)		987 (11.3%)	
	No surgery (% of total)	3,786 (21.3%)		397 (25.0%)		2,771 (31.6%)	

* Yes if patient has a result of CT scan or date of CT scan

All but 3 per cent of cases were discussed at a multi-disciplinary team meeting, a proportion that was very similar across all cancer sites (Table 4.3). This percentage is higher than in previous audit years, and is more complete than in previous years. The percentage of cases discussed at a multi-disciplinary team meeting was at least 95 per cent in 89 per cent of trusts (Appendix 2).

NICE guidelines recommend that 95 per cent to 100 per cent of patients should be discussed at an MDT meeting.

The percentage of patients seen by a clinical nurse specialist (CNS) is difficult to determine as a quarter of patients did not have this information recorded (Table 4.3). Amongst patients where this information was available, just above 80 per cent of colon cancer patients and 87 per cent of rectal cancer patients were seen by a clinical nurse specialist. The percentage of patients seen by a CNS varied between trusts, with 15 trusts reporting that fewer than half of their patients saw a CNS, but in three-quarters of trusts over 80 per cent of patients saw a CNS (Appendix 2).

NICE guidelines recommend that 100 per cent of patients should be seen by a specialist nurse.

The proportion of patients who are recorded as having had a CT scan, either by having a CT scan result reported or by having a date of CT scan reported was over 80 per cent and was similar across cancer sites. This figure is probably a more accurate estimate of the use of CT imaging than previously reported and, by the simple manoeuvre of using both date and/or result of scan, the Audit is now producing a more realistic figure for this measure. In 79 per cent of trusts at least 80 per cent of patients are recorded as having had a CT scan.

NICE guidelines recommend that 100 per cent of patients should have a CT scan.

A much higher proportion of colon cancer patients (28 per cent) had an urgent or emergency operation than rectal cancer patients (12 per cent). Particular efforts need to be made in this area as the urgency of procedure has a major effect on post-operative outcome.

NICE guidance is that facilities and services should be established to provide stenting for patients with intestinal obstruction, particularly those with serious comorbidity, so that high-risk emergency surgery may be avoided.

Just under 30 per cent of patients had a completely laparoscopic procedure, regardless of cancer site. The audit reports from 2009, 2010, together with the current communication, confirm the expected increase in laparoscopically completed procedures.

Characteristics of patients undergoing major surgery and with a known cancer site are shown in Table 4.4.

Table 4.4
Description of the 17,015 patients who underwent major surgery by cancer site

		Colon		Rectosigmoid		Rectal	
		Number	%	Number	%	Number	%
Total patients undergoing major resection		**11,585**		**947**		**4,483**	
Sex	**Male**	6,025	52	574	60.6	2,900	64.7
	Female	5,556	48	373	39.4	1,583	35.3
	Missing (% of total)	4 (0.0)		0		0	
Age-group	**<65 yrs**	2,959	25.5	321	33.9	1,716	38.3
	65-74 yrs	3,770	32.5	310	32.7	1,518	33.9
	75-84 yrs	3,713	32.1	253	26.7	1,072	23.9
	85+ yrs	1,143	9.9	63	6.7	177	3.9
ASA	**ASA 1: fit**	1,307	13.9	141	18.1	679	17.7
	ASA 2: relevant disease	4,888	52	402	51.5	2,210	57.7
	ASA 3: restrictive disease	2,780	29.6	209	26.8	880	23
	ASA 4: life-threatening disease	404	4.3	28	3.6	61	1.6
	ASA 5: moribund	19	0.2	1	0.1	2	0.1
	Missing (% of total)	2,187 (18.9)		166 (17.5)		651 (14.5)	
Dukes' stage	**A**	1,407	13.2	171	19.5	1,153	28.3
	B	4,345	40.6	308	35.2	1,266	31.1
	C	3,381	31.6	287	32.8	1,321	32.4
	D	1,564	14.6	110	12.6	332	8.2
	Missing (% of total)	888 (7.7)		71 (7.5)		411 (9.2)	
Urgency	**Elective**	6,404	58.4	613	66.6	3,052	71.5
	Scheduled	1,667	15.2	119	12.9	816	19.1
	Urgent	1,495	13.6	95	10.3	318	7.4
	Emergency	1,396	12.7	94	10.2	83	1.9
	Missing (% of total)	623 (5.4)		26 (2.7%)		214 (4.8)	
Procedure	**Right hemicolectomy**	6,627	57.2	18	1.9	12	0.3
	Transverse colectomy	86	0.7	2	0.2	1	0
	Left hemicolectomy	978	8.4	23	2.4	8	0.2
	Sigmoid colectomy	1,159	10	91	9.6	39	0.9
	Total/subtotal colectomy	325	2.8	20	2.1	82	1.8
	Anterior resection	1,906	16.5	672	71	2890	64.5
	APER	0	0	0	0	1139	25.4
	Hartmann procedure	504	4.4	121	12.8	312	7

Rectal cancer patients who had major surgery tended to be younger (median age 68) than those who did not (median age 72), whereas the median age of colon cancer patients was 73 in all patients regardless of whether or not they had undergone major surgery.

A higher proportion of colon cancer patients than rectal cancer patients undergoing major surgery were classified as having restrictive or life-threatening disease or as moribund, according to their ASA grade (Table 4.4). Note however that nearly 20 per cent of patients undergoing major surgery had no ASA grade recorded. Again, colon cancer tended to have a more advanced Dukes' stage than patients with rectal cancer; and more patients had a cancer that involved extramural tissues. Major surgery was more likely to be carried out as urgent or emergency in colon cancer patients than in rectal cancer patients.

The pattern of presentation and treatment of colonic versus rectal cancer is becoming clear. Patients with colonic cancer present with more advanced disease, are more likely to present as an acute, are more likely to have urgent surgery, even in the presence of advanced disease and, when one looks at post-operative outcomes, are more likely to have an adverse outcome. Although the data completeness has improved in recent years it behoves the clinical teams to ensure that ASA grade and urgency of operation are documented fully in all surgically treated cases of colorectal cancer.

Figures 4.1 and 4.2 show that the proportion of patients with Dukes' stage D around the time of initial treatment varies between Networks from just under 20 per cent to above 35 per cent. There is a similar variation in the proportion of patients with Dukes' stage D amongst patients undergoing major surgery.

Figure 4.1
Dukes' D stage around time of initial treatment in all patients by network/nation

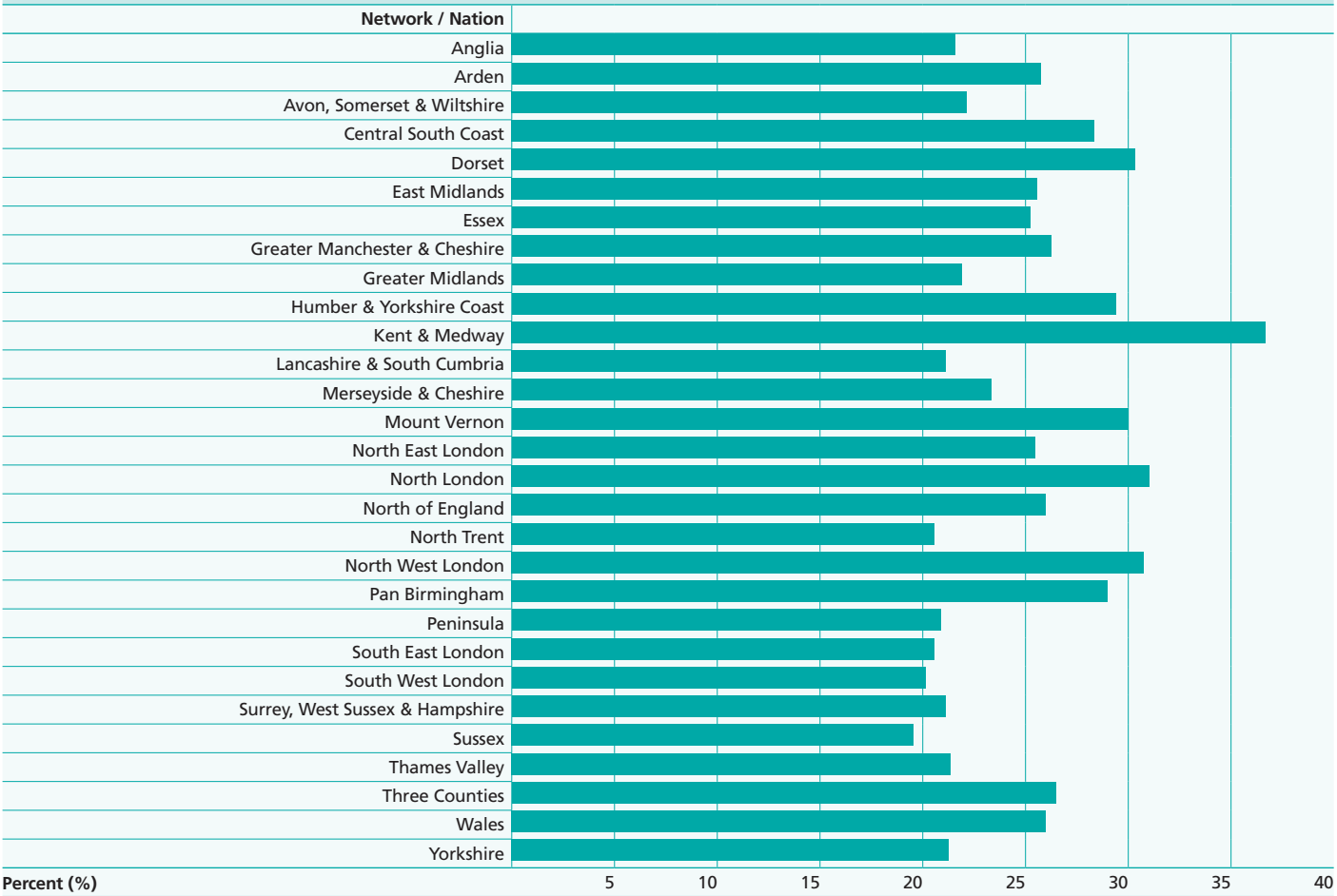
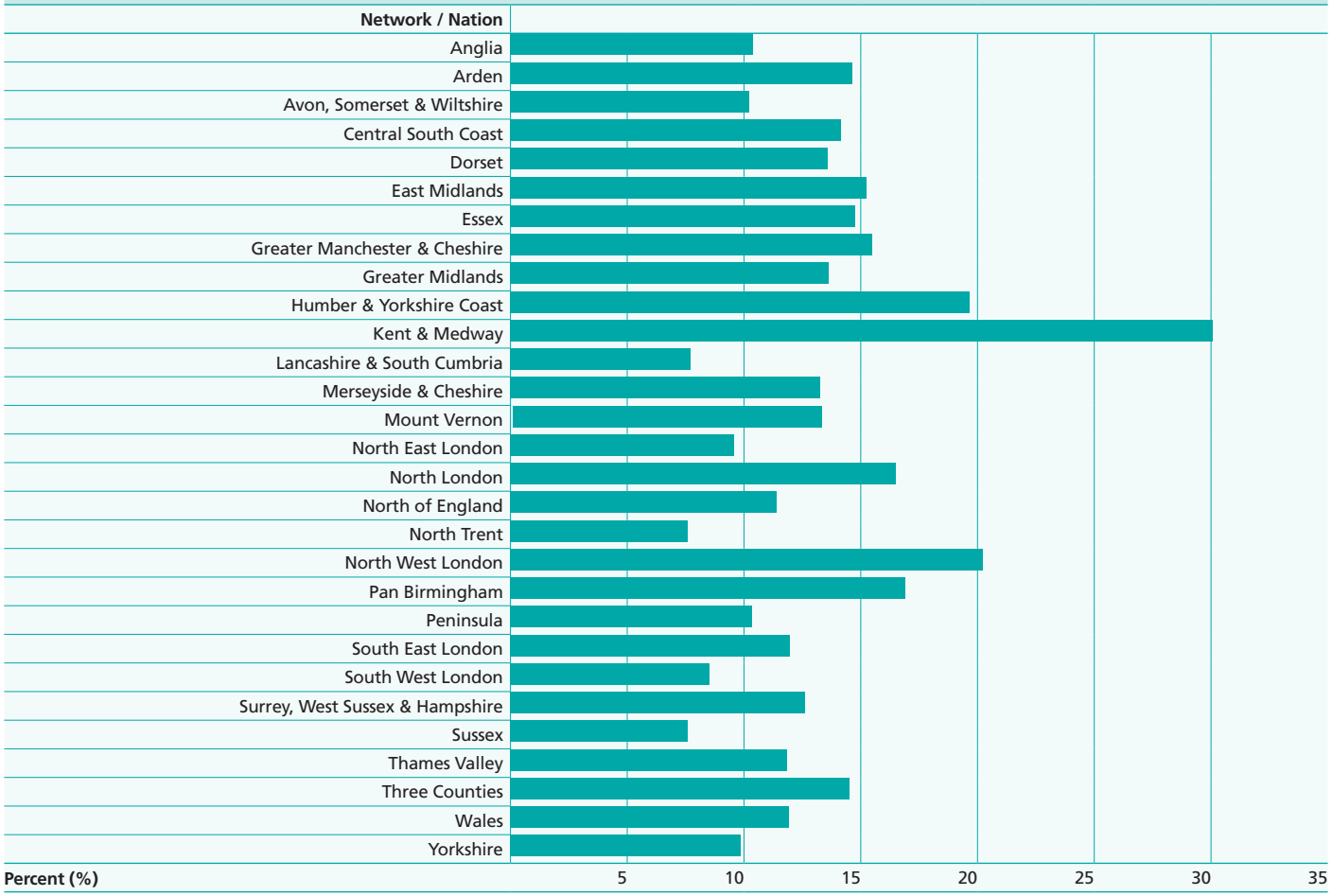
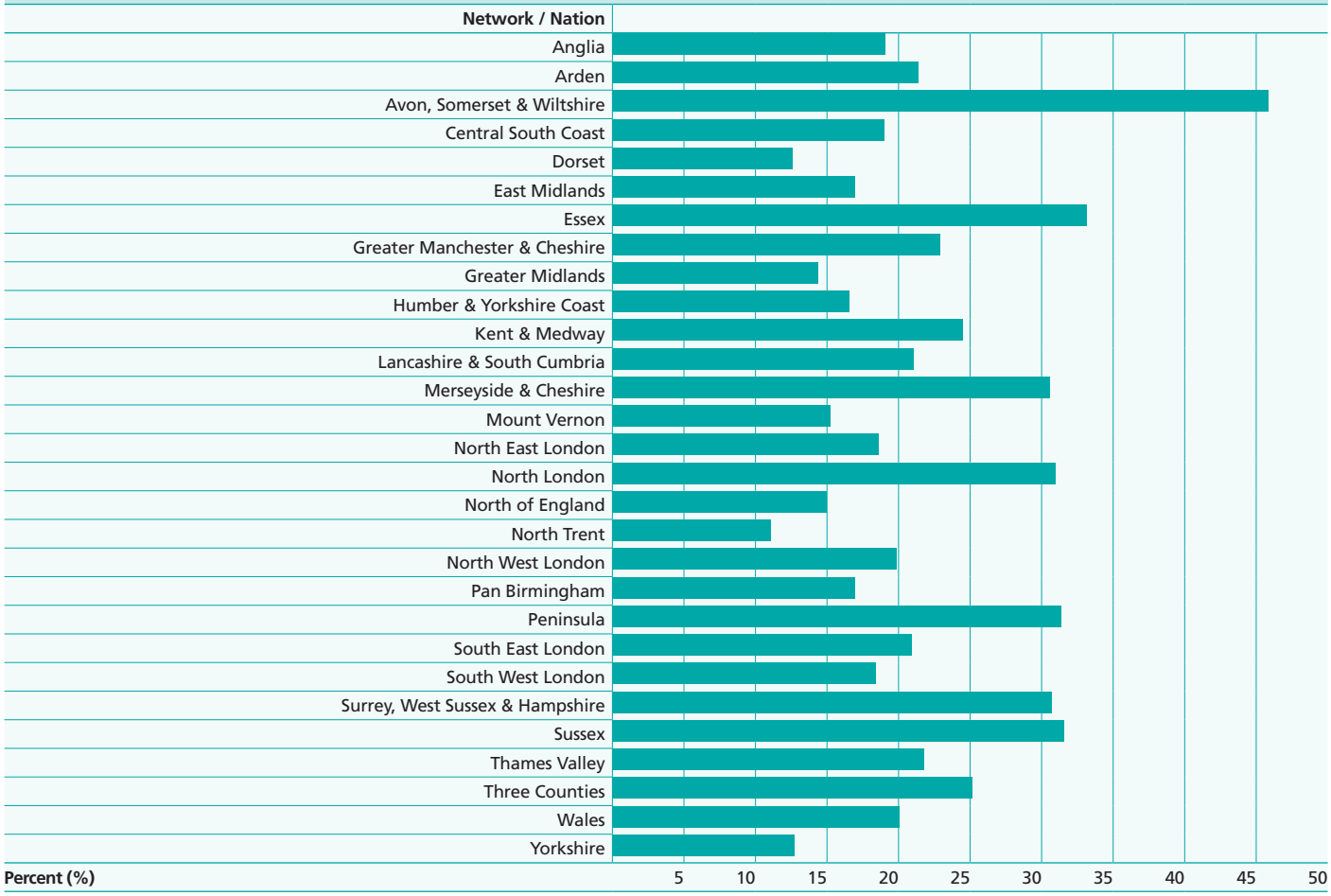


Figure 4.2
Dukes' D stage around time of initial treatment in patients undergoing major surgery by network/nation



Networks also vary widely in the proportion of major surgery that is carried out as urgent or emergency (Figure 4.3): in 5 Networks the figure is under 15 per cent and in 7 Networks it is over 30 per cent. In Appendix 3 it can be seen that trusts also vary widely in the proportion of major surgery that is carried out as urgent or emergency. Gross differences, as shown here, may well be the result of incomplete data, or under-reporting and should be interpreted with caution.

Figure 4.3
Major surgery carried out as an urgent or emergency procedure by network/nation



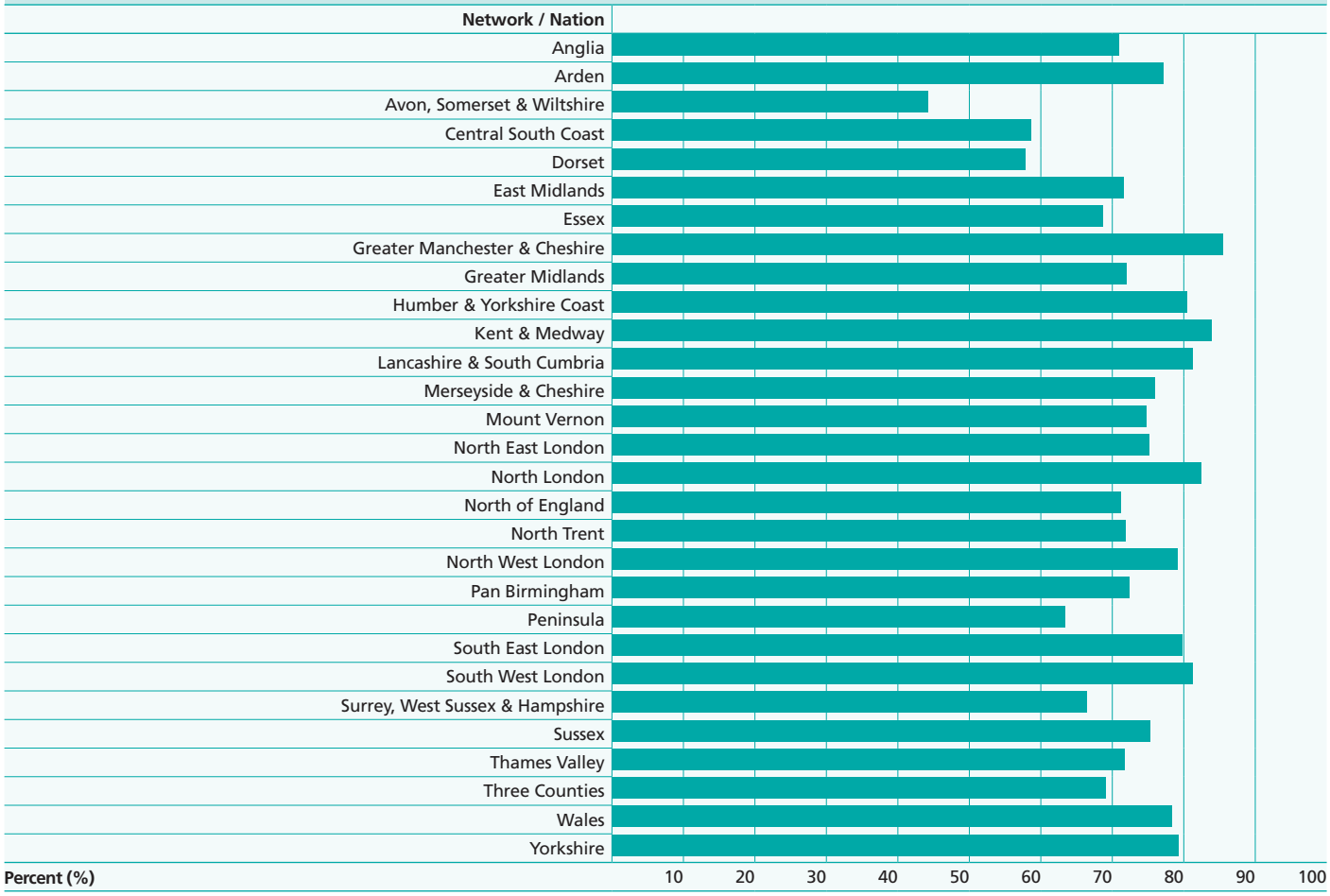
Outcomes of patients undergoing major surgery

Table 4.5 summarises the outcomes of patients undergoing major surgery, by cancer site. Data completeness is high for 30-day mortality, but missing data is a large problem for other outcomes from surgery. Use of audit data linked to HES, described later in Section 6, illustrates this problem further and also goes some way to explaining the biases which exist in the Audit when data is incomplete. Whilst we estimate that 32 per cent of those patients with colon cancer and 23 per cent of rectal cancer patients undergoing major surgery were reported as having extramural vascular invasion, in 30 per cent of patients undergoing major surgery, this information is not reported. Patients with colon cancer tend to have a slightly greater number of lymph nodes excised than rectal cancer patients, an observation previously noted and attributable to the use of pre-operative radiotherapy in the latter. The median length of stay in hospital was longer for patients undergoing major surgery for rectal cancer (9 days) than colon cancer (7 days). We are unable, as yet, to determine why this should be the case but one's impression is that delay in discharge is often related to issues around stoma management; surely an issue for future audits and of interest to all members of the clinical team. Note however that length of stay was unavailable in 16 per cent of these patients because of missing date of discharge.

Table 4.5
Surgical & pathological outcomes in 17,015 patients who had major surgery by cancer site

		Colon		Rectosigmoid		Rectal	
		Number	%	Number	%	Number	%
Total patients undergoing major resection		**11,585**		**947**		**4,483**	
Extramural Vascular Invasion	**Positive**	2,534	31.8	240	35.8	708	22.7
	Negative	5,428	68.2	430	64.2	2,410	77.3
	Missing (% of total)	3,623 (31.3)		277 (29.3)		1,365 (30.4)	
Median number of excised lymph nodes	**Median**	16		15		14	
	Range	0-590		0-110		0-99	
	Interquartile range	12-21		11-21		9-19	
At least one positive node found	**Yes**	4,573	43.7	387	44.6	1,475	36.4
	No	5,885	56.3	481	55.4	2,582	63.6
	Missing (% of total)	1,127 (9.7)		79 (8.3)		426 (9.5)	
Length of hospital stay (LOS)	**Median LOS**	7		8		9	
	Range	0-365		0-167		0-343	
	Interquartile range	5-12		5-13		6-14	
Length of stay longer than 5 days	**Yes**	6,716	69.4	604	74.8	3,087	83.3
	No	2,966	30.6	204	25.2	620	16.7
	Missing (% of total))	1,903 (16.4)		139 (14.7)		776 (17.3)	
30-day mortality following major surgery	**Yes**	488	4.2	27	2.9	113	2.5
	No	11,028	95.8	913	97.1	4,344	97.5
	Missing (% of total)	69 (0.6)		7 (0.7)		26 (0.6)	
30-day mortality by urgency of operation	**Elective**	149/6,372	2.3	8/610	1.3	79/3,039	2.6
	Scheduled	51/1,661	3.1	1/119	0.8	11/815	1.3
	Urgent	95/1,490	6.4	6/94	6.4	12/316	3.8
	Emergency	159/1,389	11.4	10/93	10.8	4/82	4.9
	Missing urgency of operation	34/623	5.5	2/26	7.7	7/214	3.3

Figure 4.4
Length of hospital stay > 5 days after major surgery by network/nation



Post-operative mortality

The classification for 30-day mortality has been corrected this year so that patients with missing date of surgery or out of range date of surgery are removed from the denominator as well as the numerator, whereas previously they were only removed from the numerator, leading to an underestimate of mortality. Also, date of surgery is only considered out of range if it is after date of death, whereas previously it was also considered out of range if it was before date of diagnosis. Last year overall 30-day mortality was estimated as 3.6 per cent whereas the new estimate for last year's 30-day mortality is 4.0 per cent.

Table 4.5 shows the observed 30-day post-operative mortality by cancer site and by urgency of operation. Overall 30-day mortality after major surgery was 3.7 per cent, but differed between cancer sites: 4.2 per cent after major surgery for colon cancer and 2.5 per cent after major surgery for rectal cancer. Overall observed 30-day post-operative mortality was 3.6 per cent for England and 5.6 per cent for Wales.

This year 90-day mortality is also presented. It was felt by the Project Team that this added significantly to the Audit although it remains to be seen what the reason for observed differences might be over time. Patients with advanced disease or co-morbidity, who have surgery, may succumb in the period between 30 and 90 days post-operatively. Overall 90-day mortality after major surgery was 5.6 per cent, specifically 6.4 per cent after major surgery for colon cancer and 3.6 per cent after major surgery for rectal cancer.

Urgency of operation markedly affects the post-operative mortality for both colon and rectal cancer. Patients undergoing urgent and emergency surgery have 30-day post-operative mortality of 6.0 per cent and 11.2 per cent respectively, compared to 2.4 per cent for both elective and scheduled surgery. Actual numbers of deaths within 30 days of surgery are small within urgent and emergency rectal cancer surgery. However, if the last three years of audit data are pooled we see that amongst elective and scheduled operations, 30-day post-operative mortality is only slightly higher in colon cancer (2.7 per cent) than rectal cancer patients (2.4 per cent). The same is not true amongst urgent and emergency operations, in which 9.6 per cent of colon cancer patients and 5.0 per cent of rectal cancer patients died within 30 days of major surgery. A similar pattern is seen across patient's site of cancer and urgency of operation for 90-day post-operative mortality.

Tables 4.6 and 4.7 shows that observed 30-day and 90-day post-operative mortality have both decreased year-on-year over the last three audit years: 30-day mortality from 4.1 per cent in 2007-08 to 3.7 per cent in 2009-10, and 90-day mortality from 6.4 per cent in 2007-08 to 5.6 per cent in 2009-10. The proportion of patients undergoing major surgery has remained stable over this period, decreasing very slightly from 63 per cent in 2007-08 to 61 per cent in 2008-09 and remaining at 61 per cent in 2009-10.

Table 4.6
30-day post-operative mortality by audit year

	2007-08		2008-09		2009-10	
	N	%	N	%	N	%
Total patients undergoing major resection	13,173		14,755		17,161	
Dead at 30 days after surgery	528	4.1	583	4.0	639	3.7
Alive at 30 days after surgery	12,503	95.9	14,066	96.0	16,419	96.3
Missing (% of total)	142 (1.1)		106 (.7)		103 (.6)	

Table 4.7
90-day post-operative mortality by audit year

	2007-08		2008-09		2009-10	
	N	%	N	%	N	%
Total patients undergoing major resection	13,173		14,755		17,161	
Dead at 30 days after surgery	836	6.4	892	6.1	957	5.6
Alive at 30 days after surgery	12,195	93.6	13,757	93.9	16,101	94.4
Missing (% of total)	142 (1.1)		106 (.7)		103 (.6)	

Adjusted mortality has also significantly decreased over the 3 audit years (see Table 4.8). The adjusted per-year odds ratio for 30-day mortality compared to this year is 1.07 (95 per cent CI: 1.00 to 1.13), P for trend is 0.05. And the adjusted per-year odds ratio for 90-day mortality compared to this year is 1.10 (95 per cent CI: 1.04 to 1.16), P for trend is 0.0003

Tables 4.8(a) and 4.8(b) describes the prognostic model for 30- and 90-day mortality respectively, which is used to estimate adjusted mortality in Figures 4.6 to 4.9 and Appendix 3. The model is very predictive of post-operative mortality, with an area under the receiver operating characteristic curve of over 80 per cent, and the model fits the data well, with good agreement between the observed and predicted risks. The strongest predictor of death within 30 days of surgery is ASA grade, with patients classified as moribund having over 20-times the odds of death than patients classified as fit. Older male patients with a later stage of cancer, who are operated on as urgent or an emergency, are the most likely to die within 30 days of major surgery.

Patients undergoing total/subtotal colectomy have a higher 30-day mortality and patients undergoing sigmoid colectomy have a lower 30-day mortality than patients undergoing other procedures. A similar pattern is seen for mortality within 90 days of major surgery, but with ASA grade having a smaller effect and Dukes' stage having a greater effect. Patients undergoing transverse or total/subtotal colectomy have a higher 90-day mortality and patients undergoing sigmoid colectomy or anterior resection have a lower 90-day mortality than patients undergoing other procedures.

By studying Table 4.8 (a and b) it is possible to see the relative importance of each of the six variables and the importance of recording and submitting these values. There have been cases in recent reports where appropriate recording of ASA grade or Dukes' staging has made the difference between a unit being a perceived or actual outlier.

Table 4.8(a)
Logistic regression model of 30-day post-operative mortality after major surgery for bowel cancer

		Odds ratio*	95% CI
Audit year	2009-2010	1	
	2008-2009	1.09	0.97 to 1.23
	2007-2008	1.13	1 to 1.28
Sex	Male	1	
	Female	0.78	0.71 to 0.87
Age**	50 yrs	0.34	0.26 to 0.43
	60 yrs	0.56	0.51 to 0.62
	70 yrs	1	
	80 yrs	1.88	1.77 to 2
	90 yrs	3.75	3.21 to 4.39
ASA	ASA 1: fit	1	
	ASA 2: relevant disease	2.25	1.58 to 3.19
	ASA 3: restrictive disease	5.41	3.8 to 7.69
	ASA 4: life-threatening disease	14.03	9.6 to 20.49
	ASA 5: moribund	26.48	14.51 to 48.33
Dukes' stage	A	1	
	B	1.2	1 to 1.45
	C	1.35	1.11 to 1.63
	D	1.84	1.49 to 2.27
Urgency	Elective	1	
	Scheduled	1.04	0.87 to 1.23
	Urgent	1.94	1.68 to 2.25
	Emergency	2.94	2.56 to 3.38
Procedure	Right hemicolectomy	1	
	Transverse colectomy	1.29	0.79 to 2.09
	Left hemicolectomy	0.97	0.77 to 1.22
	Sigmoid colectomy	0.80	0.64 to 0.99
	Total/subtotal colectomy	1.52	1.15 to 2.01
	Anterior resection	0.97	0.84 to 1.12
	APER	0.95	0.73 to 1.24
	Hartmann procedure	1.11	0.94 to 1.31

Area under ROC curve =0.82 (95% CI: 0.81 to 0.83)
* "1" represents the baseline category
** OR for age (centred on age 70) 1.062 (1.055, 1.069) and age-squared 1.0003 (0.9999, 1.0007)
Per year OR for audit year =1.06 (1.00,1.13) Pt=0.05

Table 4.8(b)
Logistic regression model of 90-day post-operative mortality after major surgery for bowel cancer

		Odds ratio*	95% CI
Audit year	**2009-2010**	1	
	2008-2009	1.12	1.01 to 1.24
	2007-2008	1.21	1.09 to 1.34
Sex	**Male**	1	
	Female	0.79	0.72 to 0.86
Age**	**50 yrs**	0.43	0.36 to 0.5
	60 yrs	0.62	0.59 to 0.66
	70 yrs	1	
	80 yrs	1.76	1.68 to 1.85
	90 yrs	3.41	2.99 to 3.89
ASA	**ASA 1: fit**	1	
	ASA 2: relevant disease	1.86	1.4 to 2.47
	ASA 3: restrictive disease	4.18	3.21 to 5.44
	ASA 4: life-threatening disease	9.64	7.21 to 12.89
	ASA 5: moribund	22.24	12.67 to 39.03
Dukes' stage	**A**	1	
	B	1.19	1.01 to 1.41
	C	1.43	1.21 to 1.68
	D	2.62	2.19 to 3.14
Urgency	**Elective**	1	
	Scheduled	0.97	0.84 to 1.11
	Urgent	1.71	1.51 to 1.94
	Emergency	2.64	2.33 to 2.98
Procedure	**Right hemicolectomy**	1	
	Transverse colectomy	1.67	1.14 to 2.46
	Left hemicolectomy	0.84	0.69 to 1.02
	Sigmoid colectomy	0.79	0.66 to 0.94
	Total/subtotal colectomy	1.29	1.01 to 1.64
	Anterior resection	0.84	0.74 to 0.94
	APER	0.95	0.78 to 1.17
	Hartmann procedure	0.99	0.86 to 1.15

Area under ROC curve =0.80 (95% CI: 0.79 to 0.81)
P for linear trend for audit year=0.0003 (OR=1.10 (1.04,1.16)

Figure 4.5 shows the observed 30-day post-operative mortality across networks/nations. Figures 4.6 and 4.7 plot the observed and adjusted 30-day mortality against number of operations, by cancer network/nation. The 99.8 per cent limits mark the boundary beyond which we would expect 0.2 per cent of networks/nations to lie, simply by chance. Similarly we would expect 5 per cent of networks/nations to lie beyond the 95 per cent limits by chance alone. Twenty-nine networks/nations submitted to the Audit and we would therefore expect 1.5 and 0.6 of them to lie beyond the 99.8 per cent and 95 per cent limits respectively, if they are performing according to the target. Therefore the results of a single year should be treated with caution. However, it would be very unlikely for the same network/nation to fall into the alert region in several audit years, just by chance. One network/nation falls outside the outer limit for observed 30-day mortality, but the distribution of prognostic risk factors in this network/nation predicts a higher than average post-operative mortality, and after adjustment for this, the 30-day mortality falls between the inner and outer limits. The same network/nation falls outside the outer limit for observed and adjusted 90-day mortality.

Figure 4.5
Overall observed (unadjusted) 30-day post-operative mortality after major surgery by network/nation

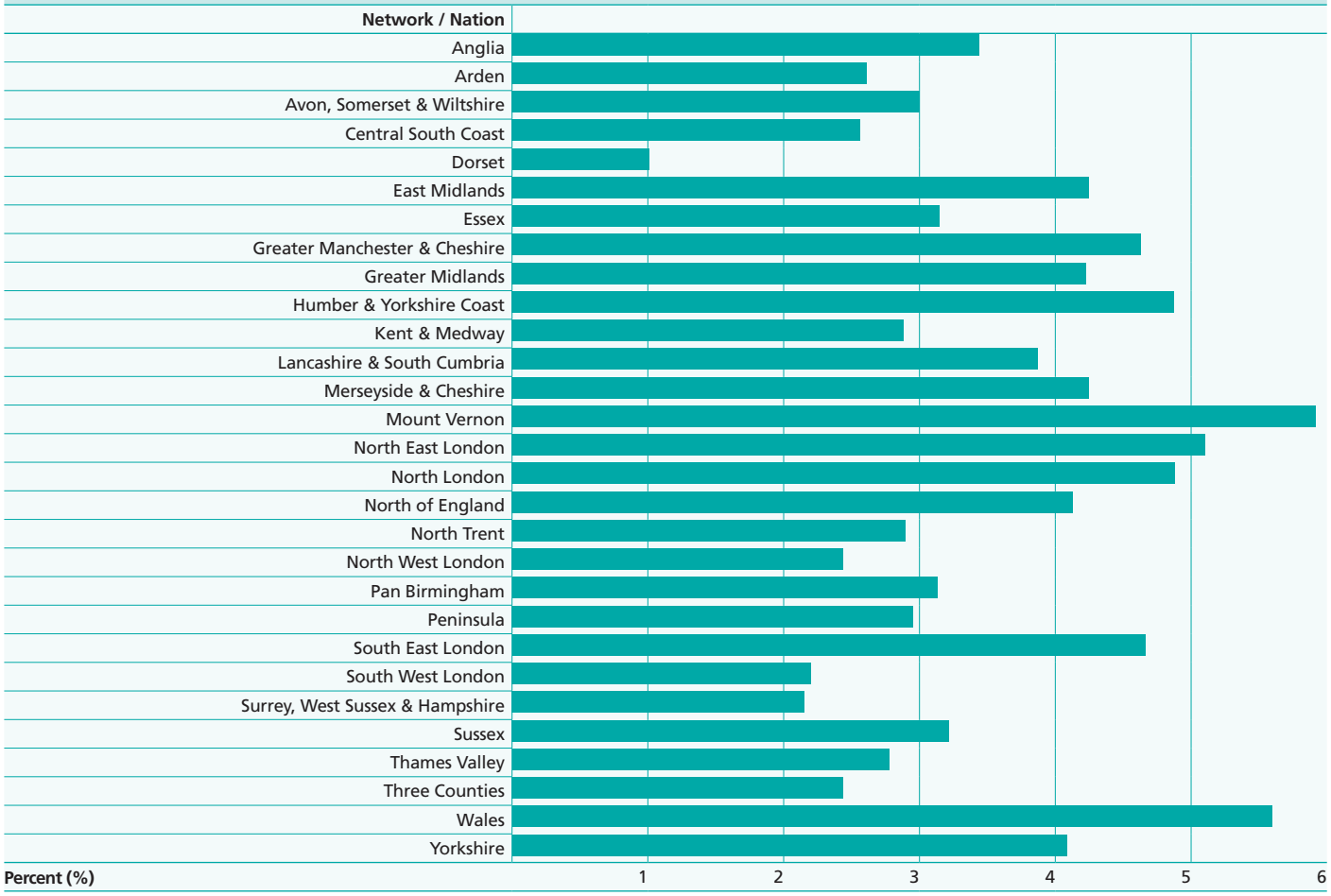


Figure 4.6
Observed 30-day and 90-day post-operative mortality by network/nation

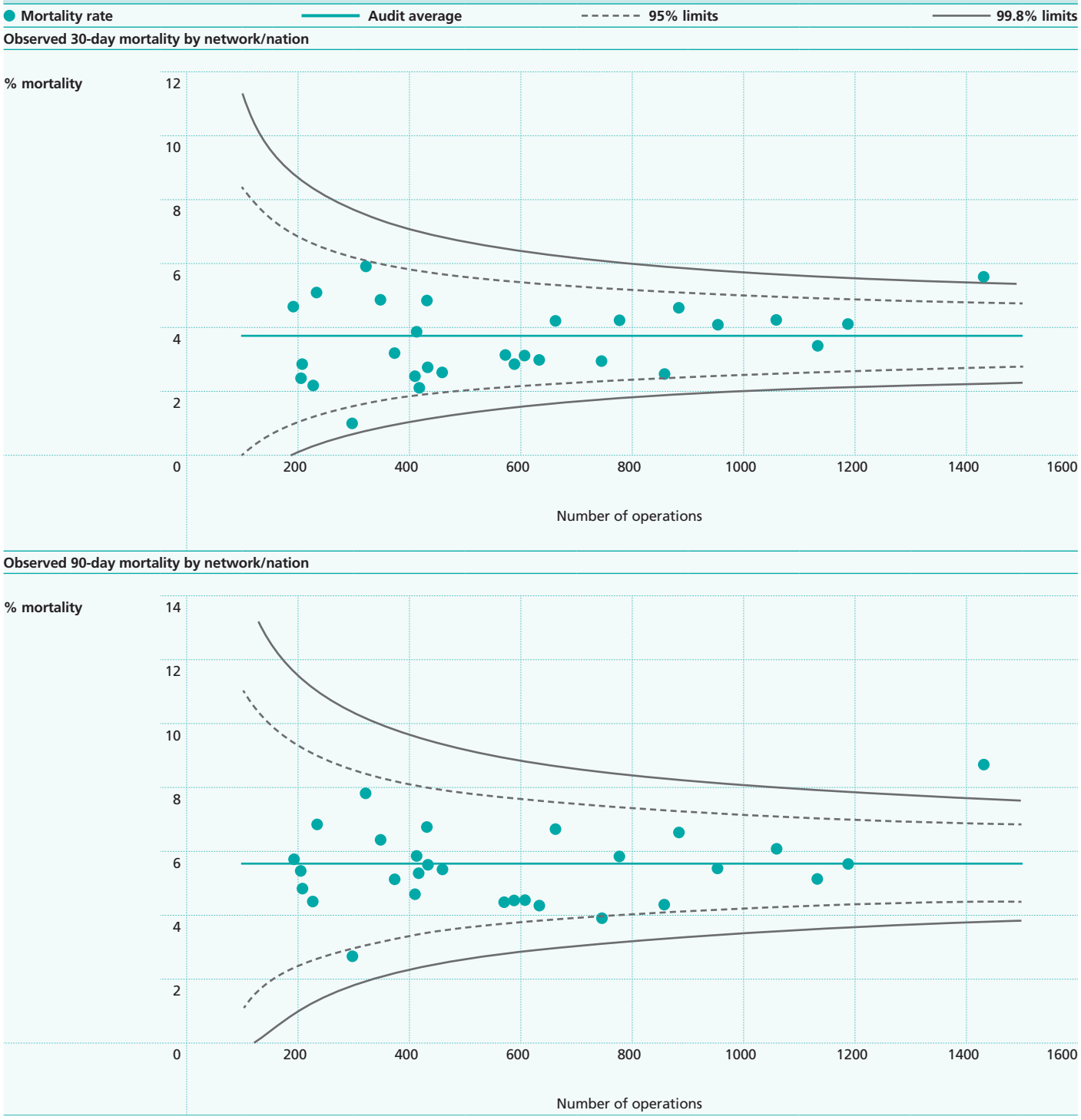
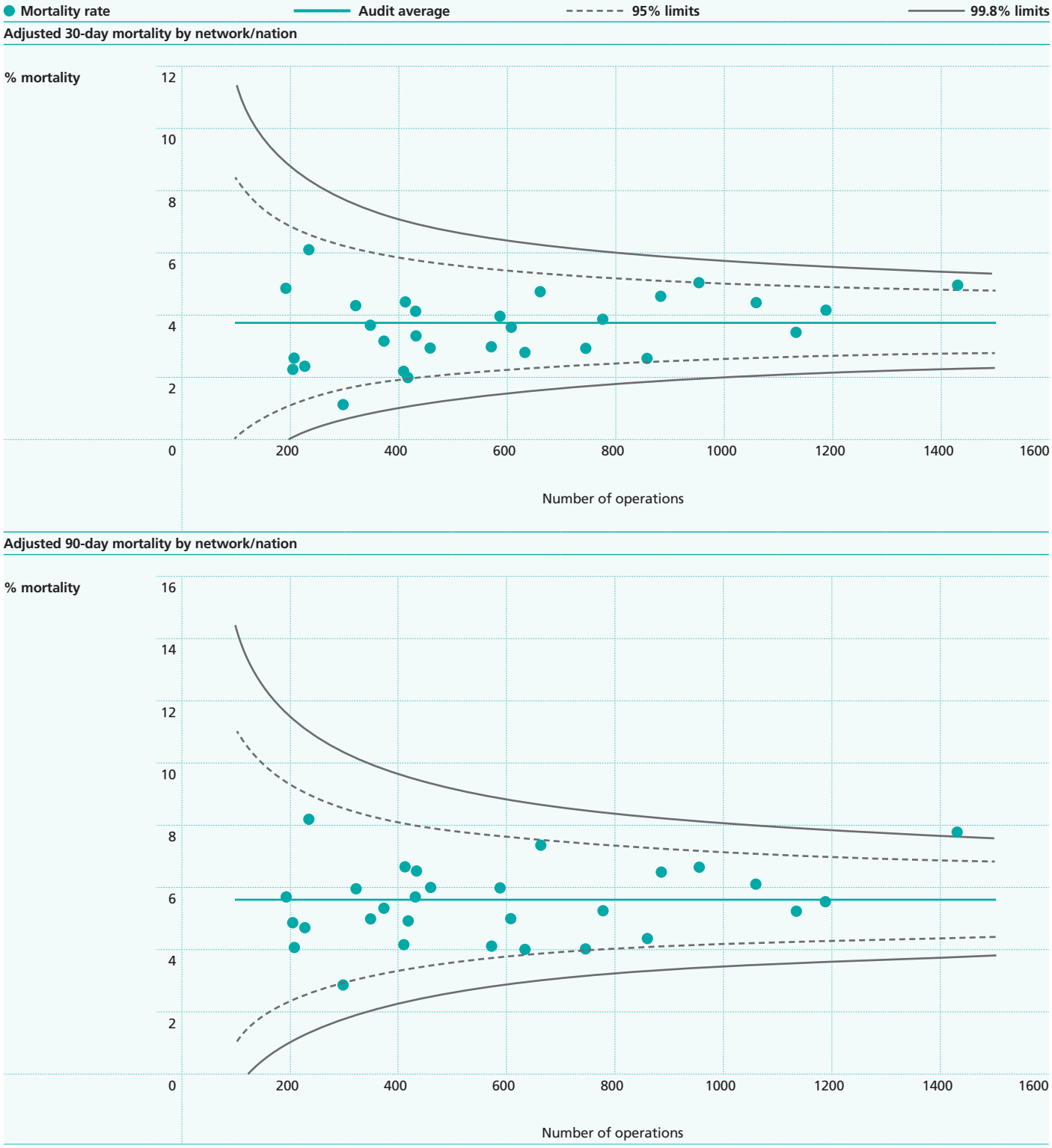


Figure 4.7
Adjusted 30-day and 90-day post-operative mortality by network/nation



Figures 4.8 and 4.9 present the observed and adjusted 30-day and 90-day mortality by trust/site. In total 10 trusts/sites were above the inner limit on adjusted 30-day and/or 90-day mortality and one further trust was above the outer limit on adjusted 90-day mortality. These trusts/sites were all informed of this and given the opportunity to resubmit any incorrect or missing data. Three trusts/sites resubmitted corrected ASA grades. Of these three trusts/sites, two were no longer above the inner limit on adjusted mortality, based on their resubmitted data, while the other trust/hospital remained outside the outer limit.

Of the 11 trusts/sites falling above the funnel limits five had submitted very incomplete data on at least one of ASA grade, Dukes' stage or surgical urgency. Trusts should be aware that missing or inaccurate information on any of the six items used in the case adjustment could affect their adjusted mortality, particularly ASA grade as this is a very strong predictor of postoperative mortality. 24 Trusts in Appendix 1 have less than 50 per cent of patients with complete data on all six of these items.

In addition, case ascertainment tended to be an issue for these trusts/sites, with four of the 11 trusts/sites having a case ascertainment below 80 per cent. On contacting the eleven trusts/sites, two of them reported that only 50 per cent of the data they had collected for the audit had been submitted.

Figure 4.8
Observed 30-day and 90-day post-operative mortality by trust/site with more than 10 operations

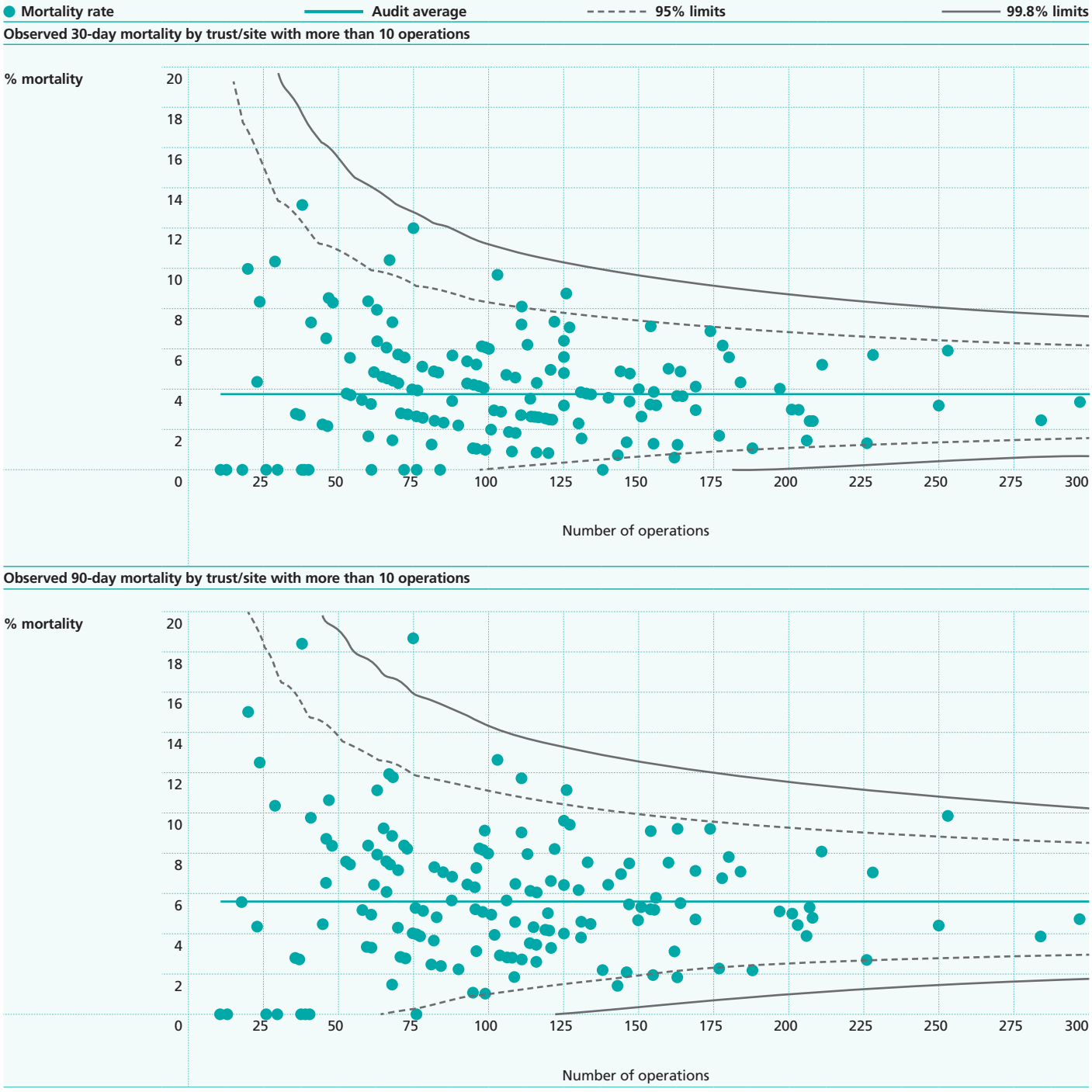


Figure 4.9
Adjusted 30-day and 90-day post-operative mortality by trust/site with more than 10 operations

5. Additional information on patients with rectal cancer who had major surgery

It is reported that over 80 per cent of rectal cancer patients undergoing major surgery had an MRI scan, although not all of these patients have a result recorded, as this includes patients for whom there is a date of MRI scan but no results. In 65 per cent of trusts at least 80 per cent of rectal cancer patients undergoing major surgery had an MRI scan.

NICE guidance is that patients with invasive rectal cancers for whom surgery is being considered should have magnetic resonance imaging (MRI) scans before treatment begins.

The items in Table 5.1 suffer from data incompleteness. For example, in over half of rectal cancer patients undergoing major surgery it is unknown whether they had radiotherapy. Only 40 per cent of rectal cancer patients are reported to have had pre-operative radiotherapy, but this figure could be much higher if there is under-reporting of this information. Circumferential resection margin data is missing in 40 per cent of rectal cancer patients undergoing major surgery. Amongst patients where this result is recorded, 9 per cent are positive, but there is large uncertainty in this figure due to missing data.

Table 5.1
Description of management of patients with rectal cancer who had major surgery

		Number	%
Total number of patients with rectal cancer who had major surgery		**4,483**	
MRI scan reported*	**Yes**	3,678	82
	No	805	18
Pre-operative radiotherapy	**Short course**	690	15.4
	Long course	1,133	25.3
	Post operative	57	1.3
	Unknown type†	66	1.5
	No radiotherapy or not reported	2,537	56.6
Circumferential resection margins	**Negative**	2,453	91.4
	Positive	230	8.6
	Missing (% of total)	1,800 (40.2)	
Rectal surgical procedures	**Anterior Resection (AR)**	2,890	64.5
	APER	1,139	25.4
	Hartmann procedure	312	7
	Other procedure	142	3.2
Stoma	**Permanent**	1,092	26.1
	Temporary	1,434	34.3
	Type unknown‡	32	0.8
	None	1,618	38.7
	Missing (% of total)	307 (6.8)	

* Yes if patient has a result of MRI scan or date of MRI scan
† Unknown radiotherapy type if date of radiotherapy is recorded, but not type.
‡ Unknown stoma type if patient was recorded as having a Hartmann procedure but their stoma type was not recorded.

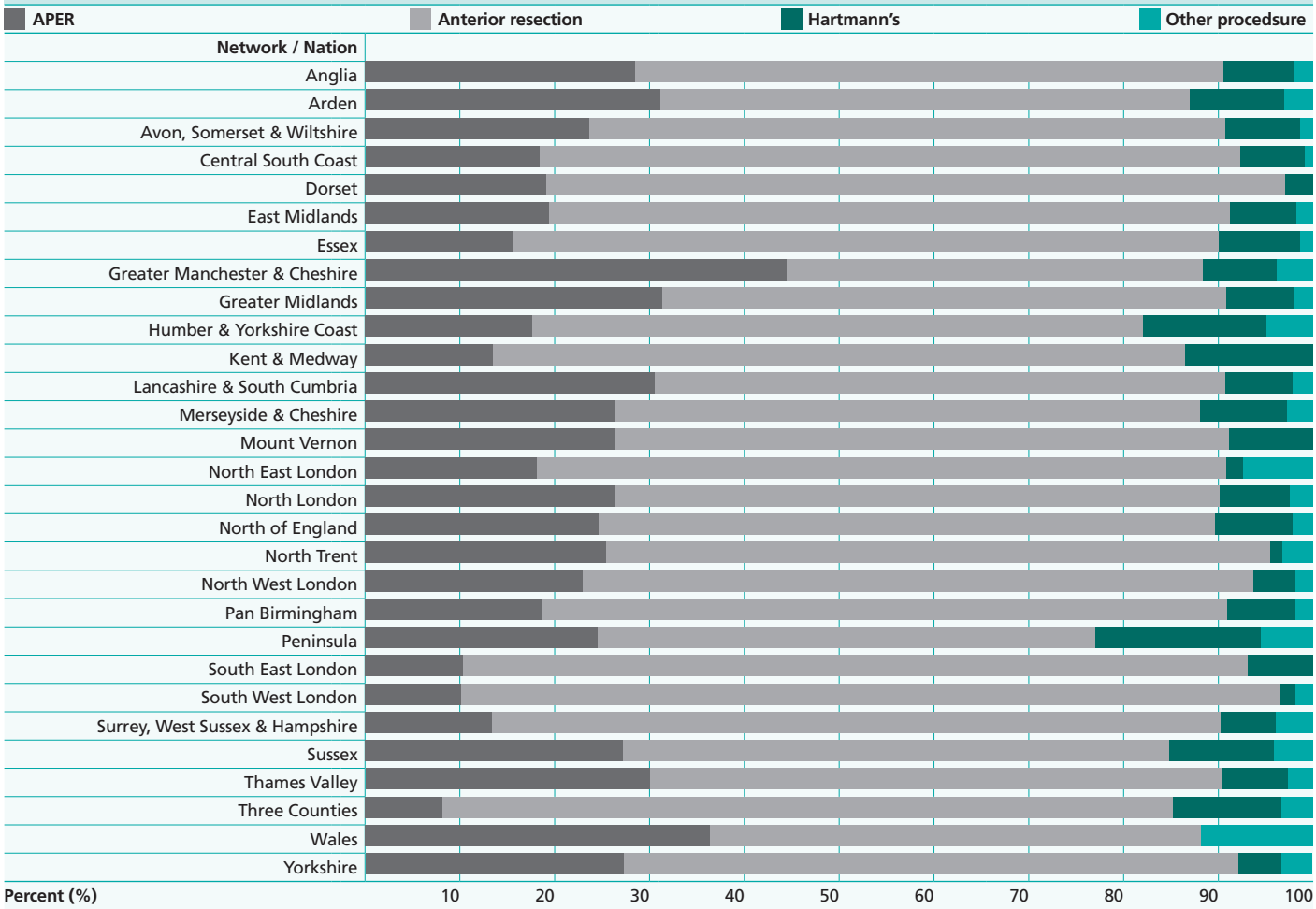
By far the most common major procedures for rectal cancer are anterior resection followed by APER. There are data quality issues with the reporting of permanent stoma, as the number of rectal cancer patients recorded as having a permanent stoma is lower than the number of patients who had an APER, even though APER always results in a permanent stoma. For the analysis of the audit data the stoma type is updated so that patients with missing information on stoma type who had an APER are recorded as having had a permanent stoma. Even with this correction, in Table 5.1 we see that slightly fewer patients are recorded as having a permanent stoma than the number of patients having an APER. It is clear that in a "permanent stoma rate" one would have to add to the APERs those who had an unreversed loop stoma following a restorative resection as well as those patients who had a Hartmann's procedure and, for whatever reason, did not have a reversal. As mentioned previously it is the hope of the Project Team that HES-linked audit data might give a clearer idea of the true permanent stoma rate, accepting that this needs both an accurate numerator and denominator.

NICE guidance recommends that the overall proportion of rectal cancers treated by APER should be less than 30 per cent.

Figure 5.1 shows the proportions of each type of procedure being carried out across networks/nations.

Appendix 4 gives a breakdown of the treatment of rectal cancer patients undergoing major surgery, by trust/hospital.

Figure 5.1
Major Surgery for rectal cancer by network/network



6. Use of HES-linked data to explore possible sources of bias in post-operative mortality in the National Bowel Cancer Audit (NBCA)

Aims

1. To assess case ascertainment in NBCA and HES, and linkage between the two.

2. To identify any bias in post-operative mortality in NBCA due to patients not ascertained in NBCA having a different post-operative mortality to those ascertained.

3. To identify whether patients not ascertained in NBCA have a different prognostic risk profile to those patients ascertained. If so, this could explain at least some of any bias in post-operative mortality caused by selection bias into NBCA.

4. To assess the quality of post-operative mortality data in NBCA by comparing the recording of mortality data items in NBCA and HES.

Summary of Findings

1. Case ascertainment in NBCA is good. Depending on the extent to which linkage errors are a cause of lack of linkage between the two databases, NBCA is failing to ascertain between 10 per cent and 30 per cent of cases identified in HES. These cases are less likely to have had major surgery than those ascertained in NBCA.

2. The cases not ascertained in NBCA have a significantly higher 30-day in-hospital post-operative mortality following major surgery than those ascertained in NBCA (5.3 per cent and 3.4 per cent respectively). This is a source of bias in the post-operative mortality estimates in NBCA.

3. There is only very modest evidence that the cases ascertained in NBCA have a different prognostic risk profile to those not ascertained, with slight differences in proportion admitted to hospital as an emergency, and proportion having a comorbidity, but similar on other risk factors.

4. Post-operative mortality amongst patients identified as having major surgery in both NBCA and HES was in good agreement. However, amongst cases ascertained in both HES and NBCA, HES records a higher proportion of them as having major surgery than NBCA. The vast majority of patients recorded as having major surgery in HES but not in NBCA are missing their procedure code in NBCA. These patients have a higher 30-day in-hospital post-operative mortality following major surgery than patients recorded as having major surgery in both NBCA and HES (5.1 per cent compared to 3.4 per cent). This is a further source of bias in the post-operative mortality estimates in NBCA.

Method

NBCA data from the 2011 audit were linked to the Hospital Episodes Statistics database (HES) using NHS number. All new diagnoses of bowel cancer between 1 August 2009 and 31 July 2010, based on ICD-10 codes, were identified in HES. The same OPCS codes used in NBCA to identify major surgery were also used in HES.

In Section 6.2 the patient characteristics of those ascertained and not ascertained in NBCA are summarised using HES data. This includes the proportion undergoing major surgery, the 30-day in-hospital post-operative mortality, and patients' prognostic risk factors. This is repeated in Section 6.3 for patients ascertained and not ascertained in HES, using NBCA data. Note that deaths are only recorded in HES if they occur whilst the patient is in hospital, whereas in NBCA the date of death is obtained from the Open Exeter system, and is provided regardless of whether the death was in hospital or not. Therefore mortality estimates in HES are for 30-day in-hospital post-operative mortality, and mortality estimates in NBCA are for 30-day post-operative mortality, in or out of hospital.

In Section 6.4 the quality of data in NBCA and HES on major surgery and post-operative mortality is compared between the two data sources for patients ascertained in both. In order to compare the same mortality estimates in HES and NBCA, 30-day in-hospital post-operative mortality was estimated in NBCA, defined as death within 30 days of surgery and before the data of discharge.

For patients with multiple treatment records in NBCA the date of discharge is selected using an algorithm developed to select the latest date of discharge of any record that matches the Date of Surgery, Primary Procedure Name and Surgery Provider Organisation Code of the primary treatment record most closely. Where there is no record containing discharge date that matches the primary treatment record on all of Date of Surgery, Primary Procedure Name and Surgery Provider Organisation Code, a record with the latest date of discharge is selected that matches on the highest number of these items. For this reason it is not possible to reliably estimate in-hospital post-operative mortality for patients with multiple treatment records and we therefore include only patients with one treatment record to investigate post-operative mortality data quality in NBCA.

Results

6.1. Case ascertainment and linkage in NBCA and HES

Of the 29,577 new diagnoses of bowel cancer ascertained in HES, 72 per cent were linked to NBCA on NHS number. 82 per cent of the 26,251 cases ascertained in England in NBCA were linked to a patient in HES. See Table 6.1 below. The patients identified in HES who were unlinked to NBCA were spread fairly evenly across all trusts. Note that some of the cases unlinked between NBCA and HES could be unlinked due to linkage errors. This would mean that some of the 8,143 cases ascertained in HES but unlinked to NBCA were the same patients as the 4,817 cases ascertained in NBCA but unlinked to HES. Depending on the extent to which linkage is a problem, the percentage of all cases ascertained in HES that were not captured in NBCA could be as low as 10 per cent or as high as 30 per cent.

Table 6.1
Total cases identified by HES and NBCA, according to whether or not they are linked between the two data sources.

	Case ascertained in NBCA?		
Case ascertained in HES?	**Yes**	**No**	**Total**
Yes	21,434	8,143	29,577
No	4,817	N/A	
Total	**26,251**		

6.2. Characteristics of patients not ascertained in NBCA compared to those ascertained

Patients undergoing major surgery were much more likely to be captured in NBCA (Table 6.2). 73 per cent of cases ascertained in NBCA had major surgery according to HES, compared to only 46 per cent of cases not ascertained in NBCA.

Table 6.2
29,577 patients ascertained in HES. Percentage undergoing major surgery according to HES, in those ascertained and not ascertained in NBCA

		Ascertained in NBCA?						
		Yes	**%**	**No**	**%**	**Overall**	**%**	**P for difference**
Major surgery according to HES?	**Yes**	15,534	72.5	3,713	45.6	19,247	65.1	P<0.001
	No	5,900	27.5	4,430	54.4	10,330	34.9	
	Total	**21,434**		**8,143**		**29,577**		

Table 6.3 demonstrates that amongst patients recorded as having major surgery in HES, 30-day in-hospital post-operative mortality was significantly higher in patients not identified in NBCA (5.3 per cent) than those identified in NBCA (3.4 per cent). There is only very modest evidence that the cases in HES that were not ascertained in NBCA have a different prognostic risk profile to those that were ascertained. They tend to be slightly younger, are slightly more likely to have been admitted to hospital as an emergency, and a slightly higher proportion have at least one comorbidity according to the Charlson Index. They are similar in terms of gender and socio-economic status, based on the Index of Multiple Deprivation (IMD). Some important prognostic risk factors are not available in HES, specifically ASA grade and Dukes' stage. In addition, urgency of admission to hospital is recorded in HES but not surgical urgency, and we do not know whether this is as good a predictor of post-operative mortality as surgical urgency.

Table 6.3
19,247 patients undergoing major surgery according to HES. Outcomes and characteristics of those ascertained and not ascertained in NBCA.

		Ascertained in NBCA?						
		Yes	%	No	%	Overall	%	P for difference
Total patients		**15,534**		**3,713**		**19,247**		
Died in hospital within 30 days of major surgery, according to HES?	**Yes**	534	3.4	198	5.3	732	3.8	P<0.001
	No	14,998	96.6	3,515	94.7	18,513	96.2	
	Missing	2 (0.0%)		0 (0.0%)		2 (0.0%)		
Sex according to HES	**Male**	8,706	56.0	2,084	56.1	10,790	56.1	P=0.91
	Female	6,828	44.0	1,628	43.9	8,456	43.9	
	Missing	0 (0.0%)		1 (0.0%)		1 (0.0%)		
Age according to HES	**Median (Q25-Q75)**	71 (63-78)		70 (62-78)		71 (63-78)		0.08*
	Missing	0 (0.0%)		7 (0.2%)		7 (0.0%)		
Emergency admission according to HES?	**Yes**	2,842	18.3	733	19.7	3,575	18.6	P=0.04
	No	12,689	81.7	2,979	80.3	15,668	81.4	
	Missing	3 (0.0%)		1 (0.0%)		4 (0.0%)		
RCS Charlson score 1+	**Yes**	3,559	22.9	913	24.6	4,472	23.2	P=0.03
	No	11,975	77.1	2,800	75.4	14,775	76.8	
	Missing	0 (0.0%)		0 (0.0%)		0 (0.0%)		
IMD in lowest quintile (most deprived)	**Yes**	2,300	14.9	523	14.3	2,823	14.8	P=0.37
	No	13,162	85.1	3,138	85.7	16,300	85.2	
	Missing	72 (0.5%)		52 (1.4%)		124 (0.6%)		

* P for t test of difference in $\log_e$(age)

6.3. Characteristics of patients ascertained and not ascertained in HES

82 per cent of the 26,251 cases ascertained in England in NBCA were linked to a first diagnosis of bowel cancer in HES. As was found for the patients in HES unlinked to NBCA, the patients in NBCA unlinked to HES are much less likely to have undergone major surgery than those linked to HES (Table 6.4).

Of those patients who underwent major surgery, patients not linked to HES had a significantly higher 30-day post-operative mortality (in or outside of hospital) than those linked to HES (Table 6.5). Patients unlinked to HES were of a similar age and sex distribution, had a similar proportion of Dukes' grade D, and a similar IMD distribution as those linked to HES. They were however slightly more likely to have had emergency surgery and also slightly more likely to have a higher ASA grade.

The patients not ascertained in HES share characteristics with the patients not ascertained in NBCA; both groups of patients are less likely to have undergone major surgery, have a higher post-operative mortality, but are similar on prognostic risk factors to those patients who were ascertained in their respective database. This supports the suggestion that at least some of these are the same patients, and that linkage between NBCA and HES is not perfect.

Table 6.4
26,251 patients ascertained in NBCA. Patients undergoing major surgery, according to NBCA, in those ascertained and not ascertained in HES

		Ascertained in NBCA?						
		Yes	%	No	%	Overall	%	P for difference
Total patients		**21,434**		**4,817**		**26,251**		
Major surgery according to NBCA?	**Yes**	13,877	64.7	1,854	38.5	15,731	59.9	P<0.001
	No	7,557	35.3	2,963	61.5	10,520	40.1	

Table 6.5
15,731 patients undergoing major surgery in NBCA. Outcomes and characteristics in those ascertained and not ascertained in HES.

		Ascertained in NBCA?						
		Yes	%	No	%	Overall	%	P for difference
Total patients		**13,877**		**1,854**		**15,731**		
Died in hospital within 30 days of major surgery, according to NBCA?	**Yes**	477	3.5	82	4.5	559	3.6	P=0.03
	No	13,318	96.5	1,751	95.5	15,069	96.4	
	Missing	82 (0.6%)		21 (1.1%)		103		
Sex according to NBCA	**Male**	7,737	55.8	1,012	54.6	8,749	55.6	P=0.35
	Female	6,137	44.2	841	45.4	6,978	44.4	
	Missing	3 (0.02%)		1 (0.05%)				
Age according to NBCA	**Median (Q25-Q75)**	71 (63-78)		72 (63-79)		71 (63-78)		P=0.62*
	Missing	0		0				
Emergency surgery according to NBCA?	**Yes**	1,199	9.1	198	11.6	1,397	9.4	P=0.001
	No	11,971	90.9	1,510	88.4	13,481	90.6	
	Missing	707 (5.1%)		146 (7.9%)				
ASA grade 3+	**Yes**	3,453	30.6	500	34.0	3,953	31.0	P=0.009
	No	7,833	69.4	972	66.0	8,805	69.0	
	Missing	2,591 (18.7%)		382 (20.6%)				
Dukes' grade D	**Yes**	1,671	13.1	199	12.2	1,870	13.0	P=0.31
	No	11,117	86.9	1,435	87.8	12,552	87.0	
	Missing	1,089 (7.9%)		220 (11.9%)				
IMD in lowest quintile (most deprived)	**Yes**	2,028	15.0	293	16.2	2,321	15.1	P=0.38
	No	11,502	85.0	1,521	83.8	13,023	84.9	
	Missing	287 (2.1%)		40 (2.2%)				

* P for t test of difference in $\log_e$(age)

6.4. Post-operative mortality data quality in NBCA compared to HES

One-third of the patients ascertained in NBCA who were linked to HES had multiple treatment records in NBCA. The remaining 14,324 patients had single treatment records in NBCA and were compared in terms of their data quality on major surgery and post-operative mortality. The percentage of these patients having major surgery is estimated as 68 per cent in HES and 61 per cent in NBCA. The agreement between HES and NBCA on major surgery is good, with 86 per cent of the 14,324 HES-linked NBCA cases classified the same on major surgery.

Table 6.6
Agreement between NBCA and HES on major surgery

		Major surgery according to NBCA?		
		Yes	No	Total
Major surgery according to HES?	**Yes**	8,227	1,491	9,718 (67.8%)
	No	535	4,071	4,606 (32.2%)
	Total	**8,762 (61.2%)**	**5,562 (38.8%)**	**14,324 (100%)**

The first column of Table 6.7 demonstrates that post-operative mortality estimates are in good agreement between HES and NBCA; patients identified as having major surgery in both HES and NBCA have a 30-day in-hospital post-operative mortality of 3.4 per cent according to HES and 3.3 per cent according to NBCA.

A further group of patients are identified as having major surgery according to HES but not according to NBCA, and these make up the last two columns of Table 6.7. Most of these patients have a missing procedure code in NBCA. Patients with no procedure code recorded in NBCA have a higher mortality (5.1 per cent) than those with a procedure code in NBCA corresponding to major surgery (3.4 per cent).

Note that the majority of patients with missing procedure code in NBCA also have missing mortality data in NBCA because they have no date of surgery. The group of patients classified as having major surgery in HES with missing procedure code in NBCA is substantial and therefore has an impact on the overall mortality estimate in HES compared to NBCA: these patients make up 14 per cent of those patients who had major surgery according to HES.

Only a small proportion of patients recorded as having major surgery in HES have a procedure code recorded in NBCA which is for non-major surgery. Therefore their post-operative mortality, although it seems to be high, has little effect on the overall mortality estimate in HES compared to NBCA.

Table 6.7
9,718 patients having major surgery according to HES. 30-day in-hospital post-operative mortality by whether or not they were identified as having major surgery in NBCA.

		Major surgery in NBCA		Not major surgery in NBCA		Procedure type not recorded in NBCA	
		N	%	N	%	N	%
Total patients		**8,227**		**86**		**1,405**	
Died in hospital within 30 days of major surgery according to HES?	**Yes**	277	3.4	7	8.1	72	5.1
	No	7,950	96.6	79	91.9	1,333	94.9
	Missing	0 (0.0%)		0 (0.0%)		0 (0.0%)	
Died in hospital within 30 days of surgery according to NBCA?*	**Yes**	266	3.3	5	5.8	25	5.0
	No	7,914	96.7	81	94.2	471	95.0
	Missing	47 (0.6%)		0 (0.0%)		909† (64.7%)	

* Major surgery according to HES
† No date of surgery in NBCA

Conclusions

Two potential sources of bias in the post-operative mortality estimate in NBCA have been identified. One source of bias is that some bowel cancer cases are not ascertained in NBCA and according to HES, these patients have a higher post-operative mortality than those ascertained. The second source is that there are patients with missing procedure code in NBCA who have undergone major surgery according to HES. These patients are not included in the estimate of post-operative mortality following major surgery in NBCA, and according to HES they have a higher post-operative mortality than those who are included in the estimate. Both sources potentially lead to large bias because they make up a sizeable proportion of the cases undergoing major surgery according to HES: 20 per cent of cases having major surgery according to HES are not ascertained in NBCA and nearly 15 per cent of cases have no procedure code recorded in NBCA.

7. Summary and Discussion

This year's audit report confirms the progress that has been observed over recent years. Case ascertainment for England and Wales, is around 90 per cent and in several Networks the figure is over 90 per cent; something Wales has achieved for several time periods. Completeness of data submitted to the Audit is variable and, whilst data that is submitted seems to be fairly accurate when one compares with HES data, missing data remains a very real problem.

There has been a good deal of national interest in post-operative mortality figures and we renew the plea that the six variables that are used for risk adjusted mortality are completed in all cases. The use of HES linked audit data has given added value to the National Bowel Cancer Audit and it seems to have revealed several findings, in particular the increased peri-operative mortality in those cases not submitted, for whatever reason, to the Audit. We can, nevertheless, be pleased with the year on year reduction in post-operative mortality.

Several measures that indicate good practice are now contained within the Audit and, where data completeness is of a high standard, the results at a Trust level are of considerable value in the peer review process. Almost all our patients are being discussed at MDT meetings, are being appropriately imaged with CT scanning and this, together with the pathological examination of the resected specimen and discussion at the MDT should lead to an integrated clinico-pathological stage for almost all cases. We remain disappointed that figures for the use of MR imaging in rectal cancer and the use of radiotherapy for such cases is so incomplete.

There are many other areas where the advances in the management of colorectal cancer are reflected in the Audit. The year on year increase in the use of laparoscopic techniques is just one such example. This successful audit also has the ability to highlight areas where further work is needed. In studying the post-operative mortality issue there is clearly a need to resolve, at a national level, areas where improvements can be made. These may not be surgical but most surely will be of interest to the multi-professional team. Similarly, in accepting for the moment the late presentation with advanced disease, the management of the emergency admission, with its associated high mortality, also requires further investigation. These are just two of the many areas that could be the subject of a more focussed audit and the changes in the cancer audits, currently under discussion, together with a resolution to the uncertainty over sustainable funding, should allow the Audit to develop, refine the data set, and allow for a more flexible platform which can be altered to suit the audit questions posed.

Appendices

Appendix 1: Case ascertainment and data completeness according to trust/hospital site in England and Wales for the period 2009/10

Case ascertainment and data completeness are allocated to trusts by place of surgery. Clatterbridge Centre for Oncology NHS Foundation Trust is a tertiary centre that mainly provides oncological treatment for bowel cancer patients so although the Trust submitted data to the 2011 Annual Report no cases have been allocated to the Trust. A case ascertainment estimate is not included for The Royal Marsden, as current methodology does not accurately reflect ascertainment for specialist tertiary cancer centres.

Grade	Case Ascertainment (CA)	Data Completeness (DC)
Good ●	>80 % completeness	<20 % missing
Fair ■	50-80 % completeness	20-50 % missing
Poor ▲	<50 % completeness	>50 % missing

Appendix 1

Network / Trust Name	Number of cases reported to the audit	Case ascertainment	Data completeness for patients who had major surgery
Lancashire & South Cumbria			
University Hospitals of Morecambe Bay NHS Trust	224	100.0 ●	5.0 ▲
Blackpool, Fylde & Wyre Hospitals NHS Foundation Trust	225	106.1 ●	97.5 ●
Lancashire Teaching Hospitals NHS Foundation Trust	232	92.4 ●	38.5 ▲
East Lancashire Hospitals NHS Trust	227	90.8 ●	5.8 ▲
Greater Manchester & Cheshire			
The Mid Cheshire Hospitals NHS Trust	95	76.6 ■	89.2 ●
Christie Hospital NHS Foundation Trust	41	36.3 ▲	90.0 ●
East Cheshire NHS Trust	109	97.3 ●	83.1 ●
University Hospitals of South Manchester NHS Foundation Trust	111	80.4 ●	93.4 ●
Salford Royal NHS Foundation Trust	124	102.5 ●	75.6 ■
Trafford Healthcare NHS Trust	63	95.5 ●	100.0 ●
Bolton Hospitals NHS Trust	146	99.3 ●	94.3 ●
Tameside & Glossop Acute Services NHS Trust	110	85.9 ●	1.5 ▲
Wrightington, Wigan & Leigh NHS Trust	85	62.5 ■	75.0 ■
Central Manchester University Hospitals NHS Foundation Trust	104	94.5 ●	51.4 ■
Pennine Acute Hospitals NHS Trust	377	100.0 ●	69.6 ■
Stockport NHS Foundation Trust	142	92.2 ●	70.1 ■
Merseyside & Cheshire			
Wirral University Teaching Hospital NHS Foundation Trust	228	104.6 ●	98.6 ●
St Helens & Knowsley Hospitals NHS Trust	167	99.4 ●	97.2 ●
Aintree University Hospitals NHS Foundation Trust	217	94.3 ●	36.9 ▲
Countess of Chester Hospital NHS Foundation Trust	148	119.4 ●	91.4 ●
Royal Liverpool & Broadgreen University Hospitals NHS Trust	215	119.4 ●	84.5 ●
Southport & Ormskirk Hospital NHS Trust	152	111.8 ●	82.8 ●
Warrington & Halton Hospitals NHS Foundation Trust	171	108.2 ●	66.7 ■
Yorkshire			
Bradford Teaching Hospitals NHS Foundation Trust	167	93.8 ●	99.1 ●
York Hospitals NHS Foundation Trust	201	100.0 ●	64.0 ■
Harrogate & District NHS Foundation Trust	103	92.0 ●	96.2 ●
Airedale NHS Foundation Trust	136	120.4 ●	96.8 ●
Leeds Teaching Hospitals NHS Trust	382	94.3 ●	57.0 ■
Calderdale & Huddersfield NHS Foundation Trust	166	65.9 ■	92.1 ●
Mid Yorkshire Hospitals NHS Trust	292	105.0 ●	86.4 ●

Appendix 1 (continued)

Network / Trust Name	Number of cases reported to the audit	Case ascertainment	Data completeness for patients who had major surgery
Humber & Yorkshire Coast			
Scarborough & North East Yorkshire Health Care NHS Trust	115	78.8 ■	94.3 ●
Northern Lincolnshire & Goole Hospitals NHS Foundation Trust	213	89.5 ●	56.0 ■
Hull & East Yorkshire Hospitals NHS Trust	293	94.2 ●	72.6 ■
North Trent			
Barnsley Hospital NHS Foundation Trust	113	88.3 ●	67.9 ■
The Rotherham NHS Foundation Trust	129	97.7 ●	89.2 ●
Chesterfield Royal Hospital NHS Foundation Trust	190	95.5 ●	100.0 ●
Sheffield Teaching Hospitals NHS Foundation Trust	317	96.9 ●	99.0 ●
Doncaster & Bassetlaw Hospitals NHS Foundation Trust	118	40.7 ▲	89.4 ●
Pan Birmingham			
Walsall Hospitals NHS Trust	73	67.6 ■	76.7 ■
Heart of England NHS Foundation Trust	395	96.6 ●	96.4 ●
University Hospital Birmingham NHS Foundation Trust	223	104.2 ●	37.7 ▲
Sandwell & West Birmingham Hospitals NHS Trust	215	106.4 ●	96.6 ●
Arden			
South Warwickshire General Hospitals NHS Trust	132	89.2 ●	97.9 ●
University Hospitals Coventry & Warwickshire NHS Trust	186	83.8 ●	98.3 ●
George Eliot Hospital NHS Trust	62	68.9 ■	87.8 ●
Worcestershire Acute Hospitals NHS Trust	374	101.4 ●	80.2 ●
Mount Vernon			
Luton & Dunstable Hospital NHS Foundation Trust	87	61.3 ■	0.0 ▲
West Hertfordshire Hospitals NHS Trust	215	97.3 ●	83.9 ●
East & North Hertfordshire NHS Trust	218	101.9 ●	92.4 ●
North West London			
The Hillingdon Hospitals NHS Foundation Trust	78	86.7 ●	97.3 ●
Ealing Hospital NHS Trust	63	123.5 ●	87.2 ●
West Middlesex University Hospital NHS Trust	107	112.6 ●	66.0 ■
Chelsea & Westminster Hospital NHS Foundation Trust	77	104.1 ●	91.3 ●
North West London Hospitals NHS Trust	51	19.8 ▲	100.0 ●
Imperial College Healthcare NHS Trust	226	100.0 ●	87.0 ●
North London			
Royal Free Hampstead NHS Trust	94	102.2 ●	1.5 ▲
North Middlesex University Hospital NHS Trust	32	40.5 ▲	0.0 ▲
The Whittington Hospital NHS Trust	88	107.3 ●	74.2 ■
The Princess Alexandra Hospital NHS Trust	85	63.0 ■	43.6 ▲
University College London Hospitals NHS Foundation Trust	78	65.5 ■	92.5 ●
Barnet & Chase Farm Hospitals NHS Trust	194	98.0 ●	97.4 ●
North East London			
Barking, Havering & Redbridge Hospitals NHS Trust	162	62.3 ■	61.6 ■
Whipps Cross University Hospital NHS Trust	118	88.7 ●	91.0 ●
Newham University Hospital NHS Trust	59	96.7 ●	92.3 ●
Barts & The London NHS Trust	58	59.2 ■	97.8 ●
Homerton University Hospital NHS Foundation Trust	56	121.7 ●	96.6 ●

Appendix 1 (continued)

Network / Trust Name	Number of cases reported to the audit	Case ascertainment	Data completeness for patients who had major surgery
South East London			
Guy's & St Thomas' NHS Foundation Trust	1	0.6 ▲	0.0 ▲
The Lewisham Hospital NHS Trust	85	88.5 ●	73.5 ■
King's College Hospital NHS Foundation Trust	118	100.9 ●	96.3 ●
South London Healthcare NHS Trust	317	75.7 ■	7.8 ▲
South West London			
Kingston Hospital NHS Trust	113	73.9 ■	88.5 ●
Mayday Healthcare NHS Trust	83	76.9 ■	67.8 ■
St George's Healthcare NHS Trust	20	14.2 ▲	68.4 ■
The Royal Marsden NHS Foundation Trust	28	N/A ▲	61.5 ■
Epsom & St Helier University Hospitals NHS Trust	150	78.5 ■	0.0 ▲
Peninsula			
South Devon Health Care NHS Foundation Trust	158	91.9 ●	98.1 ●
Northern Devon Healthcare NHS Trust	144	88.9 ●	89.9 ●
Royal Cornwall Hospitals NHS Trust	297	97.1 ●	62.4 ■
Royal Devon & Exeter NHS Foundation Trust	294	91.0 ●	66.0 ■
Plymouth Hospitals NHS Trust	330	110.7 ●	74.1 ■
Dorset			
Dorset County Hospital NHS Foundation Trust	107	72.8 ■	46.6 ▲
Poole Hospital NHS Foundation Trust	179	105.3 ●	100.0 ●
Royal Bournemouth & Christchurch Hospitals NHS Foundation Trust	188	101.1 ●	100.0 ●
Avon, Somerset & Wiltshire			
Weston Area Health NHS Trust	98	101.0 ●	79.4 ■
Yeovil District Hospital NHS Foundation Trust	138	101.5 ●	77.8 ■
University Hospitals Bristol NHS Foundation Trust	167	91.3 ●	28.9 ▲
Taunton & Somerset NHS Foundation Trust	212	90.2 ●	50.0 ■
Royal United Hospital Bath NHS Trust	237	95.2 ●	0.0 ▲
North Bristol NHS Trust	249	96.1 ●	72.4 ■
3 Counties			
Hereford Hospitals NHS Trust	113	101.8 ●	94.1 ●
Gloucestershire Hospitals NHS Foundation Trust	225	51.5 ■	50.8 ■
Thames Valley			
Heatherwood & Wexham Park Hospitals NHS Foundation Trust	93	56.7 ■	0.0 ▲
Milton Keynes General Hospital NHS Foundation Trust	87	64.0 ■	93.5 ●
Royal Berkshire NHS Foundation Trust	195	96.1 ●	76.9 ■
Great Western Hospitals NHS Foundation Trust	172	90.5 ●	66.9 ■
Oxford Radcliffe Hospitals NHS Trust	182	49.9 ▲	89.3 ●
Buckinghamshire Hospitals NHS Trust	83	40.9 ▲	87.1 ●

Appendix 1 (continued)

Network / Trust Name	Number of cases reported to the audit	Case ascertainment	Data completeness for patients who had major surgery
Central South Coast			
Isle of Wight NHS PCT	83	127.7 ●	72.2 ■
Southampton University Hospitals NHS Trust	265	110.9 ●	91.0 ●
Portsmouth Hospitals NHS Trust	342	120.4 ●	95.6 ●
Winchester & Eastleigh Healthcare NHS Trust	135	113.4 ●	81.8 ●
Basingstoke & North Hampshire NHS Foundation Trust	119	86.9 ●	68.5 ■
Salisbury NHS Foundation Trust	145	98.0 ●	99.0 ●
Western Sussex Hospitals NHS Trust	169	98.3 ●	100.0 ●
Surrey, West Sussex & Hampshire			
Royal Surrey County Hospital NHS Trust	151	91.5 ●	75.3 ■
Frimley Park Hospital NHS Foundation Trust	176	95.7 ●	61.3 ■
Ashford & St Peter's Hospitals NHS Trust	191	97.9 ●	56.4 ■
Surrey & Sussex Healthcare NHS Trust	178	122.8 ●	82.7 ●
Sussex			
East Sussex Hospitals NHS Trust	301	95.0 ●	84.2 ●
Brighton & Sussex University Hospitals NHS Trust	192	91.0 ●	18.1 ▲
Western Sussex Hospitals NHS Trust	176	97.8 ●	89.7 ●
Kent & Medway			
Dartford & Gravesham NHS Trust	72	55.8 ■	94.1 ●
Medway NHS Trust	140	70.4 ■	0.0 ▲
East Kent Hospitals NHS Trust	340	80.4 ●	0.0 ▲
Maidstone & Tunbridge Wells NHS Trust	267	90.5 ●	49.3 ▲
Greater Midlands			
Mid Staffordshire General Hospitals NHS Trust	151	104.9 ●	95.0 ●
University Hospital of North Staffordshire NHS Trust	318	112.4 ●	67.7 ■
The Royal Wolverhampton Hospitals NHS Trust	240	108.1 ●	98.2 ●
Dudley Group of Hospitals NHS Trust	204	102.0 ●	3.1 ▲
Shrewsbury & Telford Hospital NHS Trust	315	96.0 ●	76.3 ■
North of England			
South Tyneside NHS Foundation Trust	75	94.9 ●	82.3 ●
City Hospitals Sunderland NHS Foundation Trust	167	89.3 ●	67.1 ■
North Cumbria Acute Hospitals NHS Trust	180	79.3 ■	66.1 ■
Gateshead Health NHS Foundation Trust	146	113.2 ●	68.1 ■
The Newcastle Upon Tyne Hospitals NHS Foundation Trust	221	90.2 ●	97.2 ●
Northumbria Health Care NHS Foundation Trust	238	87.5 ●	93.7 ●
South Tees Hospitals NHS Trust	287	101.8 ●	79.4 ■
North Tees & Hartlepool NHS Trust	192	98.0 ●	97.6 ●
County Durham & Darlington NHS Foundation Trust	298	92.0 ●	97.0 ●
Anglia			
Bedford Hospital NHS Trust	142	102.9 ●	42.2 ▲
The Queen Elizabeth Hospital King's Lynn NHS Foundation Trust	170	104.3 ●	90.8 ●
Peterborough & Stamford Hospitals NHS Foundation Trust	189	94.5 ●	2.4 ▲
James Paget Healthcare NHS Foundation Trust	149	105.7 ●	88.0 ●
Ipswich Hospital NHS Trust	152	63.1 ■	14.3 ▲
West Suffolk Hospitals NHS Trust	176	119.7 ●	99.1 ●
Cambridge University Hospitals NHS Foundation Trust	215	87.4 ●	64.4 ■
Norfolk & Norwich University Hospital NHS Trust	434	99.8 ●	58.8 ■
Hinchingbrooke Health Care NHS Trust	119	100.8 ●	96.1 ●

Appendix 1 (continued)

Network / Trust Name	Number of cases reported to the audit	Case ascertainment	Data completeness for patients who had major surgery
Essex			
Southend University Hospital NHS Foundation Trust	204	87.6 ●	91.3 ●
Basildon & Thurrock University Hospitals NHS Foundation Trust	142	72.8 ■	78.9 ■
Colchester Hospital University NHS Foundation Trust	275	87.6 ●	56.9 ■
Mid Essex Hospital Services NHS Trust	159	88.8 ●	78.4 ■
East Midlands			
Burton Hospitals NHS Trust	185	124.2 ●	1.6 ▲
Sherwood Forest Hospitals NHS Foundation Trust	184	84.8 ●	99.3 ●
Kettering General Hospital NHS Trust	192	123.1 ●	53.0 ■
Northampton General Hospital NHS Trust	136	76.4 ■	53.1 ■
Derby Hospitals NHS Foundation Trust	280	92.1 ●	72.3 ■
United Lincolnshire Hospitals NHS Trust	19	4.6 ▲	81.8 ●
University Hospitals of Leicester NHS Trust	501	131.8 ●	93.3 ●
Nottingham University Hospitals NHS Trust	427	136.9 ●	0.0 ▲
Wales			
Ysbwyty Glan Clwydd MDT	153	87.9 ●	100.0 ●
Ysbwyty Gwynedd MDT	178	127.1 ●	79.7 ■
Ysbwyty Maelor MDT	142	76.8 ■	85.4 ●
Nevill Hall Hospital MDT	107	93.9 ●	76.0 ■
Royal Gwent Hospital MDT	230	127.8 ●	90.2 ●
Cardiff MDT	259	134.9 ●	86.3 ●
Prince Charles Hospital MDT	142	106.0 ●	92.8 ●
Royal Glamorgan Hospital MDT	116	95.9 ●	98.8 ●
Princess of Wales MDT	172	94.5 ●	96.0 ●
Swansea MDT	208	98.6 ●	72.4 ■
Bronglais MDT	44	93.6 ●	100.0 ●
West Wales General & Prince Phillip MDT	165	95.4 ●	96.3 ●
Withybush General Hospital MDT	93	98.9 ●	86.3 ●

Appendix 2: Results for all patients reported to the Audit according to trust/hospital site

Appendix 2				
Network/Trust Name	**Number of patients reported to the audit**	**Discussed at MDT meeting (%)**	**Seen by clinical nurse specialist (%)**	**CT scan reported (%)**
Lancashire & South Cumbria				
University Hospitals of Morecambe Bay NHS Trust	224	99.5	1.1	77.7
Blackpool, Fylde & Wyre Hospitals NHS Foundation Trust	225	99.1	98.6	95.1
Lancashire Teaching Hospitals NHS Foundation Trust	232	97.0	3.0	95.7
East Lancashire Hospitals NHS Trust	227	97.3	86.7	58.1
Greater Manchester & Cheshire				
The Mid Cheshire Hospitals NHS Trust	95	100.0	85.0	69.5
Christie Hospital NHS Foundation Trust	41	77.5	89.5	92.7
East Cheshire NHS Trust	109	100.0	87.4	89.9
University Hospitals of South Manchester NHS Foundation Trust	111	90.1	98.2	98.2
Salford Royal NHS Foundation Trust	124	100.0	96.2	94.4
Trafford Healthcare NHS Trust	63	96.8	98.4	100.0
Bolton Hospitals NHS Trust	146	99.3	82.4	96.6
Tameside & Glossop Acute Services NHS Trust	110	100.0	86.7	100.0
Wrightington, Wigan & Leigh NHS Trust	85	98.7	64.5	75.3
Central Manchester University Hospitals NHS Foundation Trust	104	100.0	98.9	81.7
Pennine Acute Hospitals NHS Trust	377	98.3	14.0	85.9
Stockport NHS Foundation Trust	142	99.3	97.7	93.7
Merseyside And Cheshire				
Wirral University Teaching Hospital NHS Foundation Trust	228	98.6	75.3	95.2
St Helens & Knowsley Hospitals NHS Trust	167	100.0	94.4	77.8
Aintree University Hospitals NHS Foundation Trust	217	100.0	73.0	91.7
Countess of Chester Hospital NHS Foundation Trust	148	98.6	98.4	86.5
Royal Liverpool & Broadgreen University Hospitals NHS Trust	215	99.5	96.1	20.9
Southport & Ormskirk Hospital NHS Trust	152	100.0	55.2	96.7
Warrington & Halton Hospitals NHS Foundation Trust	171	95.7	93.9	92.4
Yorkshire				
Bradford Teaching Hospitals NHS Foundation Trust	167	99.4	92.6	95.2
York Hospitals NHS Foundation Trust	201	98.5	95.0	97.5
Harrogate & District NHS Foundation Trust	103	100.0	97.8	95.1
Airedale NHS Foundation Trust	136	100.0	78.7	99.3
Leeds Teaching Hospitals NHS Trust	382	99.0	68.2	92.4
Calderdale & Huddersfield NHS Foundation Trust	166	61.4	98.5	94.0
Mid Yorkshire Hospitals NHS Trust	292	100.0	94.7	94.9
Humber & Yorkshire Coast				
Scarborough & North East Yorkshire Health Care NHS Trust	115	99.1	96.6	91.3
Northern Lincolnshire & Goole Hospitals NHS Foundation Trust	213	100.0	97.7	96.7
Hull & East Yorkshire Hospitals NHS Trust	293	86.0	86.7	87.4
North Trent				
Barnsley Hospital NHS Foundation Trust	113	99.1	92.2	94.7
The Rotherham NHS Foundation Trust	129	100.0	100.0	92.2
Chesterfield Royal Hospital NHS Foundation Trust	190	100.0	98.5	98.9
Sheffield Teaching Hospitals NHS Foundation Trust	317	98.7	89.7	95.0
Doncaster & Bassetlaw Hospitals NHS Foundation Trust	118	100.0	96.6	93.2
Pan Birmingham				
Walsall Hospitals NHS Trust	73	98.6	97.0	93.2
Heart of England NHS Foundation Trust	395	100.0	93.4	85.3
University Hospital Birmingham NHS Foundation Trust	223	100.0	96.1	79.8
Sandwell & West Birmingham Hospitals NHS Trust	215	100.0	99.4	99.1

Appendix 2 (continued)

Network / Trust Name	Number of patients reported to the audit	Discussed at MDT meeting (%)	Seen by clinical nurse specialist (%)	CT scan reported (%)
Arden				
South Warwickshire General Hospitals NHS Trust	132	100.0	93.4	95.5
University Hospitals Coventry & Warwickshire NHS Trust	186	100.0	93.4	95.7
George Eliot Hospital NHS Trust	62	100.0	87.8	91.9
Worcestershire Acute Hospitals NHS Trust	374	97.3	14.7	89.8
Mount Vernon				
Luton & Dunstable Hospital NHS Foundation Trust	87	100.0	*	89.7
West Hertfordshire Hospitals NHS Trust	215	100.0	98.1	78.6
East & North Hertfordshire NHS Trust	218	100.0	100.0	84.4
North West London				
The Hillingdon Hospitals NHS Foundation Trust	78	100.0	98.6	92.3
Ealing Hospital NHS Trust	63	100.0	90	95.2
West Middlesex University Hospital NHS Trust	107	94.3	94.1	49.5
Chelsea & Westminster Hospital NHS Foundation Trust	77	98.7	98.7	100
North West London Hospitals NHS Trust	51	100	97.8	92.2
Imperial College Healthcare NHS Trust	226	100	91.8	98.7
North London				
Royal Free Hampstead NHS Trust	94	100.0	100.0	94.7
North Middlesex University Hospital NHS Trust	32	100.0	100.0	40.6
The Whittington Hospital NHS Trust	88	100.0	96.1	90.9
The Princess Alexandra Hospital NHS Trust	85	100.0	94.9	60.0
University College London Hospitals NHS Foundation Trust	78	100.0	96.0	91.0
Barnet & Chase Farm Hospitals NHS Trust	194	99.5	98.8	99.5
North East London				
Barking, Havering & Redbridge Hospitals NHS Trust	162	93.4	87.9	90.7
Whipps Cross University Hospital NHS Trust	118	94.9	90.7	88.1
Newham University Hospital NHS Trust	59	96.2	70.8	72.9
Barts & The London NHS Trust	58	100.0	93.9	89.7
Homerton University Hospital NHS Foundation Trust	56	96.4	97.0	91.1
South East London				
Guy's & St Thomas' NHS Foundation Trust	1	100.0	100.0	100.0
The Lewisham Hospital NHS Trust	85	100.0	53.7	54.1
King's College Hospital NHS Foundation Trust	118	100.0	100.0	96.6
South London Healthcare NHS Trust	317	100.0	100.0	35.0
Homerton University Hospital NHS Foundation Trust	56	96.4	97.0	91.1
South West London				
Kingston Hospital NHS Trust	113	99.1	93.5	93.8
Mayday Healthcare NHS Trust	83	100.0	100.0	83.1
St George's Healthcare NHS Trust	20	100.0	100.0	95.0
The Royal Marsden NHS Foundation Trust	28	96.4	100.0	85.7
Epsom & St Helier University Hospitals NHS Trust	150	93.8	97.9	6.7
Peninsula				
South Devon Health Care NHS Foundation Trust	158	99.4	94.3	100.0
Northern Devon Healthcare NHS Trust	144	100.0	91.0	96.5
Royal Cornwall Hospitals NHS Trust	297	100.0	97.9	95.3
Royal Devon & Exeter NHS Foundation Trust	294	98.6	98.1	91.5
Plymouth Hospitals NHS Trust	330	100.0	80.8	73.6

Appendix 2 (continued)

Network / Trust Name	Number of cases reported to the Audit	Discussed at MDT meeting	Seen by clinical nurse specialist	CT scan results reported
Dorset				
Dorset County Hospital NHS Foundation Trust	107	99.0	100.0	85.0
Poole Hospital NHS Foundation Trust	179	98.9	87.7	93.3
Royal Bournemouth & Christchurch NHS Foundation Trust	188	100.0	100.0	94.7
Avon, Somerset & Wiltshire				
Weston Area Health NHS Trust	98	100.0	86.6	87.8
Yeovil District Hospital NHS Foundation Trust	138	100.0	88.8	87.7
University Hospitals Bristol NHS Foundation Trust	167	99.4	45.1	88.0
Taunton & Somerset NHS Foundation Trust	212	99.5	59.7	84.9
Royal United Hospital Bath NHS Trust	237	100.0	74.0	84.4
North Bristol NHS Trust	249	98.0	91.1	91.2
3 Counties				
Hereford Hospitals NHS Trust	113	96.4	93.9	99.1
Gloucestershire Hospitals NHS Foundation Trust	225	99.6	97.8	92.0
Thames Valley				
Heatherwood & Wexham Park NHS Foundation Trust	93	98.9	*	0.0
Milton Keynes General Hospital NHS Foundation Trust	87	92.9	94.2	62.1
Royal Berkshire NHS Foundation Trust	195	99.5	98.8	51.3
Great Western Hospitals NHS Foundation Trust	172	100.0	78.5	92.4
Oxford Radcliffe Hospitals NHS Trust	182	100.0	100.0	46.7
Buckinghamshire Hospitals NHS Trust	83	100.0	91.3	95.2
Central South Coast				
Isle of Wight NHS PCT	83	100.0	97.4	98.8
Southampton University Hospitals NHS Trust	265	60.4	100.0	80.4
Portsmouth Hospitals NHS Trust	342	99.7	50.0	97.1
Winchester & Eastleigh Healthcare NHS Trust	135	100.0	91.1	97.8
Basingstoke & North Hampshire NHS Foundation Trust	119	93.3	98.3	96.6
Salisbury NHS Foundation Trust	145	92.3	91.8	98.6
Western Sussex Hospitals NHS Trust	169	99.4	91.4	91.7
Surrey, West Sussex & Hampshire				
Royal Surrey County Hospital NHS Trust	151	97.4	19.0	86.8
Frimley Park Hospital NHS Foundation Trust	176	100.0	65.2	79.5
Ashford & St Peter's Hospitals NHS Trust	191	96.9	0.0	76.4
Surrey & Sussex Healthcare NHS Trust	178	100.0	43.1	92.1
Sussex				
East Sussex Hospitals NHS Trust	301	100.0	94.3	99.0
Brighton & Sussex University Hospitals NHS Trust	192	100.0	58.3	87.5
Western Sussex Hospitals NHS Trust	176	100.0	85.2	92.0
Kent & Medway				
Dartford & Gravesham NHS Trust	72	100.0	95.5	97.2
Medway NHS Trust	140	100.0	*	0.7
East Kent Hospitals NHS Trust	340	61.5	*	0.0
Maidstone & Tunbridge Wells NHS Trust	267	100.0	98.7	73.4

Appendix 2 (continued)

Network / Trust Name	Number of cases reported to the Audit	Discussed at MDT meeting	Seen by clinical nurse specialist	CT scan results reported
Greater Midlands				
Mid Staffordshire General Hospitals NHS Trust	151	100.0	100.0	94.0
University Hospital of North Staffordshire NHS Trust	318	100.0	45.1	87.4
The Royal Wolverhampton Hospitals NHS Trust	240	98.8	87.1	97.5
The Dudley Group of Hospitals NHS Foundation Trust	204	99.5	41.9	80.9
Shrewsbury & Telford Hospital NHS Trust	315	84.6	60.5	83.5
North of England				
South Tyneside NHS Foundation Trust	75	97.3	100.0	98.7
City Hospitals Sunderland NHS Foundation Trust	167	97.0	86.1	95.2
North Cumbria Acute Hospitals NHS Trust	180	100.0	88.8	84.4
Gateshead Health NHS Foundation Trust	146	100.0	98.6	96.6
The Newcastle Upon Tyne Hospitals NHS Foundation Trust	221	99.5	98.2	96.8
Northumbria Health Care NHS Foundation Trust	238	100.0	99.6	92.4
South Tees Hospitals NHS Trust	287	97.2	94.5	94.4
North Tees & Hartlepool NHS Trust	192	96.4	4.5	95.3
County Durham & Darlington NHS Foundation Trust	298	100.0	98.5	97.0
Anglia				
Bedford Hospital NHS Trust	142	97.2	90.5	96.5
The Queen Elizabeth Hospital King's Lynn NHS Foundation Trust	170	98.2	72.0	90.6
Peterborough & Stamford Hospitals NHS Foundation Trust	189	98.4	32.9	51.9
James Paget Healthcare NHS Foundation Trust	149	99.3	86.9	94.6
Ipswich Hospital NHS Trust	152	98.0	30.3	34.2
West Suffolk Hospitals NHS Trust	176	100.0	97.7	97.7
Cambridge University Hospitals NHS Foundation Trust	215	100.0	98.6	80.5
Norfolk & Norwich University Hospital NHS Trust	434	99.3	78.2	88.0
Hinchingbrooke Health Care NHS Trust	119	100.0	91.6	87.4
Essex				
Southend University Hospital NHS Foundation Trust	204	97.0	99.5	95.1
Basildon & Thurrock University Hospitals NHS Foundation Trust	142	94.3	96.4	97.2
Colchester Hospital University NHS Foundation Trust	275	99.2	95.0	85.1
Mid Essex Hospital Services NHS Trust	159	97.4	93.1	91.8
East Midlands				
Burton Hospitals NHS Trust	185	99.5	50.0	8.1
Sherwood Forest Hospitals NHS Foundation Trust	184	100.0	98.4	98.4
Kettering General Hospital NHS Trust	192	87.5	100.0	0.5
Northampton General Hospital NHS Trust	136	88.1	41.8	75.7
Derby Hospitals NHS Foundation Trust	280	92.3	94.9	87.5
United Lincolnshire Hospitals NHS Trust	19	100.0	90.9	73.7
University Hospitals of Leicester NHS Trust	501	97.4	87.2	93.0
Nottingham University Hospitals NHS Trust	427	96.8	100.0	54.8

Appendix 2 (continued)

Network / Trust Name	Number of cases reported to the Audit	Discussed at MDT meeting	Seen by clinical nurse specialist	CT scan results reported
Wales				
Ysbwyty Glan Clwydd MDT	153	99.3	82.4	91.5
Ysbwyty Gwynedd MDT	178	100.0	94.4	86.0
Ysbwyty Maelor MDT	142	96.5	90.1	85.9
Nevill Hall Hospital MDT	107	92.5	9.3	60.7
Royal Gwent Hospital MDT	230	99.1	96.5	84.8
Cardiff MDT	259	93.4	81.4	85.7
Prince Charles Hospital MDT	142	97.9	98.6	86.6
Royal Glamorgan Hospital MDT	116	100.0	85.3	77.6
Princess of Wales MDT	172	99.4	87.1	86.6
Swansea MDT	208	97.1	82.5	77.9
Bronglais MDT	44	95.5	52.3	88.6
West Wales General & Prince Phillip MDT	165	100.0	79.4	83.6
Withybush General Hospital MDT	93	97.8	95.7	92.5

* This item was missing in all patients for this trust

Appendix 3: Results for patients who had major surgery according to trust/hospital site

Appendix 3

Network/Trust Name	Number of patients under-going major surgery	Patients with Dukes' D at time of surgery (%)	Major surgery carried out as urgent or emergency procedure (%)	Median number of lymph nodes excised	Observed 30-day mortality (%)	Adjusted 30-day mortality (%)	Observed 90-day mortality (%)	Adjusted 90-day mortality (%)
Lancashire & South Cumbria								
University Hospitals of Morecambe Bay NHS Trust	20	6.3	30.0	11	10.0	6.3	15.0	9.7
Blackpool, Fylde & Wyre Hospitals NHS Foundation Trust	121	11.9	17.4	12	5.0	5.6	6.6	7.1
Lancashire Teaching Hospitals NHS Foundation Trust	117	9.7	6.1	11	2.6	4.7	3.4	5.8
East Lancashire Hospitals NHS Trust	156	2.3	34.0	17	3.2	3.1	5.8	6.1
Greater Manchester & Cheshire								
The Mid Cheshire Hospitals NHS Trust	37	5.7	77.8	13	2.8	3.6	2.8	3.6
Christie Hospital NHS Foundation Trust	30	22.2	3.3	14.5	0.0	0.0	0.0	0.0
East Cheshire NHS Trust	71	10.4	29.4	14	2.8	2.1	2.8	2.2
University Hospitals of South Manchester NHS Foundation Trust	76	17.1	13.2	19	4.0	3.8	4.0	3.6
Salford Royal NHS Foundation Trust	78	21.3	29.7	14	2.6	1.7	3.9	2.6
Trafford Healthcare NHS Trust	47	21.3	10.6	14	8.5	8.5	10.6	11.3
Bolton Hospitals NHS Trust	88	12.8	29.5	13	5.7	5.9	6.8	6.8
Tameside & Glossop Acute Services NHS Trust	68	8.3	18.2	11	7.4	9.5	11.8	15.3
Wrightington, Wigan & Leigh NHS Trust	28	23.1	10.7	14	0.0	0.0	0.0	0.0
Central Manchester University Hospitals NHS Foundation Trust	37	30.0	36.4	14.5	2.7	2.1	2.7	2.1
Pennine Acute Hospitals NHS Trust	253	16.1	20.2	15	5.9	6.4	9.9	10.9
Stockport NHS Foundation Trust	77	8.7	14.7	13.5	3.9	4.3	5.3	5.5
Merseyside & Cheshire								
Wirral University Teaching Hospital NHS Foundation Trust	147	19.9	17.0	17	4.8	3.8	7.5	5.8
St Helens & Knowsley Hospitals NHS Trust	109	1.9	13.8	13	4.6	4.8	4.6	5.0
Aintree University Hospitals NHS Foundation Trust	122	9.2	91.7	17	2.5	2.1	3.3	3.0
Countess of Chester Hospital NHS Foundation Trust	70	15.7	33.3	13	6.1	4.5	6.1	4.9
Royal Liverpool & Broadgreen University Hospitals NHS Trust	116	22.1	18.3	20	4.3	4.2	6.0	5.3
Southport & Ormskirk Hospital NHS Trust	99	17.2	16.2	14	6.1	5.2	9.1	7.5
Warrington & Halton Hospitals NHS Foundation Trust	120	5.7	22.9	14.5	2.5	3.0	4.2	5.0
Yorkshire								
Bradford Teaching Hospitals NHS Foundation Trust	111	11.8	6.3	18	7.2	5.7	9.0	7.2
York Hospitals NHS Foundation Trust	111	6.3	18.0	16	2.7	3.4	2.7	3.7
Harrogate & District NHS Foundation Trust	78	5.2	15.6	16	5.1	6.8	5.1	6.5
Airedale NHS Foundation Trust	95	6.5	16.8	22	4.2	4.4	6.3	6.6
Leeds Teaching Hospitals NHS Trust	228	9.2	14.2	19	5.7	6.4	7.0	8.0
Calderdale & Huddersfield NHS Foundation Trust	126	13.3	6.5	16	3.2	5.1	4.0	6.2
Mid Yorkshire Hospitals NHS Trust	206	12.6	13.2	16	1.5	2.6	3.9	6.1
Humber & Yorkshire Coast								
Scarborough & North East Yorkshire Health Care NHS Trust	70	10.3	30.0	15	5.7	3.9	7.1	5.1
Northern Lincolnshire & Goole Hospitals NHS Foundation Trust	150	19.0	17.3	12	4.0	3.1	4.7	3.8
Hull & East Yorkshire Hospitals NHS Trust	212	23.2	11.8	14	5.2	5.1	8.1	7.4
North Trent								
Barnsley Hospital NHS Foundation Trust	81	9.5	16.0	12	2.6	3.8	3.9	5.1
The Rotherham NHS Foundation Trust	93	9.4	6.5	14	4.3	6.0	6.5	8.6
Chesterfield Royal Hospital NHS Foundation Trust	116	6.0	12.1	14	0.9	1.1	2.6	3.4
Sheffield Teaching Hospitals NHS Foundation Trust	204	9.4	12.3	29	3.0	4.1	4.4	6.2
Doncaster & Bassetlaw Hospitals NHS Foundation Trust	104	2.9	8.2	17	4.1	5.1	5.1	6.7

Appendix 3 (continued)

Network/Trust Name	Number of patients under-going major surgery	Patients with Dukes' D at time of surgery (%)	Major surgery carried out as urgent or emergency procedure (%)	Median number of lymph nodes excised	Observed 30-day mortality (%)	Adjusted 30-day mortality (%)	Observed 90-day mortality (%)	Adjusted 90-day mortality (%)
Pan Birmingham								
Walsall Hospitals NHS Trust	60	22.4	18.3	16	8.3	5.9	8.3	5.9
Heart of England NHS Foundation Trust	251	15.6	16.1	20	3.2	3.8	4.4	5.1
University Hospital Birmingham NHS Foundation Trust	151	19.6	19.0	18	2.6	3.5	5.3	6.8
Sandwell & West Birmingham Hospitals NHS Trust	146	14.7	15.8	23	1.4	1.7	2.1	2.4
Arden								
South Warwickshire General Hospitals NHS Trust	96	7.4	14.6	14	1.0	1.2	3.1	3.5
University Hospitals Coventry & Warwickshire NHS Trust	115	21.7	22.6	22	2.6	2.4	6.1	5.4
George Eliot Hospital NHS Trust	41	13.2	14.6	17	7.3	12.0	9.8	14.1
Worcestershire Acute Hospitals NHS Trust	212	14.4	25.2	15	2.4	3.0	5.3	6.4
Mount Vernon								
Luton & Dunstable Hospital NHS Foundation Trust	23	0.0	0.0		4.3	8.7	4.3	7.4
West Hertfordshire Hospitals NHS Trust	155	15.3	16.9	13	7.1	6.7	9.1	8.4
East & North Hertfordshire NHS Trust	144	11.2	15.3	15	4.9	2.6	6.9	4.2
North West London								
The Hillingdon Hospitals NHS Foundation Trust	73	23.9	21.9	10	5.6	2.7	8.3	4.3
Ealing Hospital NHS Trust	39	17.1	10.5	15	0.0	0.0	0.0	0.0
West Middlesex University Hospital NHS Trust	53	28.6	22.6	15	3.8	3.5	7.5	6.5
Chelsea & Westminster Hospital NHS Foundation Trust	46	19.0	28.3	21	6.5	6.9	8.7	9.4
North West London Hospitals NHS Trust	39	2.6	2.6	18	0.0	0.0	0.0	0.0
Imperial College Healthcare NHS Trust	162	22.0	22.0	25.5	0.6	0.6	3.1	3.1
North London								
Royal Free Hampstead NHS Trust	67	17.9	9.2	17	10.4	11.7	11.9	13.6
North Middlesex University Hospital NHS Trust	10	0.0	10.0		10.0	12.5	10.0	11.4
The Whittington Hospital NHS Trust	62	23.9	77.4	17.5	4.8	1.6	6.5	2.4
The Princess Alexandra Hospital NHS Trust	55	18.6	93.9	17	5.6	4.7	7.4	6.0
University College London Hospitals NHS Foundation Trust	40	20.5	15.0	17.5	0.0	0.0	0.0	0.0
Barnet & Chase Farm Hospitals NHS Trust	116	11.4	7.8	14	2.6	2.5	4.3	4.5
North East London								
Barking, Havering & Redbridge Hospitals NHS Trust	73	6.9	14.1	15	4.3	4.1	4.3	4.3
Whipps Cross University Hospital NHS Trust	67	3.2	26.9	16	4.5	4.8	6.1	6.8
Newham University Hospital NHS Trust	26	25.0	11.5	16	8.3	7.5	12.5	10.3
Barts & The London NHS Trust	46	17.4	24.4	17	2.2	5.8	6.5	15.0
Homerton University Hospital NHS Foundation Trust	29	3.4	6.9	16	10.3	17.7	10.3	16.3
South East London								
Guy's & St Thomas' NHS Foundation Trust	1	0.0	0.0	13	0.0	0.0	0.0	0.0
The Lewisham Hospital NHS Trust	49	8.3	23.1	21	8.3	7.7	8.3	7.1
King's College Hospital NHS Foundation Trust	81	19.2	16.0	15	1.2	1.5	2.5	2.7
South London Healthcare NHS Trust	64	2.3	26.7	16.5	6.3	6.2	7.9	8.0
South West London								
Kingston Hospital NHS Trust	78	13.0	28.6	17	2.6	3.4	5.1	6.1
Mayday Healthcare NHS Trust	59	1.8	11.9	13	3.4	4.1	5.2	6.1
St George's Healthcare NHS Trust	19	11.8	5.9		0.0	0.0	5.6	3.4
The Royal Marsden NHS Foundation Trust	13	23.1	0.0	24	0.0	0.0	0.0	0.0
Epsom & St Helier University Hospitals NHS Trust	61	4.3	50.0		1.7	1.5	3.3	3.1

Appendix 3 (continued)

Network/Trust Name	Number of patients under-going major surgery	Patients with Dukes' D at time of surgery (%)	Major surgery carried out as urgent or emergency procedure (%)	Median number of lymph nodes excised	Observed 30-day mortality (%)	Adjusted 30-day mortality (%)	Observed 90-day mortality (%)	Adjusted 90-day mortality (%)
Peninsula								
South Devon Health Care NHS Foundation Trust	106	12.3	32.1	16	4.7	4.4	5.7	5.4
Northern Devon Healthcare NHS Trust	99	6.6	53.5	13	1.0	0.9	1.0	1.0
Royal Cornwall Hospitals NHS Trust	197	14.1	27.7	15	4.1	4.5	5.1	5.7
Royal Devon & Exeter NHS Foundation Trust	188	9.6	17.7	14	1.1	1.1	2.1	2.5
Plymouth Hospitals NHS Trust	158	7.3	38.6	18	3.9	3.3	5.2	4.6
Dorset								
Dorset County Hospital NHS Foundation Trust	73	8.8	8.3	19	0.0	0.0	2.8	3.2
Poole Hospital NHS Foundation Trust	95	7.4	14.7	18	1.1	1.1	1.1	1.1
Royal Bournemouth & Christchurch Hospitals NHS Foundation Trust	131	20.6	13.0	16	1.5	1.7	3.8	3.9
Avon, Somerset & Wiltshire								
Weston Area Health NHS Trust	68	16.7	17.6	13	4.4	4.1	8.8	7.4
Yeovil District Hospital NHS Foundation Trust	81	3.0	95.1	16	1.2	1.0	2.5	2.1
University Hospitals Bristol NHS Foundation Trust	90	6.9	13.3	15	2.2	2.6	2.2	2.6
Taunton & Somerset NHS Foundation Trust	68	12.5	10.3	14	4.5	4.5	7.5	8.0
Royal United Hospital Bath NHS Trust	165	10.5	33.1	17	4.9	4.8	5.5	5.5
North Bristol NHS Trust	163	10.7	85.0	20	1.2	1.0	1.8	1.5
Three Counties								
Hereford Hospitals NHS Trust	85	6.3	20.0	13	2.4	2.3	7.1	7.1
Gloucestershire Hospitals NHS Foundation Trust	130	19.8	31.1	22	2.5	2.3	4.2	3.5
Thames Valley								
Milton Keynes General Hospital NHS Foundation Trust	46	18.2	91.1	15.5	2.2	2.3	4.4	4.3
Royal Berkshire NHS Foundation Trust	65	14.5	25.4	18	4.6	3.9	9.2	7.8
Great Western Hospitals NHS Foundation Trust	130	12.7	8.5	19	2.3	2.6	6.2	6.9
Oxford Radcliffe Hospitals NHS Trust	131	6.0	17.6	17	3.8	5.8	4.6	6.7
Buckinghamshire Hospitals NHS Trust	62	14.8	4.8	16.5	0.0	0.0	3.3	5.2
Central South Coast								
Isle of Wight NHS PCT	54	8.2	45.3	18	3.7	2.5	7.4	5.5
Southampton University Hospitals NHS Trust	155	14.0	27.2	16	1.3	1.5	1.9	2.1
Portsmouth Hospitals NHS Trust	226	18.6	15.0	15	1.3	1.5	2.7	2.8
Winchester & Eastleigh Healthcare NHS Trust	88	10.2	15.9	14	3.4	3.2	5.7	5.6
Basingstoke & North Hampshire NHS Foundation Trust	108	9.5	13.0	13.5	0.9	1.4	2.8	3.9
Salisbury NHS Foundation Trust	102	16.8	13.7	17	2.9	2.8	3.9	3.7
Western Sussex Hospitals NHS Trust	125	12.0	16.8	12	6.4	5.1	9.6	7.9
Surrey, West Sussex & Hampshire								
Royal Surrey County Hospital NHS Trust	97	10.4	8.2	29	1.0	1.3	5.2	6.4
Frimley Park Hospital NHS Foundation Trust	106	11.3	74.5	16	2.9	2.2	2.9	2.2
Ashford & St Peter's Hospitals NHS Trust	133	18.9	18.9	13	0.8	0.8	5.0	4.6
Surrey & Sussex Healthcare NHS Trust	98	8.2	20.4	17.5	4.1	3.7	8.2	7.6
Sussex								
East Sussex Hospitals NHS Trust	184	8.8	19.6	16	4.3	4.2	7.1	6.8
Brighton & Sussex University Hospitals NHS Trust	83	4.1	78.3	14	2.4	1.6	3.7	2.9
Western Sussex Hospitals NHS Trust	107	7.8	15.9	12.5	1.9	3.0	2.8	4.6

Appendix 3 (continued)

Network/Trust Name	Number of patients under-going major surgery	Patients with Dukes' D at time of surgery (%)	Major surgery carried out as urgent or emergency procedure (%)	Median number of lymph nodes excised	Observed 30-day mortality (%)	Adjusted 30-day mortality (%)	Observed 90-day mortality (%)	Adjusted 90-day mortality (%)
Kent & Medway								
Dartford & Gravesham NHS Trust	68	1.6	27.9	21	1.5	2.2	1.5	2.1
Maidstone & Tunbridge Wells NHS Trust	140	44.2	22.9	17	3.6	2.7	6.4	4.5
Greater Midlands								
Mid Staffordshire General Hospitals NHS Trust	101	13.3	6.9	14	2.0	2.2	5.0	5.1
University Hospital of North Staffordshire NHS Trust	96	11.9	11.8	15	5.2	6.0	7.3	8.9
The Royal Wolverhampton Hospitals NHS Trust	169	16.2	15.4	18	4.1	4.1	7.1	7.2
The Dudley Group of Hospitals NHS Foundation	129	8.7	20.3	14	7.1	7.7	9.4	9.7
Shrewsbury & Telford Hospital NHS Trust	169	16.2	14.9	16	3.0	3.9	4.7	6.1
North of England								
South Tyneside NHS Foundation Trust	62	16.1	8.1	17	3.3	3.5	4.9	5.0
City Hospitals Sunderland NHS Foundation Trust	76	9.5	13.2	15	0.0	0.0	0.0	0.0
North Cumbria Acute Hospitals NHS Trust	118	11.0	12.0	15	3.5	4.8	3.5	4.5
Gateshead Health NHS Foundation Trust	113	16.3	12.4	13	6.2	4.9	8.0	6.4
The Newcastle Upon Tyne Hospitals NHS Foundation Trust	143	15.6	16.1	18	0.7	0.6	1.4	1.2
Northumbria Health Care NHS Foundation Trust	174	6.9	15.3	13	6.9	7.2	9.2	9.9
South Tees Hospitals NHS Trust	180	11.7	11.1	15	5.6	6.0	7.8	8.1
North Tees & Hartlepool NHS Trust	125	9.7	26.4	16	5.6	3.9	6.4	4.7
County Durham & Darlington NHS Foundation Trust	201	10.5	16.4	13	3.0	3.6	5.0	5.7
Anglia								
Bedford Hospital NHS Trust	83	10.4	12.0	13	4.9	6.1	7.3	8.7
The Queen Elizabeth Hospital King's Lynn NHS Foundation Trust	98	8.9	22.4	10	6.1	4.8	8.2	6.8
Peterborough & Stamford Hospitals NHS Foundation Trust	123	17.1	15.4	17	7.4	7.1	8.2	7.7
James Paget Healthcare NHS Foundation Trust	100	7.4	34.0	13.5	6.0	3.5	8.0	5.1
Ipswich Hospital NHS Trust	84	4.6	33.3	13	0.0	0.0	2.4	2.4
West Suffolk Hospitals NHS Trust	109	11.1	23.9	16	1.8	1.6	4.6	4.2
Cambridge University Hospitals NHS Foundation Trust	177	12.8	15.5	15	1.7	2.4	2.3	3.2
Norfolk & Norwich University Hospital NHS Trust	284	9.9	14.8	13	2.5	2.7	3.9	4.3
Hinchingbrooke Health Care NHS Trust	77	9.1	16.9	15	2.6	4.0	5.2	7.6
Essex								
Southend University Hospital NHS Foundation Trust	149	12.5	19.7	15	3.4	2.8	5.4	4.5
Basildon & Thurrock University Hospitals NHS Foundation Trust	109	12.5	6.4	12	1.8	3.1	1.8	2.9
Colchester Hospital University NHS Foundation Trust	181	13.9	84.3	11	6.2	4.7	6.7	5.0
Mid Essex Hospital Services NHS Trust	139	20.9	11.5	15	0.0	0.0	2.2	2.4
East Midlands								
Burton Hospitals NHS Trust	126	16.3	0.0		8.7	7.8	11.1	10.6
Sherwood Forest Hospitals NHS Foundation Trust	134	12.0	14.2	17	3.7	3.8	4.5	4.6
Kettering General Hospital NHS Trust	66	2.4	32.8	14	6.1	4.7	7.6	5.9
Northampton General Hospital NHS Trust	64	7.8	19.4	14	7.9	9.3	11.1	13.2
Derby Hospitals NHS Foundation Trust	155	15.7	18.1	15	3.2	3.2	5.2	4.9
United Lincolnshire Hospitals NHS Trust	11	20.0	18.2	12	0.0	0.0	0.0	0.0
University Hospitals of Leicester NHS Trust	297	19.4	13.8	13	3.4	3.9	4.7	5.1
Nottingham University Hospitals NHS Trust	208	14.5		14	2.4	2.8	4.8	5.2

Appendix 3 (continued)

Network/Trust Name	Number of patients under-going major surgery	Patients with Dukes' D at time of surgery (%)	Major surgery carried out as urgent or emergency procedure (%)	Median number of lymph nodes excised	Observed 30-day mortality (%)	Adjusted 30-day mortality (%)	Observed 90-day mortality (%)	Adjusted 90-day mortality (%)
Wales								
Ysbwyty Glan Clwydd MDT	93	10.8	23.7	14.5	5.4	4.9	6.5	5.9
Ysbwyty Gwynedd MDT	133	13.1	21.1	12	3.8	3.1	7.5	6.2
Ysbwyty Maelor MDT	103	10.8	11.8	13	9.7	9.3	12.6	11.8
Nevill Hall Hospital MDT	75	8.1	36.0	15	12.0	9.3	18.7	14.4
Royal Gwent Hospital MDT	164	9.0	20.1	11.5	3.7	3.4	5.5	5.2
Cardiff MDT	160	14.5	20.3	15	5.0	4.7	7.5	7.2
Prince Charles Hospital MDT	111	9.7	10.8	12	8.1	7.1	11.7	10.2
Royal Glamorgan Hospital MDT	83	12.2	25.3	13	4.8	6.3	4.8	6.1
Princess of Wales MDT	125	11.7	12.8	17	4.8	4.8	6.4	6.5
Swansea MDT	163	12.3	24.6	16	3.7	3.2	9.2	8.5
Bronglais MDT	38	23.7	36.8	9	13.2	5.9	18.4	8.5
West Wales General & Prince Phillip MDT	109	12.4	17.4	9	4.6	3.9	6.4	5.7
Withybush General Hospital MDT	73	12.5	15.1	15	2.7	2.3	8.2	6.9

Appendix 4: Results for patients with rectal cancer who had major surgery according to trust/hospital site

Appendix 4					
Network/Trust Name	Number of patients with rectal cancer undergoing major surgery	MRI scan reported (%)	Pre-operative radiotherapy (short or long course) (%)	APER rate (%)	Permanent stoma rate (%)
Lancashire & South Cumbria					
University Hospitals of Morecambe Bay NHS Trust	4	75.0	50.0	75.0	75.0
Blackpool, Fylde & Wyre Hospitals NHS Foundation Trust	25	100.0	48.0	36.0	40.0
Lancashire Teaching Hospitals NHS Foundation Trust	39	92.3	61.5	23.1	23.1
East Lancashire Hospitals NHS Trust	30	56.7	70.0	30.0	30.0
Greater Manchester & Cheshire					
The Mid Cheshire Hospitals NHS Trust	14	71.4	50.0	35.7	35.7
Christie Hospital NHS Foundation Trust	13	100.0	69.2	46.2	53.8
East Cheshire NHS Trust	21	85.7	57.1	23.8	23.8
University Hospitals of South Manchester NHS Foundation Trust	17	100.0	47.1	23.5	29.4
Salford Royal NHS Foundation Trust	18	88.9	44.4	33.3	33.3
Trafford Healthcare NHS Trust	12	100.0	75.0	25.0	50.0
Bolton Hospitals NHS Trust	26	92.3	65.4	23.1	30.8
Tameside & Glossop Acute Services NHS Trust	12	100.0	58.3	50.0	50.0
Wrightington, Wigan & Leigh NHS Trust	9	88.9	33.3	77.8	77.8
Pennine Acute Hospitals NHS Trust	85	85.9	28.2	68.2	69.4
Stockport NHS Foundation Trust	15	40.0	53.3	13.3	33.3
Merseyside & Cheshire					
Wirral University Teaching Hospital NHS Foundation Trust	33	90.9	60.6	18.2	21.2
St Helens & Knowsley Hospitals NHS Trust	31	93.5	74.2	51.6	51.6
Aintree University Hospitals NHS Foundation Trust	26	100.0	57.7	7.7	7.7
Countess of Chester Hospital NHS Foundation Trust	14	85.7	35.7	21.4	21.4
Royal Liverpool & Broadgreen University Hospitals NHS Trust	28	85.7	42.9	35.7	53.6
Southport & Ormskirk Hospital NHS Trust	18	83.3	50.0	22.2	22.2
Warrington & Halton Hospitals NHS Foundation Trust	35	88.6	68.6	22.9	35.7
Yorkshire					
Bradford Teaching Hospitals NHS Foundation Trust	31	87.1	58.1	19.4	22.2
York Hospitals NHS Foundation Trust	28	85.7	32.1	25.0	63.6
Harrogate & District NHS Foundation Trust	24	100.0	62.5	12.5	25.0
Airedale NHS Foundation Trust	27	96.3	59.3	37.0	37.0
Leeds Teaching Hospitals NHS Trust	63	74.6	34.9	23.8	43.2
Calderdale & Huddersfield NHS Foundation Trust	47	95.7	10.6	17.0	23.4
Mid Yorkshire Hospitals NHS Trust	69	95.7	60.9	37.7	48.5
Humber & Yorkshire Coast					
Scarborough & North East Yorkshire Health Care NHS Trust	18	94.4	55.6	16.7	35.3
Northern Lincolnshire & Goole Hospitals NHS Foundation Trust	41	85.4	36.6	9.8	23.1
Hull & East Yorkshire Hospitals NHS Trust	65	86.2	61.5	23.1	27.7
North Trent					
Barnsley Hospital NHS Foundation Trust	25	76.0	0.0	36.0	50.0
The Rotherham NHS Foundation Trust	30	96.7	53.3	26.7	33.3
Chesterfield Royal Hospital NHS Foundation Trust	29	89.7	24.1	31.0	32.1
Sheffield Teaching Hospitals NHS Foundation Trust	46	89.1	54.3	21.7	28.3
Doncaster & Bassetlaw Hospitals NHS Foundation Trust	26	84.6	11.5	15.4	23.1
Pan Birmingham					
Walsall Hospitals NHS Trust	14	85.7	50.0	0.0	7.1
Heart of England NHS Foundation Trust	58	74.1	50.0	13.8	20.0
University Hospital Birmingham NHS Foundation Trust	43	74.4	44.2	32.6	32.6
Sandwell & West Birmingham Hospitals NHS Trust	51	94.1	52.9	17.6	17.6

Appendix 4 (continued)

Network/Trust Name	Number of patients with rectal cancer undergoing major surgery	MRI scan reported (%)	Pre-operative radiotherapy (short or long course) (%)	APER rate (%)	Permanent stoma rate (%)
Arden					
South Warwickshire General Hospitals NHS Trust	25	84.0	56.0	40.0	50.0
University Hospitals Coventry & Warwickshire NHS Trust	39	61.5	61.5	15.4	20.0
George Eliot Hospital NHS Trust	15	80.0	53.3	13.3	26.7
Worcestershire Acute Hospitals NHS Trust	52	98.1	57.7	44.2	55.8
Mount Vernon					
Luton & Dunstable Hospital NHS Foundation Trust	11	90.9	0.0	18.2	27.3
West Hertfordshire Hospitals NHS Trust	35	48.6	34.3	20.0	22.9
East & North Hertfordshire NHS Trust	45	77.8	0.0	33.3	80.0
North West London					
The Hillingdon Hospitals NHS Foundation Trust	16	75.0	50.0	18.8	18.8
Ealing Hospital NHS Trust	5	100.0	0.0	20.0	20.0
West Middlesex University Hospital NHS Trust	20	100.0	30.0	25.0	30.0
Chelsea & Westminster Hospital NHS Foundation Trust	11	100.0	45.5	18.2	18.2
North West London Hospitals NHS Trust	10	80.0	0.0	10.0	10.0
Imperial College Healthcare NHS Trust	51	92.2	58.8	27.5	29.2
North London					
Royal Free Hampstead NHS Trust	12	58.3	66.7	33.3	62.5
The Whittington Hospital NHS Trust	15	73.3	40.0	0.0	7.1
The Princess Alexandra Hospital NHS Trust	14	71.4	0.0	28.6	33.3
University College London Hospitals NHS Foundation Trust	10	80.0	50.0	20.0	40.0
Barnet & Chase Farm Hospitals NHS Trust	32	100.0	53.1	37.5	41.4
North East London					
Barking, Havering & Redbridge Hospitals NHS Trust	17	82.4	70.6	17.6	20.0
Whipps Cross University Hospital NHS Trust	15	86.7	46.7	20.0	20.0
Newham University Hospital NHS Trust	7	71.4	14.3	42.9	42.9
Barts & The London NHS Trust	12	58.3	33.3	8.3	18.2
Homerton University Hospital NHS Foundation Trust	4	75.0	25.0	0.0	0.0
South East London					
Guy's & St Thomas' NHS Foundation Trust	1	100.0	100.0	0.0	0.0
The Lewisham Hospital NHS Trust	7	42.9	0.0	14.3	20.0
King's College Hospital NHS Foundation Trust	14	100.0	57.1	14.3	15.4
South London Healthcare NHS Trust	7	85.7	0.0	0.0	
South West London					
Kingston Hospital NHS Trust	17	100.0	29.4	17.6	17.6
Mayday Healthcare NHS Trust	16	87.5	6.3	6.3	25.0
St George's Healthcare NHS Trust	4	50.0	0.0	0.0	0.0
The Royal Marsden NHS Foundation Trust	6	66.7	50.0	16.7	33.3
Epsom & St Helier University Hospitals NHS Trust	16	12.5	12.5	6.3	100.0
Peninsula					
South Devon Health Care NHS Foundation Trust	28	85.7	28.6	21.4	33.3
Northern Devon Healthcare NHS Trust	21	85.7	33.3	38.1	38.1
Royal Cornwall Hospitals NHS Trust	51	98.0	49.0	21.6	22.4
Royal Devon & Exeter NHS Foundation Trust	47	83.0	6.4	14.9	25.5
Plymouth Hospitals NHS Trust	36	86.1	44.4	36.1	36.1

Appendix 4 (continued)

Network/Trust Name	Number of patients with rectal cancer undergoing major surgery	MRI scan reported (%)	Pre-operative radiotherapy (short or long course) (%)	APER rate (%)	Permanent stoma rate (%)
Dorset					
Dorset County Hospital NHS Foundation Trust	24	37.5	4.2	20.8	31.6
Poole Hospital NHS Foundation Trust	14	64.3	28.6	28.6	28.6
Royal Bournemouth & Christchurch Hospitals NHS Foundation Trust	30	76.7	13.3	13.3	13.3
Avon, Somerset & Wiltshire					
Weston Area Health NHS Trust	16	100.0	25.0	31.3	31.3
Yeovil District Hospital NHS Foundation Trust	25	92.0	48.0	28.0	28.0
University Hospitals Bristol NHS Foundation Trust	10	90.0	70.0	10.0	10.0
Taunton & Somerset NHS Foundation Trust	12	91.7	16.7	16.7	16.7
Royal United Hospital Bath NHS Trust	51	82.4	45.1	19.6	19.6
North Bristol NHS Trust	38	76.3	34.2	28.9	28.9
Three Counties					
Hereford Hospitals NHS Trust	24	79.2	25.0	12.5	21.7
Gloucestershire Hospitals NHS Foundation Trust	37	73.0	32.4	5.4	16.2
Thames Valley					
Milton Keynes General Hospital NHS Foundation Trust	20	50.0	30.0	30.0	30.0
Royal Berkshire NHS Foundation Trust	5	100.0	80.0	0.0	50.0
Great Western Hospitals NHS Foundation Trust	42	81.0	26.2	40.5	50.0
Oxford Radcliffe Hospitals NHS Trust	42	71.4	0.0	14.3	16.7
Buckinghamshire Hospitals NHS Trust	17	88.2	58.8	52.9	58.8
Central South Coast					
Isle of Wight NHS PCT	13	84.6	76.9	53.8	61.5
Southampton University Hospitals NHS Trust	56	76.8	25.0	28.6	36.2
Portsmouth Hospitals NHS Trust	71	85.9	25.4	11.3	14.1
Winchester & Eastleigh Healthcare NHS Trust	21	85.7	0.0	4.8	5.3
Basingstoke & North Hampshire NHS Foundation Trust	36	100.0	5.6	2.8	3.4
Salisbury NHS Foundation Trust	30	93.3	10.0	26.7	30.0
Western Sussex Hospitals NHS Trust	22	77.3	22.7	22.7	22.7
Surrey, West Sussex & Hampshire					
Royal Surrey County Hospital NHS Trust	21	85.7	0.0	14.3	14.3
Frimley Park Hospital NHS Foundation Trust	19	78.9	36.8	31.6	31.6
Ashford & St Peter's Hospitals NHS Trust	31	32.3	22.6	9.7	28.6
Surrey & Sussex Healthcare NHS Trust	33	93.9	3.0	6.1	9.1
Sussex					
East Sussex Hospitals NHS Trust	43	88.4	48.8	32.6	32.6
Brighton & Sussex University Hospitals NHS Trust	26	76.9	30.8	23.1	23.1
Western Sussex Hospitals NHS Trust	30	80.0	26.7	23.3	23.3
Kent & Medway					
Dartford & Gravesham NHS Trust	16	100.0	43.8	12.5	31.3
Maidstone & Tunbridge Wells NHS Trust	21	85.7	23.8	14.3	25.0
Greater Midlands					
Mid Staffordshire General Hospitals NHS Trust	22	72.7	36.4	50.0	50.0
University Hospital of North Staffordshire NHS Trust	26	88.5	34.6	26.9	26.9
The Royal Wolverhampton Hospitals NHS Trust	42	97.6	35.7	16.7	16.7
The Dudley Group of Hospitals NHS Foundation	25	96.0	48.0	44.0	44.0
Shrewsbury & Telford Hospital NHS Trust	41	87.8	41.5	31.7	34.1

Appendix 4 (continued)

Network/Trust Name	Number of patients with rectal cancer undergoing major surgery	MRI scan reported (%)	Pre-operative radiotherapy (short or long course) (%)	APER rate (%)	Permanent stoma rate (%)
North of England					
South Tyneside NHS Foundation Trust	16	81.3	31.3	43.8	43.8
City Hospitals Sunderland NHS Foundation Trust	29	79.3	24.1	34.5	35.7
North Cumbria Acute Hospitals NHS Trust	32	71.9	28.1	18.8	26.7
Gateshead Health NHS Foundation Trust	34	94.1	61.8	23.5	35.3
The Newcastle Upon Tyne Hospitals NHS Foundation Trust	42	90.5	57.1	16.7	28.6
Northumbria Health Care NHS Foundation Trust	47	83.0	61.7	21.3	23.4
South Tees Hospitals NHS Trust	57	91.2	73.7	36.8	54.9
North Tees & Hartlepool NHS Trust	29	96.6	62.1	17.2	17.2
County Durham & Darlington NHS Foundation Trust	54	90.7	53.7	18.5	25.9
Anglia					
Bedford Hospital NHS Trust	27	100.0	37.0	33.3	33.3
The Queen Elizabeth Hospital King's Lynn NHS Foundation Trust	22	90.9	40.9	18.2	18.2
Peterborough & Stamford Hospitals NHS Foundation Trust	21	61.9	52.4	52.4	52.4
James Paget Healthcare NHS Foundation Trust	29	58.6	44.8	44.8	44.8
Ipswich Hospital NHS Trust	16	43.8	0.0	12.5	20.0
West Suffolk Hospitals NHS Trust	27	81.5	14.8	11.1	18.5
Cambridge University Hospitals NHS Foundation Trust	63	63.5	63.5	30.2	34.9
Norfolk & Norwich University Hospital NHS Trust	69	66.7	26.1	24.6	24.6
Hinchingbrooke Health Care NHS Trust	24	87.5	37.5	29.2	29.2
Essex					
Southend University Hospital NHS Foundation Trust	48	87.5	50.0	18.8	21.3
Basildon & Thurrock University Hospitals NHS Foundation Trust	37	91.9	29.7	13.5	16.2
Colchester Hospital University NHS Foundation Trust	38	73.7	21.1	10.5	33.3
Mid Essex Hospital Services NHS Trust	37	67.6	21.6	18.9	19.4
East Midlands					
Burton Hospitals NHS Trust	32	31.3	6.3	18.8	54.5
Sherwood Forest Hospitals NHS Foundation Trust	29	89.7	65.5	13.8	24.1
Kettering General Hospital NHS Trust	20	0.0	10.0	20.0	100.0
Northampton General Hospital NHS Trust	19	63.2	21.1	10.5	21.4
Derby Hospitals NHS Foundation Trust	37	94.6	35.1	13.5	22.2
United Lincolnshire Hospitals NHS Trust	2	100.0	0.0	100.0	100.0
University Hospitals of Leicester NHS Trust	103	95.1	79.6	26.2	33.0
Nottingham University Hospitals NHS Trust	46	71.7	21.7	13.0	20.7
Wales					
Ysbwyty Glan Clwydd MDT	21	90.5	81.0	47.6	57.1
Ysbwyty Gwynedd MDT	23	100.0	65.2	43.5	52.2
Ysbwyty Maelor MDT	31	77.4	93.5	22.6	38.7
Nevill Hall Hospital MDT	14	50.0	35.7	50.0	100.0
Royal Gwent Hospital MDT	41	82.9	58.5	34.1	54.8
Cardiff MDT	40	95.0	70.0	25.0	44.0
Prince Charles Hospital MDT	37	83.8	16.2	35.1	37.1
Royal Glamorgan Hospital MDT	22	72.7	22.7	50.0	66.7
Princess of Wales MDT	25	88.0	40.0	24.0	52.0
Swansea MDT	41	36.6	34.1	39.0	62.2
Bronglais MDT	8	37.5	12.5	37.5	75.0
West Wales General & Prince Phillip MDT	19	73.7	15.8	47.4	66.7
Withybush General Hospital MDT	18	94.4	38.9	44.4	52.9

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