Public Health (2004) **118**, 360–369

PUBLIC HEALTH
JOURNAL OF THE ROYAL INSTITUTE OF PUBLIC HEALTH
www.elsevierhealth.com/journals/pubh

# Re-organizing services for the management of upper gastrointestinal cancers: patterns of care and problems with change

**J. Parry*, K. Jolly, A. Rouse, R. Wilson**

*Health Impact Assessment Research Unit, Department of Public Health & Epidemiology, University of Birmingham, Edgbaston, Birmingham, UK*

**KEYWORDS**
Oesophagogastric; Centralisation; Calman–Hine; Pancreatic; Cancer

**Summary** The 'Calman–Hine' report (1995) recommended that cancer surgery should be limited to specialist high-volume units. National guidance from the National Health Service (NHS) Executive in 2001 stated that specialist oesophagogastric cancer centres should 'aim to draw patients from catchment areas with a population of 1–2 million.' For pancreatic cancers, the catchment areas should be between 2 and 4 million, reflecting the relatively lower incidence of disease. For the West Midlands region, these recommendations would suggest that four or five centres might be required to provide specialist surgical management for oesophagogastric cancer, and one or two centres for pancreatic disease. We used Hospital Episode Statistics to analyse trends in management patterns for these tumours within the West Midlands during the period 1992–2000. Over 20 different units were involved in the management of oesophagogastric and pancreatic disease, and we were unable to discern any clear and consistent move towards the centralisation of the upper gastrointestinal work in high-volume units since the publication of the Calman–Hine report in 1995. Although the drive for centralisation might be anticipated to increase following the publication of the NHS Executive's guidance, there is a substantial way to go before the provision of surgical services for upper gastrointestinal cancers is limited to a small number of high-volume specialist units.


## Introduction

In 1995, the Expert Advisory Group on Cancer to the Chief Medical Officers of England and Wales published recommendations (the 'Calman–Hine' report) for the management of cancer.[1] Central to the conclusions of this report is the recommendation to limit cancer surgery to disease-site-specialised 'high-volume' multidisciplinary teams working in designated cancer units and centres.

The implementation of the Calman–Hine recommendations in England has been supported by the publication of a series of reports—Guidance on Commissioning of Cancer Services—by the NHS Executive.[2–4] Initial reports focused on the management of breast, colorectal, lung and gynaecological disease, and we have previously demonstrated that some move towards service centralisation for the management of these tumours has arisen within the West Midlands region.[5]

In January 2001, guidance on the commissioning of services for the management of upper gastrointestinal (oesophagus, stomach and pancreas)

*Corresponding author. Tel.: +44-121-414-3191.
*E-mail address:* j.m.parry.1@bham.ac.uk

0033-3506/$ - see front matter © 2004 The Royal Institute of Public Health. Published by Elsevier Ltd. All rights reserved.
doi:10.1016/j.puhe.2003.12.006

tumours was published.[6] This report suggested that specialist oesophagogastric cancer teams should be based in cancer centres or larger cancer units, and 'aim to draw patients from catchment areas with a population of 1–2 million.' For pancreatic cancers, catchment areas of between 3 and 4 million were advocated, reflecting the relatively lower incidence of these cancers. These recommendations suggest that in the West Midlands region, four or five centres/units are required to provide specialist surgical management for oeosphagogastric cancer, and one or two centres are required for pancreatic cancer.

In this paper, we analyse changing patterns in the provision of potentially curative surgical management of oesophageal, gastric and pancreatic cancers in the West Midlands region during the period 1992–1993 to 1999–2000. Specifically, the two inter-related questions addressed by the study are (i) were an increasing proportion of patients treated by high-volume units between 1992 and 2000 and (ii) were fewer low-volume units undertaking primary resective cancer surgery between 1992 and 2000?

## Methods

### Study setting and population

Our study uses data from the West Midlands region of the National Health Service (NHS). The region serves a population of approximately 5.3 million; this is more than 10% of the population of England and Wales.

### Data abstraction and case definition

We used a methodology previously reported elsewhere.[5] Briefly, the Hospital Episode Statistics (HES) dataset was interrogated to identify records of patients who (i) were admitted to NHS hospitals within the West Midlands region between 01/04/1992 and 31/03/2000; (ii) had an admission diagnostic code for oesophageal, gastric or pancreatic cancer; and (iii) underwent a surgical resection, the nature of which was compatible with the primary excision of the tumour. Thus, for example, for gastric cancer, this included all total or partial excisions of the stomach, but excluded non-specific laparotomy or palliative de-bulking procedures. Cancers with a procedure code indicating removal of both oesophagus and stomach (Office of Population Census and Surveys (now the Office of National Statistics–ONS) OPCS 4 code G01) were classified as oesophageal cancers. For all disease sites, patients managed non-surgically by radiotherapy and/or chemotherapy were excluded from the study, as were patients whose only procedure was for stent insertion. The International Classification of Diseases (ICD) codes and OPCS procedure codes that we used are shown in Table 1. We also included cases recorded as 'gastrointestinal not otherwise specified' in our search (ICD-9 A159; ICD-10 C26) in order to maximise the ascertainment of potentially eligible cases. For each case included in the analysis, information on date of operation and hospital admitted were abstracted. We were not able to abstract information on consultant surgeons responsible for care due to changes in the HES dataset that precluded the identification of individual consultants from 1997 onwards.

**Table 1** Diagnostic and procedural codes used to select cases of oesophageal, stomach and pancreatic cancer which were treated by potentially curative surgery with the number of cases identified, 1992–2000.

| | Oesophagogastric cancer | | Pancreatic cancer |
|---|---|---|---|
| | Oesophageal cancer | Stomach cancer | |
| ICD-9 diagnosis | A150 | A151 | A157 |
| | A159 | A159 | A159 |
| ICD-10 diagnosis | C15 | C16 | C25 |
| | C26 | C26 | C26 |
| OPCS procedure codes | G01 | G27–G29 | J55–J58 |
| | G02–G04 | | |

### Case volume definition and selection of thresholds

We defined the surgical throughput of each hospital as the number of procedures that involved primary resection of the tumour undertaken each year (1 April–31 March) for each of the 8 years of the study period. For each cancer site, a number of throughput groups were created. The National Guidance on Commissioning Cancer Services estimates that each oesophagogastric cancer site should be undertaking approximately 100 resections per year.[6] We therefore selected our highest volume cut-off to reflect this. For oesophageal and gastric cancers combined (referred to henceforth as oesophagogastric cancer), cut-off points were fewer than 20 resections per year, 20–39, 40–59, 60–79, and 80+. However, we also explored trends in oesophageal and gastric disease separately. Therefore, the cut-off points for these

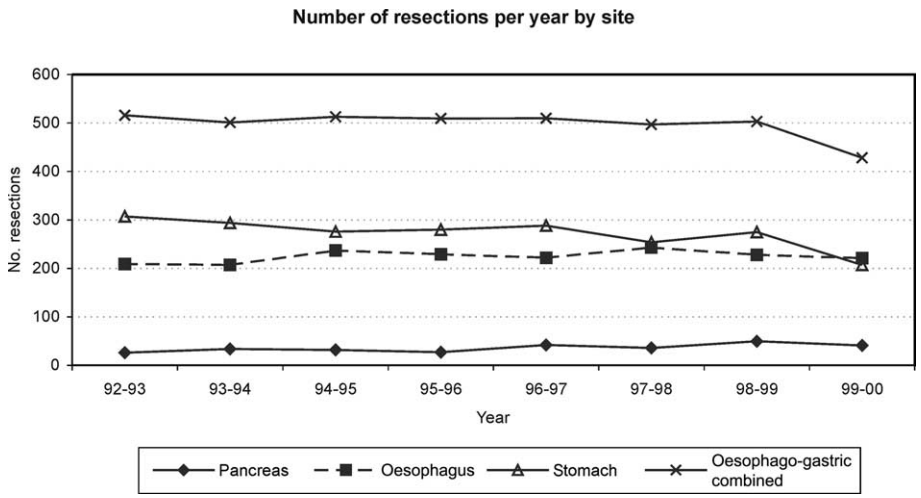


**Figure 1** Number of potentially curative resections carried out for oesophagogastric and pancreatic cancers, 1992–2000.

analyses were set to be half of the combined oesophagogastric threshold figures. When considered separately, the cut-off points for oesophageal cancers and gastric cancers were less than 10, 10–19, 20–29, 30–39, 40–49, and 50 + resections per year. For pancreas, the groups were 0–4, 5–9, 10–14, and 15 + resections per year, reflecting the lower incidence of the disease.

The number of hospitals undertaking resective surgery each year was noted, and the proportion of cases managed by hospitals with different volumes of work were calculated for each year of the study.

## Results

Three thousand, nine hundred and seventy-seven oesophagogastric tumours, and 288 pancreatic tumours underwent potentially curative resection during the 8-year period from 1992–1993 to 1999–2000 (Fig. 1). The number of resections undertaken each year increased slightly for tumours of the pancreas (from 26 in 1992–1993 to 41 in 1999–2000). In contrast, the number of resections undertaken for oesophagogastric tumours fell slightly, with a marked drop-off in the last year of the study period (428 in 1999–2000) (Fig. 2, Table 2). When considered separately, the trends seen for oesophageal and stomach resections were different, with the number of gastric resections falling and those for oesophageal disease rising slightly.

The 3977 resections undertaken for oesophagogastric cancer were performed in 21 units within the West Midlands. During the study period, the mean number of resections per unit was 189,

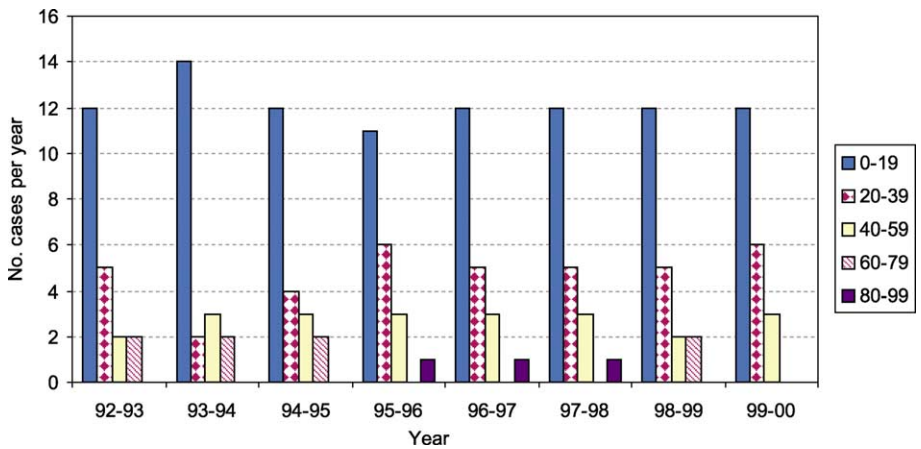


**Figure 2** Distribution of units by the number of resections undertaken for oesophageal and gastric cancers combined, 1992–2000.

**Table 2** Proportion of upper gastrointestinal resections undertaken by units with different workloads, 1992–2000.

| | Unit throughput (no. resections) | 1992–1993 (%) | 1993–1994 (%) | 1994–1995 (%) | 1995–1996 (%) | 1996–1997 (%) | 1997–1998 (%) | 1998–1999 (%) | 1999–2000 (%) |
|---|---|---|---|---|---|---|---|---|---|
| Oesophagus | 0–9 | 46 (22.0) | 53 (25.6) | 48 (20.3) | 49 (21.4) | 56 (25.2) | 51 (21.0) | 37 (16.2) | 23 (10.4) |
| | 10–19 | 87 (41.6) | 35 (16.9) | 59 (24.9) | 32 (14.0) | 40 (18.0) | 89 (36.6) | 58 (25.4) | 94 (42.5) |
| | 20–29 | 23 (11.0) | 71 (34.3) | 72 (30.4) | 52 (22.7) | 27 (12.2) | 0 (0.0) | 78 (34.2) | 27 (12.2) |
| | 30–39 | 0 (0.0) | 0 (0.0) | 0 (0.0) | 31 (13.5) | 32 (14.4) | 35 (14.4) | 0 (0.0) | 32 (14.5) |
| | 40–49 | 0 (0.0) | 48 (23.2) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 45 (20.4) |
| | 50 + | 53 (25.4) | 0 (0.0) | 58 (24.5) | 65 (28.4) | 67 (30.2) | 68 (28.0) | 55 (24.1) | 0 (0.0) |
| | | 209 | 207 | 237 | 229 | 222 | 243 | 228 | 221 |
| Stomach | 0–9 | 67 (21.8) | 38 (12.9) | 58 (21.0) | 43 (15.4) | 51 (17.7) | 56 (22.0) | 32 (11.6) | 65 (31.4) |
| | 10–19 | 93 (30.3) | 119 (40.5) | 106 (38.4) | 141 (50.4) | 93 (32.3) | 84 (33.1) | 111 (40.4) | 94 (45.4) |
| | 20–29 | 72 (23.5) | 98 (33.3) | 74 (26.8) | 96 (34.3) | 144 (50.0) | 84 (33.1) | 93 (33.8) | 48 (23.2) |
| | 30–39 | 31 (10.1) | 39 (13.3) | 38 (13.8) | 0 (0.0) | 0 (0.0) | 30 (11.8) | 39 (14.2) | 0 (0.0) |
| | 40–49 | 44 (14.3) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| | 50 + | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| | | 307 | 294 | 276 | 280 | 288 | 254 | 275 | 207 |
| Oesophagogastric combined | 0–19 | 146 (28.3) | 183 (36.5) | 140 (27.3) | 125 (24.6) | 126 (24.7) | 133 (26.8) | 121 (24.1) | 106 (24.8) |
| | 20–39 | 153 (29.7) | 56 (11.2) | 114 (22.2) | 162 (31.8) | 142 (27.8) | 135 (27.2) | 137 (27.2) | 172 (40.2) |
| | 40–59 | 85 (16.5) | 129 (25.7) | 125 (24.4) | 140 (27.5) | 147 (28.8) | 141 (28.4) | 105 (20.9) | 150 (35.0) |
| | 60–79 | 132 (25.6) | 133 (26.5) | 134 (26.1) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 140 (27.8) | 0 (0.0) |
| | 80–99 | 0 (0.0) | 0 (0.0) | 0 (0.0) | 82 (16.1) | 95 (18.6) | 88 (17.7) | 0 (0.0) | 0 (0.0) |
| | | 516 | 501 | 513 | 509 | 510 | 497 | 503 | 428 |
| Pancreas | 0–4 | 21 (80.8) | 18 (52.9) | 9 (28.1) | 12 (44.4) | 11 (26.2) | 13 (36.1) | 11 (22.0) | 10 (24.4) |
| | 5–9 | 5 (19.2) | 16 (47.1) | 5 (15.6) | 0 (0.0) | 16 (38.1) | 0 (0.0) | 15 (30.0) | 11 (26.8) |
| | 10–14 | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| | 15 + | 0 (0.0) | 0 (0.0) | 18 (56.3) | 15 (55.6) | 15 (35.7) | 23 (63.9) | 24 (48.0) | 20 (48.8) |
| | | 26 | 34 | 32 | 27 | 42 | 36 | 50 | 41 |

although the range was considerable (25–610) and heavily skewed towards the lower throughput units; over half of all units treated fewer than 20 patients per year (Table 3). When considered separately, a similar distribution of surgical services was noted for oesophageal and stomach cancers. Between 11 and 15 units managed less than 10 cases of oesophageal cancer each year, with only two units managing 20 + patients per year (Fig. 3). For stomach cancer, the majority of units undertook 0–9 or 10–19 resections each year. The number of low-volume units remained relatively constant throughout the study period.

Eighteen units undertook pancreatic resections during the study period (Table 3). Of these, only one unit (from 1994–1995 onwards) consistently undertook 15 + resections per year, with the remaining units undertaking four or less (between 14 and 17 units each year) or between 5 and 9 (between 1 and 3 units) resections each year.

The high number of low-throughput units is reflected in the relatively low proportion of patients who underwent surgical resection of their disease in high-throughput units. During the study period, there has been no substantial shift in the proportion of cases treated in low-, medium- and high-throughput units. For oesophagogastric cancer, the proportion of patients managed in units treating more than 60 patients per year has remained between 16.1%–27.8% throughout the study (Table 2). Indeed, this figure fell to zero in 1999–2000 when the maximal throughput was 57 cases in any unit. When oesophageal and gastric tumours are considered separately, no evidence of a shift towards centralisation or development of high-throughput units is unmasked. Indeed, the small fall in the proportion of patients with oesophageal cancer managed in the lowest throughput units seems merely to reflect a shift in workload to 'medium-sized' units (10–19 resections per year).

For pancreatic disease, the proportion of patients treated in the lowest throughput units (0–4 resections per year) fell substantially from 81% in 1992–1993 to 22% in 1999–2000. However, other than a substantial increase between the years 1993–1994 and 1994–1995, the proportion of cases managed in the highest throughput units has not increased in a substantial or consistent manner.

**Table 3** Distribution of units by the number of resections undertaken for cancers in the upper gastrointestinal tract, 1992–2000.

| | Unit throughput (resections/year) | 1992–1993 | 1993–1994 | 1994–1995 | 1995–1996 | 1996–1997 | 1997–1998 | 1998–1999 | 1999–2000 |
|---|---|---|---|---|---|---|---|---|---|
| Oesophagus | 0–9 | 13 | 14 | 13 | 14 | 15 | 13 | 12 | 11 |
| | 10–19 | 7 | 5 | 4 | 2 | 3 | 6 | 5 | 7 |
| | 20–29 | 1 | 1 | 3 | 2 | 1 | 0 | 3 | 1 |
| | 30–39 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 |
| | 40–49 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 50 + | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 |
| | | 22 | 21 | 21 | 20 | 20 | 21 | 21 | 21 |
| Stomach | 0–9 | 10 | 7 | 9 | 7 | 9 | 10 | 8 | 12 |
| | 10–19 | 6 | 9 | 8 | 10 | 6 | 6 | 8 | 7 |
| | 20–29 | 3 | 4 | 3 | 4 | 6 | 4 | 4 | 2 |
| | 30–39 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 |
| | 40–49 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 |
| Oesophagogastric | 0–19 | 12 | 14 | 12 | 11 | 12 | 12 | 12 | 12 |
| Combined | 20–39 | 5 | 2 | 4 | 6 | 5 | 5 | 5 | 6 |
| | 40–59 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 3 |
| | 60–79 | 2 | 2 | 2 | 0 | 0 | 0 | 2 | 0 |
| | 80–99 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| | | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 |
| Pancreas | 0–4 | 17 | 16 | 16 | 17 | 14 | 17 | 15 | 14 |
| | 5–9 | 1 | 2 | 3 | 0 | 3 | 0 | 2 | 2 |
| | 10–14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 15 + | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | 17 | 18 | 20 | 18 | 18 | 18 | 18 | 17 |

## Discussion

The Calman–Hine report was published in 1995 and explicitly advocated a need for service centralisation in the management of cancers. However, in this study, we have been unable to discern any clear and consistent move towards the centralisation of upper gastrointestinal work in high-volume units during the period 1992–2000. For oesophagogastric disease, since 1996, the number of low-volume units (0–19 resections per year) has remained constant (12 of 21), as has the proportion of cases treated in these settings (~25%). When considered separately, there is some suggestion that for oesophageal disease, the number of cases managed in low-throughput units (0–9 resections per year) has reduced from 1996 onwards, but that this workload has shifted to 'medium-sized' units

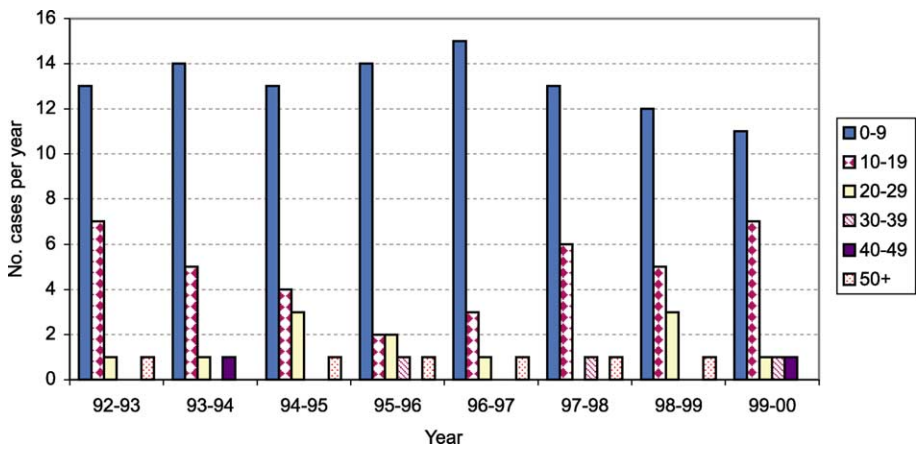


**Figure 3** Distribution of units by the number of resections undertaken for oesophageal cancers, 1992–2000.

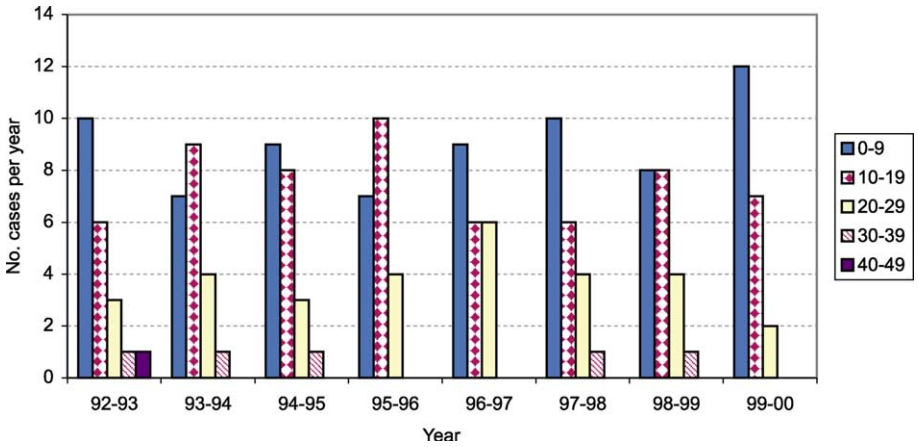


**Figure 4** Distribution of units by the number of resections undertaken for gastric cancers, 1992–2000.

(10–19 resections per year) rather than to high-volume centres (50 + resections per year). For gastric disease, the number of units undertaking very low volumes of work (0–9 resections per year) was at its highest ($n = 12$) in the final year of the study period. For pancreatic disease, the proportion of cases managed in the lowest throughput units (0–4 resections per year) has fallen substantially during the study period (Figs. 4 and 5). Consequently, from 1996 onwards, more than half of all cases have been managed in high-volume units (15 + resections per year), although this proportion has not increased with low- and medium-volume units still undertaking a substantial number of resections in the later years of the study period.

This study has described management trends in a population of 5.3 million residents in England. We have used methods that have been applied successfully to the analysis of management trends for other cancers,[5] and the 8-year study period is of a suitable length to permit comparisons of management both before and after publication of the Calman–Hine report.[1] Information on the completeness and accuracy of the West Midlands HES data during the study period suggests a low (1.4%) non-completion rate for the main diagnostic codes.[7]

Any analysis of the HES data will underestimate surgical activity if incomplete recording of surgical procedures occurs within Trusts. To estimate whether this potential coding deficiency could affect our findings, we compared the resection rate for oesophagogastric cancers in our series with that reported by a population-based case note review of the management of upper gastrointestinal disease in the North West of England undertaken in the mid-1990s (Centre for Cancer Epidemiology, University of Manchester—data on file). In 1997, there were 1630 registrations for oesophageal and gastric cancers among residents of the West Midlands region.[8] In the comparable periods of our study (1996–1997 and 1997–1998), there were 510 and 501 resections for these tumours recorded in the HES. Thus, assuming an average number of resections for this period to be 506, the resection rate in the West Midlands was approximately 31%. This is almost identical to that reported in the North West series (30.7%). We believe, therefore, that underascertainment of

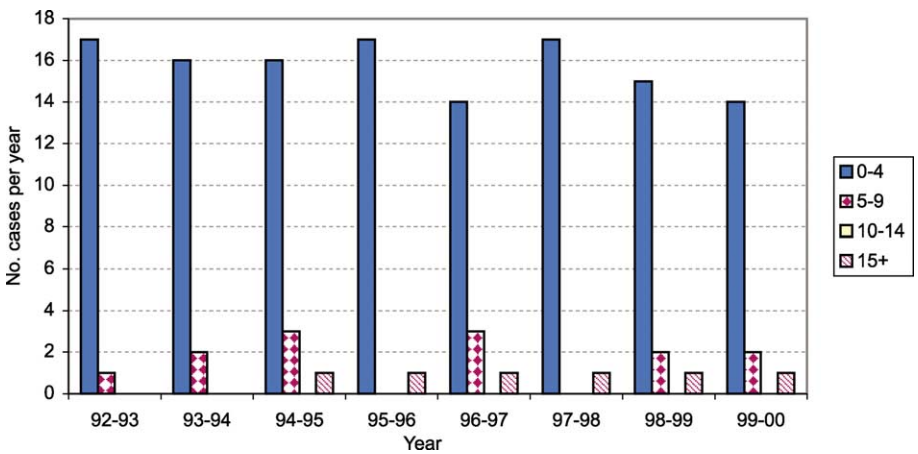


**Figure 5** Distribution of units by the number of resections undertaken for pancreatic cancers, 1992–2000.

information on surgical procedures is unlikely to compromise the finding of our study.

In this study, we used a tight definition for the surgical procedure, and thus also for the estimation of volume of work. To be included in the analysis, cases had to have an OPCS code consistent with both the admission diagnosis and with resection of the disease. In this way, we attempted to limit inclusion in the study population to primary surgical procedures only. However, two misclassification errors are possible. Firstly, it is inevitable that we have included some procedures undertaken for tumour recurrence and not primary resection. We believe such procedures are substantially less likely to be undertaken for upper gastrointestinal disease than for other tumours, for example colorectal cancer, where local recurrence or the development of metachronous tumours may precipitate a second major surgical procedure; that being said, the possibility of this misclassification error should be considered. However, if resection for recurrent disease is more likely to be undertaken by a specialist high-volume unit as might be anticipated, then the inclusion of these cases in our series will have overestimated the throughput of high-volume units relative to lower volume units. We will thus have overestimated the degree of centralisation that has occurred.

The second misclassification error relates to the underestimation of surgical activity of units that inevitably arises when only potentially curative resections are included in the analysis. Many cases of upper gastrointestinal cancers will present at an advanced stage and be unsuitable for resective surgery, although palliative procedures may be undertaken. If the proportion of advanced, non-resectable cases is greater among the workload of low-volume units (assuming that potentially curative cases are referred to high-volume 'specialist' units), any shift towards centralisation of surgery will, in reality, be less marked and the proportion of cases seen by high-volume units will be overestimated (Figs. 6–9).

We have previously suggested that the relative absence of centralisation of services for ovarian cancer might reflect the fact that gynaecological cancers were not among the initial tranche of cancers targeted by the Calman–Hine re-organization process.[5] Similarly, whilst the Calman–Hine report defined the direction of travel—i.e. complex surgery in larger volume, but fewer, units—it did not provide detail for individual upper gastrointestinal disease sites. Furthermore, since publication of the Calman–Hine report, work has been concentrated on looking at the changes around specialist oncological treatments—for example, chemotherapy and radiotherapy—rather than specialist surgery. It is possible, therefore, that changes in patterns of care for upper gastrointestinal tumours may only start to arise from now onwards following the publication of the guidance for the management of these tumours in 2001, and after the data collection for this study had ended.[6] As such, this study should be considered as a 'baseline' against which future comparisons of service activity and patterns of care may be compared. Substantial service re-organization is also required; with regard to oesophageal and gastric cancers, surgical management was undertaken at 20 + units with no single unit managing 100 resections per year as the national guidance suggests should occur. Yet the West Midlands population can support only four or five gastro-oesophageal centres. Of the five highest volume units, three are in designated cancer centres, one is in a teaching hospital and one is in

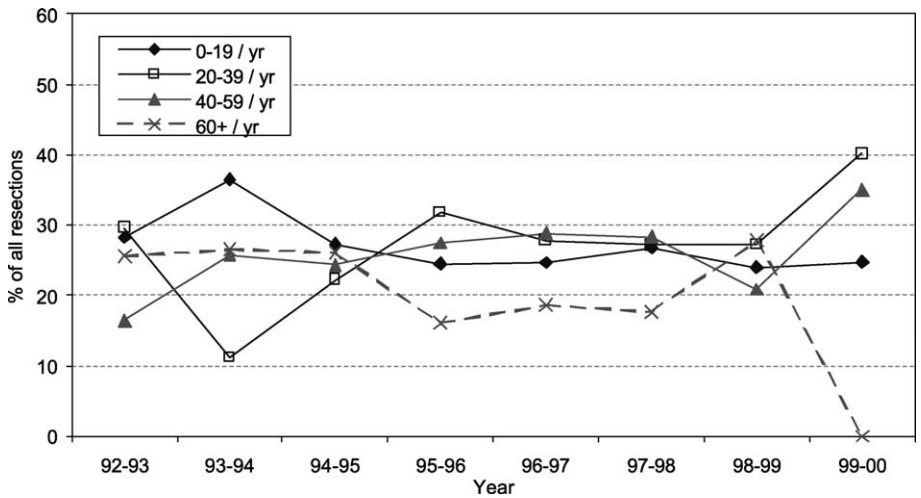


**Figure 6** Proportion of oesophageal and gastric resections undertaken by units with different workloads, 1992–2000.

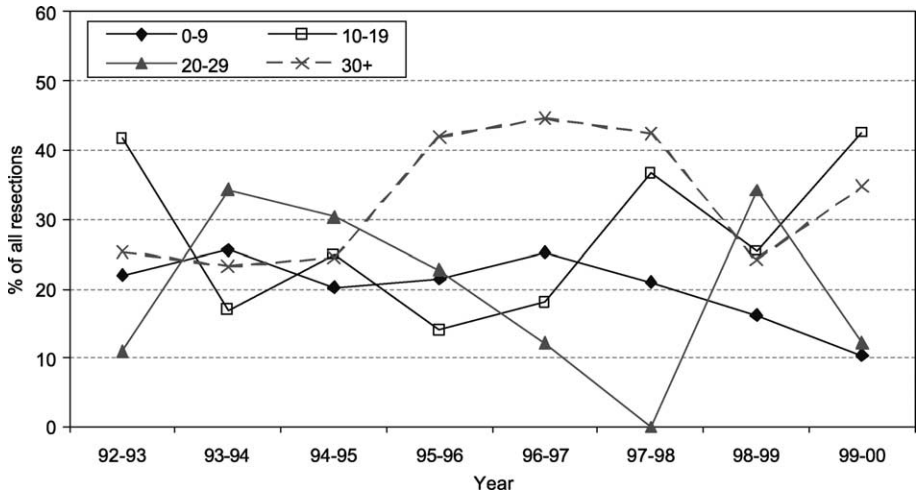


**Figure 7** Proportion of oesophageal resections undertaken by units with different workloads, 1992–2000.

a district general hospital (DGH) located close to another cancer centre. Consideration needs to be given to centralising work at these units, although there may be substantial pressure to move surgery from the DGH to the nearby cancer centre. The teaching hospital needs to ensure high-quality working with oncology colleagues from a designated cancer centre in order to maximise expertise and patient access to radiotherapy and chemotherapy.

There was only one unit undertaking 15 + pancreatic resections each year, and this unit provides surgical care for more than 50% of resections within the region. This unit is also the regional hepatobiliary and liver transplant centre, and geographically lies at the centre of region. The guidance suggests that two centres could operate within the West Midlands, but our data suggest that there is no obvious second centre for pancreas at present as remaining cases are distributed relatively evenly throughout the region's other units.

Gynaecological cancers were the first tumours that necessitated inter-unit rather than intra-unit changes in patient flows as a consequence of the implementation of the Calman–Hine recommendations.[4] Upper gastrointestinal disease will undoubtedly necessitate similar changes in management and referral patterns. However, upper gastrointestinal cancer surgery is a large component of upper gastrointestinal surgeons' workload, and the need to experience the management of diseases at this site during training is made clear in the University of Birmingham's undergraduate curriculum.[9] Given that there are, at present, six hospitals providing teaching placements for Birmingham clinical students in basic surgery, it is

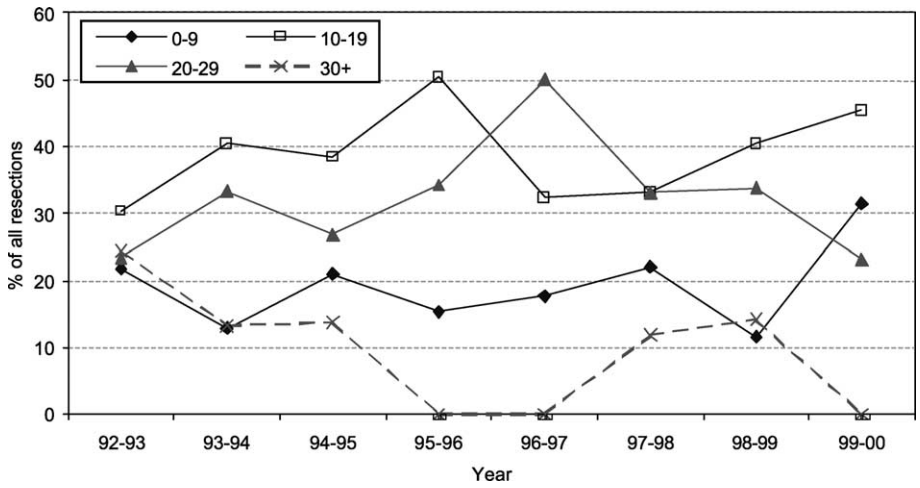


**Figure 8** Proportion of gastric resections undertaken by units with different workloads, 1992–2000.

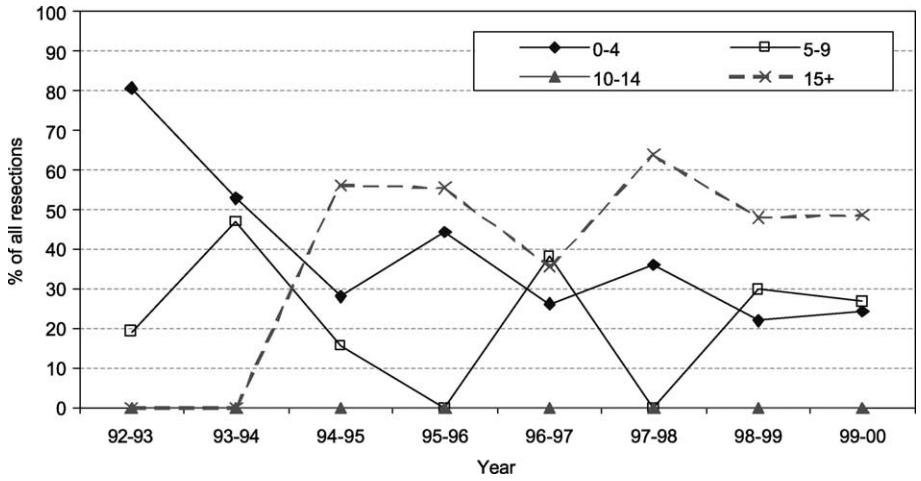


**Figure 9** Proportion of pancreatic resections undertaken by units with different workloads, 1992–2000.

inevitable that if the guidance is implemented, some teaching hospitals will not provide an upper gastrointestinal cancer service and students may not experience the management of these diseases. This problem may be anticipated to worsen as the number of teaching hospitals increases in order to cope with the substantial undergraduate expansion and introduction of direct-entry graduate medical training.[10] Further consideration of the impact of the reconfiguration of cancer services on both undergraduate and postgraduate training is required.

Finally, in this study, we were able to consider volume of work at the institutional level but not at the level of the individual surgeon. Up to 1997, HES data were presented in such a manner that permitted the coded identification of individual consultant firms. Since then, however, changes in the dataset have precluded the identification of individual consultants. An alternative approach would have been to use information held by the regional cancer registry—but the use of cancer registration data in itself is also not without problems with regard to ascertainment of cases and the completeness of information gathered. In the West Midlands, as elsewhere, the primary focus of the cancer registration process is on gaining information about the tumour (for example, tumour location, size, histological type) rather than specific treatment—although this is now beginning to change. There may also be issues with regard to identifying the consultant responsible for care—particularly for those tumours reported by pathologists. We considered undertaking a linkage exercise between the HES dataset and the regional cancer registry dataset to permit analysis at the individual consultant level, but two problems faced us. Firstly, the use of cancer registration data to report on throughput and workload at the individual consultant level could breach the requirements of the Data Protection Act if the consultants were unaware that data on workload would be used and reported in this way. Secondly, and related to this, at the time the work for this paper was undertaken, the security agreements required by the Department of Health to allow HES data to be linked to an external cancer registry database were not in place. Although frustrating from a research perspective, these requirements do at least reflect a more responsible use of electronic data that has evolved since the introduction of the Data Protection Act. Our difficulties in executing this aspect of the analyses clearly illustrate the need for routinely available robust systems for the monitoring of cancer care.

## References

1. Department of Health, *A policy framework for commissioning cancer services. A report by the Expert Advisory Group on cancer to the Chief Medical Officers of England and Wales*, London: Department of Health; 1995.
2. NHS Executive, *Guidance on commissioning cancer services. Improving outcomes in breast cancer*. London: Department of Health; 1997.
3. NHS Executive, *Guidance on commissioning cancer services. Improving outcomes in colorectal cancer*. London: Department of Health; 1998.
4. NHS Executive, *Guidance on commissioning cancer services. Improving outcomes in gynaecological cancer*. London: Department of Health; 1999.
5. Jolly K, Parry JM, Rouse A, Stevens A. Volume of cancer surgery for breast, colorectal and ovarian cancer 1992—97: is

there evidence of increasing sub-specialization by surgeons? *Br J Cancer* 2001;**84**:1308—13.
6. NHS Executive, *Guidance on commissioning cancer services. Improving outcomes in upper gastrointestinal cancer*. London: Department of Health; 2001.
7. Wilson R. Utilization of routinely collected data in health services research; a study of their application across the West Midlands Region of the National Health Service. Doctoral Thesis. University of Birmingham; 1997.
8. Quinn M, Babb P, Brock A, Kirby L, Jones J, editors. *Cancer trends in England and Wales 1950—1999. SMPS No. 66*, London: The Statistics Office; 2001.
9. University of Birmingham. Learning outcomes for hospital attachments in year 3. M.B. Ch.B 2000/01. University of Birmingham; August 2000.
10. University of Birmingham. The Black Country strategy: a proposal to increase the medical student numbers at the University of Birmingham. University of Birmingham, March; 1999.