

# The Society for Cardiothoracic Surgery in Great Britain & Ireland

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## **Second** **National Thoracic Surgery** **Activity & Outcomes Report**

2011

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*Prepared by*

The Society for Cardiothoracic Surgery in Great Britain & Ireland

Dendrite Clinical Systems



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Dendrite Clinical Systems Ltd



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Dendrite Clinical Systems Ltd  
The Hub, Station Road, Henley-on-Thames,  
Oxfordshire RG9 1AY, United Kingdom

phone +44 1491 411 288  
fax +44 1491 411 377  
e-mail [publishing@e-dendrite.com](mailto:publishing@e-dendrite.com)

## Key messages from the report

1. Thoracic surgical audit of activity in the United Kingdom and Ireland continues to be almost 100% complete *via* the Thoracic Surgical Register.
2. The audit will be useful not only to surgeons in reflecting on practices within their units, but also to all those with an interest in thoracic surgical care of patients. The variations between units can be used when planning strategy for such areas as manpower, capacity and infrastructure within thoracic surgical hospitals.
3. There has been a huge increase in thoracic surgical activity throughout the two countries over the last decade. This increase has occurred in every thoracic surgical unit. Overall around 60% more operations are being carried out.
4. Despite the increasing use of PET scanning in assessing patients for lung cancer surgery which would be expected to lead to a reduction in patients identified as being suitable for operations, the number of lung resections for primary cancer identified by the Register has risen from 3,112 in 2001-2002 to 5,265 for the financial year 2009-2010. This represents an increase in resections of almost 60%.
5. Operative mortality for lung cancer resections has almost halved over the last decade from 3.8% to 2.1%. This, along with the increase in the absolute number of patients suffering from lung cancer who are treated by surgery, illustrates significant improvements in patient selection and peri-operative care. Many patients would have been denied surgery in previous years due to age and co-morbidity and the increase in numbers having surgery will in part be due to the willingness of surgeons and the wider lung cancer team to offer them surgery as opposed to other therapies.
6. It is likely that the appointment of more consultant thoracic surgeons has led to many of these changes by increasing access to thoracic surgery for patients. The initiative established in 2002 to appoint United Kingdom trainees with a career path leading to *pure* general thoracic surgery will have facilitated this increase in appointments.
7. One of the principle aims of the NHS cancer plan introduced in 1998 has now come to fruition such that all patients with cancer are discussed in multi-disciplinary team meetings (MDT's). The regular input of thoracic surgeons into lung cancer MDT meetings will have increased the number of patients having access to a discussion about surgery for their disease and more patients being referred for a surgical opinion.
8. There has been a steady increase in the use of minimally invasive surgery in many aspects of thoracic surgical practice. In the last two years of data collection the number of lobectomies for primary lung cancer being carried out using minimally invasive techniques rose from 7.0% to 13.8%, a reflection on increased opportunities for training and a belief in efficacy and safety of the technique amongst surgeons.
9. The trend to fewer pneumonectomies and more sub-lobar lung resections has continued especially over the last decade.
10. The number of open / close operations for primary lung cancer is now very low. The figure for the year 2009-2010 was 1.9%.
11. In contrast to general thoracic surgery as a whole, the number of patients having oesophagogastric surgery in thoracic units has fallen steadily, with only five units still having a significant practice, mainly with regard to upper GI cancer treatment. Nevertheless operative mortality remains very low at 2.1%.
12. The SCTS database project is still in its infancy. This report shows that the patient profiles and outcomes for the patients treated in the 10 units who have been able to contribute to the project are remarkably similar.
13. The National Lung Cancer Audit (NLCA or LUCADA) is a separate project that requires an input from thoracic surgical units. The latest report shows marked variations in practice throughout the country especially with regard to the relative numbers of patients being treated with surgery as opposed to radiotherapy, chemotherapy *etc.* The 2010 report indicates that there is a two-fold variation in the frequency of lung cancer surgery throughout the country.



### **Foreword**

For over thirty years cardiothoracic surgeons have been committed to the production of regular audits of their work. Although major innovations in this area have been easier in cardiac surgery, thoracic surgery has always been more difficult to summarise because of a wider variety of operative procedures and over the last 10-15 years a gap had opened in the output of audit between the two arms of our specialty. I am pleased to report that the Second National Thoracic Surgical Report on behalf of the Society not only significantly narrows this gap, but in some areas has made progress beyond similar initiatives in cardiac surgery.

The SCTS Thoracic Database describes many important and interesting areas of practice such as patient access times to surgery, post-operative complications, and length of hospital stay after surgery. Although inevitably there are variations throughout the country the report shows that the overall standard of care for thoracic surgical patients as measured by these outcomes is of the highest order and compares favourably with previously described international standards.

As acknowledged in the report, a major area of concern for surgical audit is the accuracy and completeness of data. Although the Thoracic Register is an excellent tool, to comprehensively and accurately describe and compare surgical activity and outcomes properly requires patient-specific information, as is already available in the SCTS cardiac and thoracic surgical databases.

Indeed, one of the principle goals of the Society is to ensure that this information is as comprehensive as that in the Register. I am confident that new methods will be found to achieve this for all thoracic surgical hospitals in both Great Britain and Ireland. Whether this is by building on existing initiatives or facilitating collaboration with other intelligence streams such as the National Lung Cancer Audit it is likely to be an exciting journey.

**Prof. David Taggart**

**President of the Society for Cardiothoracic Surgery in Great Britain & Ireland**



## **Preface**

I warmly welcome this second national thoracic surgery activity and outcomes report. Participating hospitals are to be commended for collecting the data and the Society for Cardiothoracic surgery in Great Britain & Ireland should be congratulated on producing a lengthy but easily digestible report.

Three key findings struck me on reading the report. First, the remarkable increase in lung resections (both for cancer and for other pathologies) especially over the past four years. Between 1980 and 2006 the number of primary lung cancer resections each year was always between 3000 and 4000. In 2010 the number exceeded 5000 for the first time. This no doubt reflects a welcome expansion of the thoracic surgical workforce.

The second important finding is that this increase in activity has been achieved while maintaining generally low in-hospital mortality rates of around 2% overall for patient with resections for primary lung cancer.

The third finding that struck me is the high, though not universal, use of PET scanning in patients being assessed for radical treatment of primary lung cancer. This appears to have reached a plateau of around 80%. The use of PET scanning has no doubt contributed to the very low rate of open / close operations (1.9%).

Taken with the findings from the National Lung Cancer Audit, this report provides encouraging evidence that surgical treatment for lung cancer is improving in this country. We can be optimistic that this will in turn lead to better survival rates.

**Prof. Sir Mike Richards**

**National Cancer Director, England**



## Introduction

It is now over three years since the first SCTS report on thoracic activity<sup>1</sup>. In that time there have been further developments in the way thoracic surgery is organised and practiced throughout the United Kingdom and Ireland.

Probably the most important change is that as a result of a veritable explosion in consultant surgical appointments there now are more doctors practicing thoracic surgery in the United Kingdom and Ireland than at any time in history. This has undoubtedly improved the overall care of all patients with all thoracic diseases, especially those suffering from lung cancer. This increase in consultant numbers has been brought about by a number of factors:-

1. The increasing complexity of modern medicine and the increase in the knowledge base of cardiothoracic surgery has meant that the two arms of the specialty have become more defined from each other. This is especially the case in the training of future surgeons, which was recognised by the four Royal Colleges of Surgeons and their training committees. From 2002 mainly because of a lack of suitable candidates for consultant thoracic surgical posts, specific training appointments were made to produce fully trained thoracic (as opposed to cardiothoracic) surgeons who could undertake a dedicated thoracic practice. Over the last few years these trainees have been appointed to consultant posts. The momentum from this initiative in addition to other developments in the speciality has resulted in a definite shift in the aspirations of cardiothoracic trainees such that many more have expressed a desire to pursue a career in general thoracic surgery.
2. The constraints of the new consultant contract, which was implemented in 2004, and the developments thereafter have meant that it is more difficult to have sufficient time within the working week to have enough theatre and clinic capacity to contribute effectively to both cardiac and thoracic surgery. Hospital Trusts have realised this and for several years the appointment of *pure* cardiac or thoracic surgeons has been the rule, rather than mixed practice cardiothoracic surgeon which was the norm previously. Also consultants who were appointed as cardiothoracic surgeons have increasingly made the decision to specialise in cardiac or thoracic surgery by handing on part of their practice to colleagues. Of course this increasing specialisation is a feature of modern medicine generally.
3. The NHS cancer plan introduced in 1998 has correctly focussed on organisation of services such that patients with cancers are diagnosed and treated efficiently. All patients are discussed by teams of cancer specialists which meet on a regular and frequent basis, usually weekly. The necessity to have a thoracic surgeon present at the lung cancer meetings to provide expert opinion means that more individual surgeons are needed. This, along with the introduction of targets for cancer care (where patients have their pre-operative tests and surgery arranged within a finite time period) has resulted in a definite improvement in lung cancer treatment with more and more patients having the chance of cure with surgery. Close working with others in the team (chest physicians, oncologists, radiologists pathologists) has led to a real improvement in the overall care of lung cancer. Already small but significant improvements in survival are being seen.
4. As well as an increase in consultant numbers there have been other organisational changes which benefit thoracic surgical patients. The development of thoracic surgical nurse practitioners has helped enormously as has the creation of dedicated thoracic surgical wards for post-operative care.





In addition to the expansion in surgical manpower important developments have occurred in other aspects of thoracic surgery:

1. There has been a steady increase in the use of minimally invasive surgery for thoracic operations as a result of more surgeons being trained in these techniques. As in other branches of surgery improved results in terms of reduced pain from surgery and a faster recovery have been demonstrated. The initial concerns about inferior outcomes for cancer survival have been unfounded.
2. The place of surgery for treating thoracic malignancies, especially primary lung cancer and mesothelioma continue to be more clearly defined, making sure that as many patients as possible can benefit from surgery and preventing inappropriate surgery for those for whom better treatments are available. Improved staging with the use of PET-CT scanning is now routine. Access to endoscopic assessment of mediastinal lymph nodes using endoluminal ultrasound scanning and biopsy is also improving. Although these special tests have already been shown to benefit patients they often increase the complexity of assessment and frequently provide more questions than answers for clinicians when trying to decide on the best treatment. The dilemmas that arise require regular and frequent input from thoracic surgeons to help the rest of the cancer team.
3. The advantages of combining chemotherapy with surgery for lung cancer have been more clearly demonstrated over recent years. Although there was optimism over the use of pre-operative treatment a number of studies have shown that there are clear benefits to giving the drugs after surgery and restricting treatment to patients with specific tumour stages. This knowledge has led to more accurate staging information being obtained at the time of surgery, especially with respect to mediastinal lymph node dissection and sampling. Pathological analysis of resected tumours has improved and it is likely that this will become more sophisticated as further tests are developed. It is anticipated that these improvements will lead to more targeted adjuvant treatments being available with more patients achieving a cure.



## Thoracic Surgical Audit

The Society for Cardiothoracic Surgery has always been at the forefront of surgical audit. Although the thrust of activities over the last decade has been within the cardiac surgery, thoracic surgical audit continues to develop. This report aims to summarise the current situation.

All hospitals carrying out thoracic surgery in the United Kingdom and Ireland have contributed to the SCTS National Thoracic Surgical Register since its inception in 1980. Accrual of data on activity has regularly been over 90% complete, reflecting an astounding long-term commitment to audit amongst surgeons in the speciality. More detailed audit based on patient-specific information has been slower to develop mainly due to funding issues but is gathering momentum. The National Lung Cancer Audit has been a stimulus to this; the audit provides an annual publication on its activities, which has further stimulated interest in more sophisticated audit by thoracic surgeons.

## Organisation of this report

This 2011 thoracic surgical report contains three sections:

1. Information from the Thoracic Surgical Register as follows:
  - A National activity from 1980 to 2010.
  - B Hospital-specific reports on the most recently collected three-year period of activity (2007-2009).
  - C Comparison with the previously published analysis of 2003-2005 hospital activity.As in the 2008 report these sections are subdivided into:
  - i. Total surgical activity
  - ii. Lung resections
  - iii. Operations for pneumothorax and
  - iv. Oesophagogastric surgery.
2. Information obtained from the SCTS Thoracic Database on treatment of primary lung cancer.
3. A summary of the surgical treatment of lung cancer for 2009 using information from the 2011 publication of the National Lung Cancer Audit.





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# **The Thoracic Surgical Register**



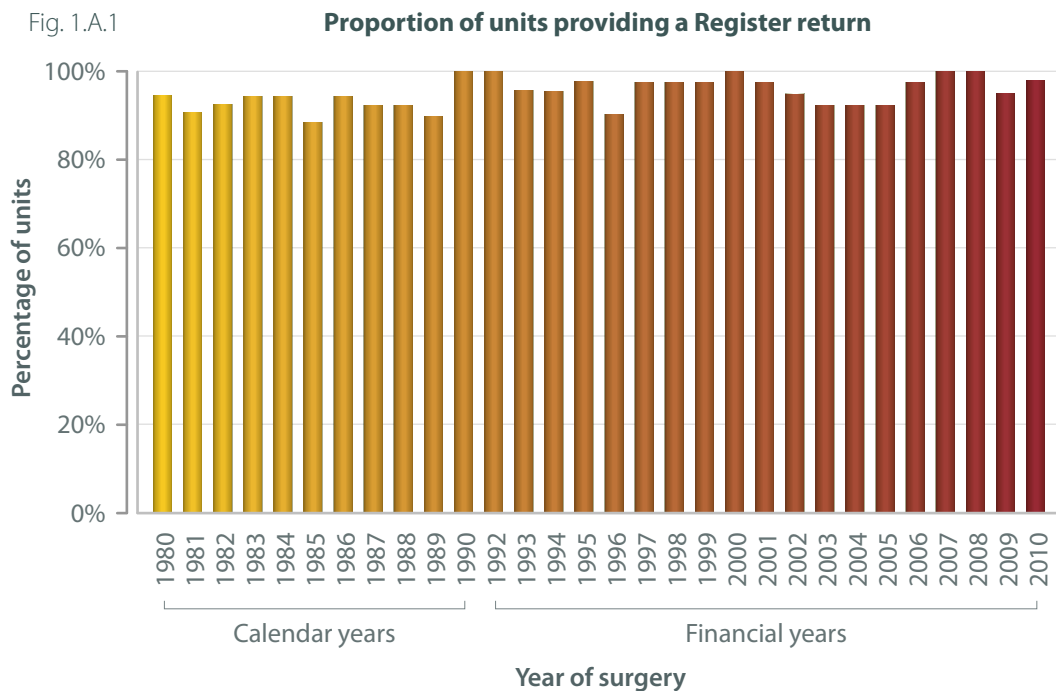
### The SCTS Thoracic Surgical Register

Since 1980 all thoracic surgeons in the United Kingdom and Ireland have contributed data on annual surgical activity to the Society. A report on national activity is then compiled and reported to members every year. The fields specified within the Register have changed over the years, reflecting changes in the spectrum of operations carried out by thoracic surgeons. Some operations are no longer carried out at all and new ones have been introduced. The most recent iteration of the Thoracic Register occurred for the financial year ending 2010 and is shown along with the total returns for that year in Appendix 1.

The only outcome measure has been in-hospital death after surgery. The initial philosophy of the project was to allow surgeons to benchmark their activity against the national picture. There was a brief initiative at the end of the last millennium to collect individual surgeon-specific mortality for the operation of lobectomy for primary lung cancer. As explained in the 2008 report it was shown very quickly that this marker proved an unhelpful measure of surgical skill and quality of care, and was abandoned in favour of reporting hospital specific outcomes. This has avoided the very real concern of promoting risk-averse behaviour, which may result from surgeon-specific reporting.

### Completeness of data collection within the Register

Always above 90% and frequently capturing 100% of activity the Register is a very good description of thoracic surgery in the United Kingdom and Ireland. Although simple in concept it involves a significant amount of work by members of the SCTS to ensure timely reporting which is to the surgeons' credit.



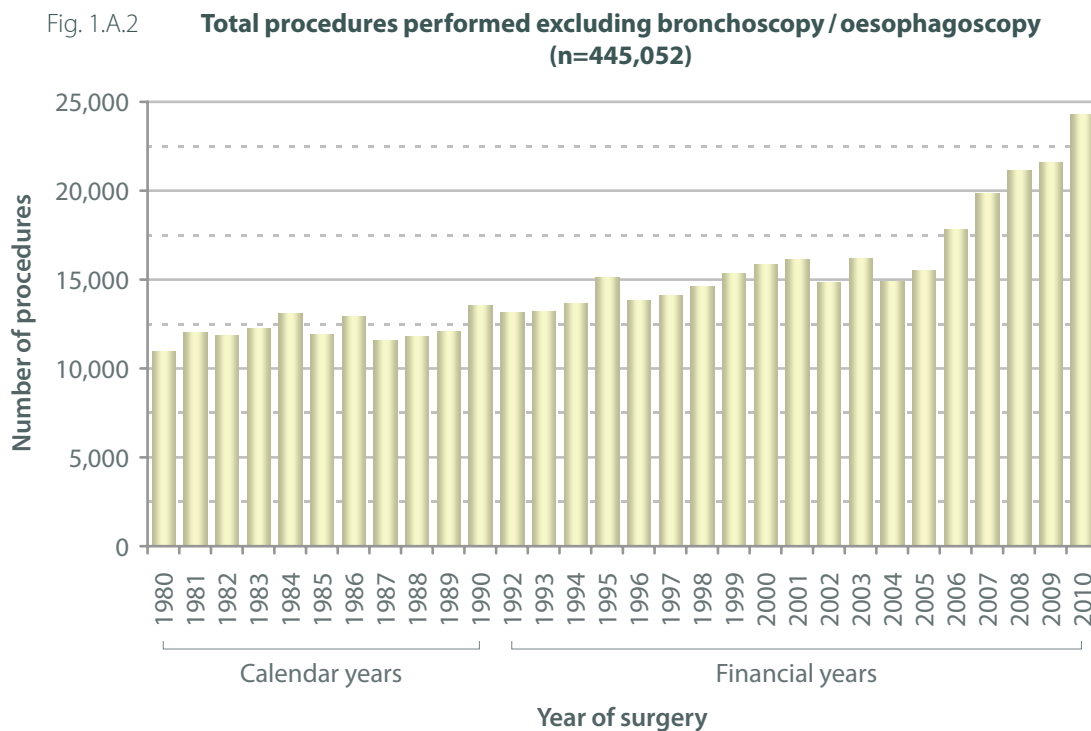


### National activity 1980-2010

It is clear in most parts of this the section that there has been a dramatic rise in activity over the last few years. This is explained principally by the increase in the number of thoracic surgeons and surgical infrastructure within the country as described in the introduction to the report.

#### Total surgical activity

This chart provides data on the total number of surgical procedures.

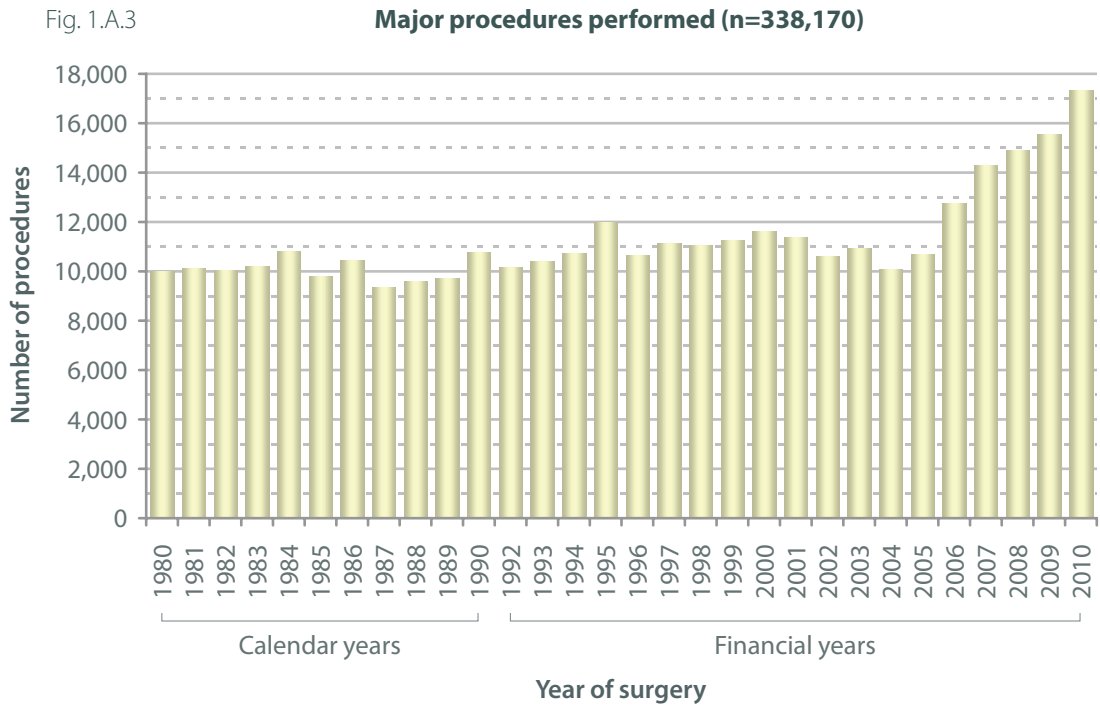


The procedures of bronchoscopy and oesophagoscopy have been excluded from these figures. There has always been a huge variation in the number of these mainly diagnostic procedures reported throughout the country and it is likely that most of the examinations are done in combination with other operations such as a lung resection. It therefore inappropriate to include diagnostic endoscopies in our audit returns and from the year 2009-2010 only therapeutic bronchoscopy and oesophagoscopy figures are collected.



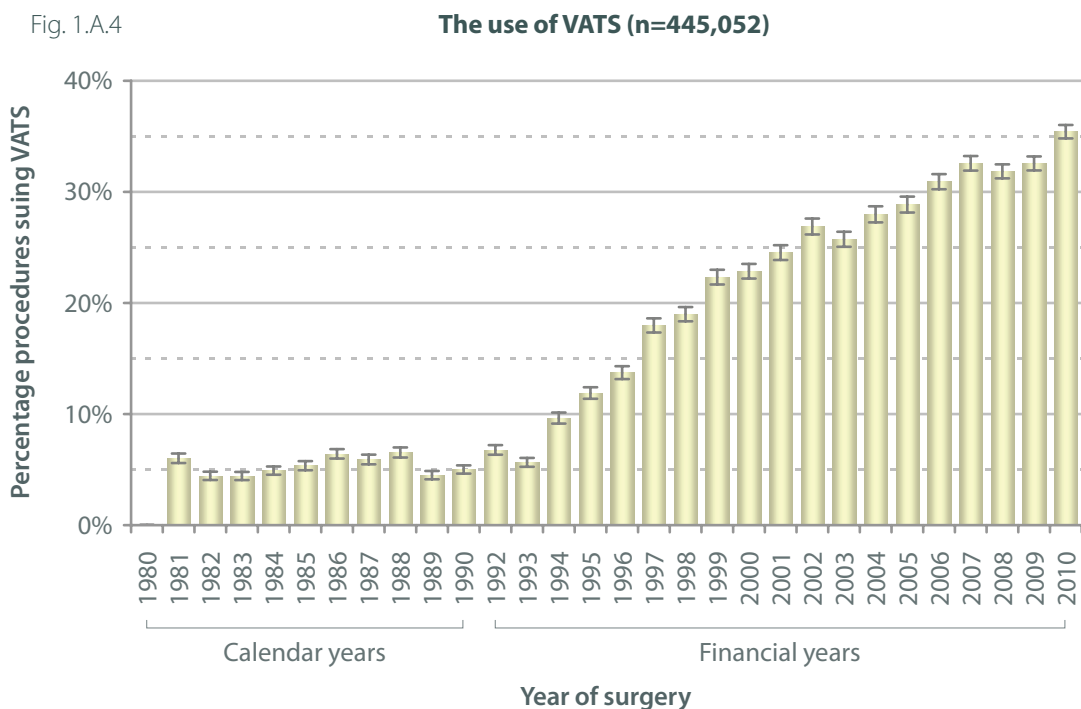
### Major procedures

National activity



### Open surgery versus VATS

For the purposes of the Register open surgery means the use a large incision with direct visualisation of the thorax, whereas VATS (video-assisted thoracic surgery) refers to surgery carried out using indirect imaging using an endoscope and a video camera. Inevitably there are some definition issues and overlap between the two techniques. Nevertheless there has been an undoubted increase in the use of VATS over recent years.

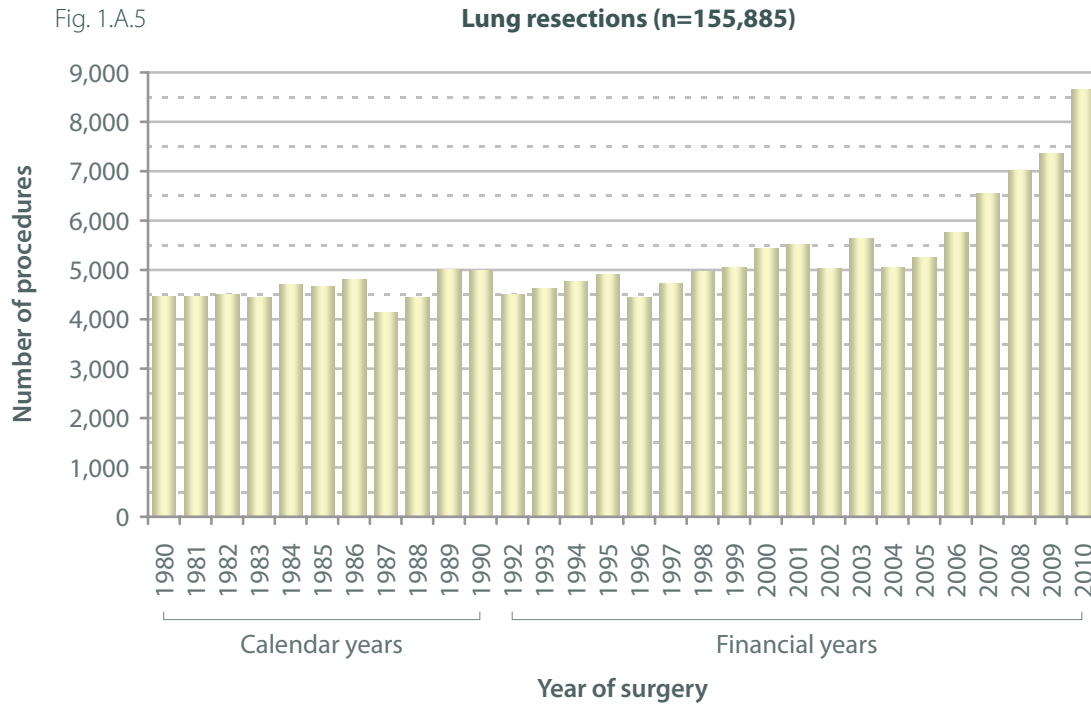




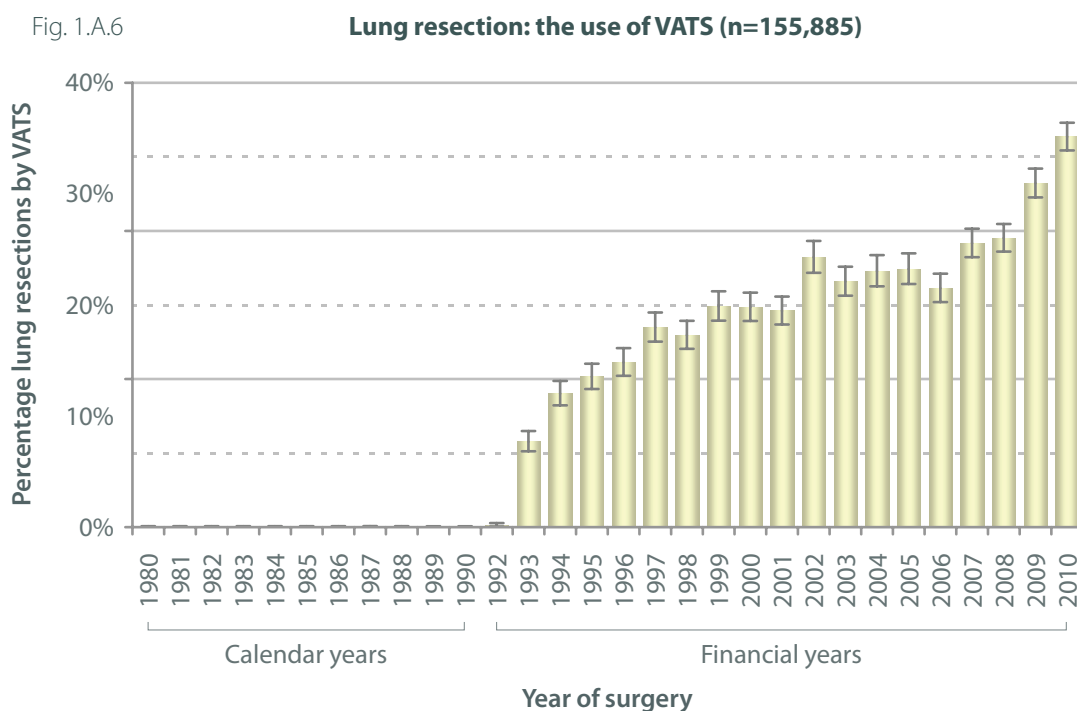
## Lung resections

The following charts describe all operations that involve resections of lung tissue, except those for pneumothorax. They include diagnostic lung biopsies as well as therapeutic procedures.

### Total lung resections



### Open versus VATS lung resection

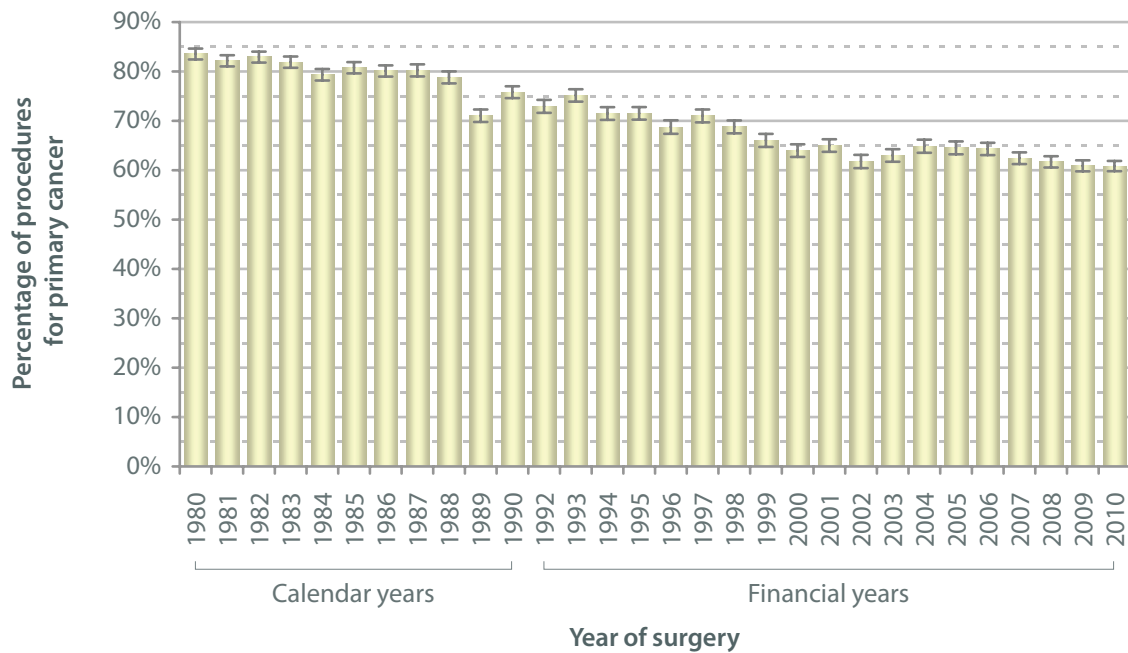




### The pathology of lung resections

Along with an overall increase in the total number of lung resections there has been a relative increase in resections for conditions other than primary lung cancer. Although not specified in the register this probably represents an increase in the number of diagnostic lung biopsies. Also it is likely that improvements in overall treatment of secondary lung malignancies, especially colorectal cancer has increased the willingness of surgeons to offer surgical treatment for these patients.

Fig. 1.A.7 Lung resections: proportion carried out for primary cancer (n=155,885)

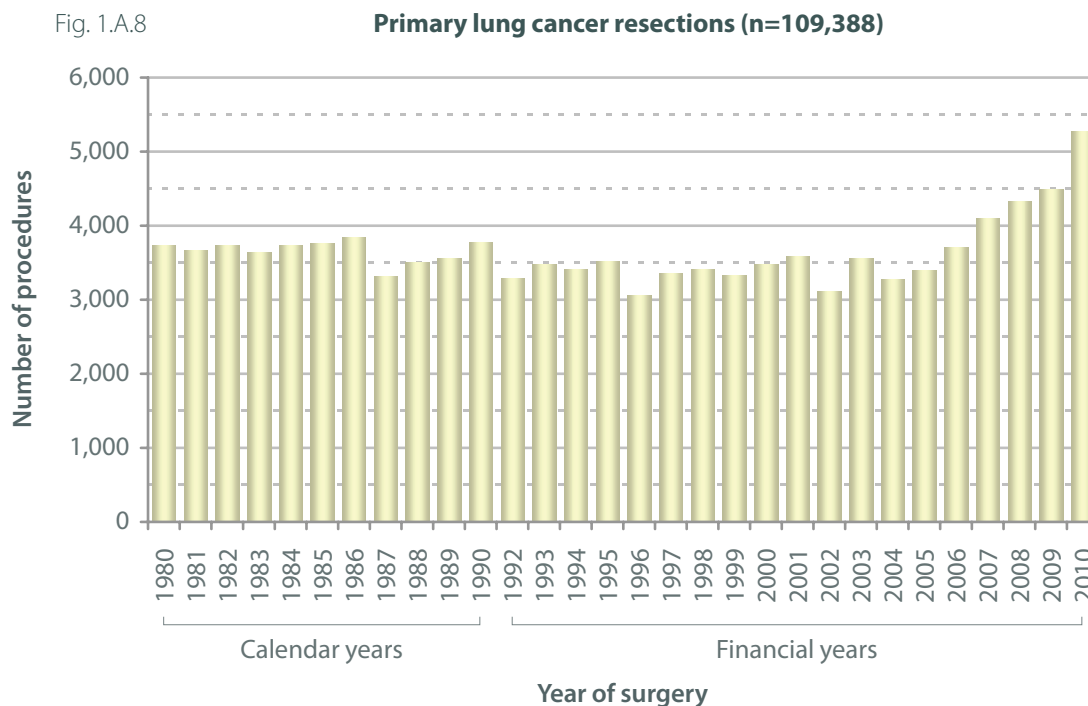




### Lung resections for primary cancer

There was a slight decline in this activity until the end of the millennium. This was a result of several factors which would have included better staging and improvements in alternative therapy, but may well have been influenced by a relative lack of access to thoracic surgery given the relative increase in cardiac surgical activity during this period. Nevertheless from 2005 onwards there has been a dramatic increase in surgery for lung cancer. This can only be due to the increasing availability of thoracic surgery generally and willingness of surgeons to accept patients of borderline operability, given the knowledge that removal of a patient's lung cancer represents their main chance of a cure. There is recent evidence that this leads to an improvement in long-term survival<sup>2</sup>.

Fig. 1.A.8





### Type of resections for primary lung cancer

There continues to be a decline in the number of pneumonectomies performed for lung cancer, reflecting an understanding of its dangers and better training. The proportion of lobectomies continues to rise, as does sub-lobar resections.

National activity

Fig. 1.A.9

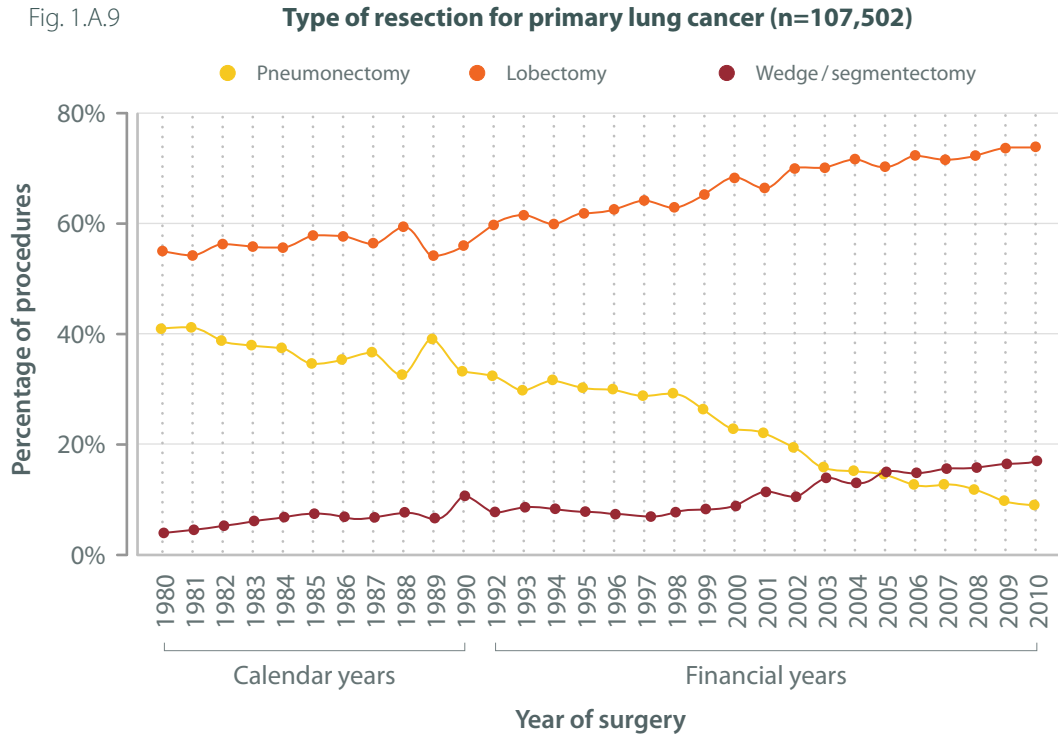
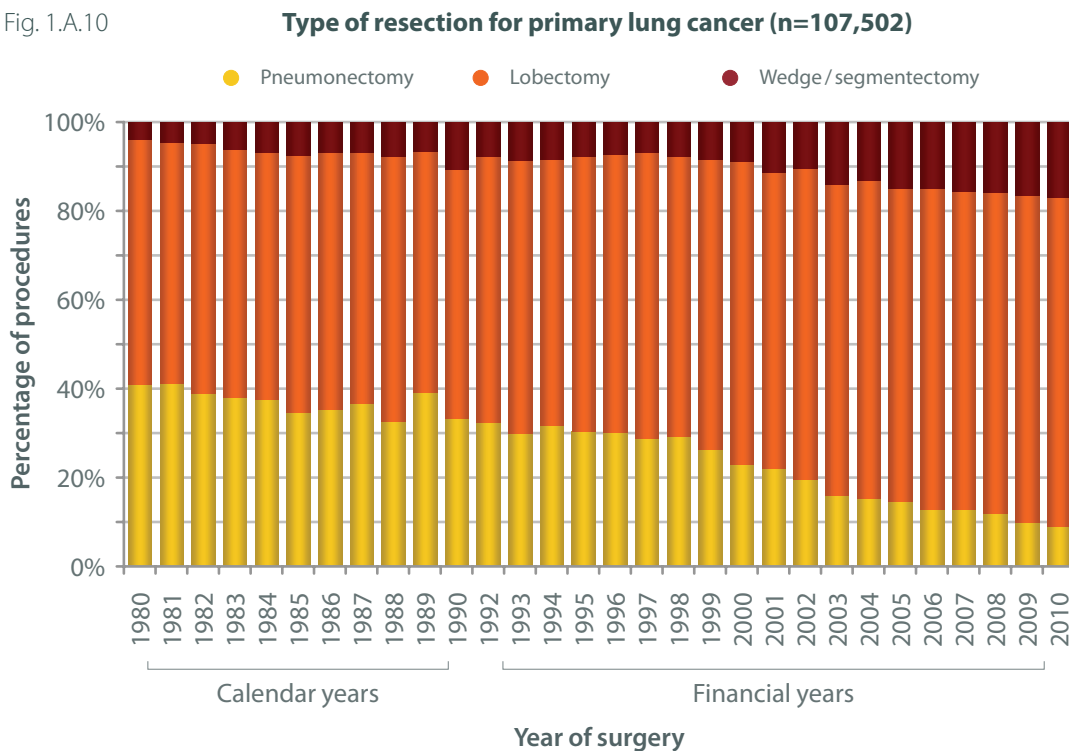


Fig. 1.A.10

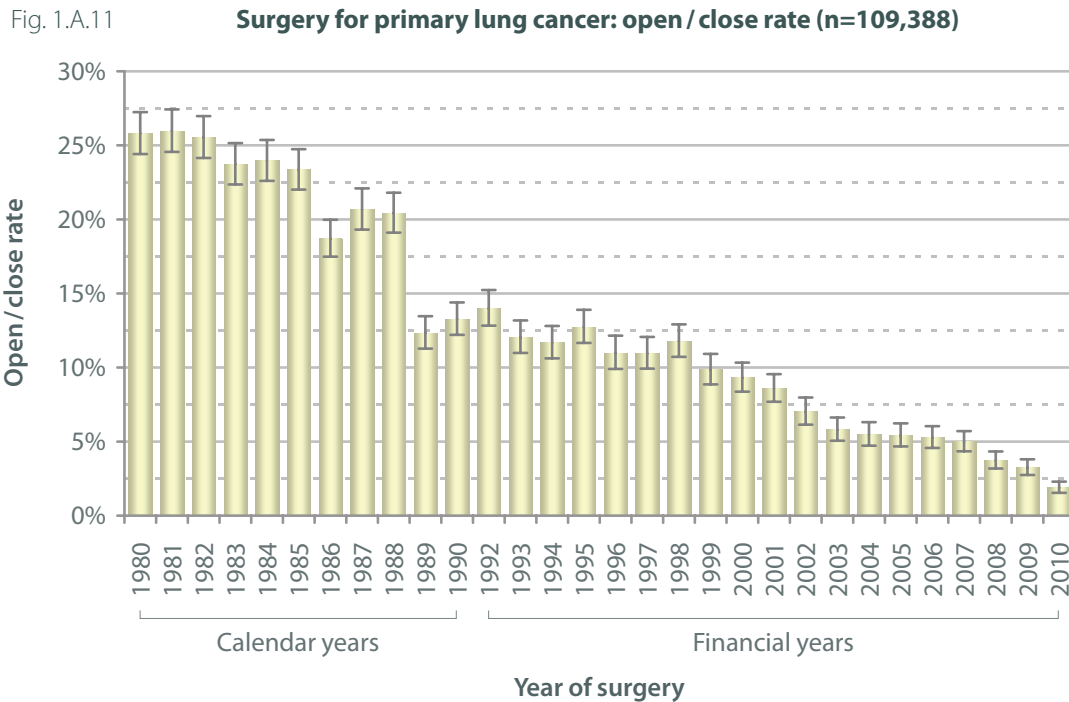






**Open / close rates in primary lung cancer surgery**

The frequency of this devastating outcome for patients (where they are taken to an operating theatre, are subjected to a major incision in their chest, but do not have their cancer removed) is now very low, especially when compared to the pre-CT era when it was over 25%. This reflects much more accurate pre-operative staging, particularly with the use of PET scanning and a better understanding of mediastinal nodal disease. There continues to be a philosophical debate as to what the rate should be. A high figure may represent poor selection and intra-operative unwillingness to push the boundaries of surgery, whereas a low figure may represent too conservative selection coupled with over-aggressive surgery. The latest figure from 2009-10 is 1.9%





### In-hospital mortality following surgery for primary lung cancer

Like most forms of cancer surgery, removal of a primary lung malignancy is a destructive operation, for which patients must have sufficient pulmonary reserve to recover successfully. Most of our patients have been long-term smokers and in addition to lung cancer have developed more chronic chest diseases such as asthma, bronchitis and emphysema. This diminishes their pulmonary reserve in virtually all cases, sometimes very significantly which can preclude safe surgery. Although they still have potential benefits from removal of their tumours in that they can escape the lethal early effects of an untreated cancer, they are at increased risk of pulmonary complications from surgery which is the principle cause of death after lung resections. As surgery remains the most effective curative treatment for early stage lung cancer when selecting patients for surgery thoracic surgeons continually need to weigh up the conflict between the long term benefits of resection of patients' tumours and short term adverse outcomes of the operations. Successful resolution of this conflict ensures that as many as possible patients receive surgery for lung cancer. Inevitably this results in the inclusion of higher-risk patients in thoracic surgical practices.

The following charts show a significant decline in mortality for all patient groups over the last 10 years. Combined operative mortality for all patients having lung cancer surgery has almost halved from 3.8% in 2001-2002 (118 deaths out of 3,112 operations) to 2.1% in 2009-2010 (112 deaths; 5,265 operations). It is unlikely that mortality after lung resections for primary cancer will fall further given the overall significant improvements in long-term survival of patients having surgery when compared to non-surgical treatments.

Fig. 1.A.12 Crude in-hospital mortality rate following pneumonectomy for primary cancer (n=28,733)

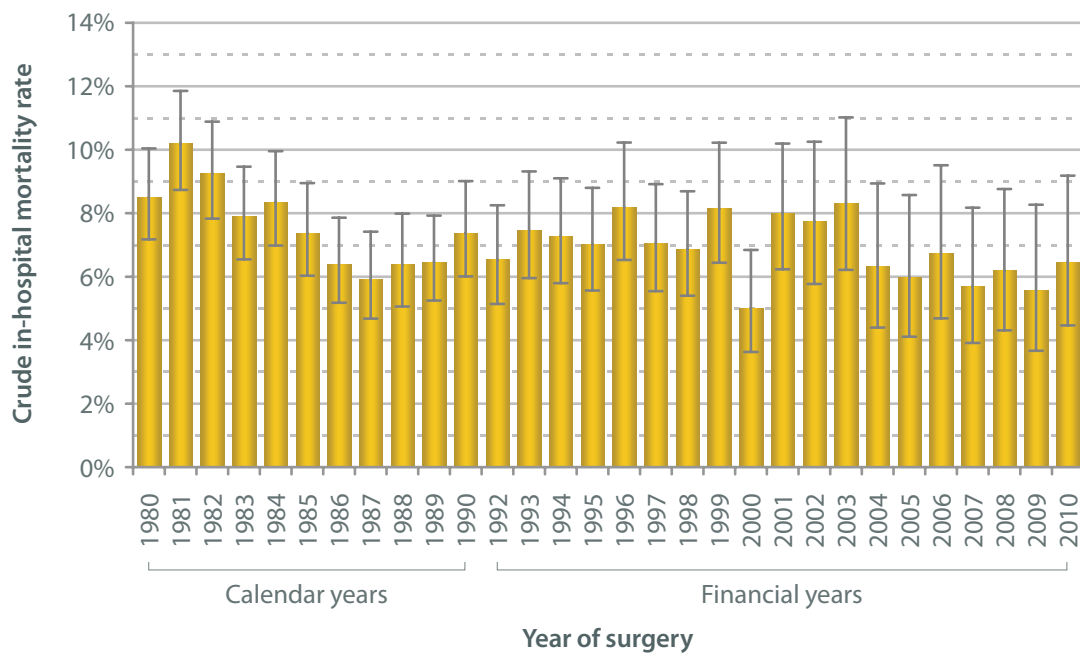




Fig. 1.A.13 **Crude in-hospital mortality rate following lobectomy for primary cancer (n=68,208)**

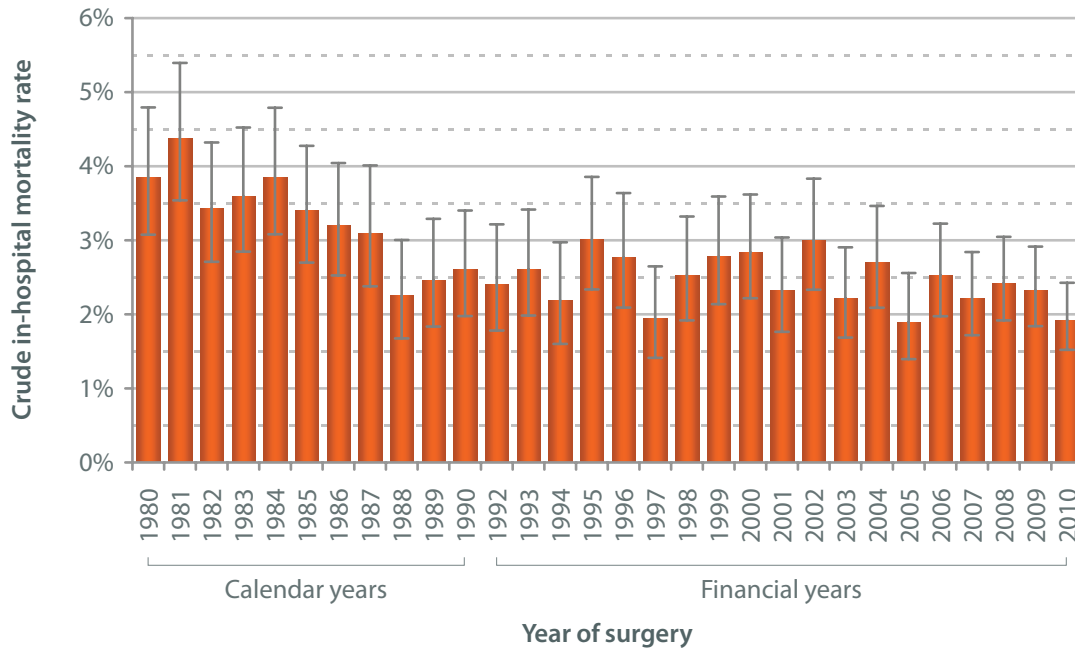
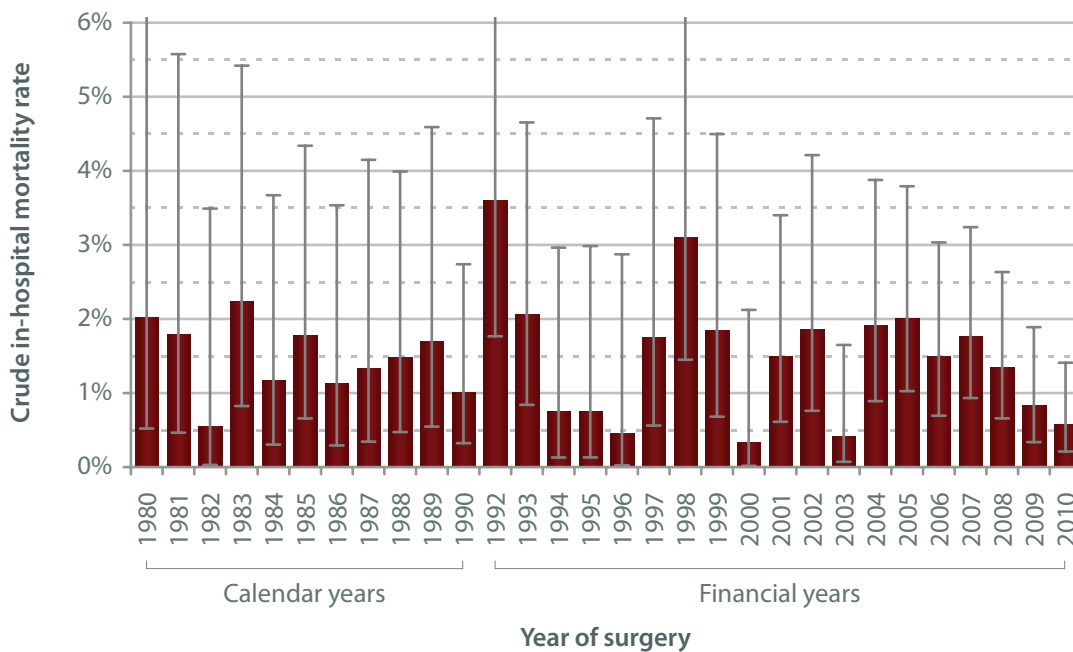


Fig. 1.A.14 **Crude in-hospital mortality rate following wedge / segmentectomy for primary cancer (n=10,561)**

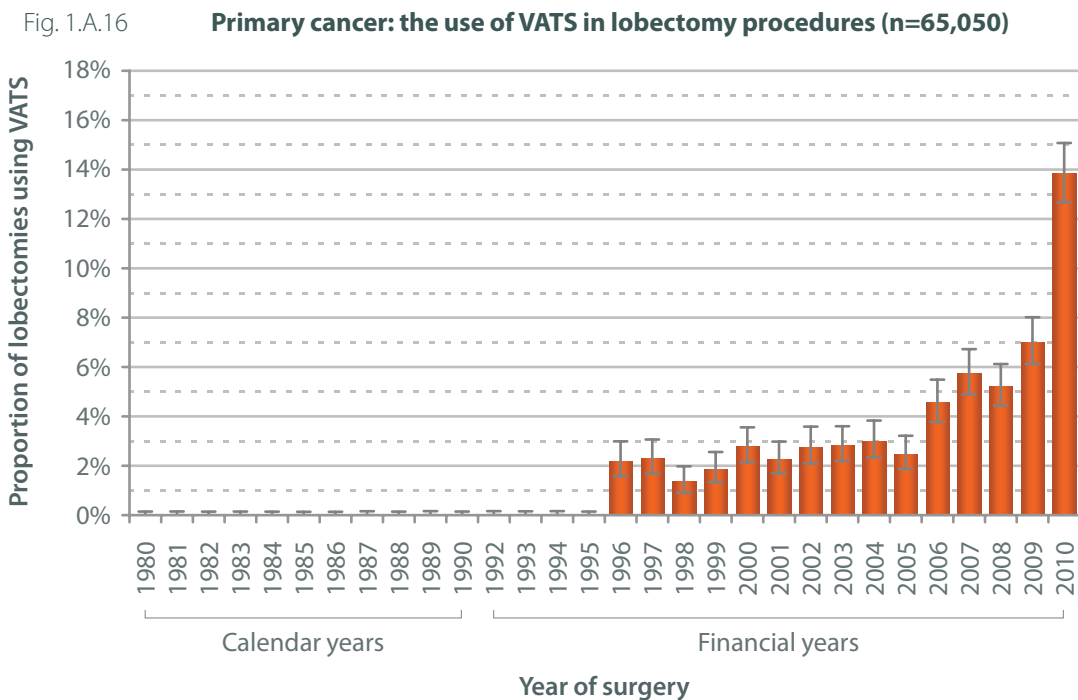
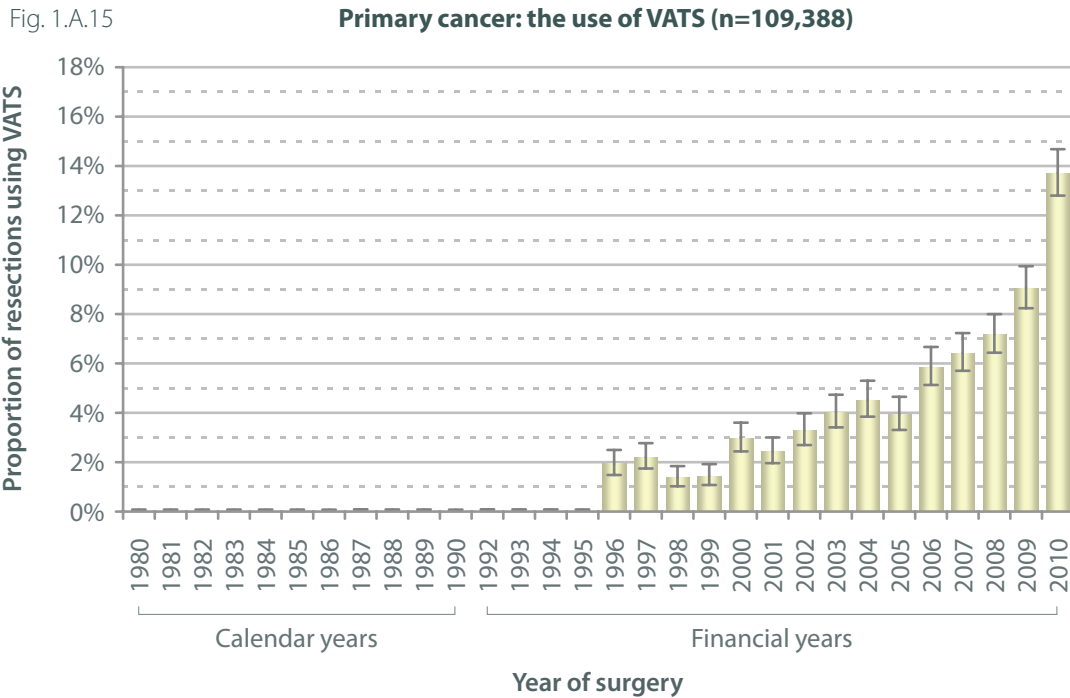


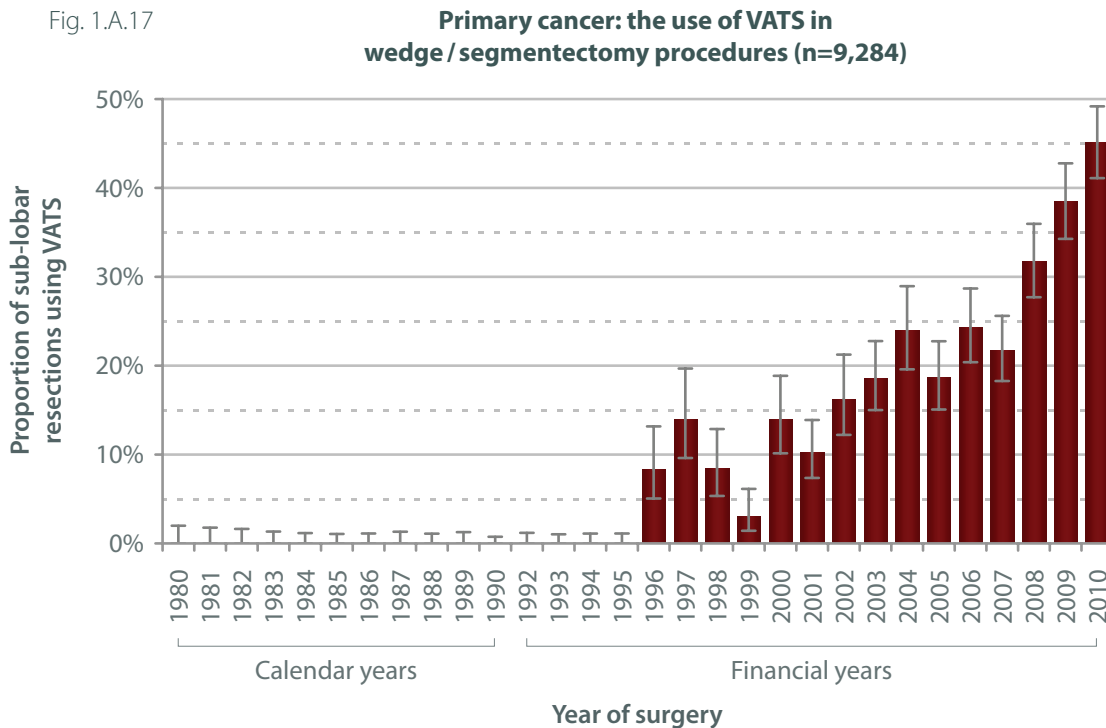


VATS resections for primary lung cancer

A steady increase especially over the last 5 years. Nevertheless the application of these techniques is still more limited than envisaged. It is likely that this is due to not enough surgeons having access to training in VATS lobectomy which is a more complex procedure than an open lobectomy. In addition, VATS operations can take longer especially when being introduced into practice which can lead to a limitation on their application due to constraints on theatre time.

National activity

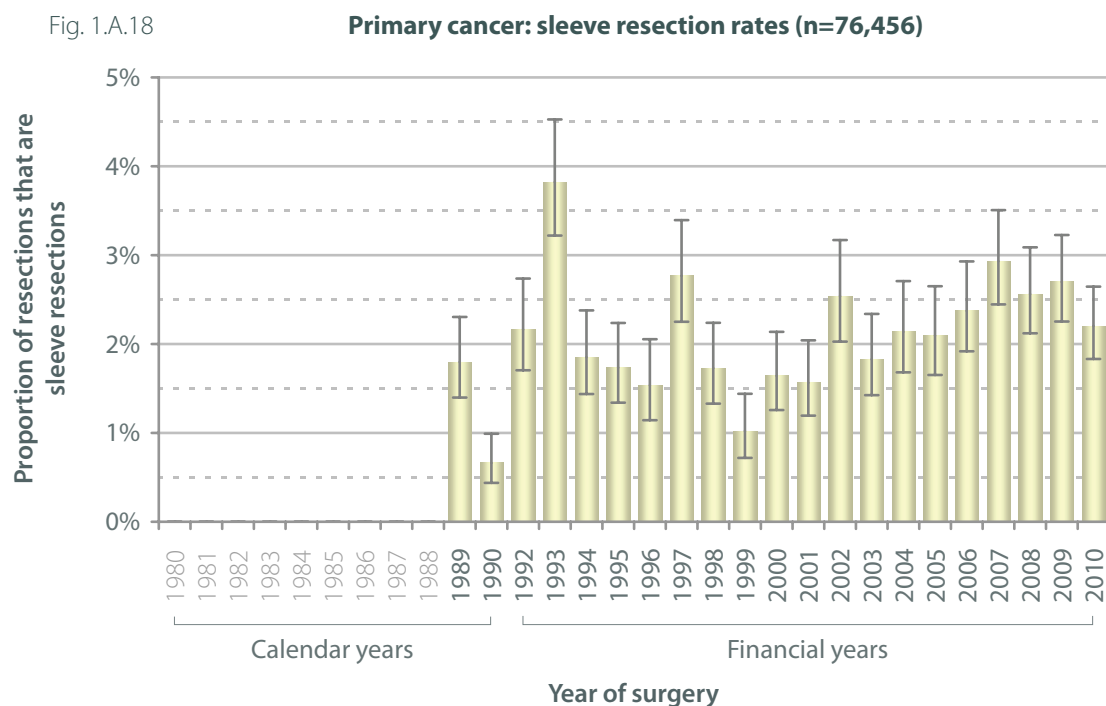




**Sleeve resections**

Although often described as a quality marker for lung cancer surgery, the frequency of this operation remains low. This is likely to be due to anatomical constraints that limit the applicability of the surgery.

Sleeve resections have only been collected as a separate procedure since 1989.

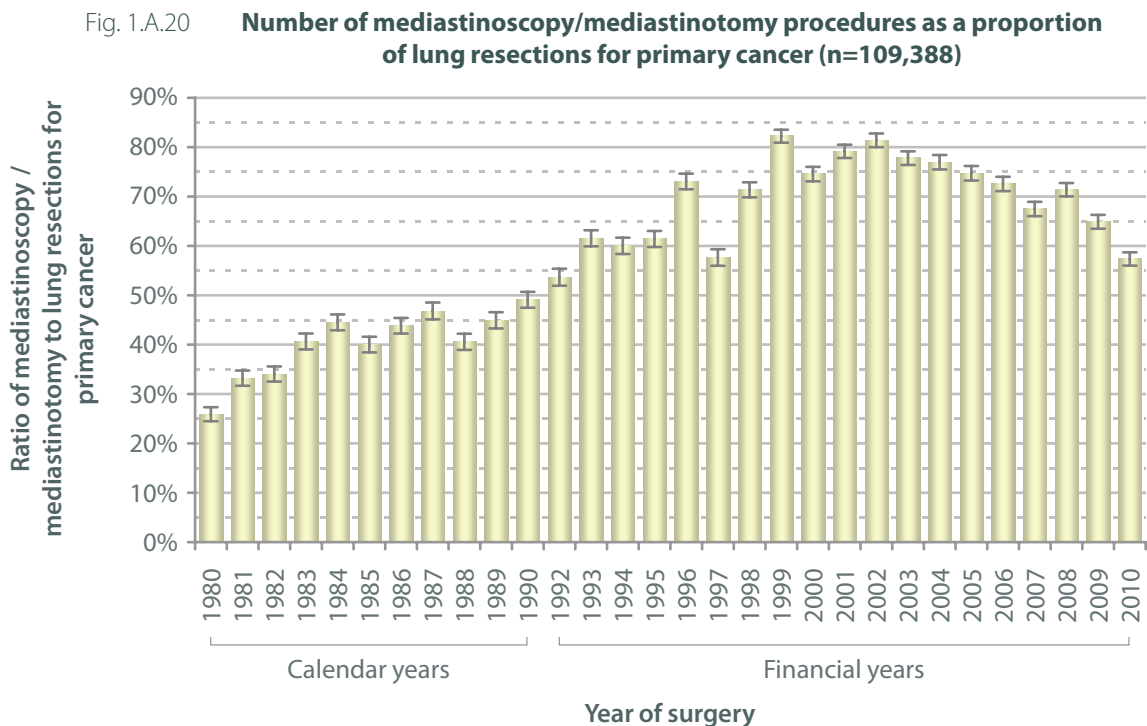
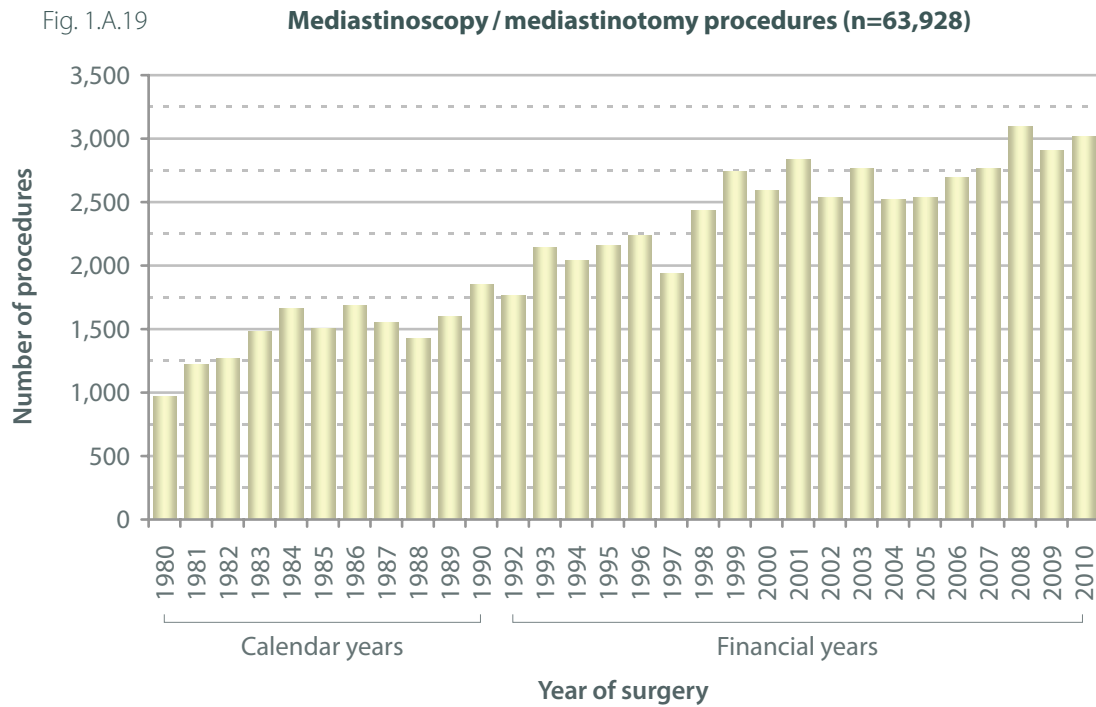




Mediastinoscopy / mediastinotomy

There appears to have been a definite decline in the need for these procedures within lung cancer management over the last 5 years, presumably as a result of the increasing availability of alternative strategies for staging the mediastinum e.g., PET-CT scanning, endobronchial ultrasound. Nevertheless the overall activity has increased, presumably due to the willingness of thoracic surgeons to offer the service for the management of conditions other than primary lung cancer.

National activity





### Conditions other than primary lung cancer

This section refers to lung resections for conditions other than primary lung cancer. It includes surgery for metastatic disease, benign tumours and various types of infections and inflammatory conditions. It also includes lung resections carried out for diagnostic reasons. As in other areas there has been a steady increase in activity and an increase in VATS resections.

Fig. 1.A.21 Lung resections for pathologies other than primary lung cancer (n=46,497)

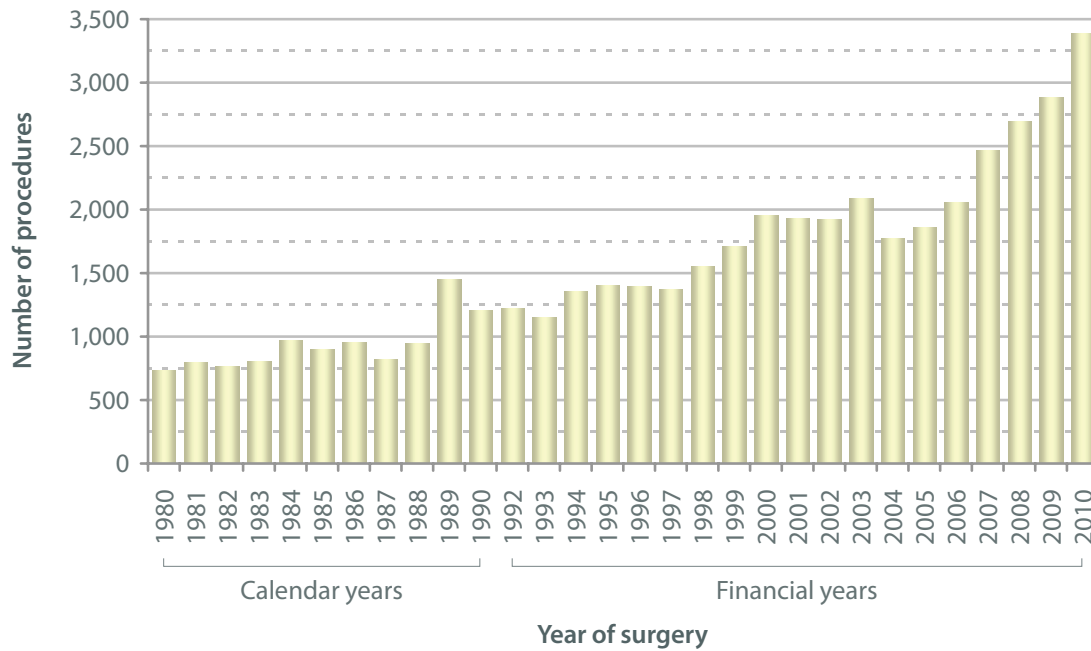
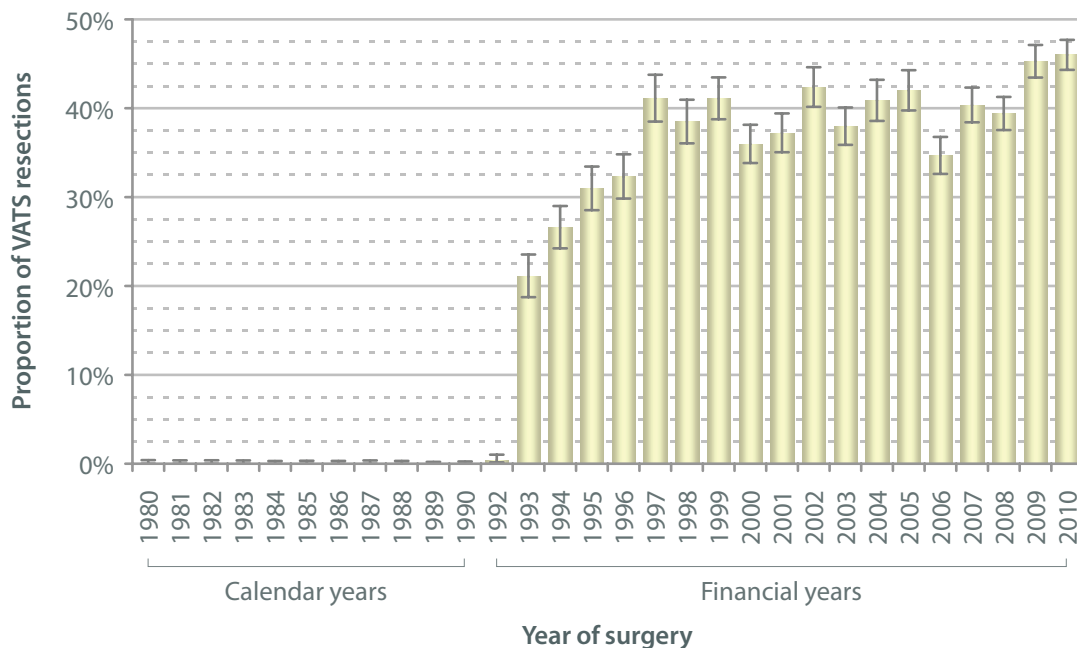


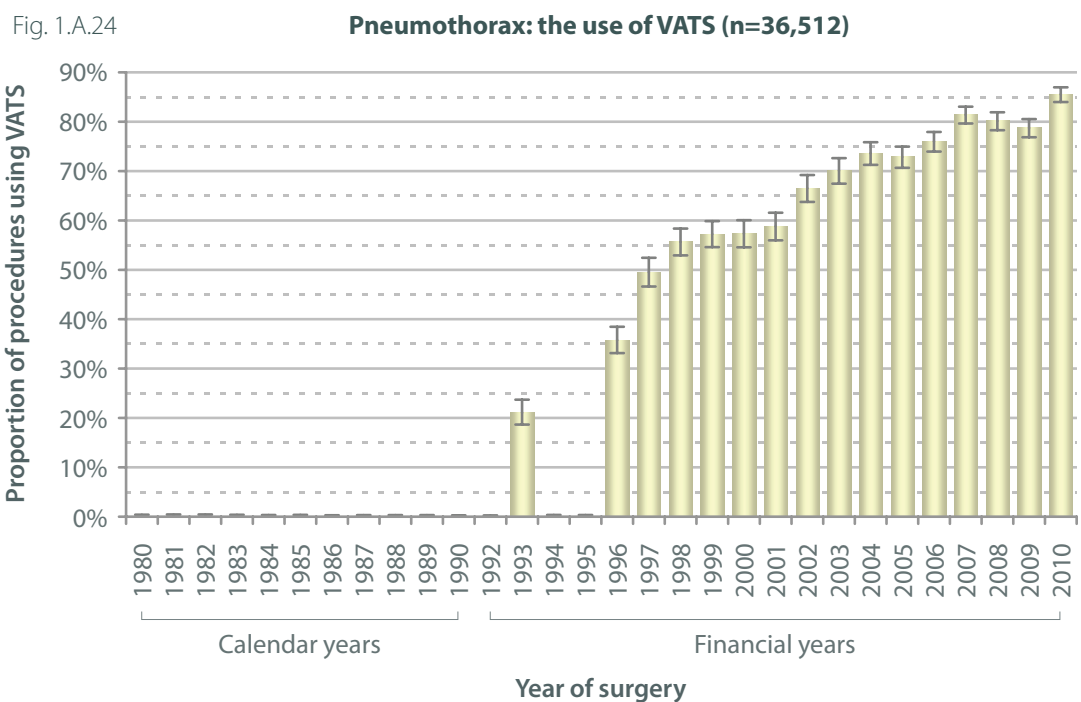
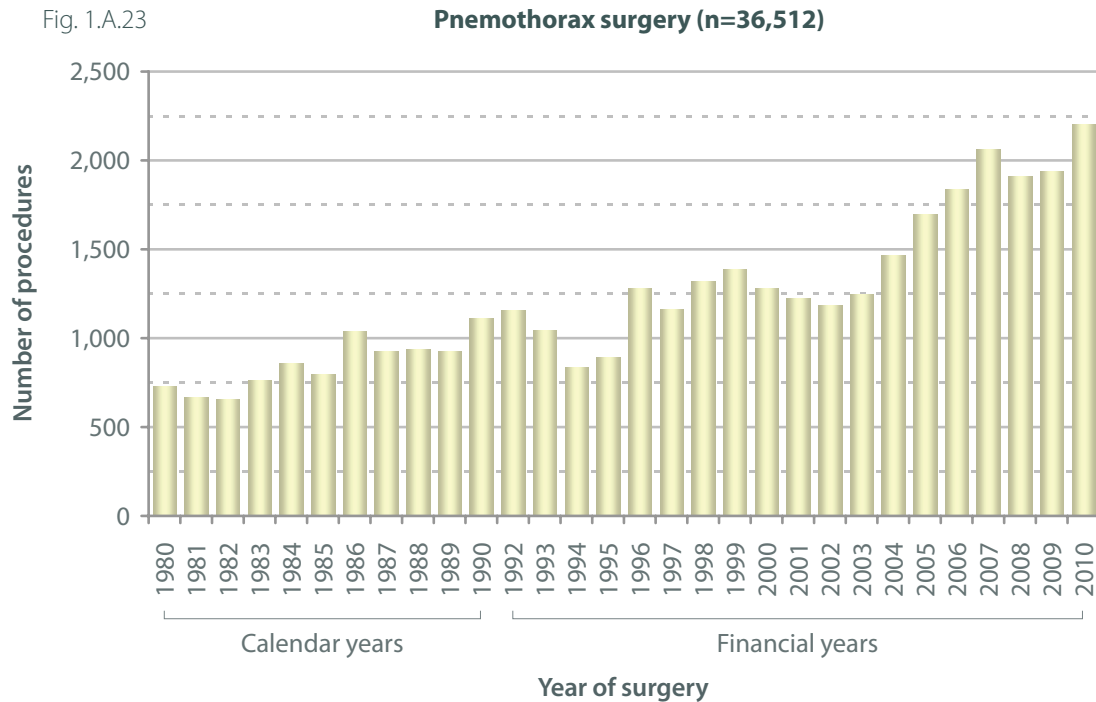
Fig. 1.A.22 Pathologies other than primary cancer: the use of VATS (n=46,497)





### Pneumothorax surgery

Patients require surgery for recurrent episodes of pneumothorax or when the lung continues to leak air despite pleural drainage. There is general agreement within the thoracic surgical community as to which patients should be offered surgery and the British Thoracic Society has produced guidelines on the management of pneumothorax<sup>3</sup>. Nevertheless, as with lung cancer surgery, there has been a dramatic rise in the numbers of procedures carried out for patients in the last five years, presumably once again due to increasing numbers of thoracic surgeons being available, as well as an increase in willingness amongst chest physicians to refer patients for surgery. The vast majority of pneumothorax operations are now carried out using VATS techniques.







**Mortality after pneumothorax surgery**

The Register includes all patients requiring surgery for pneumothorax from both primary and secondary categories. General speaking patients with secondary pneumothorax are more complex and may be more difficult to treat with VATS surgery. This may explain the higher death rate for open procedures.

Fig. 1.A.25 **Pneumothorax: crude mortality rate following open procedures (n=20,295)**

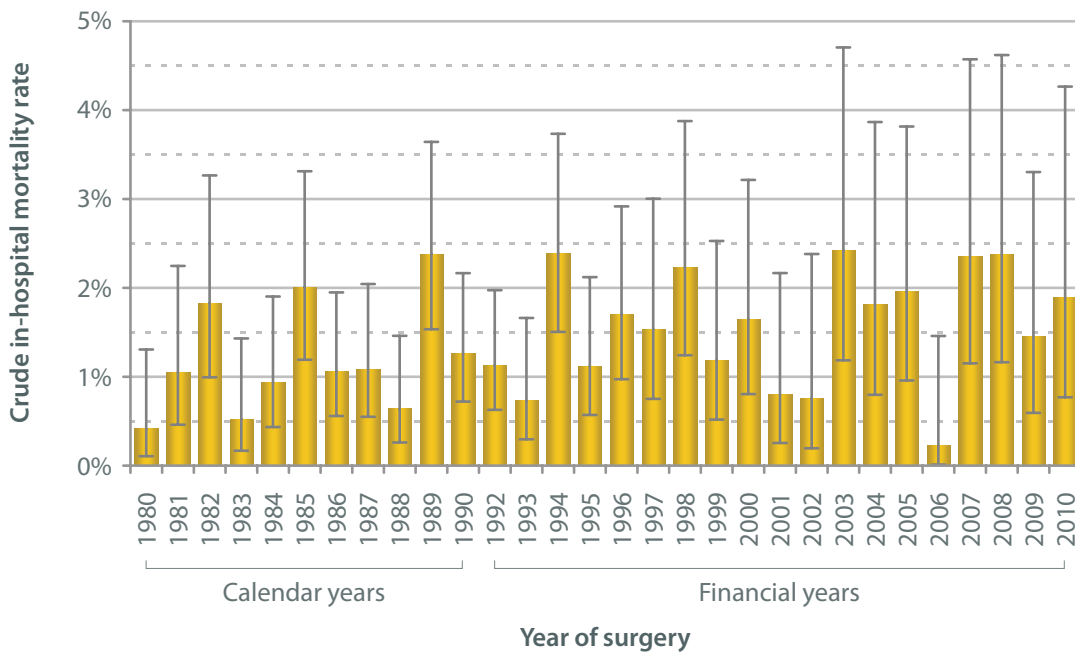
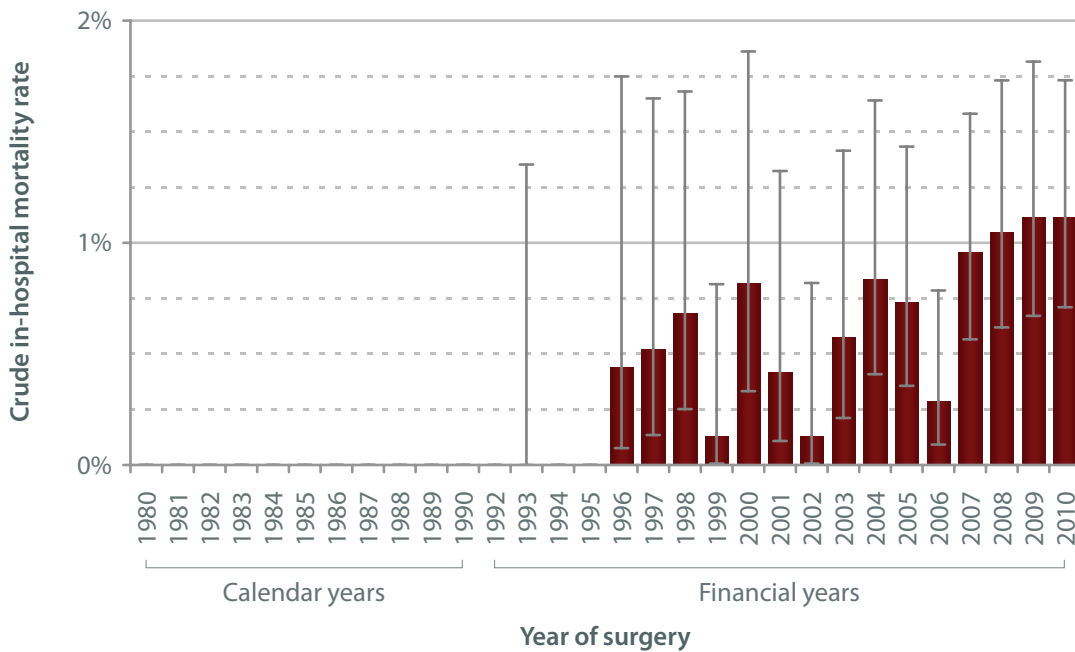


Fig. 1.A.26 **Pneumothorax: crude mortality rate following VATS procedures (n=16,217)**

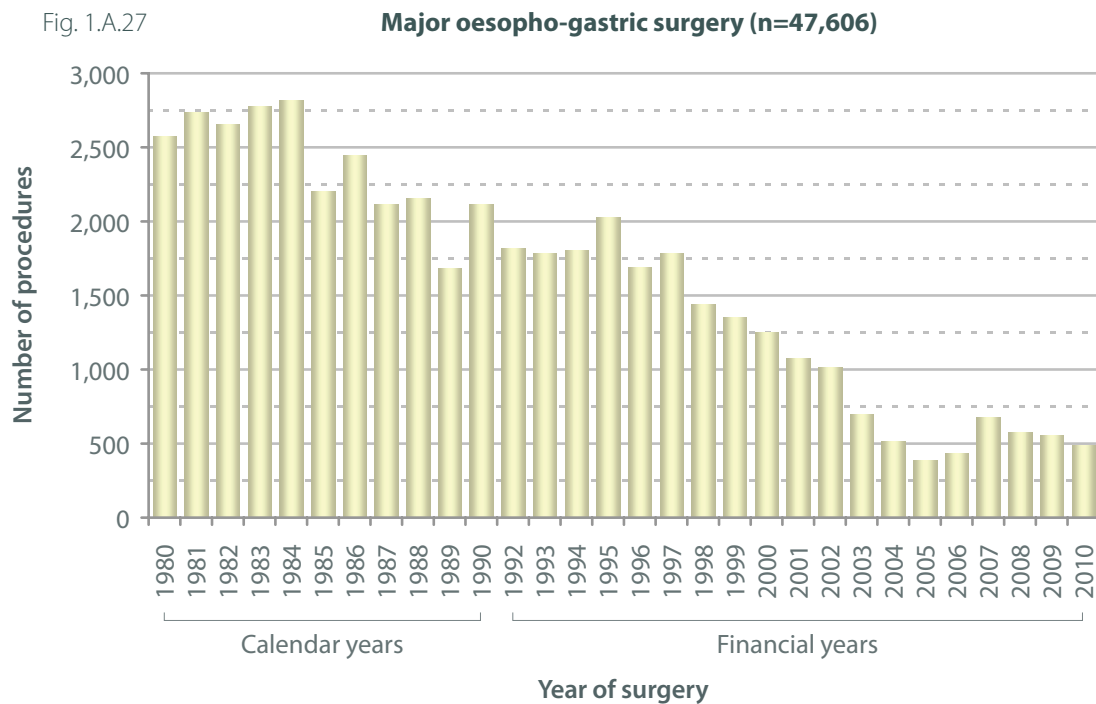




### Oesophago-gastric surgery

As shown in the last report very few oesophagogastric operations are now carried out within the speciality of thoracic surgery, as compared to the era when the Register started in 1980, although the rapid decline in numbers of procedures carried out up until the year 2005 has stabilised. This type of surgery has largely been absorbed within the newer speciality of Upper GI (gastrointestinal) Surgery. Nevertheless a number of thoracic surgical hospitals still provide a service, especially with respect to oesophageal cancer treatment, and have contributed data to the recently published National Oesophagogastric Cancer Audit (NOGCA)<sup>4</sup>. In-hospital mortality after cancer resections when carried out in thoracic surgical units for the year 2009-10 was 2.6%. This is well below the figure of 5.1% reported as the overall average in the national audit. Closer integration of upper GI and thoracic services may further reduce the overall national death rate for this disease.

National activity





Surgery for malignant disease

Fig. 1.A.28

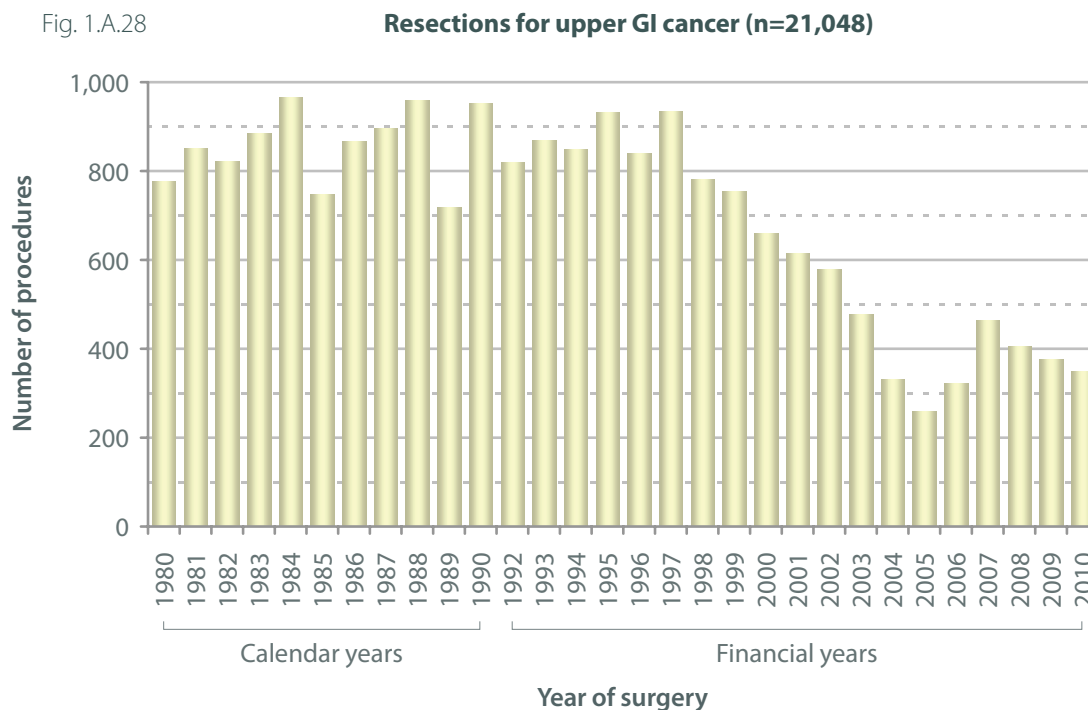


Fig. 1.A.29

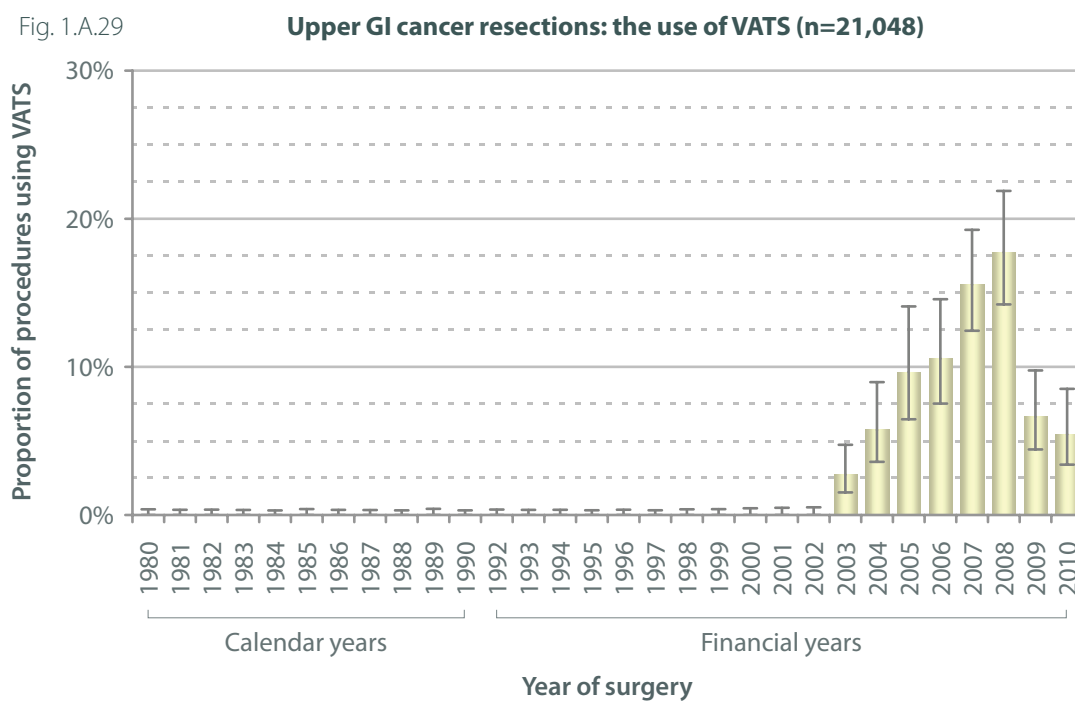




Fig. 1.A.30

Upper GI cancer resections: open / close rate (n=21,048)

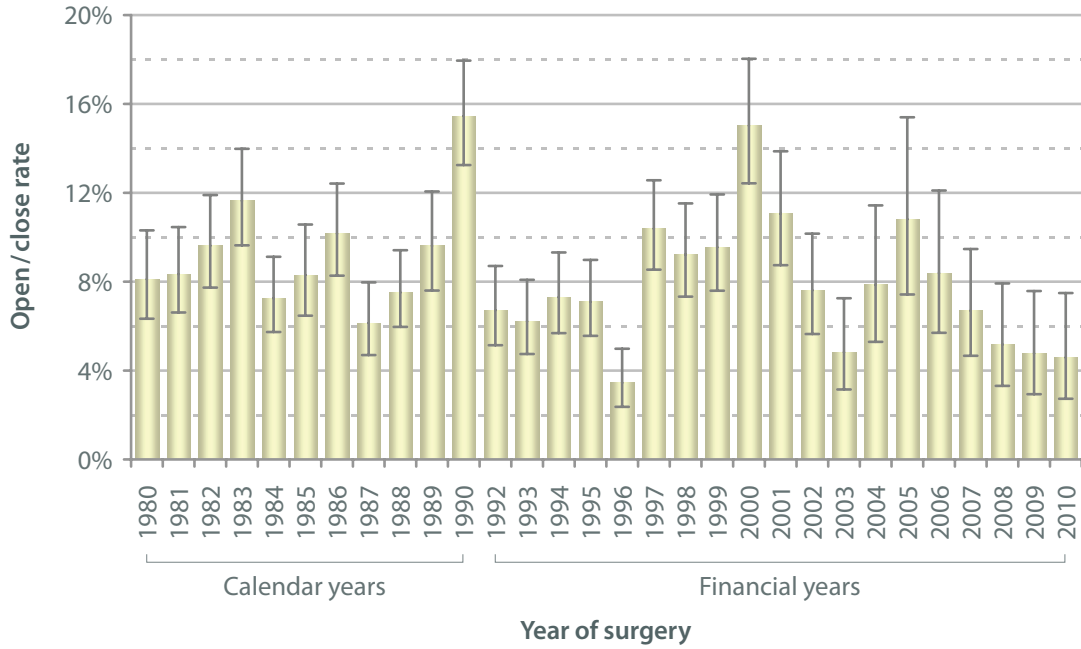
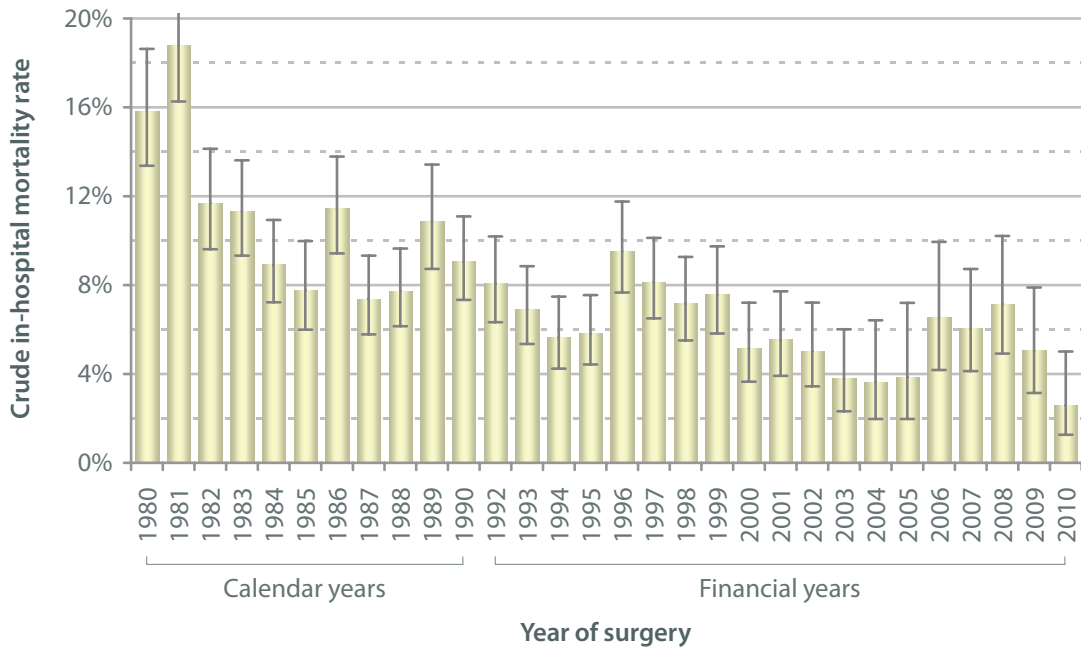


Fig. 1.A.31

Upper GI cancer resections: crude mortality rate (n=21,048)





### Surgery for benign disease

Surgery for benign disease in thoracic surgical units as a whole is now a rarity. Peptic ulcer and reflux disease are usually managed medically in most patients. Such surgery that is necessary is carried out under the auspices of the speciality of upper GI surgery. Nevertheless surgery for this group of patients can be very complex, especially when a repeat operation is needed and thoracic surgeons may be best placed to help with this, either as the lead surgeon or to assist a colleague in upper GI surgery. The latter operations are unlikely to be included in the Thoracic Surgical Register.

Fig. 1.A.32

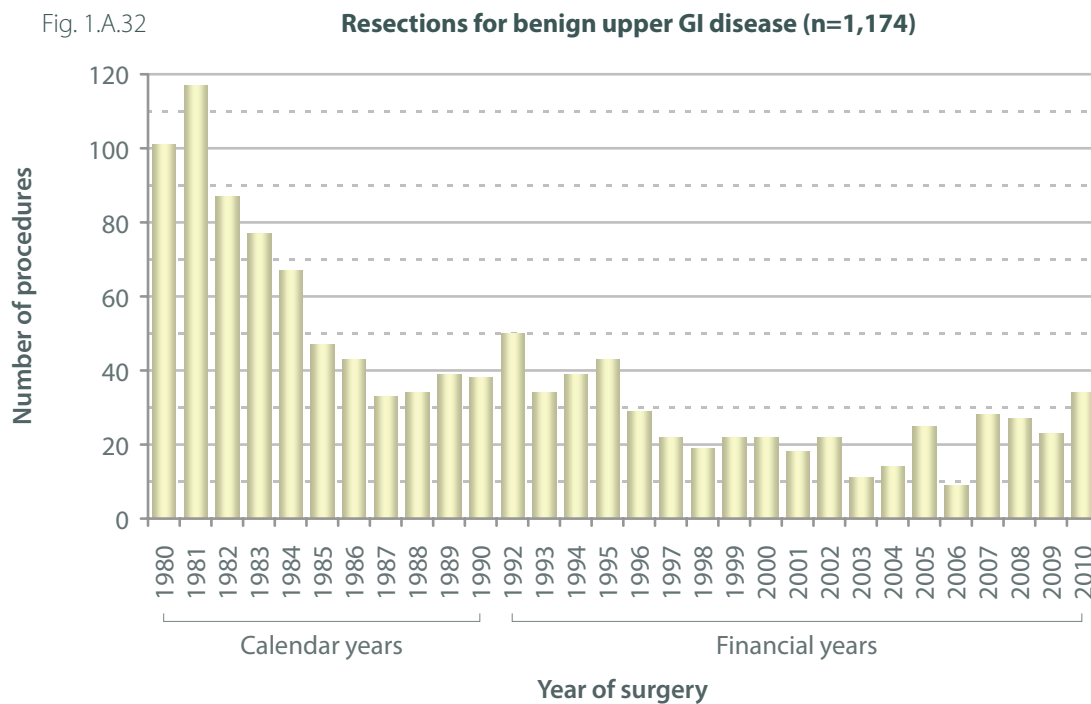
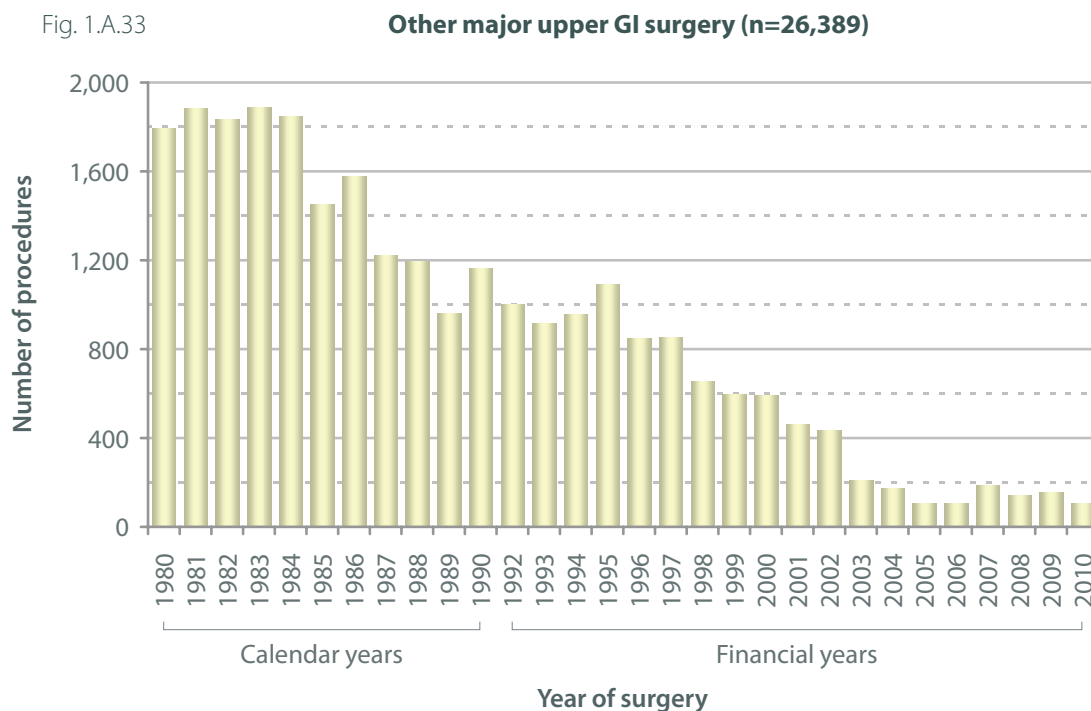


Fig. 1.A.33





### Unit-specific activity 2007-2009

Forty surgical hospitals were able to contribute as in the table below:

Unit-specific activity

City	Hospital	Thoracic Audit Lead(s)
• Aberdeen	Royal Infirmary	Mr Hussein El-Shafei
• Belfast	Victoria Hospital	Mr Mark Jones
• Birmingham	Heart of England Hospital	Mr Maninder Kalkat
• Blackpool	Victoria Hospital	Mr John Au
• Bristol	Royal Infirmary	Mr Tim Batchelor
• Cardiff	University Hospital of Wales	Ms Margaret Kornaszewska & Mr Peter O'Keefe
• Coventry	Univ. Hospitals, Coventry & Warwickshire	Mr Joseph Marzouk
• Dublin	Mater Misericordiae University Hospital St James' Hospital	Mr Freddie Wood & Mr Jim M <sup>c</sup> Carthy Mr Vincent Young
• Edinburgh	Royal Infirmary	Mr William Walker
• Exeter	Royal Devon & Exeter NHS Trust	Mr Richard Berrisford & Mr Peter Froeschle
• Glasgow	Royal Infirmary <sup>i</sup> Western Infirmary <sup>i</sup> Hairmyres Hospital <sup>i</sup>	Mr Alan Kirk Mr Alan Kirk Mr Alan Kirk
• Hull	Castle Hill Hospital	Mr Michael Cowen
• Leeds	St James' Hospital	Mr Richard Milton
• Leicester	Glenfield Hospital	Mr Sri Rathinam & Mr David Waller
• Liverpool	Heart and Chest Hospital	Mr Richard Page
• London	St Mary's Hospital Kings College Hospital Barts and the London Hospitals Harefield Hospital The Heart Hospital St George's Hospital Royal Brompton Hospital Guy's and St Thomas's	Mr Andy Chukwuemeka Mr Ranjit Deshpande Mr Kit Wong Mr Edward Townsend & Mr Eric Lim Mr Shyam Kolvekar Mr Ian Hunt Mr Eric Lim Ms Juliet King
• Manchester	Central Manchester South Manchester University Hospital	Mr Nicholas Odom Mr Rajesh Shah
• Middlesbrough	James Cook Hospital	Mr Jonny Ferguson
• Newcastle	Freeman Hospital	Mr Sasha Stamenkovic
• Norwich	Norfolk & Norwich University Hospital	Mr Marc Van Leuvan
• Nottingham	City Hospital	Mr David Beggs
• Oxford	John Radcliffe Hospital	Mr Rana Sayeed & Mr Ed Black
• Papworth Everard	Papworth Hospital	Mr Aman Coonar
• Plymouth	Derriford Hospital	Mr Adrian Marchbank
• Sheffield	Northern General Hospital	Mr Jonathan Edwards
• Southampton	General Hospital	Mr Khalid Amer
• Stoke	North Staffordshire Royal Infirmary	Mr Shilly Ghosh
• Swansea	Morrison Hospital	Mr Aprim Youhana
• Wolverhampton	New Cross Hospital	Mr Moninder Bhabra

i. Merged into a single-site thoracic surgical Unit in 2008



The following section relates to a three-year period of thoracic surgical activity running from the beginning of April 2006 to the end of March 2009 (financial years ending 2007-2009).

Two hospitals (in which the SCTS is aware of significant thoracic surgical activity) were unable to provide a full Register return for the three-year period analysed:

- University Hospital, Cork, Ireland
- Hammersmith Hospital, London (merged services with St Mary's in 2008)

Over the last few years the following hospitals and thoracic audit leads have begun to contribute to the Thoracic Surgical Register:

- St Vincent's Hospital, Dublin, Ireland (Mr Mike Tolan)
- Essex Cardiothoracic Hospital, Basildon (Mr Doug Aitchison)
- University Hospital, Galway, Ireland (Mr Dave Verasingham)

As the Society does not have complete Register returns from these hospitals for the period of analysis financial years ending 2007-2009, their activity will be included in future reports.

In terms of the comprehensiveness of the current report the Society estimates that at least 98% of the thoracic surgical activity occurring in this time frame throughout the United Kingdom and Ireland has been captured for analysis.

It should be pointed out that the large variations in activity between units are mainly due to the differing catchment populations that the units serve and the incidences of the various diseases within those populations.

### Presentation of data in charts

In all the charts in this section the data from each of the surgical units is presented so that the hospital with the most activity is at the right of the x-axis. This will vary depending on which hospital happens to be the busiest in the area of activity being presented. For example Glasgow has the most lung resections for primary lung cancer whereas when looking at lung resections for conditions other than primary cancer the Brompton is the busiest. Thus data points from these hospitals are located to the right of the charts relating to these two different areas of activity. This ordering is maintained when exploring the area of activity in more detail such as looking at the rate of VATS for lung cancer surgery.

The data is presented in the same grouping as for the report on national activity *i.e.*, overall surgical workload, lung resections, surgery for pneumothorax and operations for oesophagogastric conditions.

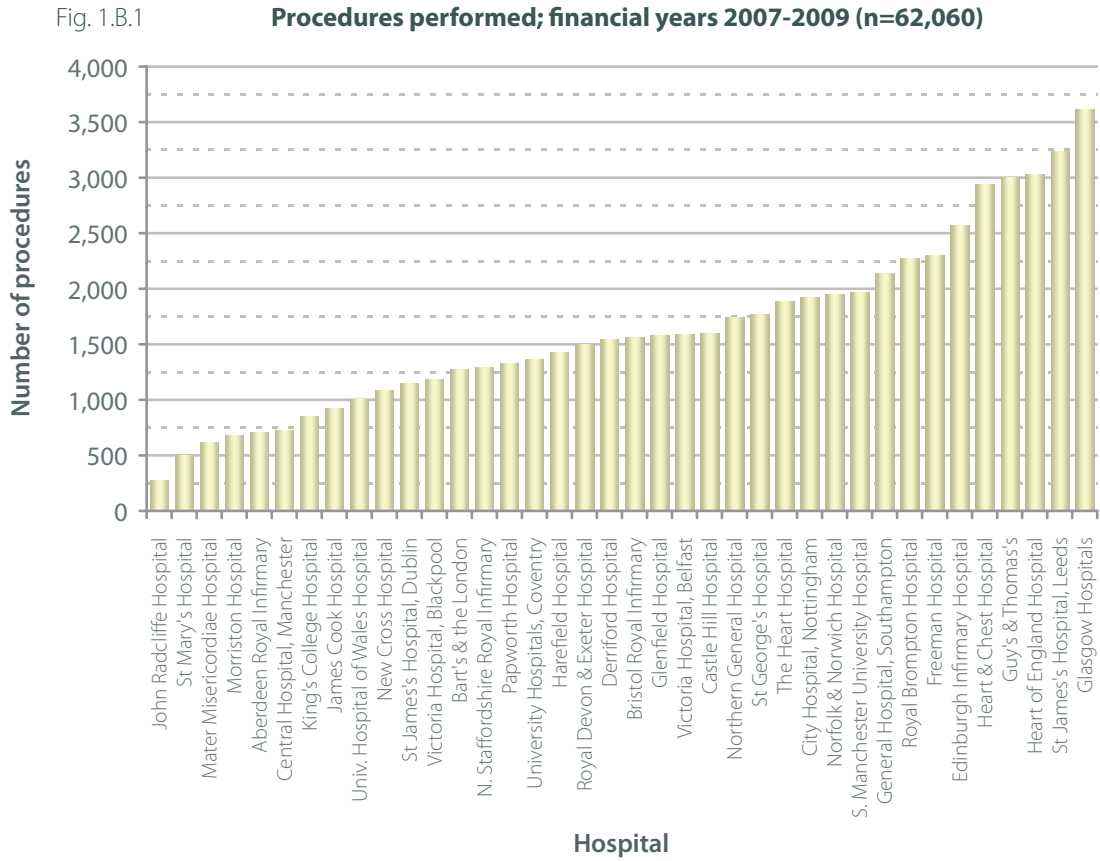


## Overall workload

### Total activity

This includes all operations with the exception of endoscopy

## Unit-specific activity

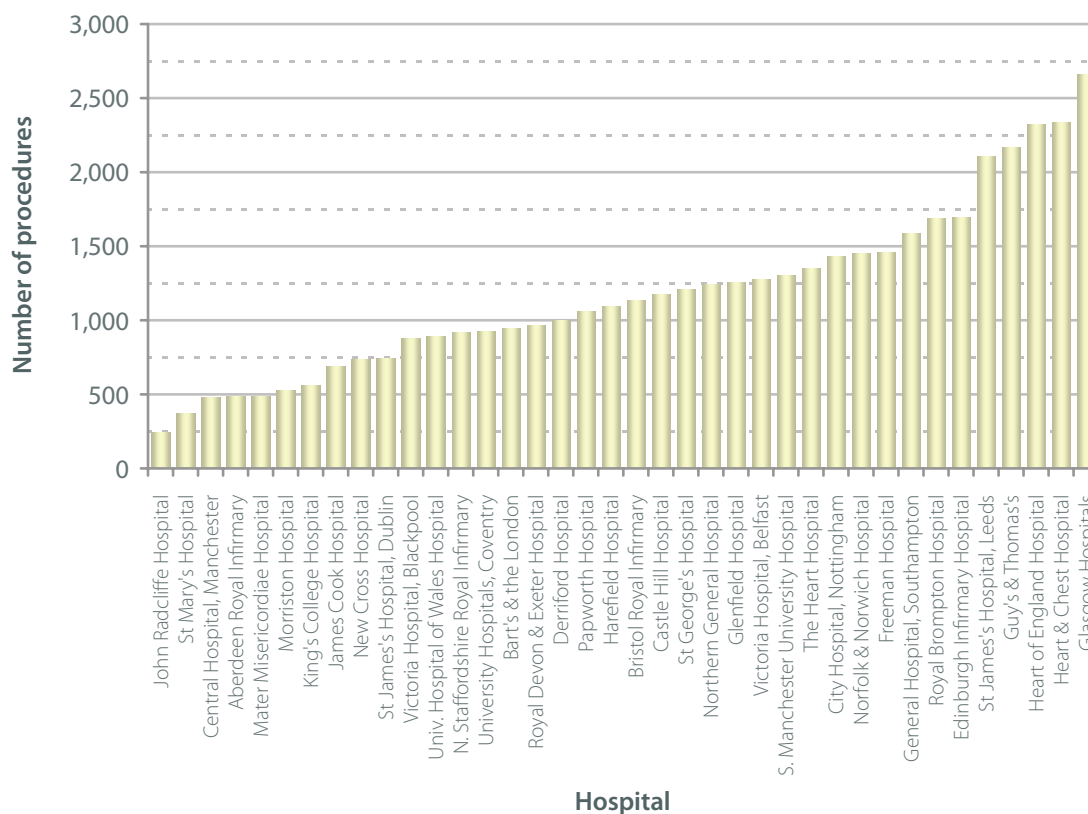






Major procedures

Fig. 1.B.2 Major procedures performed; financial years 2007-2009 (n=44,813)



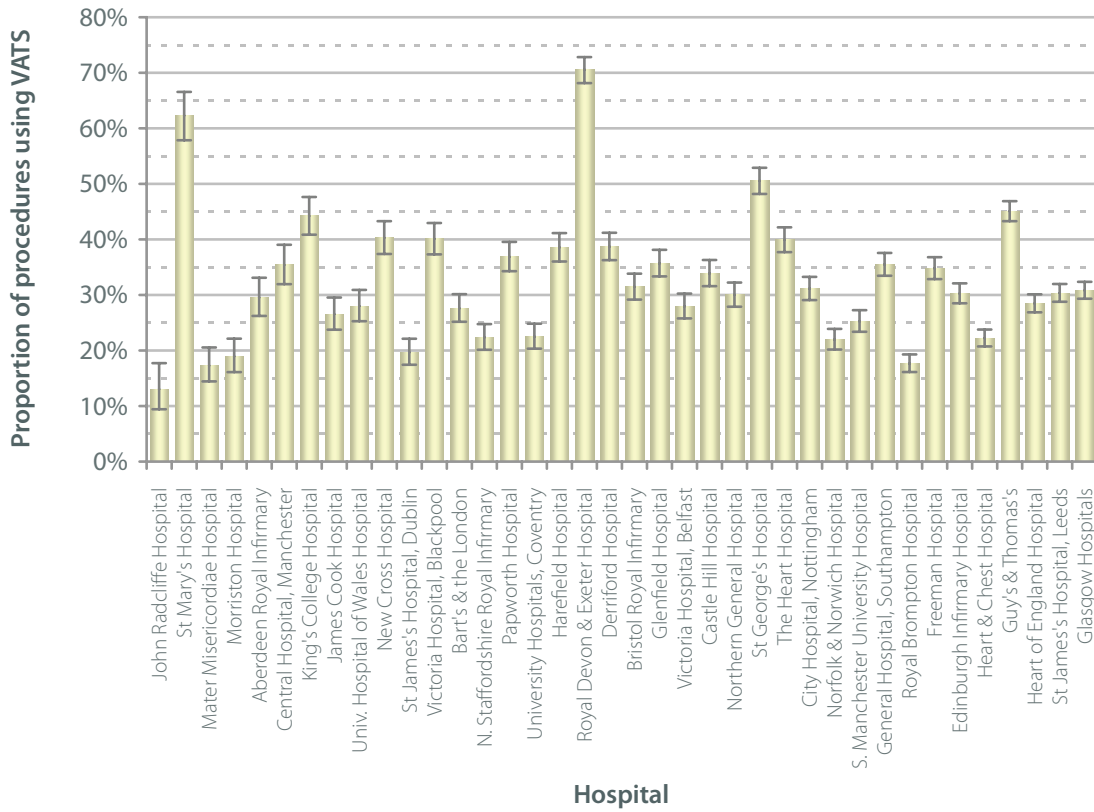


Open surgery *versus* VATS

Unit-specific activity

Fig. 1.B.3

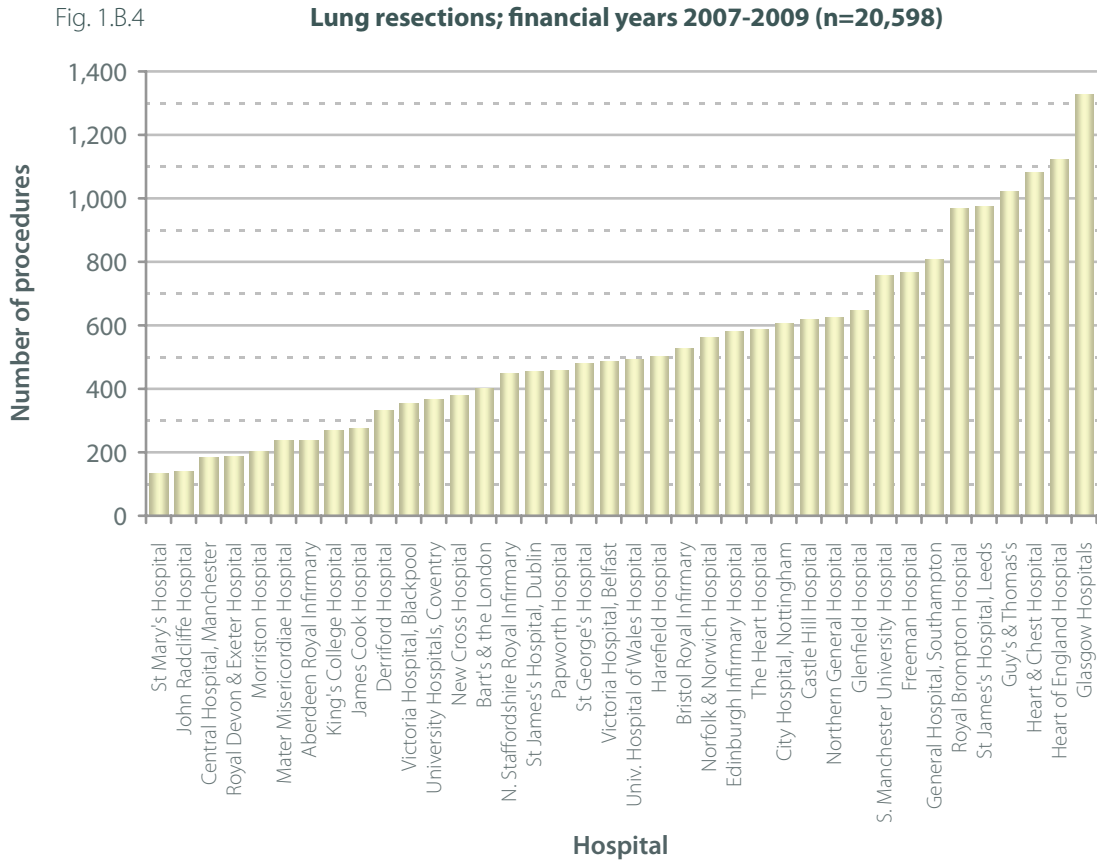
The use of VATS; financial years 2007-2009 (n=62,060)





**Lung resections**

**Total lung resections**



**Unit-specific activity**



Open versus VATS surgery

There is a slight trend to more VATS surgery being carried out in hospitals with a higher volume of activity.

Unit-specific activity

Fig. 1.B.5 Lung resections: the use of VATS; financial years 2007-2009 (n=20,598)

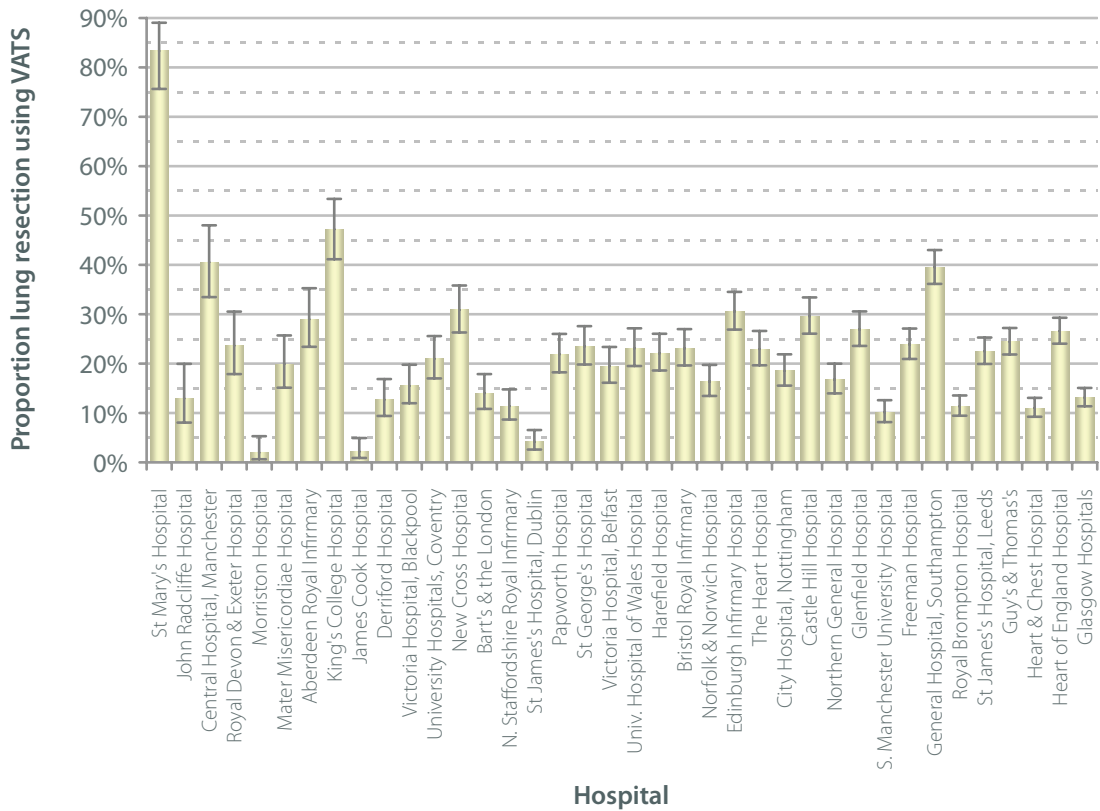
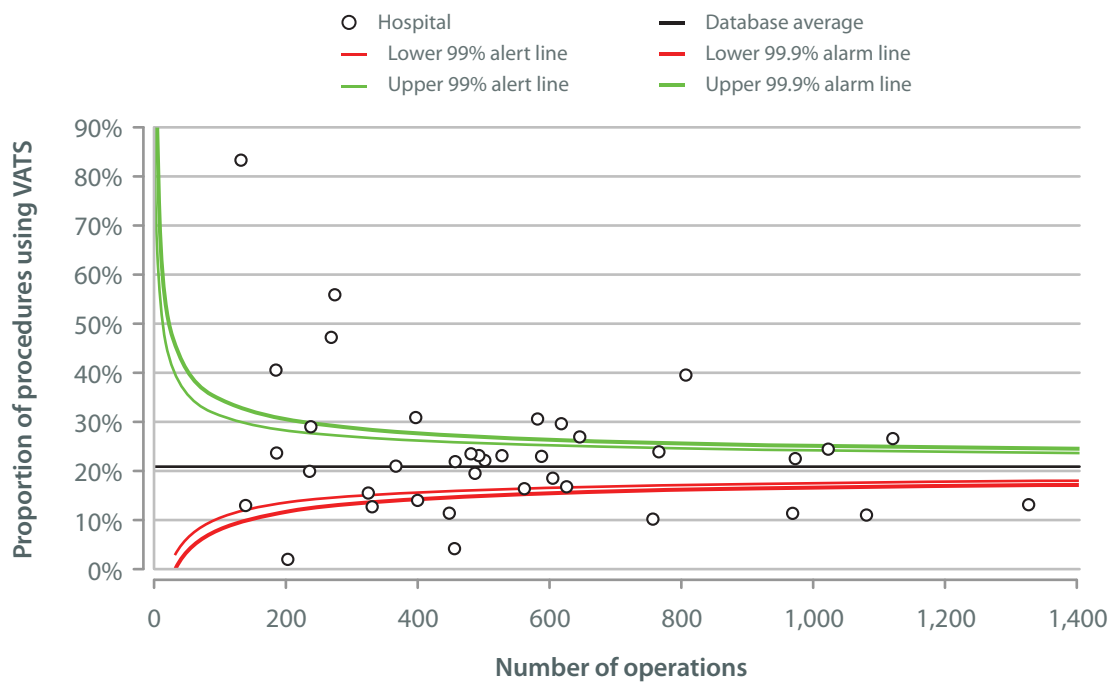




Fig. 1.B.6 Lung resections: the use of VATS; financial years 2007-2009 (n=20,598)



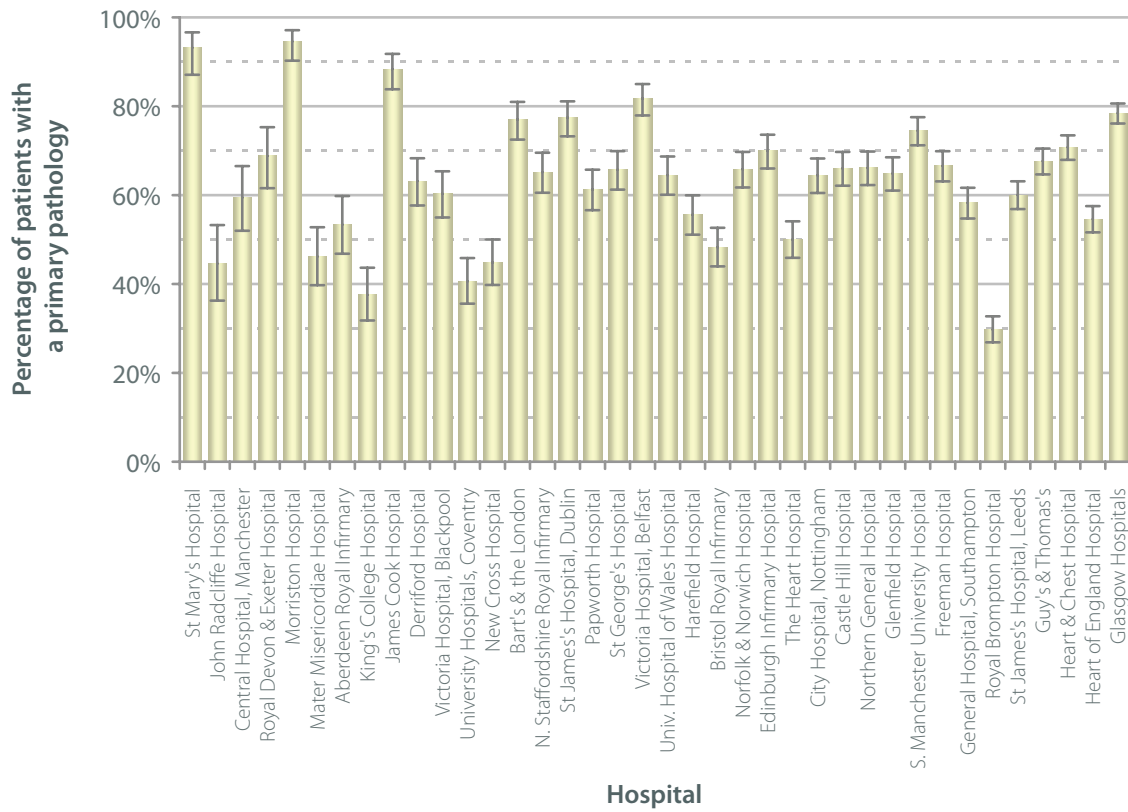
Unit-specific activity



The pathology of lung resections

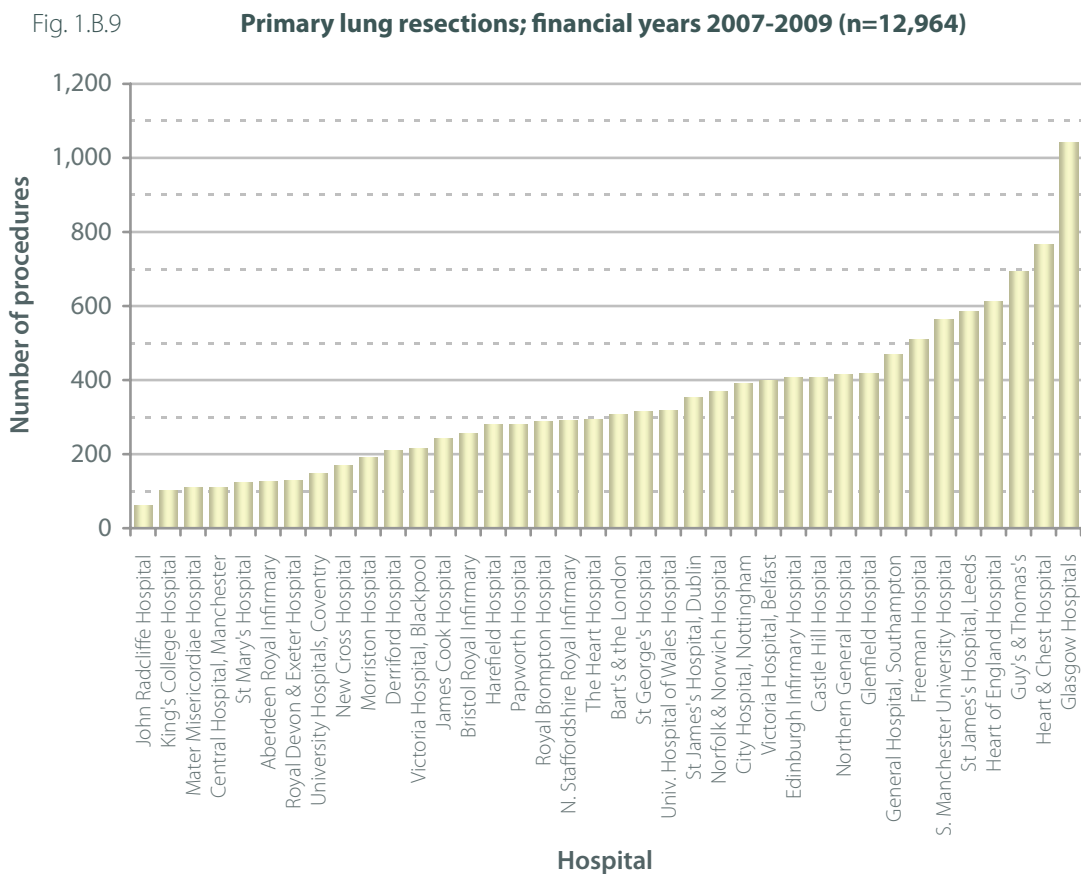
Unit-specific activity

Fig. 1.B.8 Lung resection: percentage of lung resections carried out for primary cancer versus other conditions; financial years 2007-2009 (n=20,598)





Lung resections for primary cancer



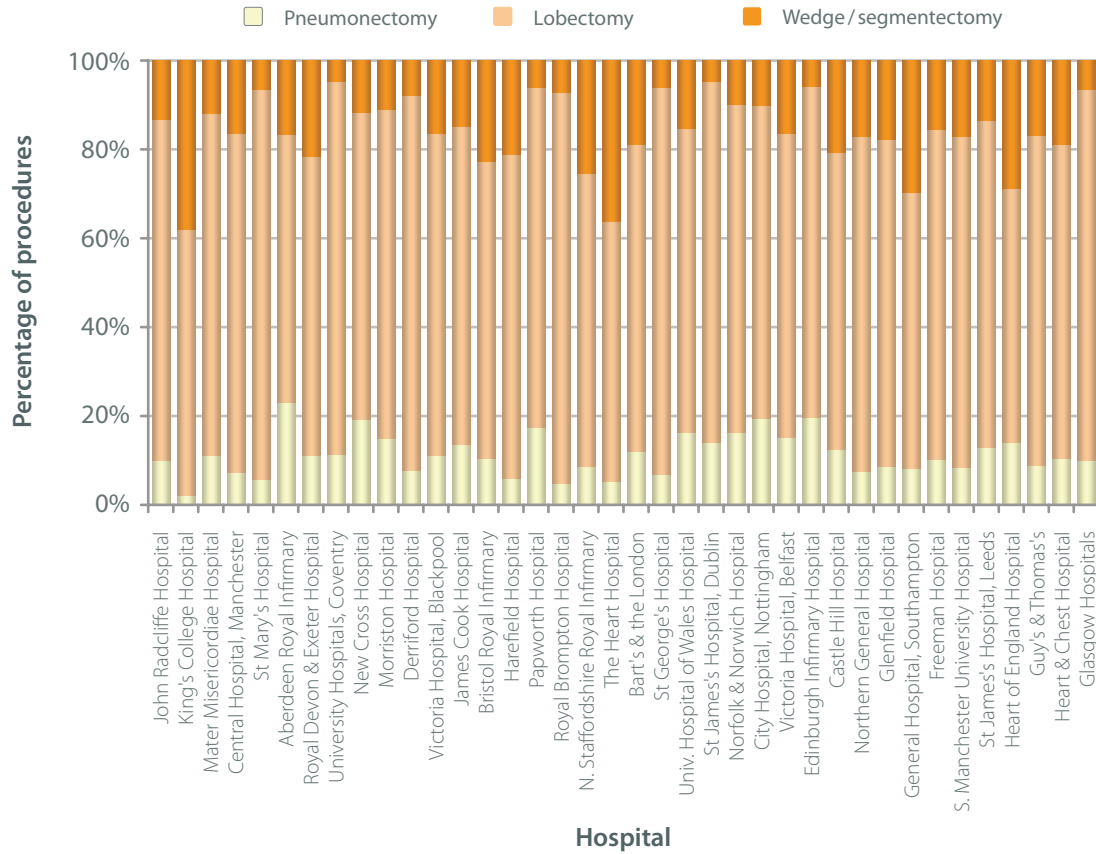
Unit-specific activity



Type of resections for primary lung cancer

Fig. 1.B.10

Type of resection for primary lung cancer;  
financial years 2007-2009 (n=12,964)



Unit-specific activity





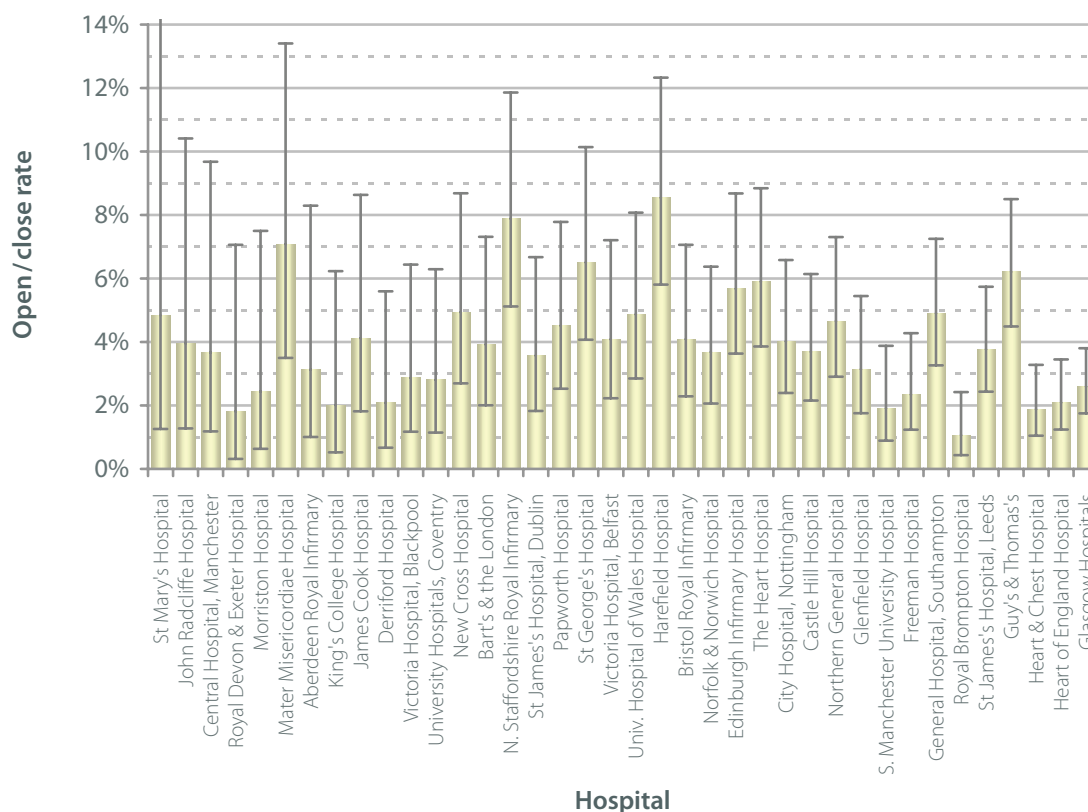
### Open / close rates in primary lung cancer surgery

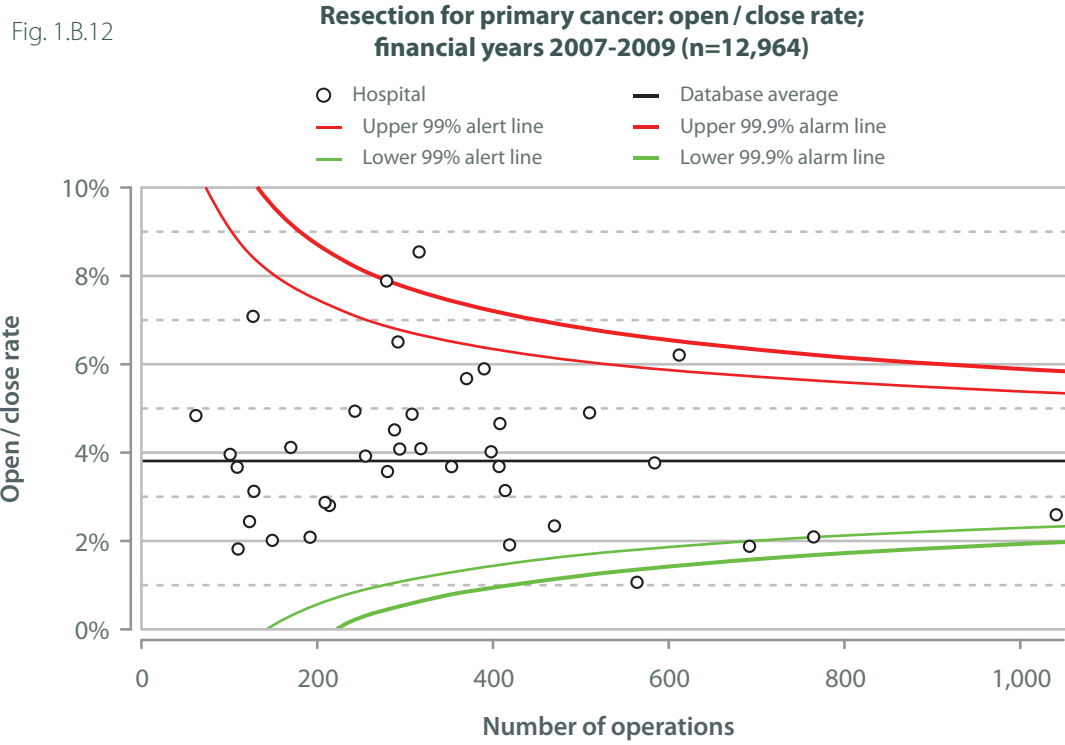
As discussed in the section on national activity the incidence of this type of intervention has fallen over the last three decades, undoubtedly due to better pre-operative staging. However as in the 2008 report there is considerable variation in the open and close rate in surgical institutions throughout the country. As always there is vigorous debate as to what the optimum rate should be. A very reasonable view is that it is better to give a patient a chance of having their cancer resected in borderline cases, which may mean the open / close rate overall is higher. A very low rate may mean such patients are not being offered surgery frequently enough or that inappropriately aggressive surgery is being carried out. The other factor that will influence this data and is not easy to identify from the Register is the use of thoracoscopy to determine operability without recourse to a full thoracotomy which is obviously good practice and not nearly as devastating for a patients. As always the SCTS supports the philosophy that highlighting the differences in various aspects of care is a stimulus to an overall improvement in patient management, rather than being an indication of poor practice.

There is a trend to a lower rate in hospitals that carry out more resections, suggesting a volume effect. This could be argued as being illustrative of better pre-operative staging and patient selection for surgery in those units with the highest throughput.

Fig. 1.B.11

**Resection for primary cancer: open / close rate;  
financial years 2007-2009 (n=12,964)**









### Mortality following surgery for primary lung cancer

As in the 2008 report, there is no evidence of a volume effect for mortality after lung cancer surgery. Nevertheless, pneumonectomy remains a high-risk operation; the mean national in-hospital mortality for the pneumonectomy for primary cancer was 6.5% for 2008-2009. The incidence of pneumonectomy is reducing and was 8.8% of all lung resections for primary lung cancer for the year 2009-2010 (see Appendix 1). This is indicative of an awareness of this within the thoracic surgical community of its dangers and the fact that a lobectomy or non-surgical treatment may be a better or option for the patients with central tumours.

Unit-specific activity

Fig. 1.B.14 **Resection for primary cancer: in-hospital mortality following pneumonectomy; financial years 2007-2009 (n=1,439)**

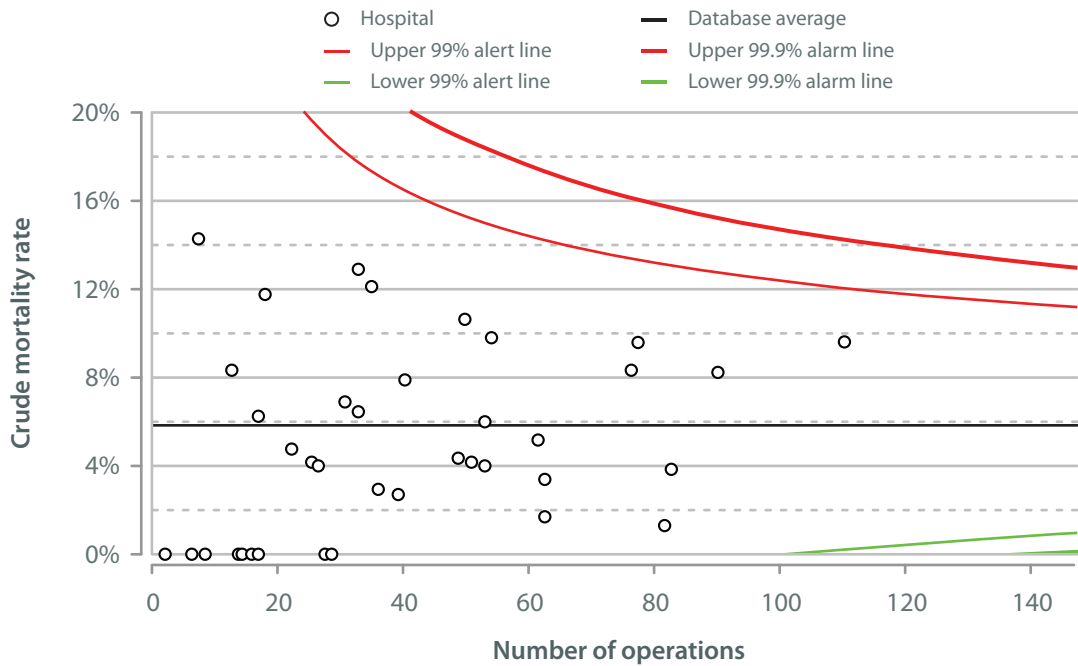


Fig. 1.B.15 **Resection for primary cancer: in-hospital mortality following lobectomy; financial years 2007-2009 (n=9,024)**

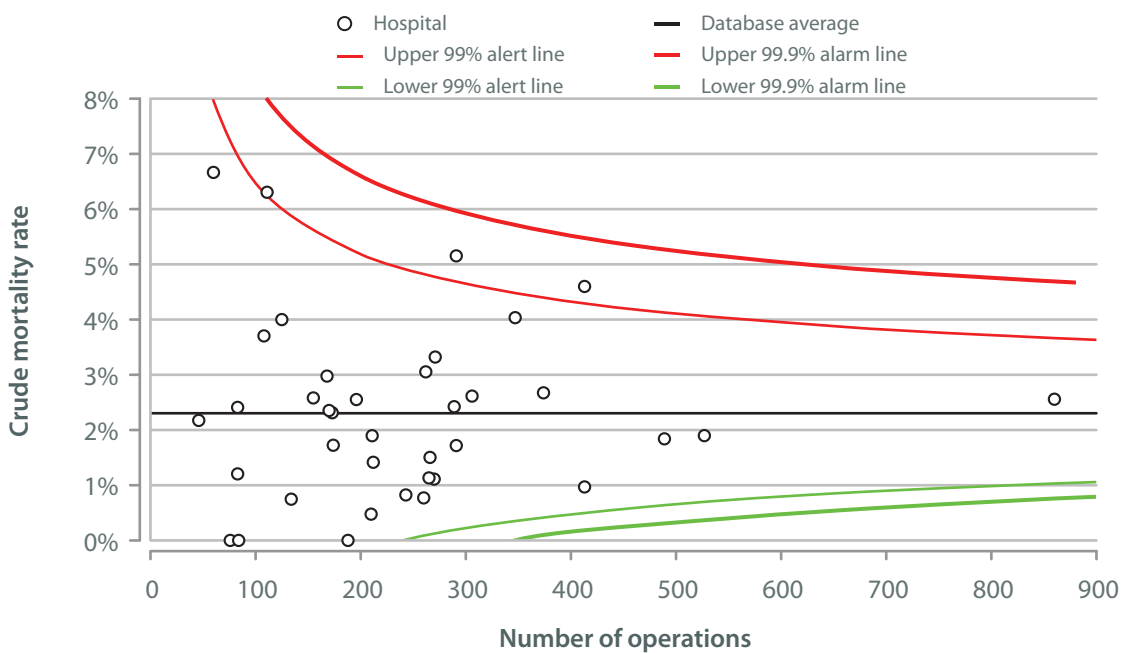
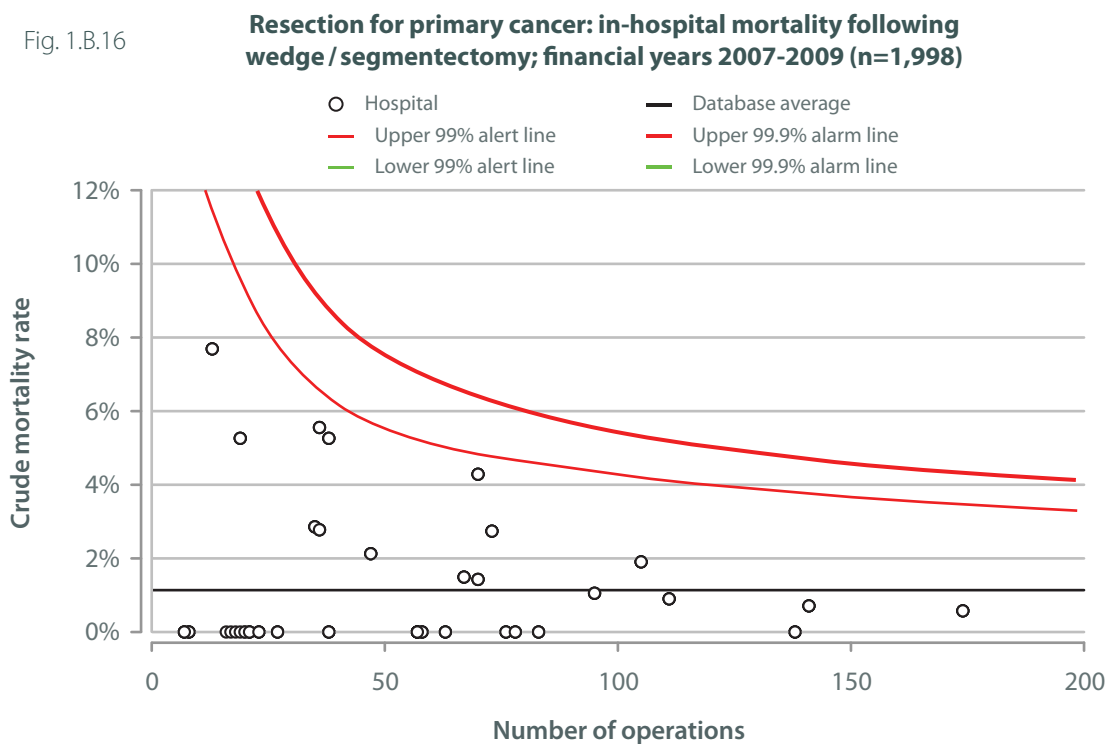




Fig. 1.B.16





### Open surgery versus VATS

Although in the National report there has been a significant increase for the year 2009-2010 (13.8% of all lobectomies for cancer are carried out using VATS in that year), the analysis of the three year period from 2006-2009 shows that operation of VATS lobectomy was performed sporadically throughout the country mainly in a number of interested units. The picture may well be changing rapidly as more surgeons gain training and confidence in the use of VATS for lobectomy. VATS wedge resections are much commoner and are performed in all hospitals to a variable degree.

### Unit-specific activity

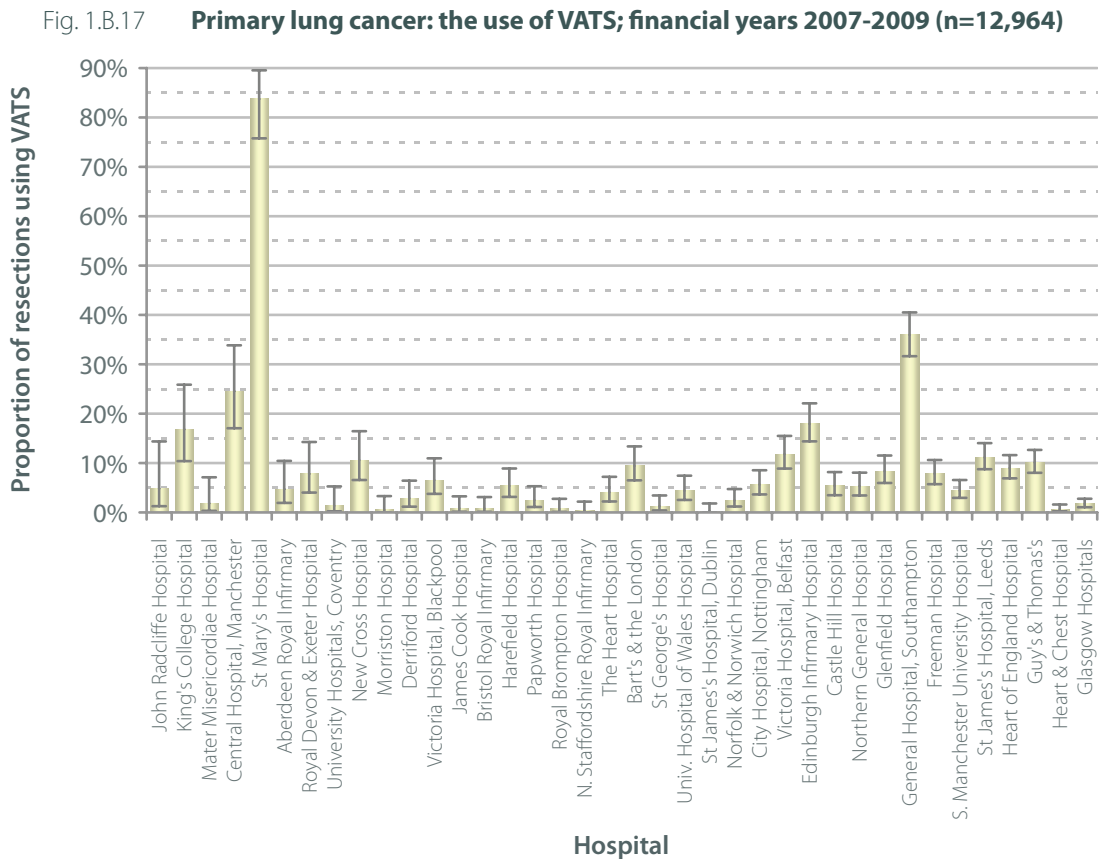
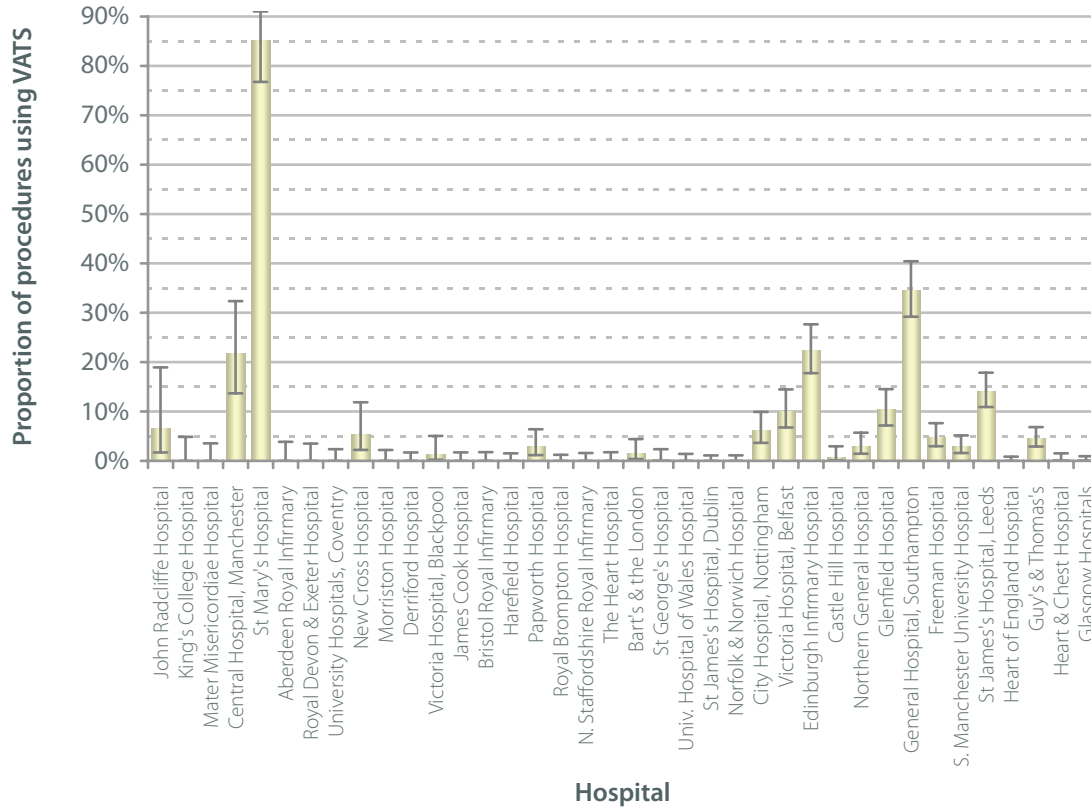




Fig. 1.B.18

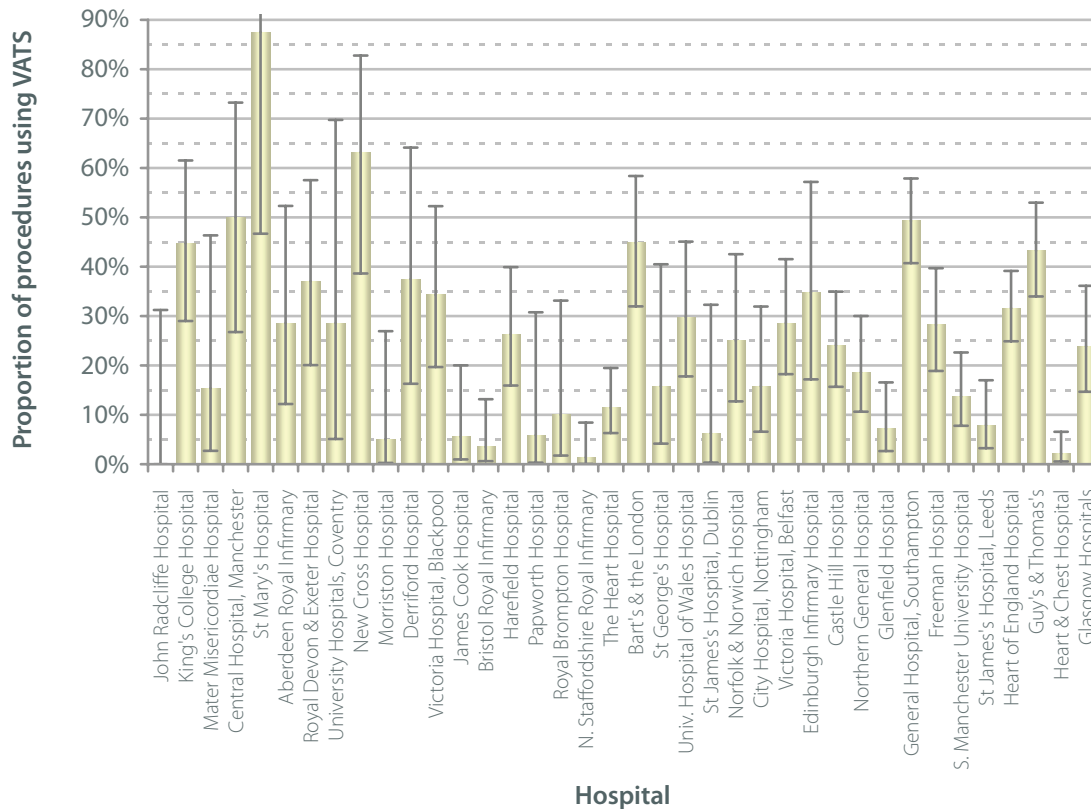
**Primary lung cancer: the use of VATS in lobectomy procedures;  
financial years 2007-2009 (n=9,207)**



Unit-specific activity

Fig. 1.B.19

**Primary lung cancer: the use of VATS in wedge / segmentectomy procedures;  
financial years 2007-2009 (n=1,998)**





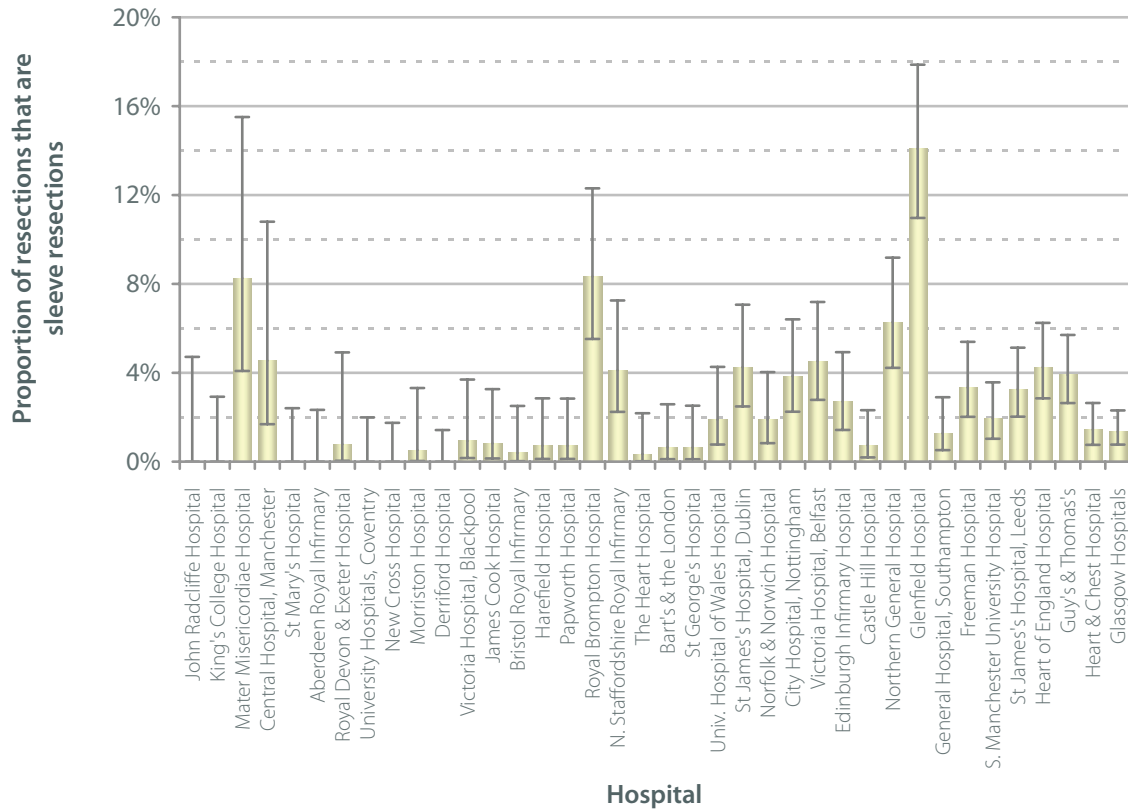
Sleeve resection

This chart shows the percentage of sleeve resections with respect to the total number of lung resections for primary cancer. Leicester and the Brompton carry out significantly more sleeve resections than all the other hospitals in the country. Although there is a slight trend to more sleeves being carried out in higher volume hospitals, the percentage overall is very small.

Unit-specific activity

Fig. 1.B.20

Primary lung cancer: sleeve resection rates; financial years 2007-2009 (n=12,964)





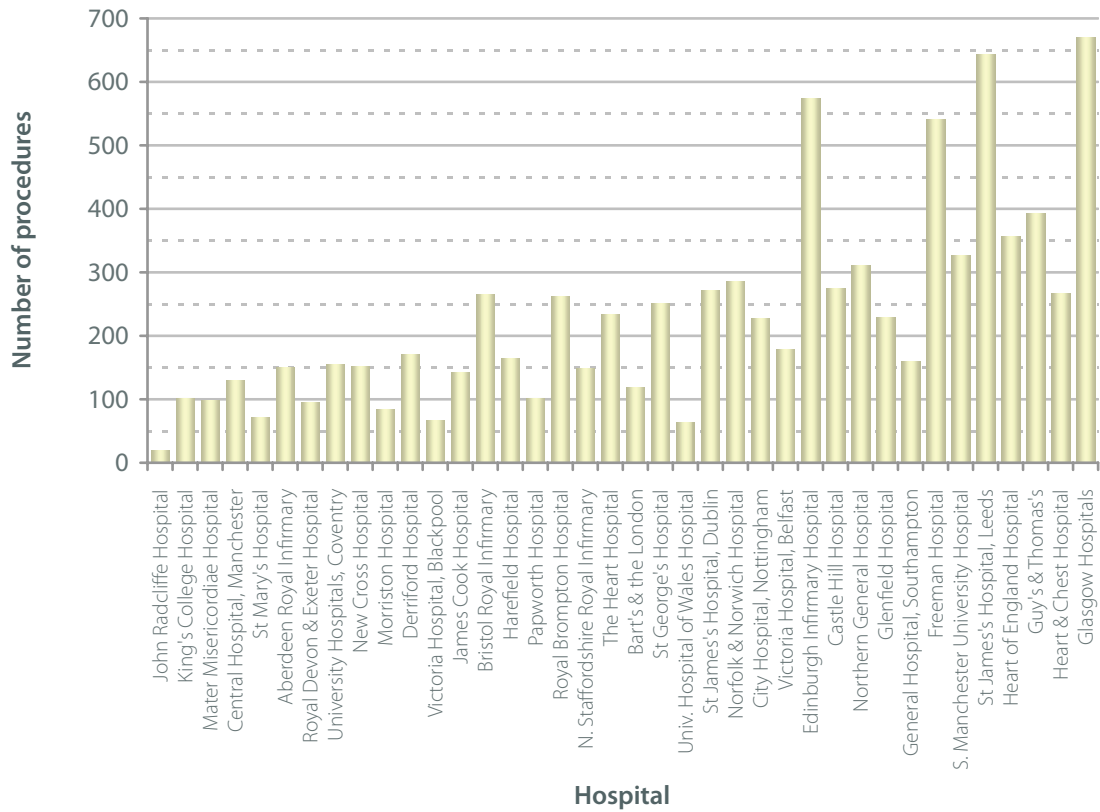




Mediastinoscopy / mediastinotomy

Unit-specific activity

Fig. 1.B.21 Primary lung cancer: total number of mediastinoscopy / mediastinotomy procedures financial years 2007-2009 (n=8,752)

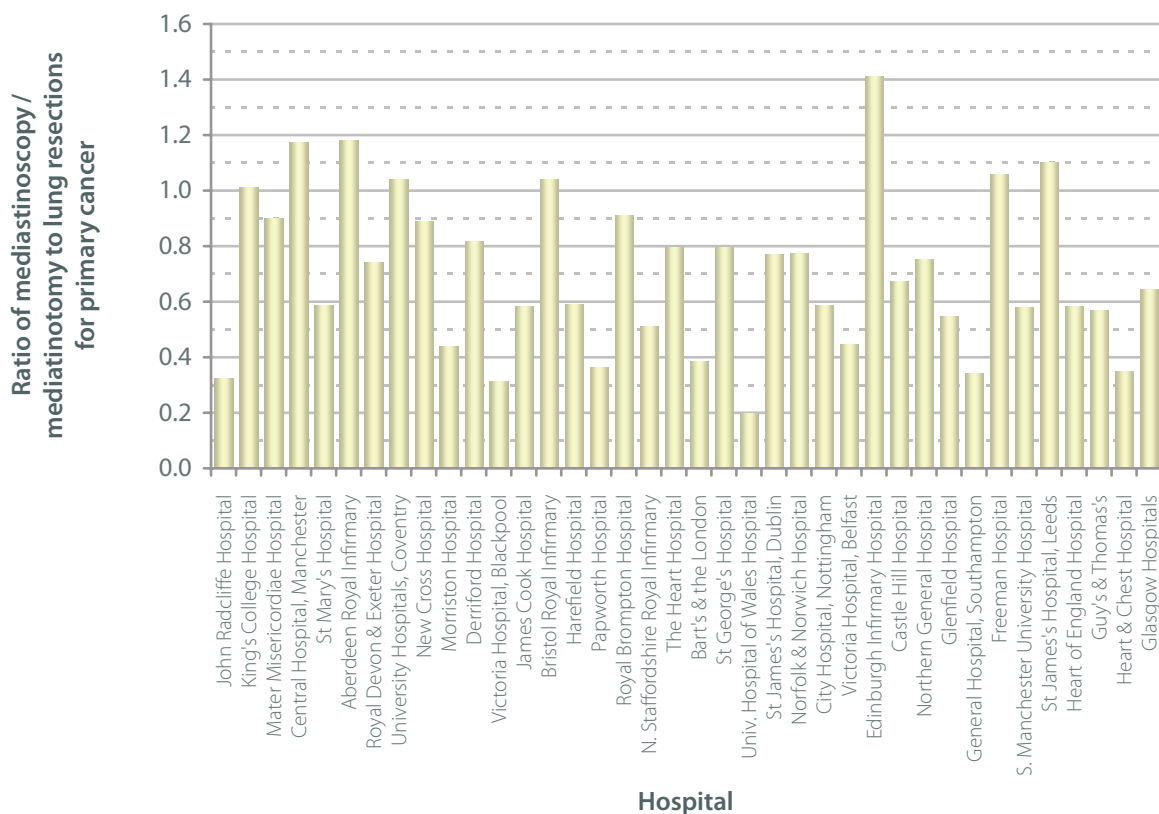




As explained in the section on National activity this chart relates the number of mediastinoscopy / mediastinotomy procedures to the number of lung resections for primary cancer. It includes procedures carried out for the diagnosis of cancer and other conditions and not just for staging purposes.

Fig. 1.B.22

**Primary lung cancer: the ratio of mediastinoscopy / mediastinotomy to resection; financial years 2007-2009 (n=12,964)**





Lung resections for conditions other than primary lung cancer

Unit-specific activity

Fig. 1.B.23

Resection for pathologies other than primary lung cancer;  
financial years 2007-2009 (n=7,634)

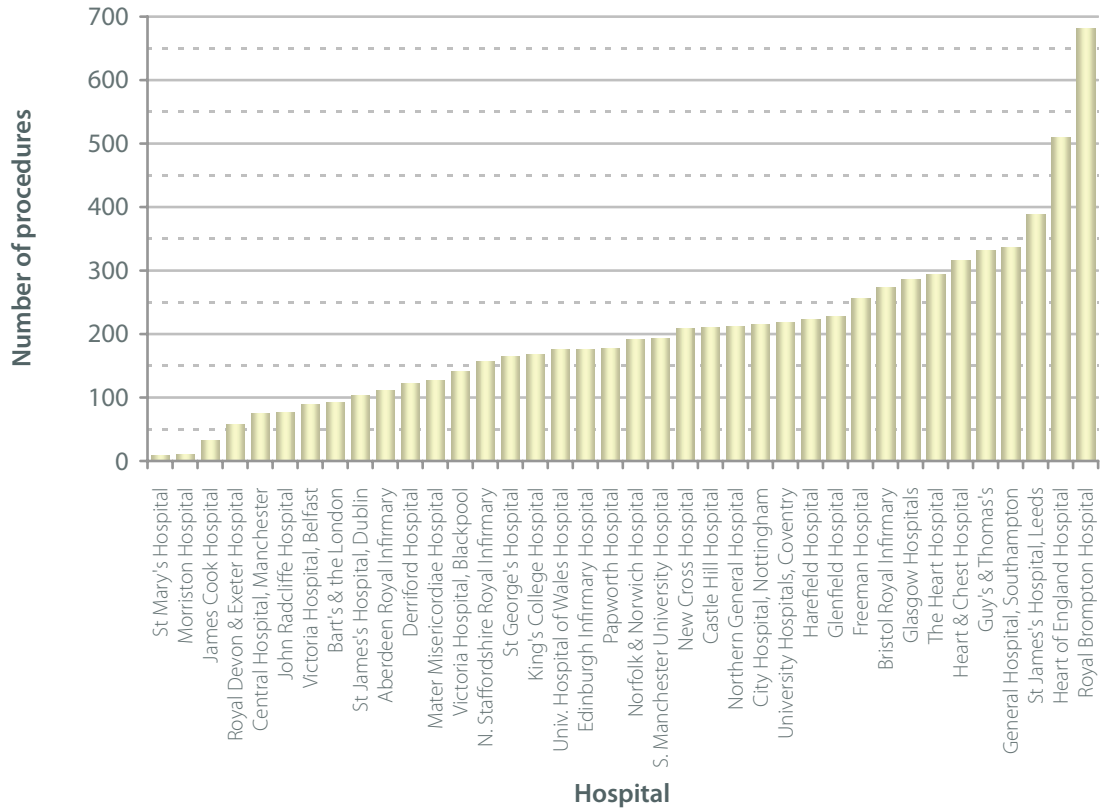
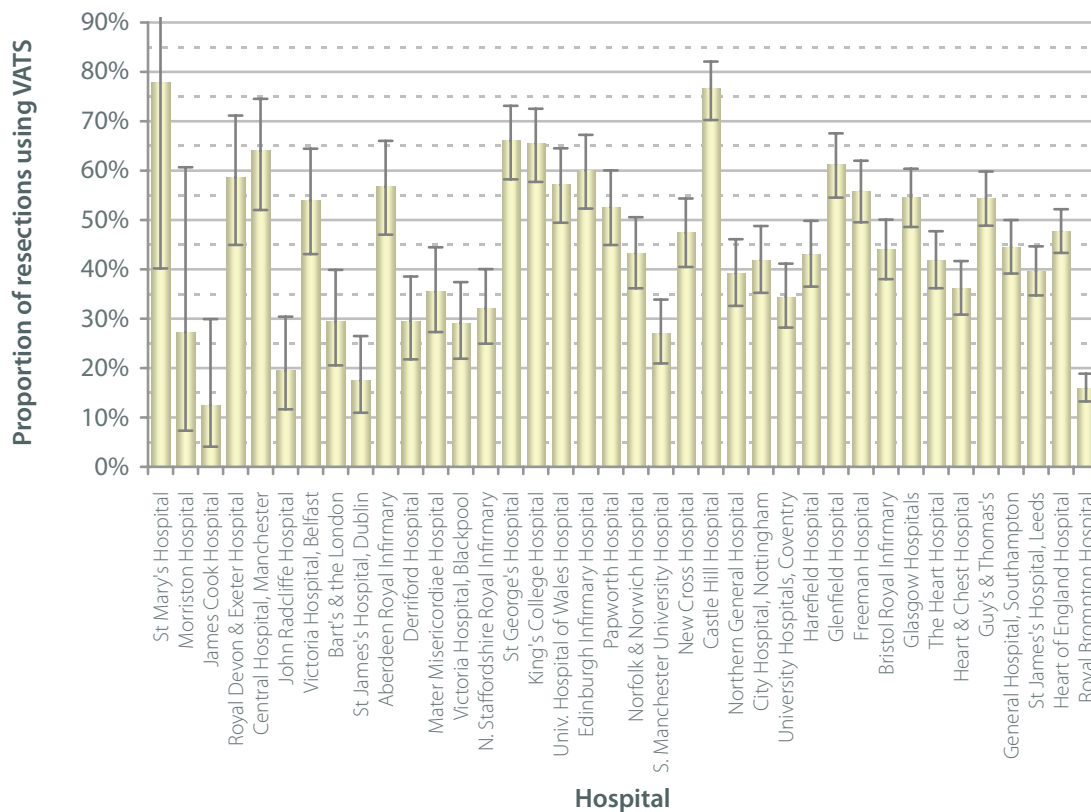




Fig. 1.B.24 **Resection for pathologies other than primary lung cancer: the use of VATS;**  
 financial years 2007-2009 (n=7,634)



Unit-specific activity



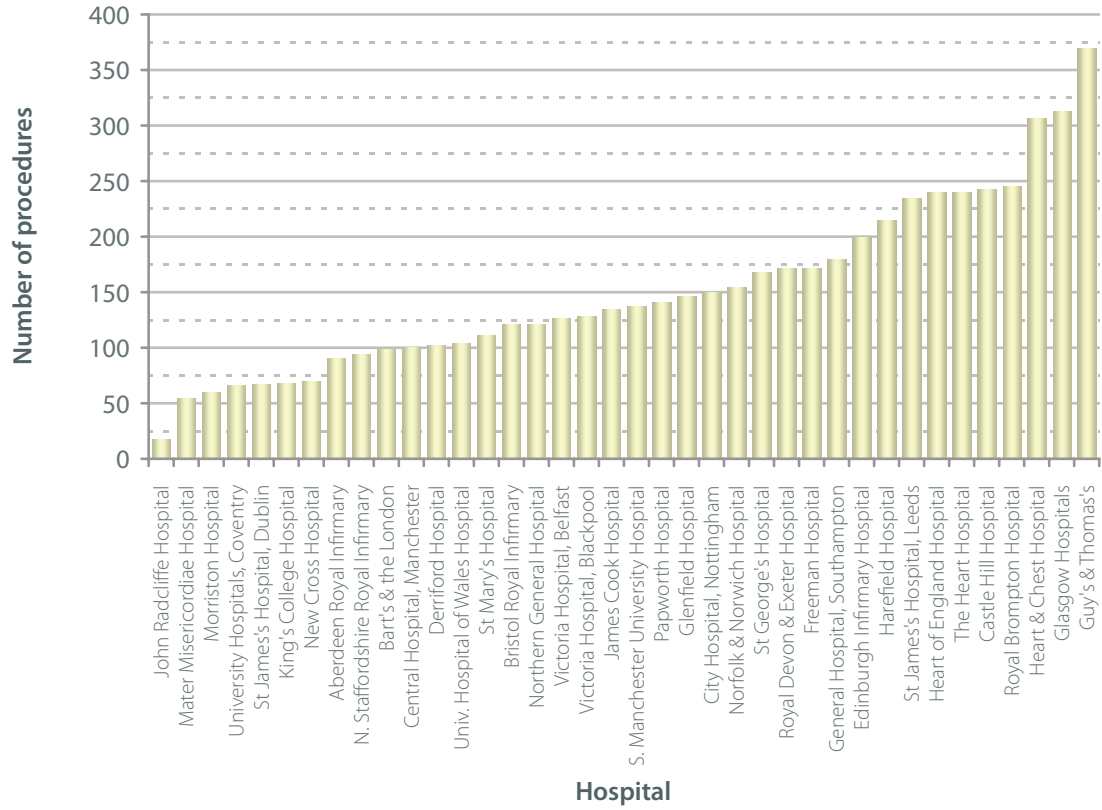
**Pneumothorax surgery**

Number of procedures

**Unit-specific activity**

Fig. 1.B.25

**Pneumothorax surgery; financial years 2007-2009 (n=5,751)**

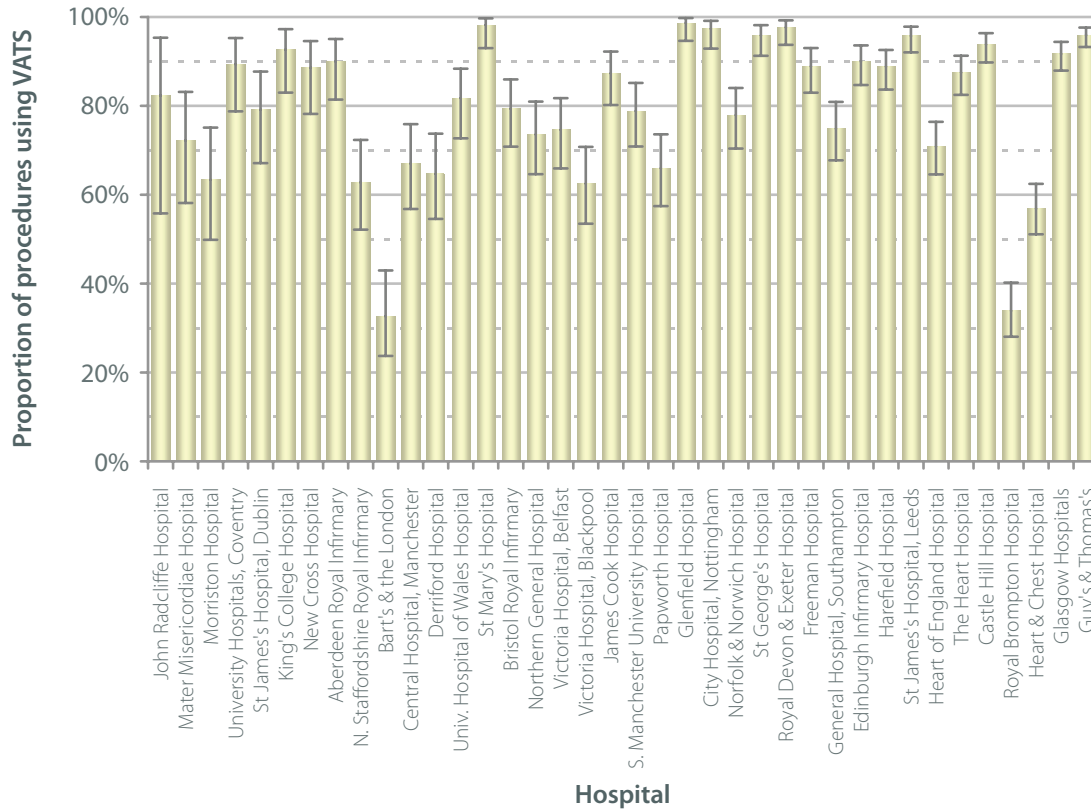




**Open surgery versus VATS**

It is clear that the majority of procedures for pneumothorax are carried out using VATS techniques.

Fig. 1.B.26 **Pneumothorax surgery: the use of VATS; financial years 2007-2009 (n=5,751)**





### Mortality after pneumothorax surgery

As explained in the section on national activity, patients who have open surgery for pneumothorax are usually those with pre-existing lung disease. Not surprisingly, the death rate for these operations is higher than for those patients who can be treated by VATS. There are also two significant outliers in the VATS funnel plot. There are a number of possible explanations for this, although it is felt that the most likely would be a willingness to offer high-risk patients with a pneumothorax an operative procedure, rather than subject them to continued non-operative treatment or open surgery, both of which could conceivably more dangerous.

Unit-specific activity

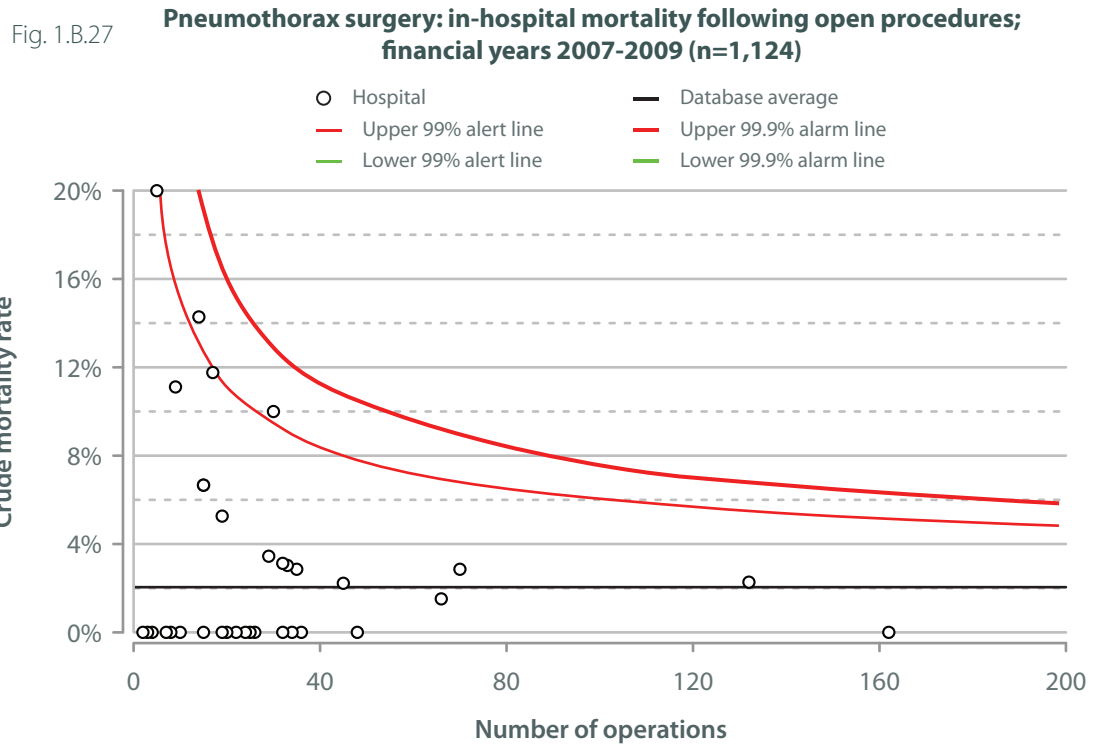
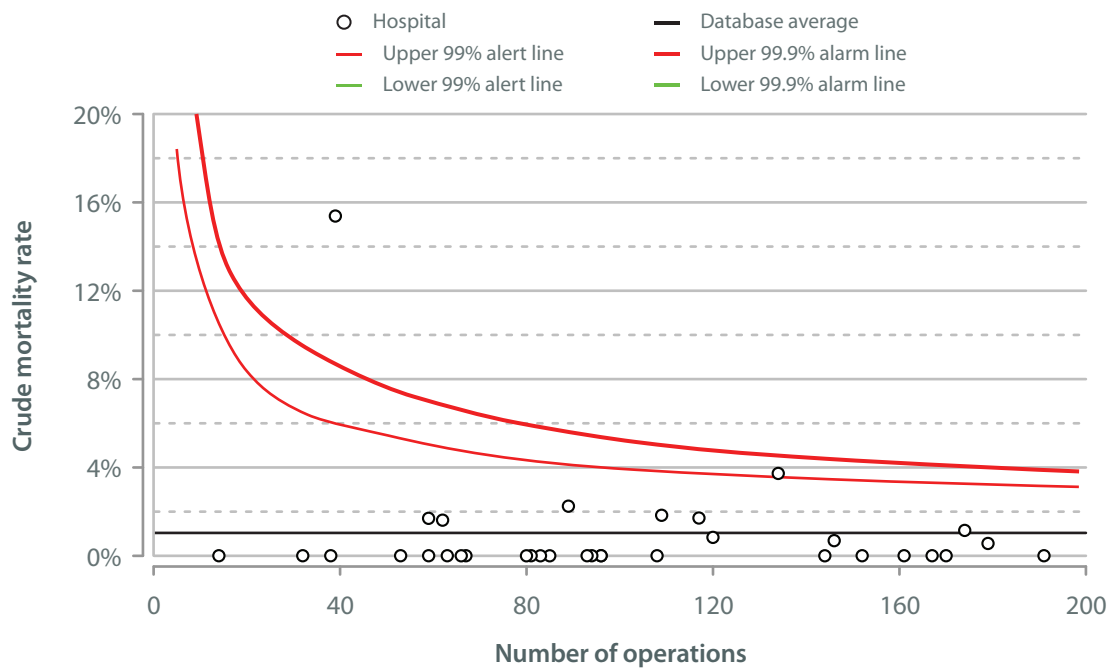






Fig. 1.B.28

**Pneumothorax surgery: in-hospital mortality following VATS procedures;  
 financial years 2007-2009 (n=1,124)**



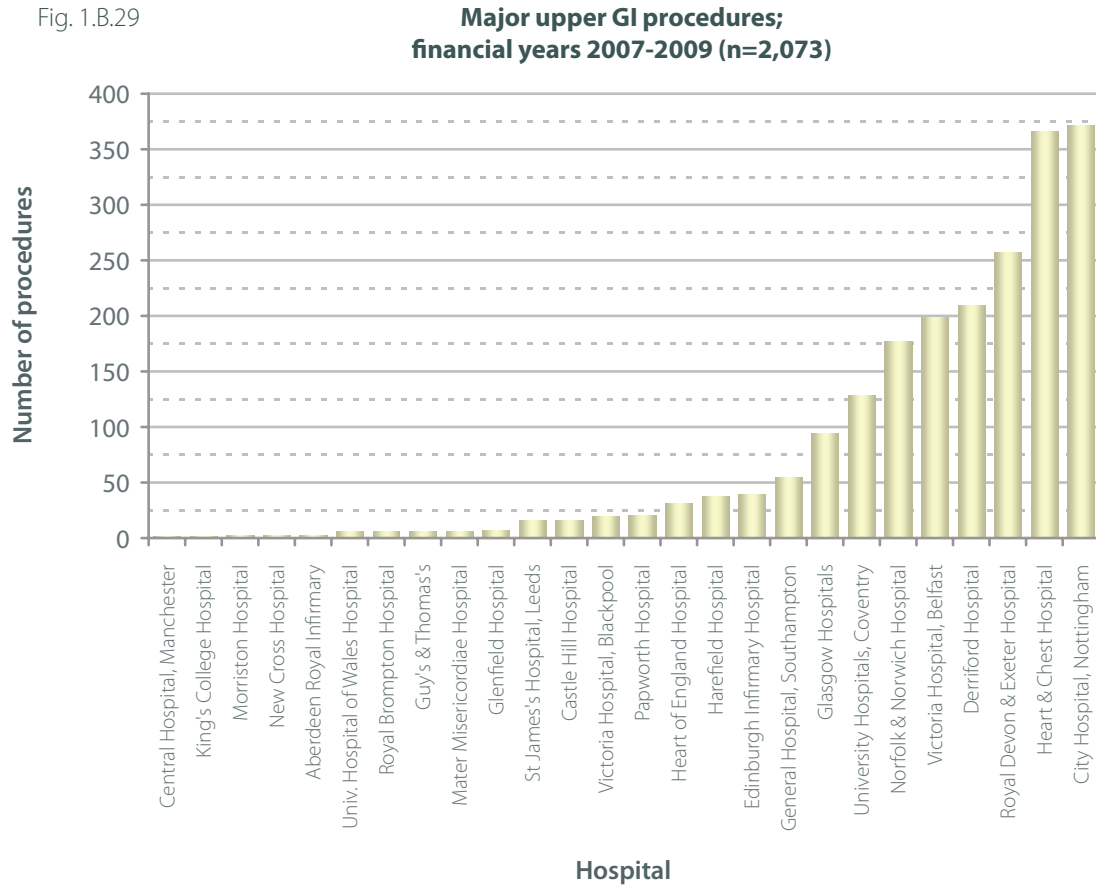


## Oesophagogastric / upper GI surgery

### Number of procedures

It is clear from the following charts that the practice of oesophagogastric surgery within thoracic surgery is now unusual with only six hospitals performing in excess of 150 procedures over the three-year period.

Unit-specific activity

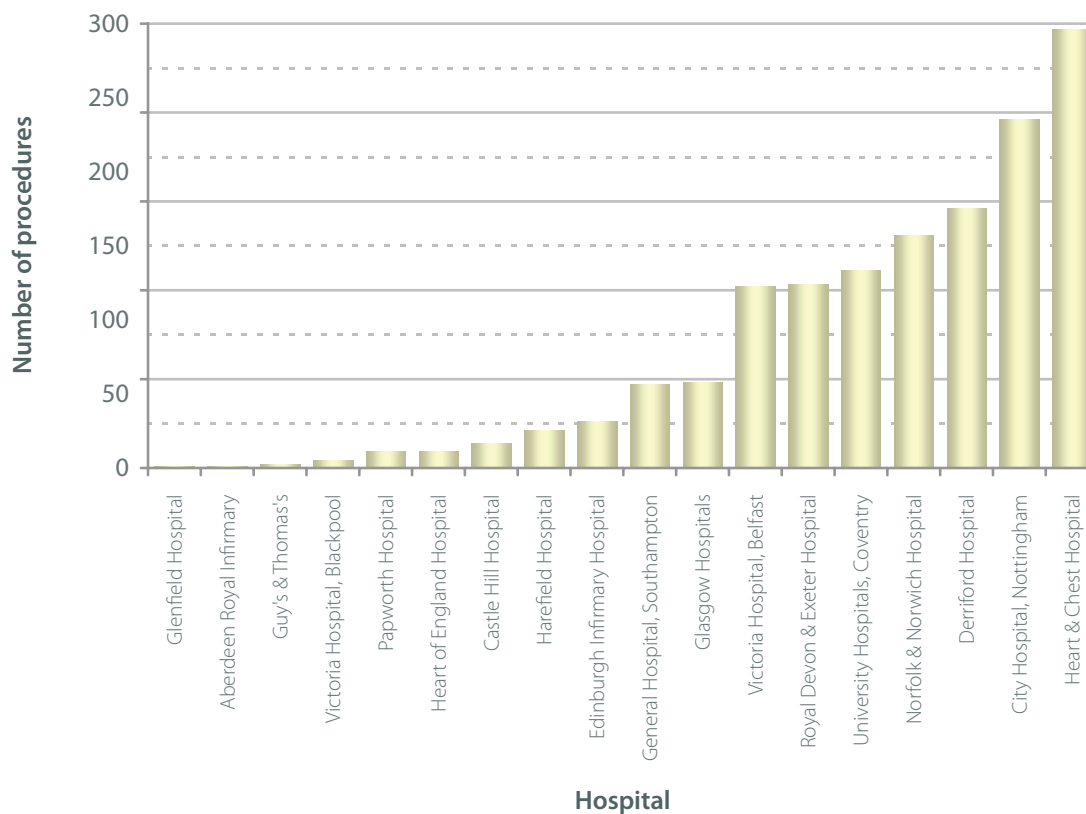




Resections for upper GI cancer

Fig. 1.B.30

Resections for upper GI cancer;  
 financial years 2007-2009 (n=1,218)



Unit-specific activity

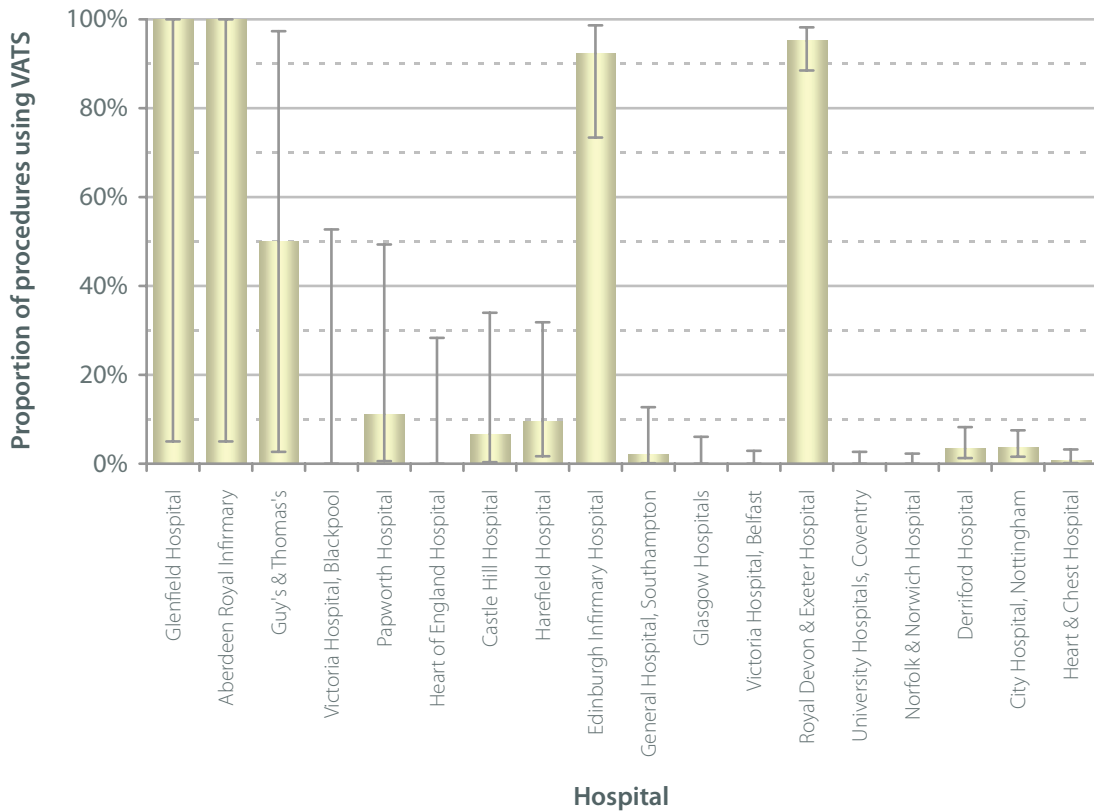


Open versus VATS resection

A rather skewed picture. Apart from Edinburgh and Exeter, none of the other larger volume hospitals have embraced VATS for cancer resections. Glenfield Hospital, Aberdeen Royal Infirmary and Guy's & St Thomas's have carried out only one or two resections in the three-year period, presumably for very specific reasons.

Fig. 1.B.31

Resections for upper GI cancer: the use of VATS; financial years 2007-2009 (n=1,219)

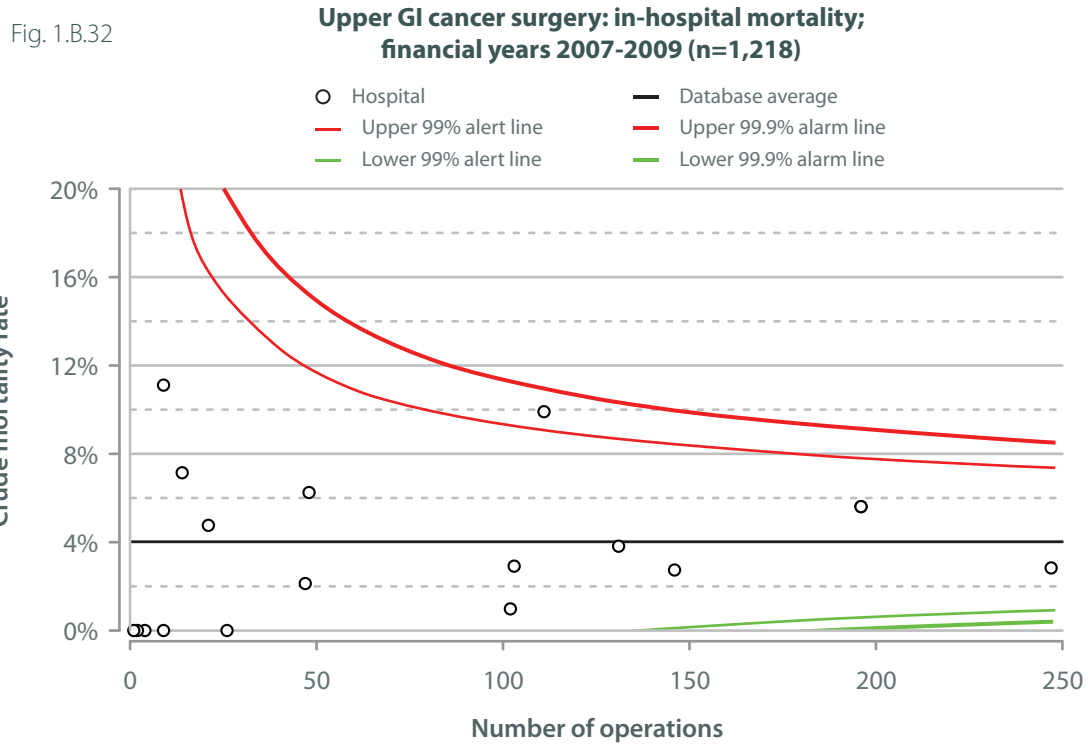


Unit-specific activity



**Mortality following surgery for upper GI cancer**

It is clear that in the high volume hospitals in-hospital mortality for oesophagogastric cancer resection is on a par with other institutions throughout the United Kingdom. The National Oesophagogastric Cancer Audit reported an average figure of 4.5% for the death rate after oesophagectomy<sup>4</sup>.



Unit-specific activity

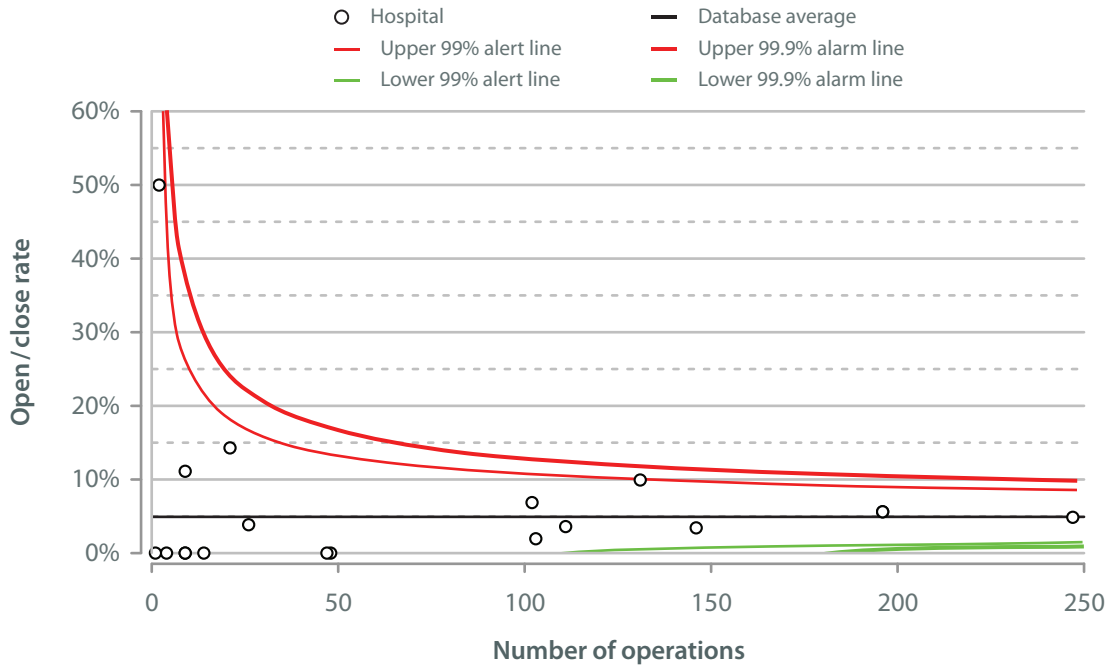


**Open / close rates**

As with lung cancer surgery, the incidence of this complication remains very low.

Fig. 1.B.33 **Upper GI cancer surgery: open / close rate; financial years 2007-2009 (n=1,218)**

Unit-specific activity

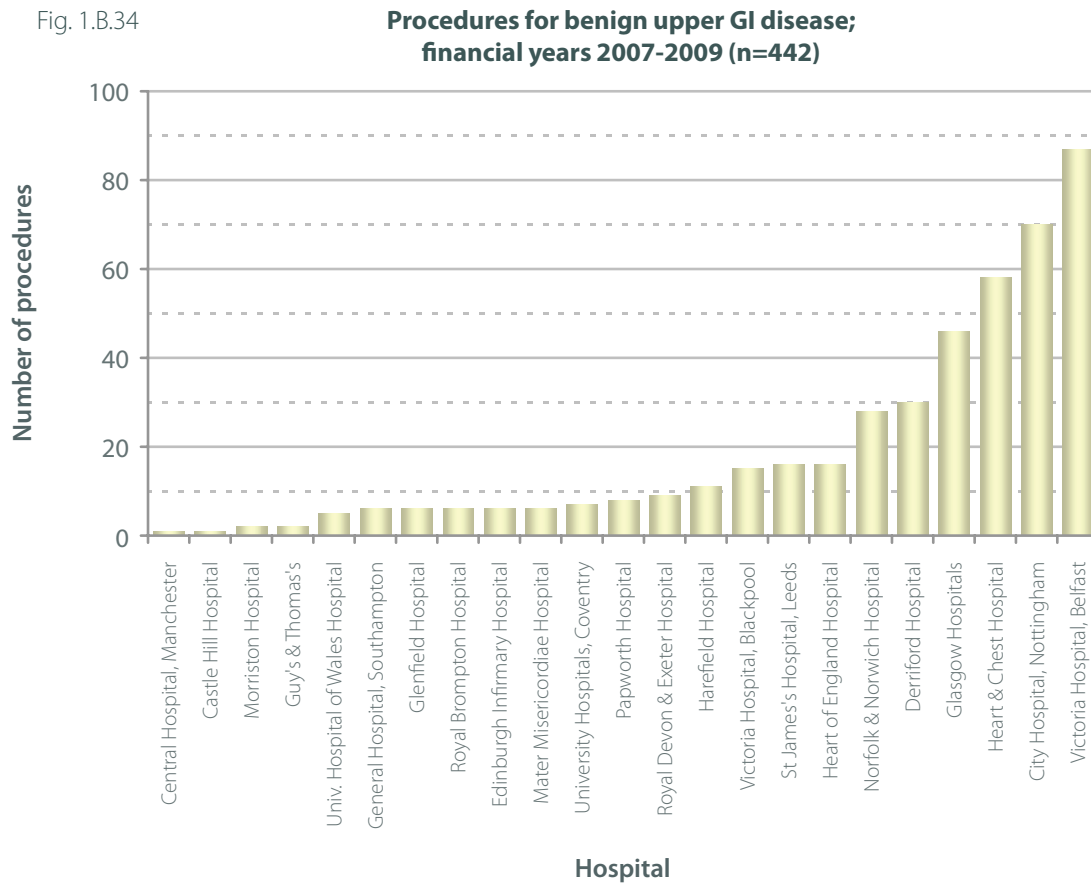




**Other major oesophagogastric surgery**

Again, apart from the hospitals that still carry out operations for oesophagogastric cancer, major surgery for benign oesophagogastric conditions is now a rarity in thoracic surgical units.

Fig. 1.B.34



**Unit-specific activity**



### Comparisons in activity 2003-2005 *versus* 2007-2009

In this section we have looked at changes in surgical activity in thoracic units over the last decade. It draws on returns to the Thoracic Register made for two separate three-year periods. The first timeframe is between the financial years ending 2003 to 2005, as described in the 2008 report<sup>1</sup>; the second is as shown in the current report *i.e.*, the financial years ending 2007 to 2009.

The charts are presented in one of two ways. When comparing information on numbers of procedures between the two time periods the charts show the absolute difference in these numbers. For data expressed as a percentage (*e.g.*, operative mortality, or VATS activity) the charts show the difference in the two percentages. The 2003-2005 activity is used as the baseline. Thus if there was an increase in activity in a particular area of practice between the two time-periods the chart shows a positive value; a reduction in activity will show as a negative. For percentage information a rise in the percentage value (such as an increase in the percentage of lobectomies carried out by VATS for a Unit) will be shown as a positive value. For a reduction in the percentage for a Unit, such as a fall in mortality for an operation between the two time-periods the chart will show a negative change. Clearly for some outcomes this change may result in a large charted value; if mortality for an operation for a Unit was zero in the 2003-2005 period and 10% for 2007-2009 then the value will be +10%.

Once again, the procedures are separated in to overall surgical workload, lung resections, surgery for pneumothorax and operations for oesophagogastric conditions. As in the previous section on Unit-specific activity, the hospitals with the most procedures are shown to the right of the y-axis.





### Hospitals providing data across both time-periods

Only the hospitals in the table below were able to provide full Register returns for all of the six years of activity being compared

City	Hospital	Thoracic Audit Lead(s)
• Aberdeen	Royal Infirmary	Mr Hussein El-Shafei
• Belfast	Victoria Hospital	Mr Mark Jones
• Birmingham	Heart of England Hospital	Mr Maninder Kalkat
• Blackpool	Victoria Hospital	Mr John Au
• Bristol	Royal Infirmary	Mr Tony Morgan & Mr Tim Batchelor
• Cardiff	University Hospital of Wales	Mr Peter O'Keefe & Ms Margaret Kornaszewska
• Coventry	Univ. Hospitals, Coventry & Warwickshire	Mr Joseph Marzouk
• Dublin	St James' Hospital	Mr Vincent Young
• Edinburgh	Royal Infirmary	Mr William Walker
• Exeter	Royal Devon & Exeter NHS Trust	Mr Richard Berrisford & Mr Peter Froeschle
• Hull	Castle Hill Hospital	Mr Michael Cowen
• Leeds	St James' Hospital	Mr Kostas Papagiannopoulos & Mr Richard Milton
• Leicester	Glenfield Hospital	Mr David Waller & Mr Sri Rathinam
• Liverpool	Heart & Chest Hospital	Mr Richard Page
• London	St Mary's Hospital	Mr Rex Stanbridge & Mr Andrew Chukwuemeka
• London	Kings College Hospital	Mr Michael Murrinan & Mr Ranjit Deshpande
	Barts & the London Hospitals	Mr Alan Wood & Mr Kit Wong
	Harefield Hospital	Mr Edward Townsend & Mr Eric Lim
	The Heart Hospital	Mr Shyam Kolvekar
	St George's Hospital	Mr Robin Kanagasaby & Mr Ian Hunt
	Royal Brompton Hospital	Mr George Ladas & Mr Eric Lim
	Guy's & St Thomas's	Mr Robert Cameron & Ms Juliet King
• Manchester	Central Manchester	Mr Nicholas Odom
	South Manchester University Hospital	Mr Rajesh Shah
• Middlesbrough	James Cook Hospital	Mr Andrew Owens & Mr Jonathan Ferguson
• Newcastle	Freeman Hospital	Mr Sion Barnard & Mr Sasha Stamenkovic
• Norwich	Norfolk & Norwich University Hospital	Mr Marc Van Leuvan
• Nottingham	City Hospital	Mr David Beggs
• Oxford	John Radcliffe Hospital	Mr Rana Sayeed & Mr Ed Black
• Papworth Everard	Papworth Hospital	Mr Andrew Ritchie & Mr Aman Coonar
• Sheffield	Northern General Hospital	Mr David Hopkinson & Mr Jonathan Edwards
• Southampton	General Hospital	Mr Khalid Amer
• Stoke	North Staffordshire Royal Infirmary	Mr Chris Smallpeice & Mr Shilajit Ghosh

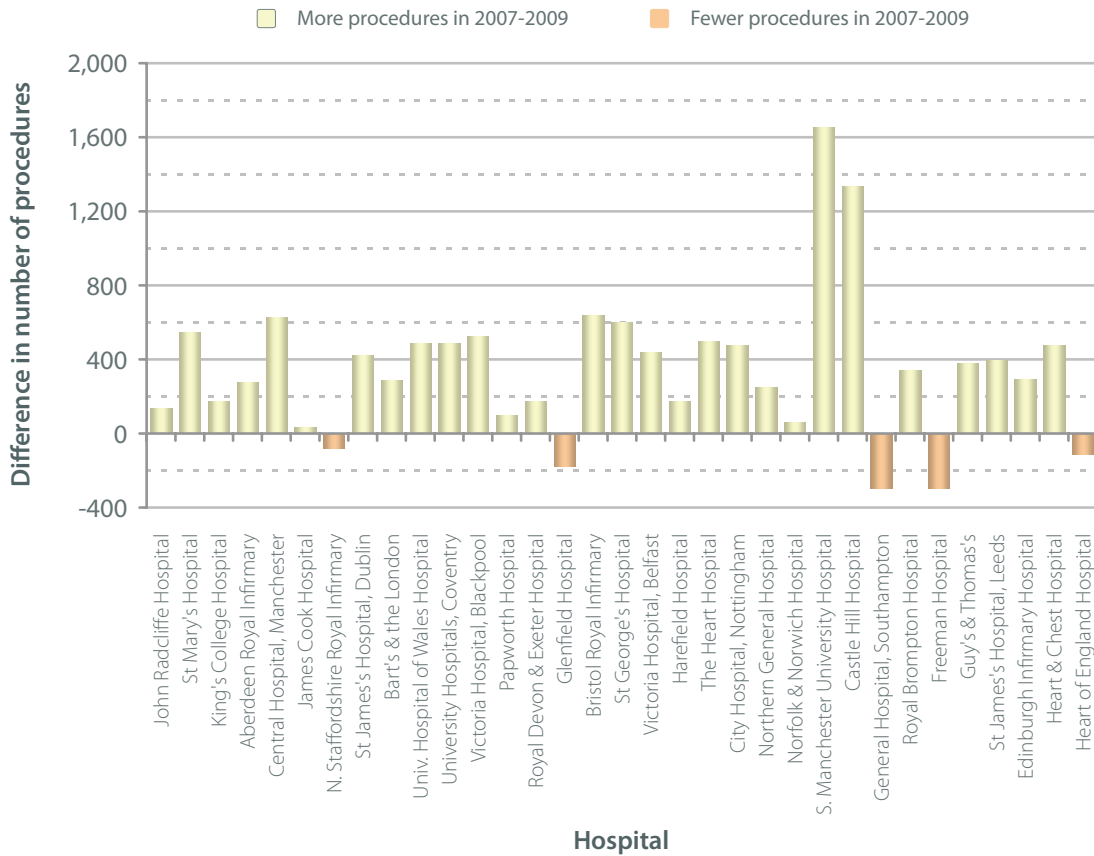


### Changes in total surgical activity

The following three charts show that virtually all hospitals are carrying out more thoracic surgery in recent years as compared to previously and the majority are doing more VATS surgery.

#### Overall activity

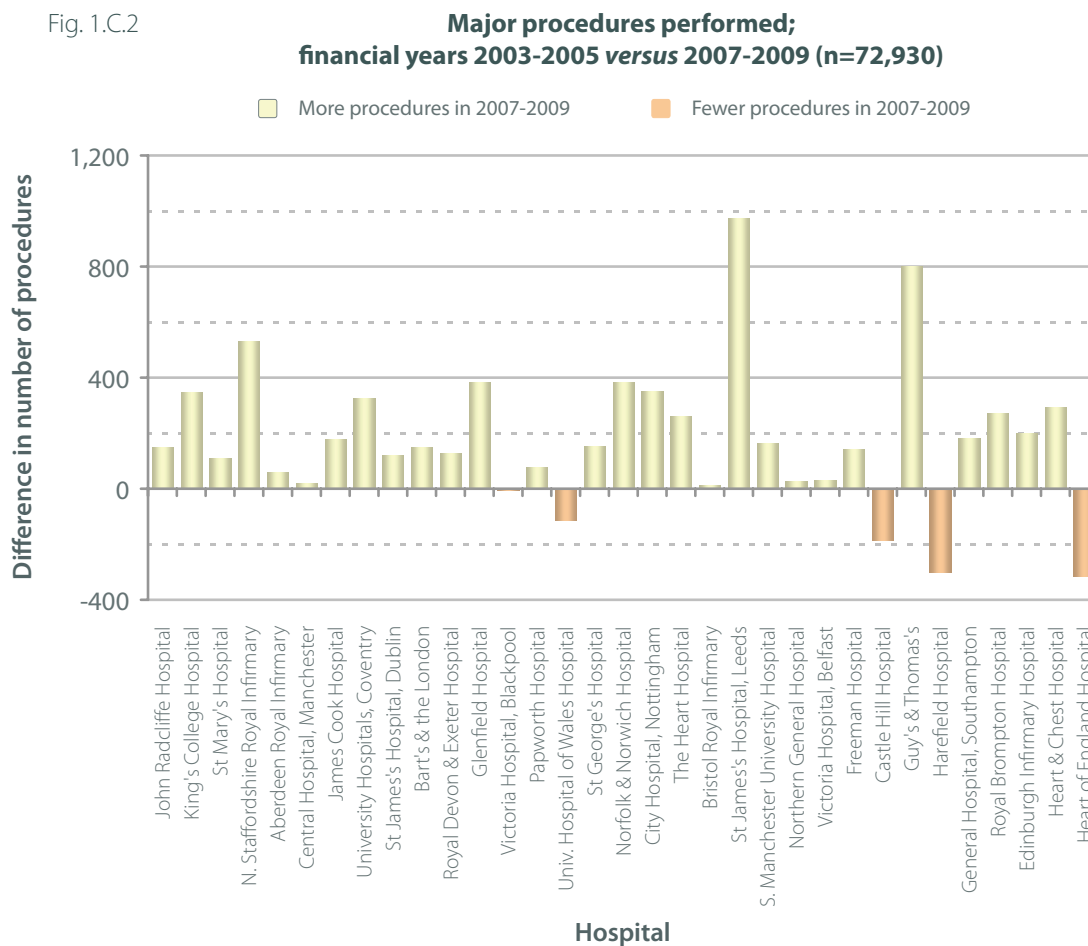
Fig. 1.C.1 **Procedures performed; financial years 2003-2005 versus 2007-2009 (n=97,746)**





Major procedures

Fig. 1.C.2





VATS procedures

Comparisons to previous report

Fig. 1.C.3

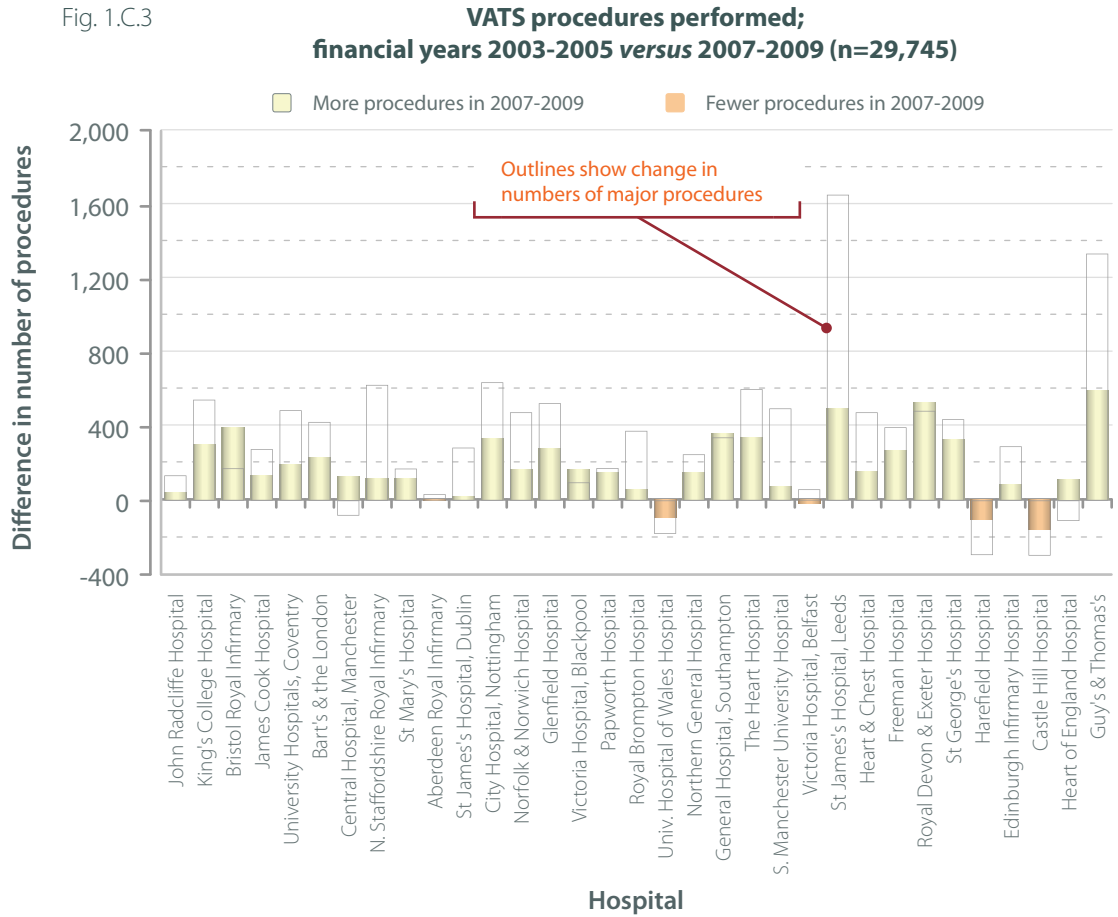
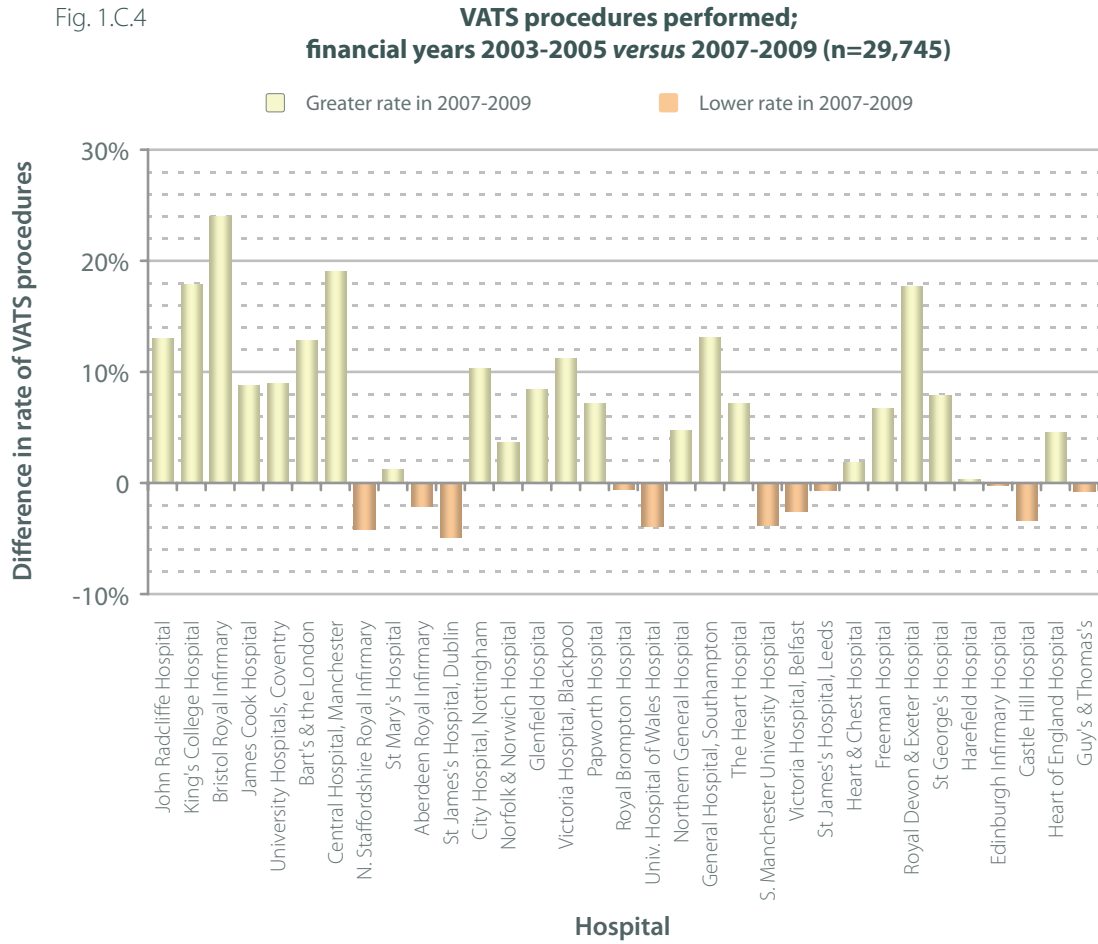




Fig. 1.C.4

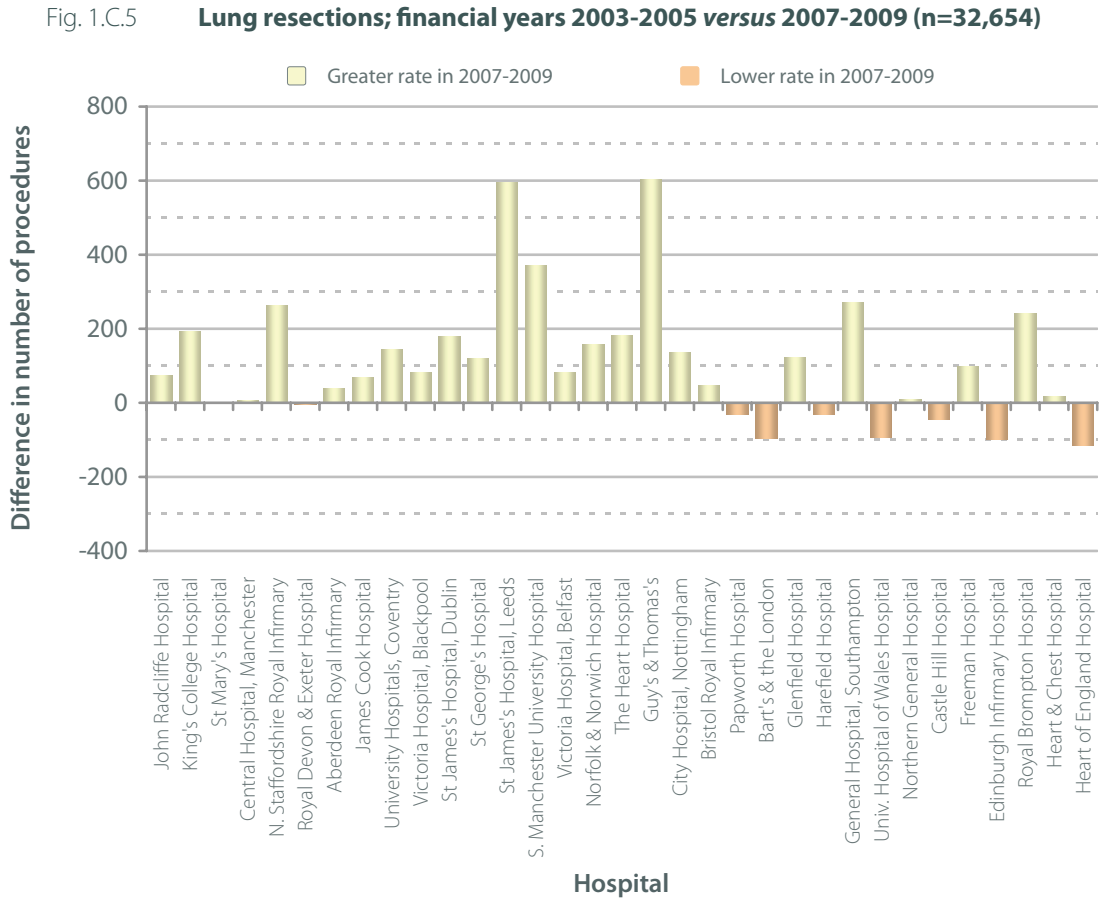




Changes in lung resection activity

Total lung resections

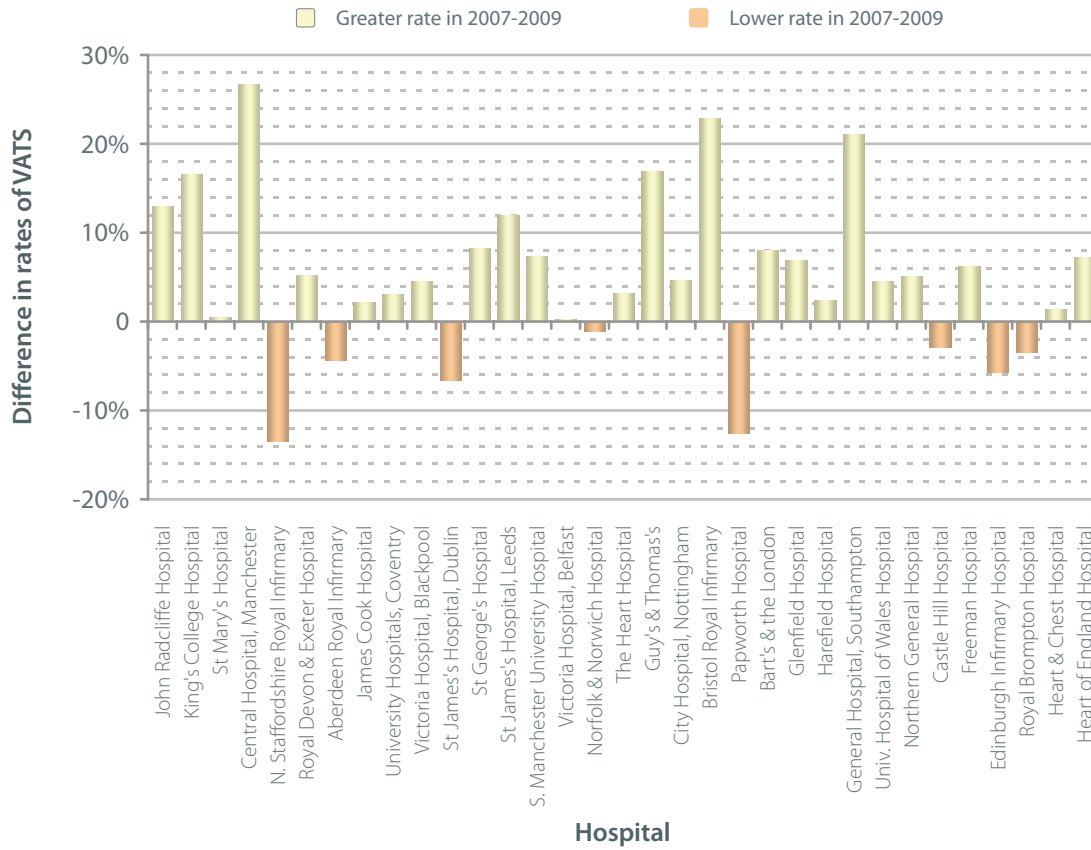
Comparisons to previous report





Open versus VATS resection

Fig. 1.C.6 The use of VATS; financial years 2003-2005 versus 2007-2009 (n=32,654)

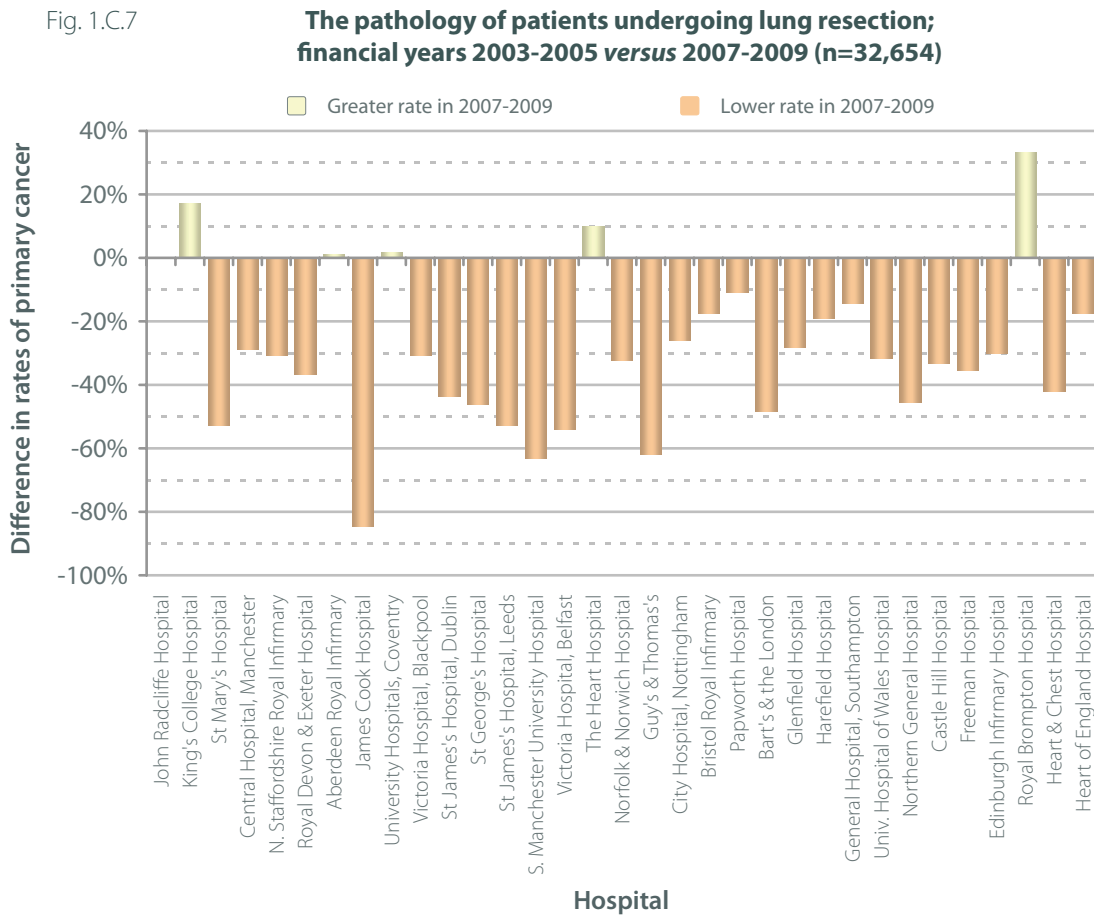




### Changes in the proportion of lung resections for primary cancer

This chart shows the changes in the number of patients having lung resections for primary cancer as opposed to other pathologies. This is separate concept to the resection rate for lung cancer (*i.e.*, the percentage of patients with lung cancer treated with surgery *versus* radiotherapy, chemotherapy *etc.*), which is discussed further in a separate section of the report. The reduction in the percentages means an increase in the relative numbers of patients having resections for conditions other than primary cancer.

Comparisons to previous report



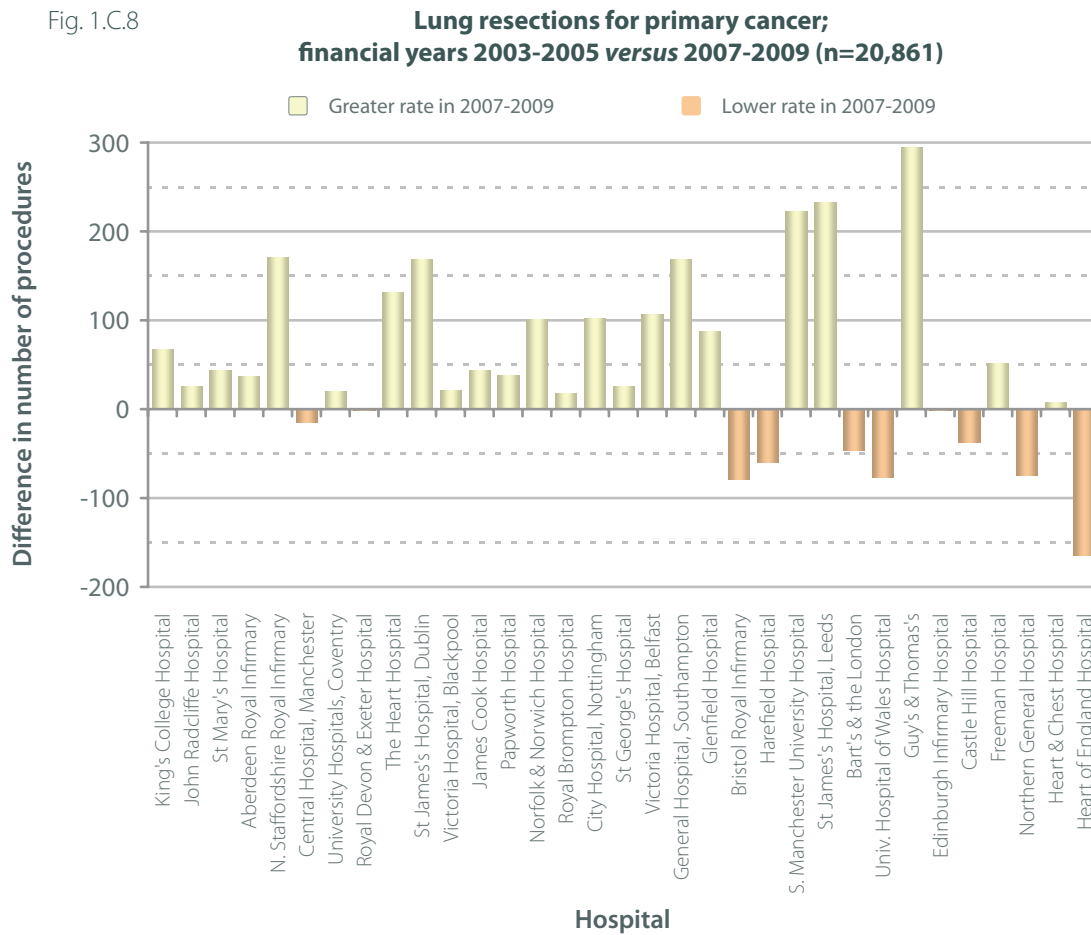




**Lung resections for primary cancer**

Virtually all units are resecting more primary cancers than previously. The decrease in some units particularly those with higher volumes of activity is probably due to a movement of surgical work to other units who have increased their workload.

Fig. 1.C.8





### Open / close rates in primary lung cancer surgery

- the rate difference is the rate in 2007-2009 less rate in 2003-2005
- the variance is calculated as follows: first,  $p$  = average rate across the two periods for the centre

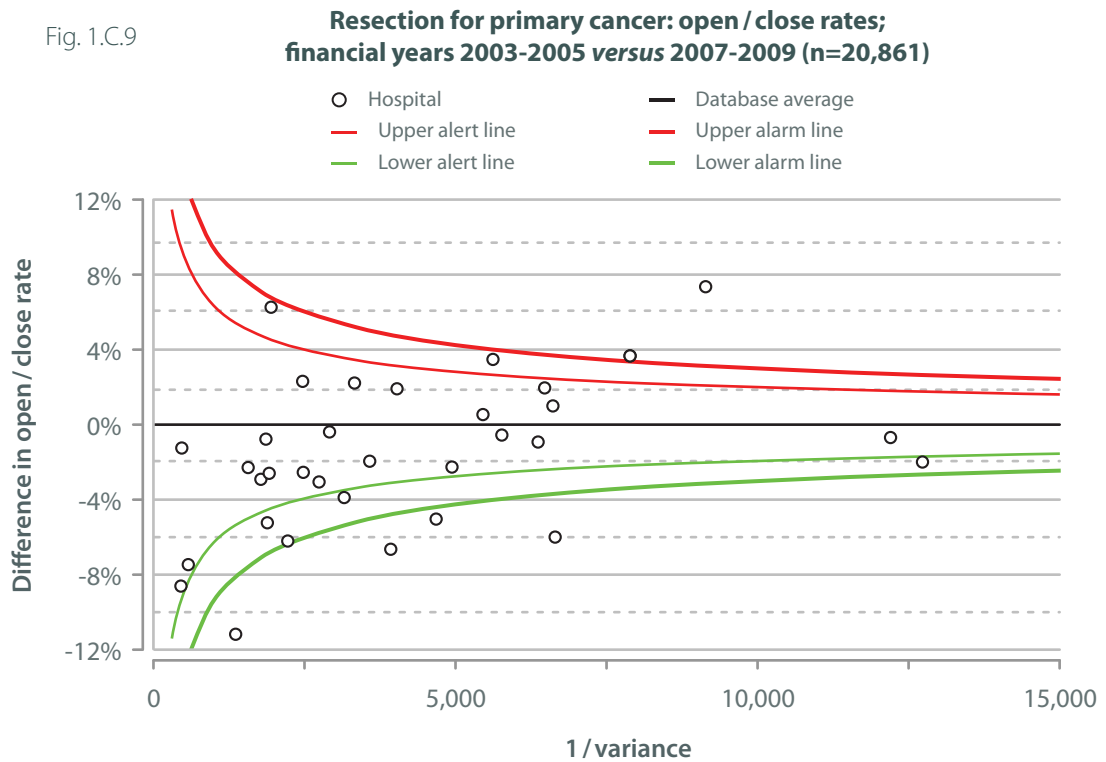
$$var = p \cdot (1 - p) \cdot \left[ \frac{1}{n_1} + \frac{1}{n_2} \right]$$

$$alert = \pm 2\sqrt{var}$$

$$alarm = \pm 3\sqrt{var}$$

Overall there has been a general reduction in the open and close rates between the two time periods

Fig. 1.C.9





**Mortality after surgery for primary cancer**

Operative mortality for lung cancer resections has been largely static between the two time periods. This, along with the increase in the numbers of patients being subjected to surgery, presumably indicates the willingness of surgeons and the wider team to offer surgery to patients with co-morbidities which previously were felt to mitigate against safe surgery.

Fig. 1.C.10

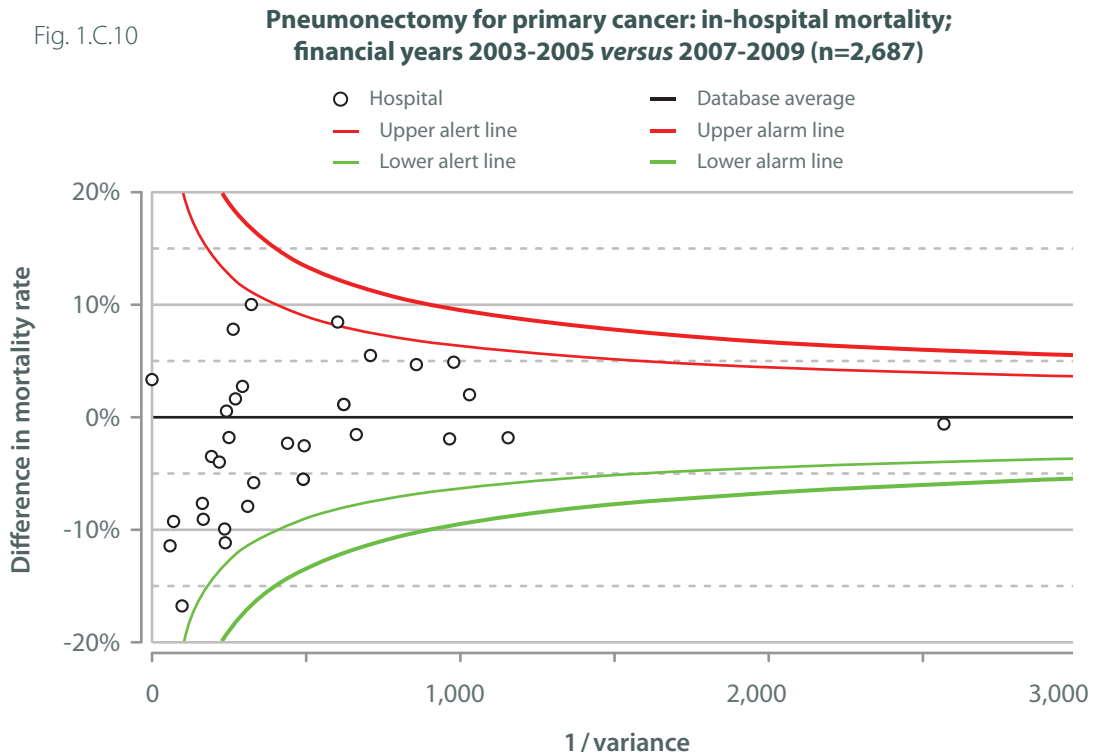


Fig. 1.C.11

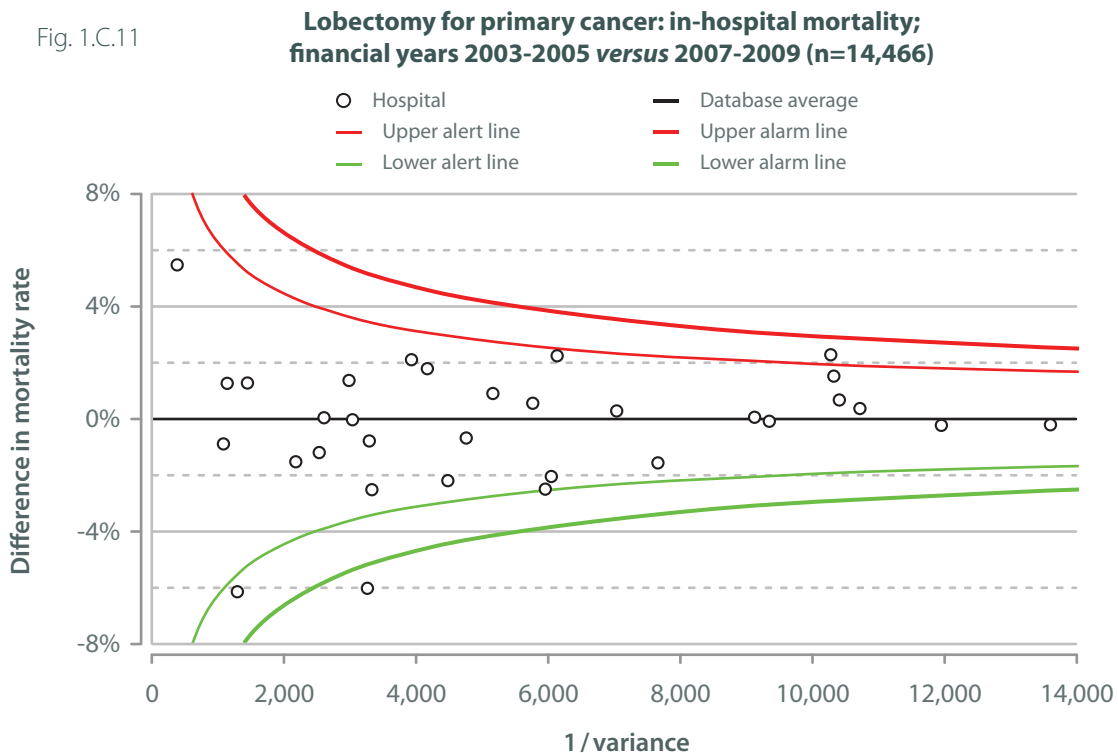
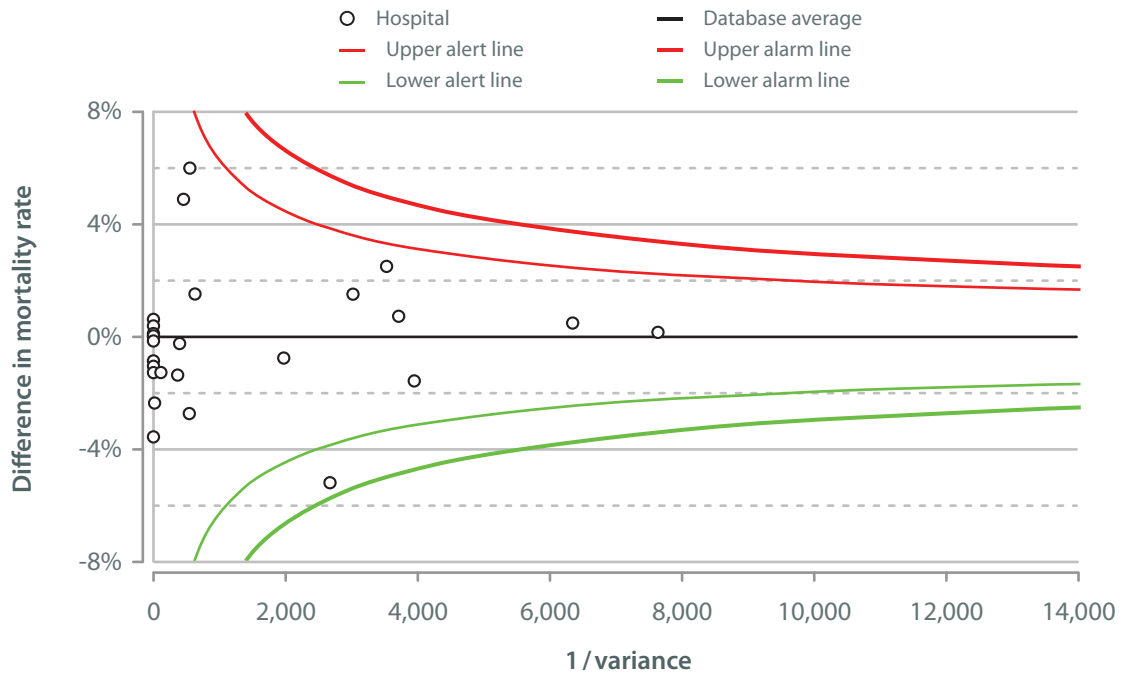




Fig. 1.C.12

**Wedge / segmentectomy for primary cancer: in-hospital mortality;  
financial years 2003-2005 versus 2007-2009 (n=3,197)**



Comparisons to previous report





### VATS resection for primary cancer

Overall more units are carrying out primary lung cancer resections using VATS techniques. In some units there has been a dramatic increase in VATS activity in this area.

Fig. 1.C.13

**Surgery for primary cancer: VATS procedures performed;  
financial years 2003-2005 versus 2007-2009 (n=20,861)**

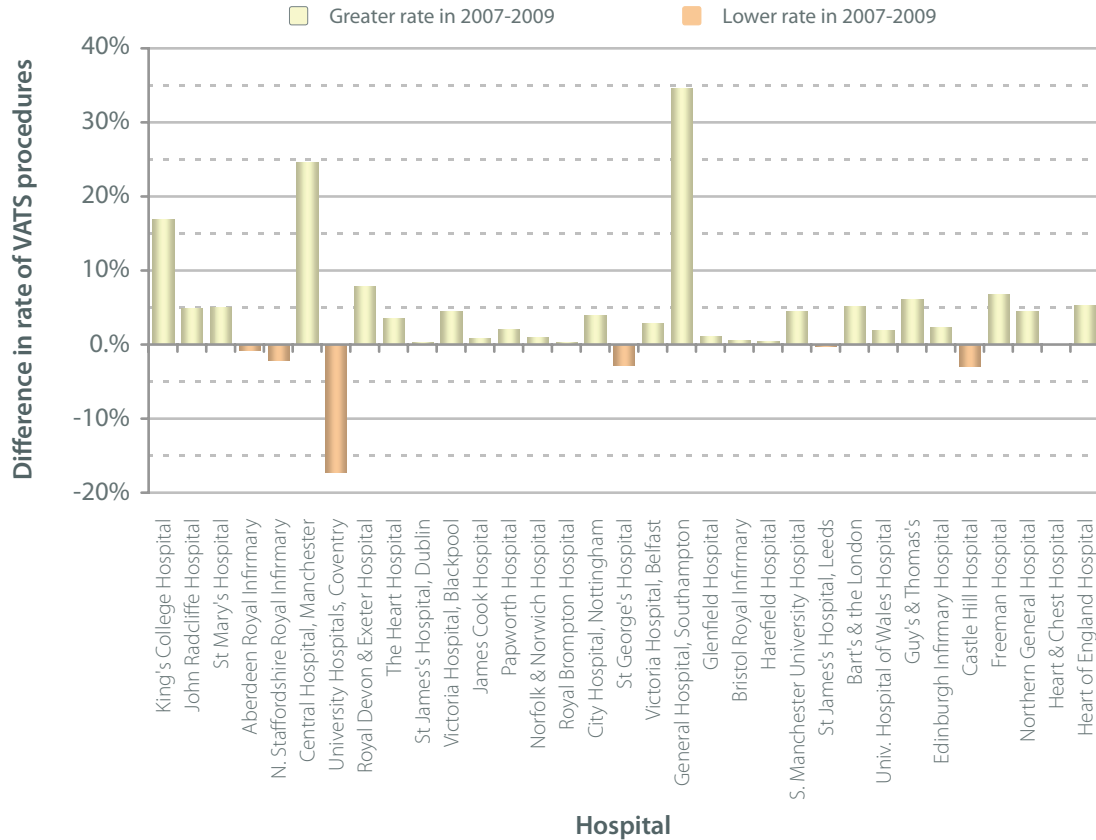
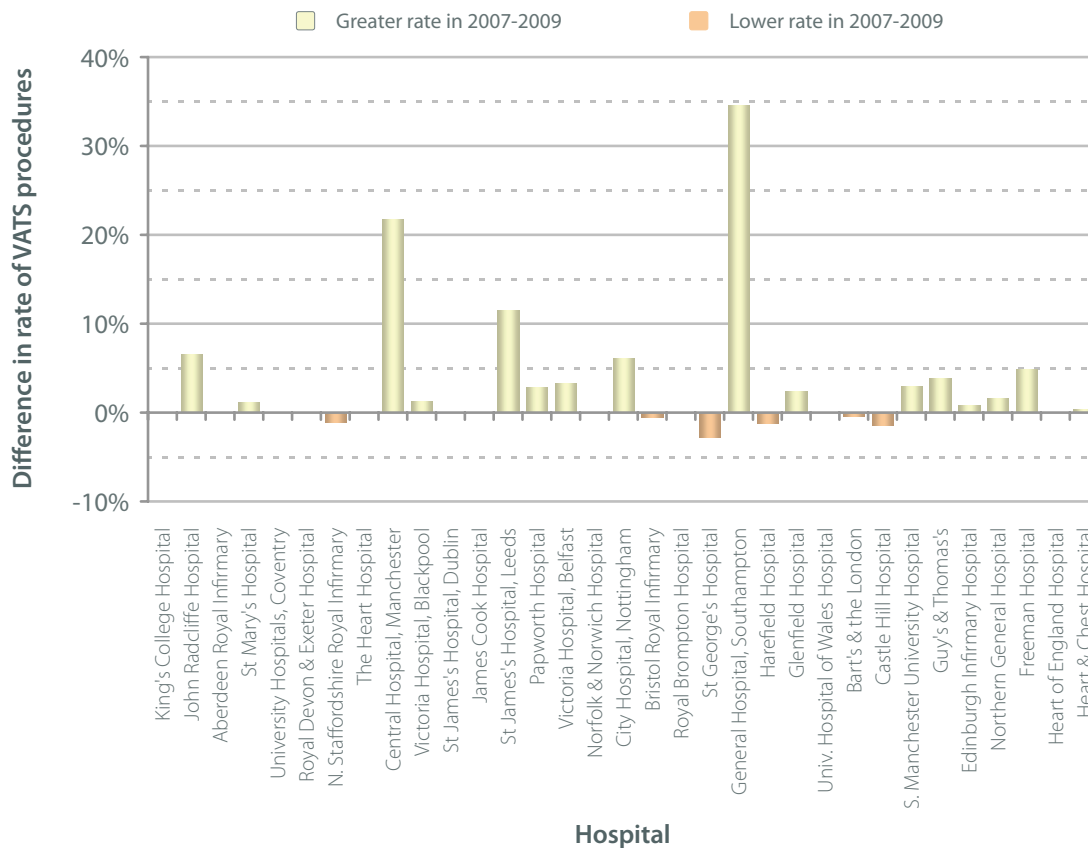


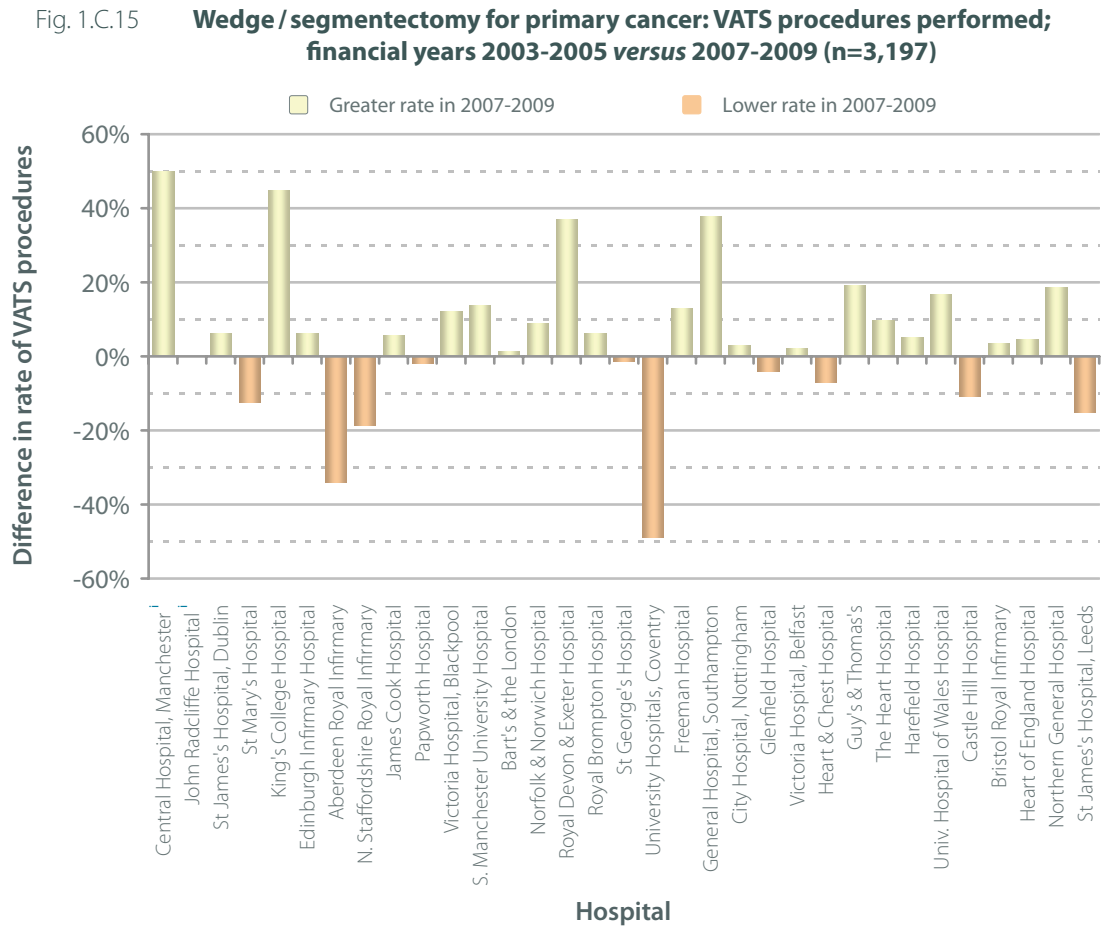


Fig. 1.C.14

**Lobectomy for primary cancer: VATS procedures performed;  
 financial years 2003-2005 versus 2007-2009 (n=14,469)**



Comparisons to previous report



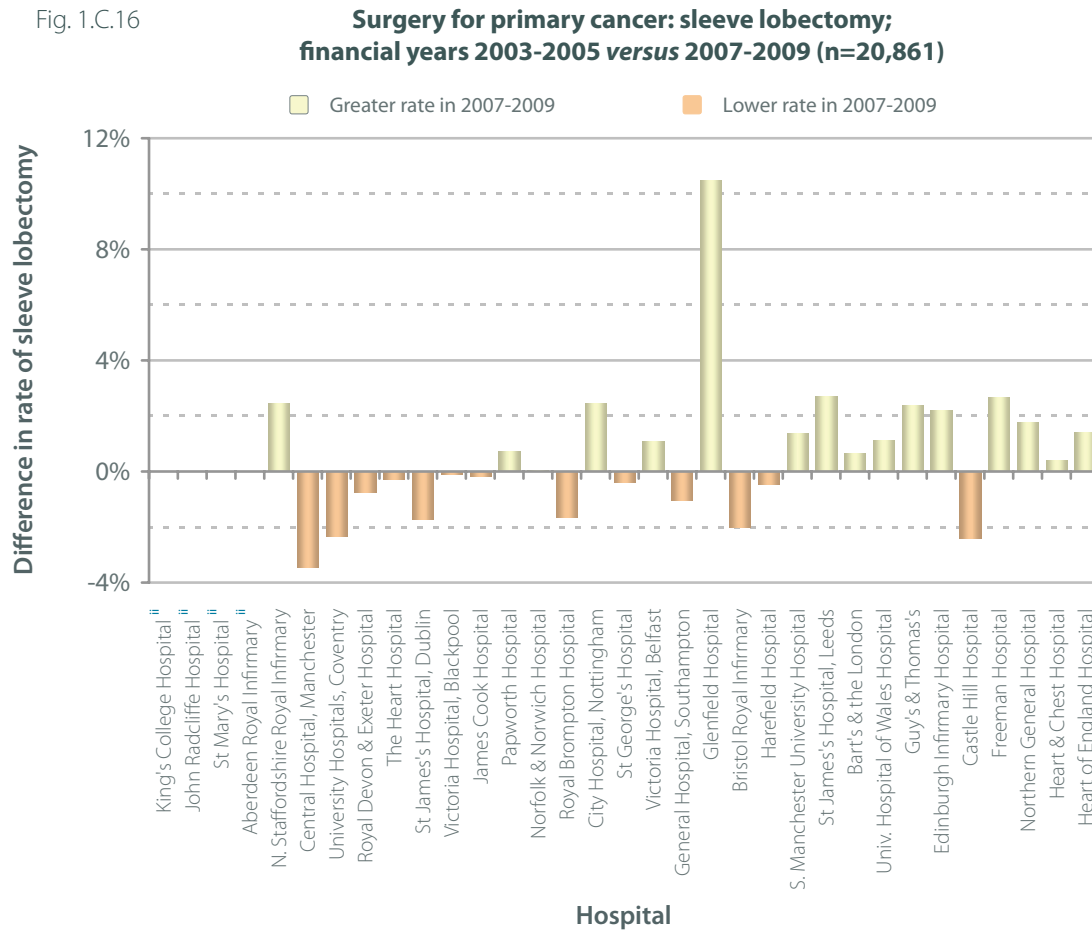
i. No wedge / segmentectomy procedures recorded in 2003-2005.





Sleeve lobectomy for primary cancer

Fig. 1.C.16



Comparisons to previous report

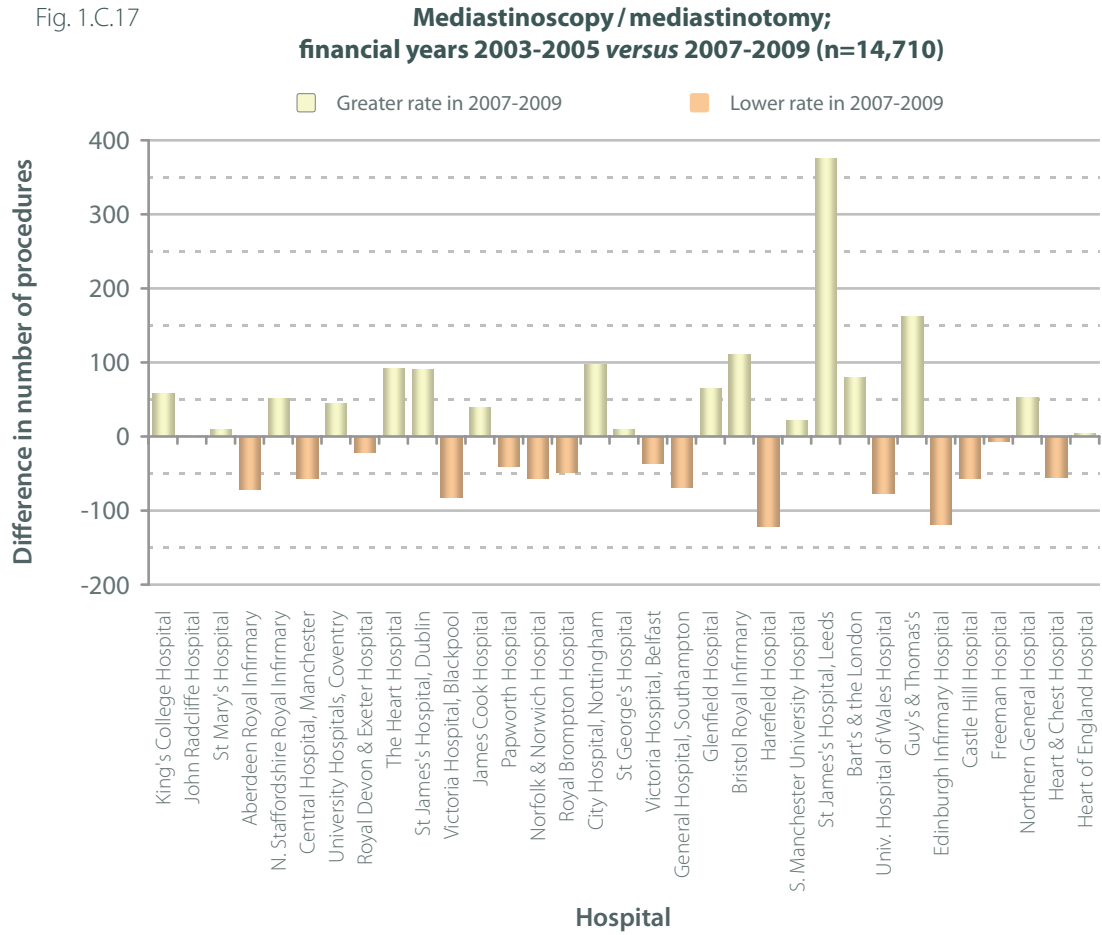
ii. No sleeve lobectomy procedures recorded in either 2003-2005 or 2007-2009.



Mediastinoscopy / mediastinotomy

Comparisons to previous report

Fig. 1.C.17







Conditions other than primary cancer

Comparisons to previous report

Fig. 1.C.18

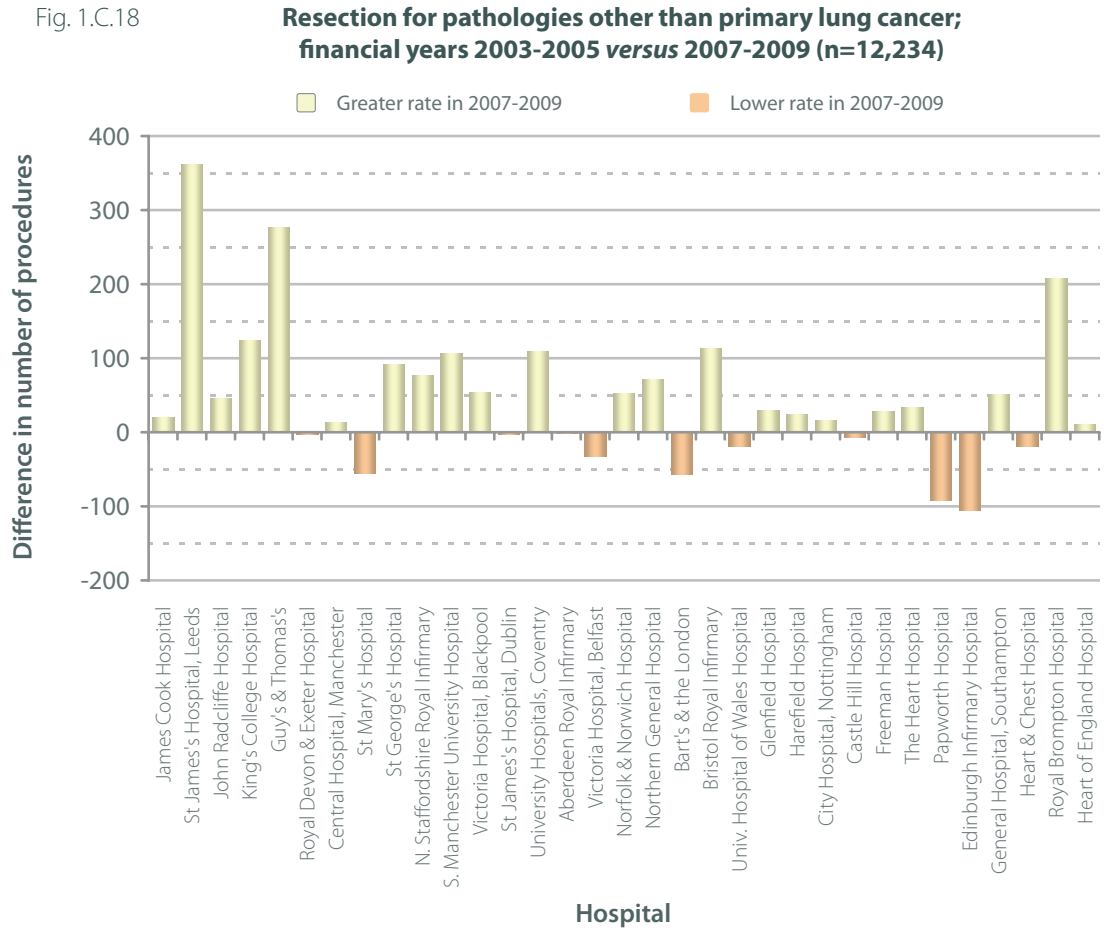
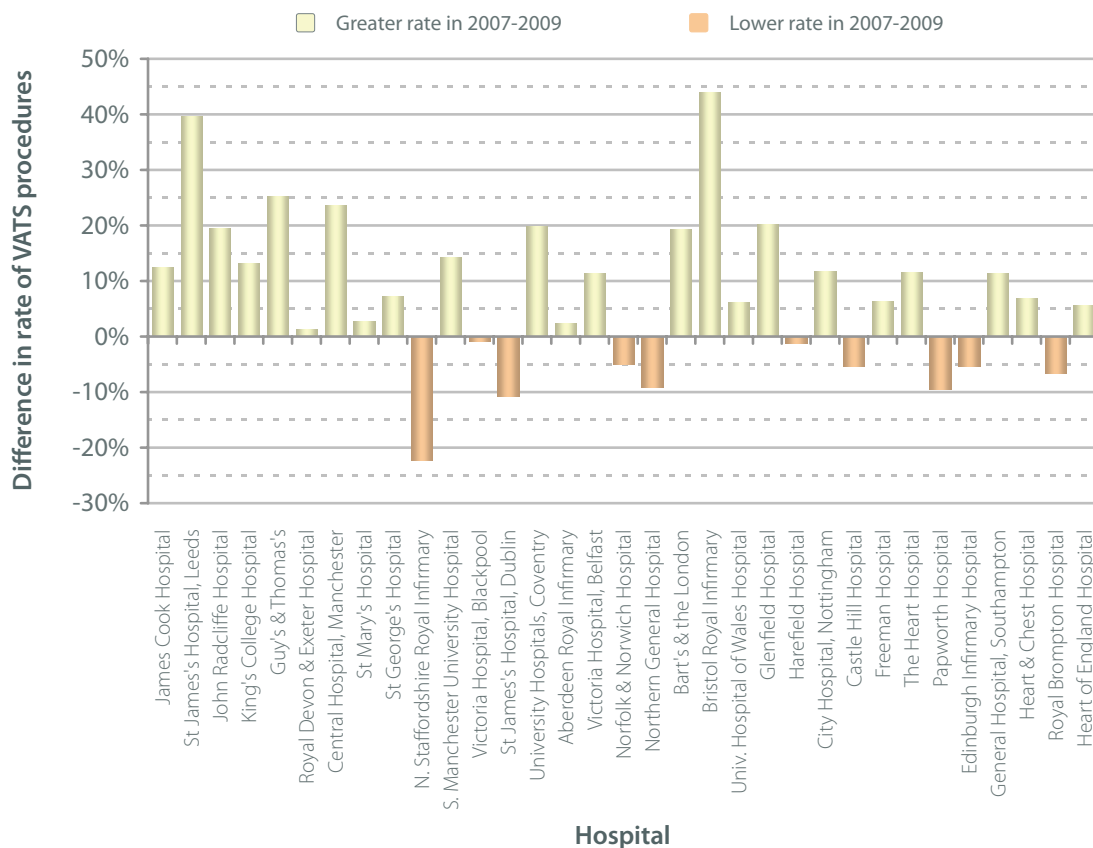




Fig. 1.C.19 **Resection for pathologies other than primary lung cancer: the use of VATS; financial years 2003-2005 versus 2007-2009 (n=12,234)**



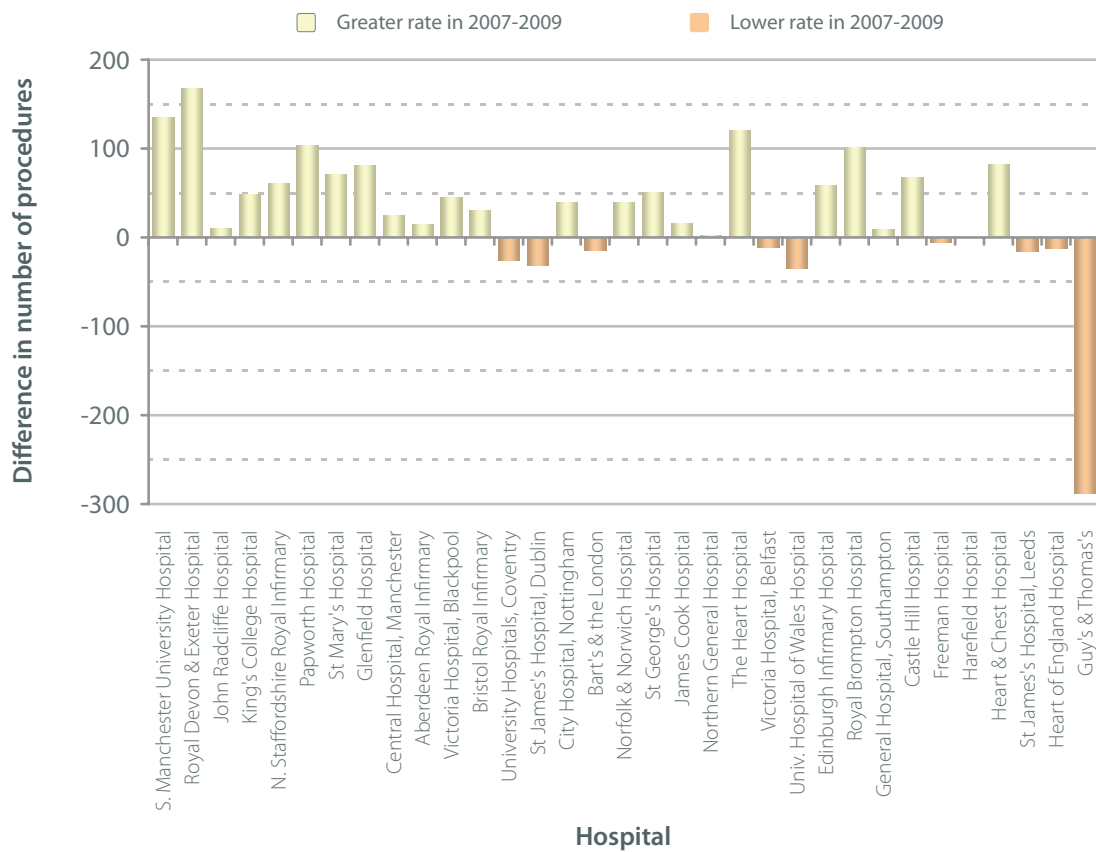


## Pneumothorax surgery

### Number of procedures

The following two charts show that virtually all units are carrying out more pneumothorax surgery. The clear exception to this is Guy's and St Thomas's. It was noted in the 2008 report that this hospital carried out many more operations for pneumothorax than all other surgical units, almost twice as many as the second most active hospital. This apparent major reduction in activity seems unusual. It may be that the definitions of what constituted pneumothorax surgery have changed within this hospital.

Fig. 1.C.20 **Pneumothorax surgery; financial years 2003-2005 versus 2007-2009 (n=9,370)**

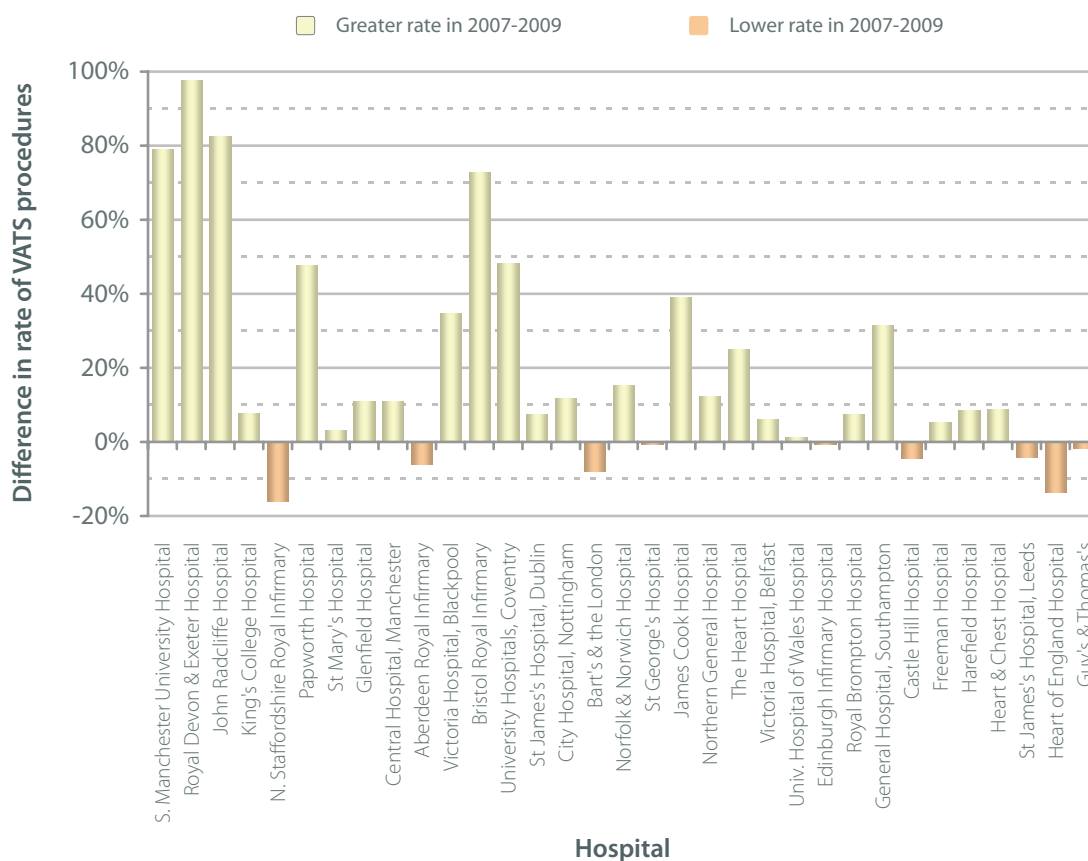




**Open surgery versus VATS**

It is clear that more hospitals are using VATS surgery for pneumothorax.

Fig. 1.C.21 **Pneumothorax surgery: the use of VATS in resections for pathologies other than primary lung cancer; financial years 2003-2005 versus 2007-2009 (n=9,370)**



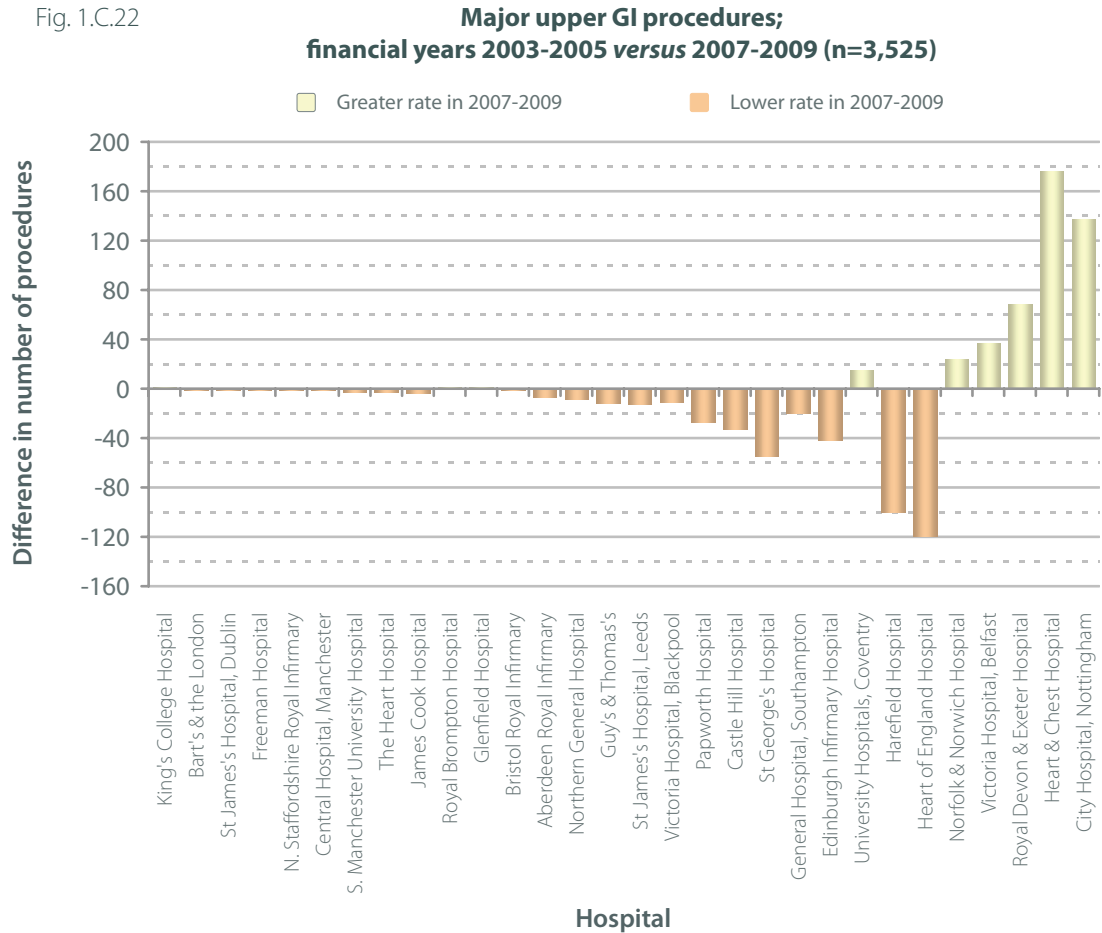


## Oesophagogastric / upper GI surgery

### Major upper GI procedures

In contrast to other areas of thoracic surgery, this area of activity has reduced significantly over recent years. The exceptions are the hospitals that had the highest activity in the 2003-2005 period and appear to have kept their oesophagogastric practice.

Fig. 1.C.22

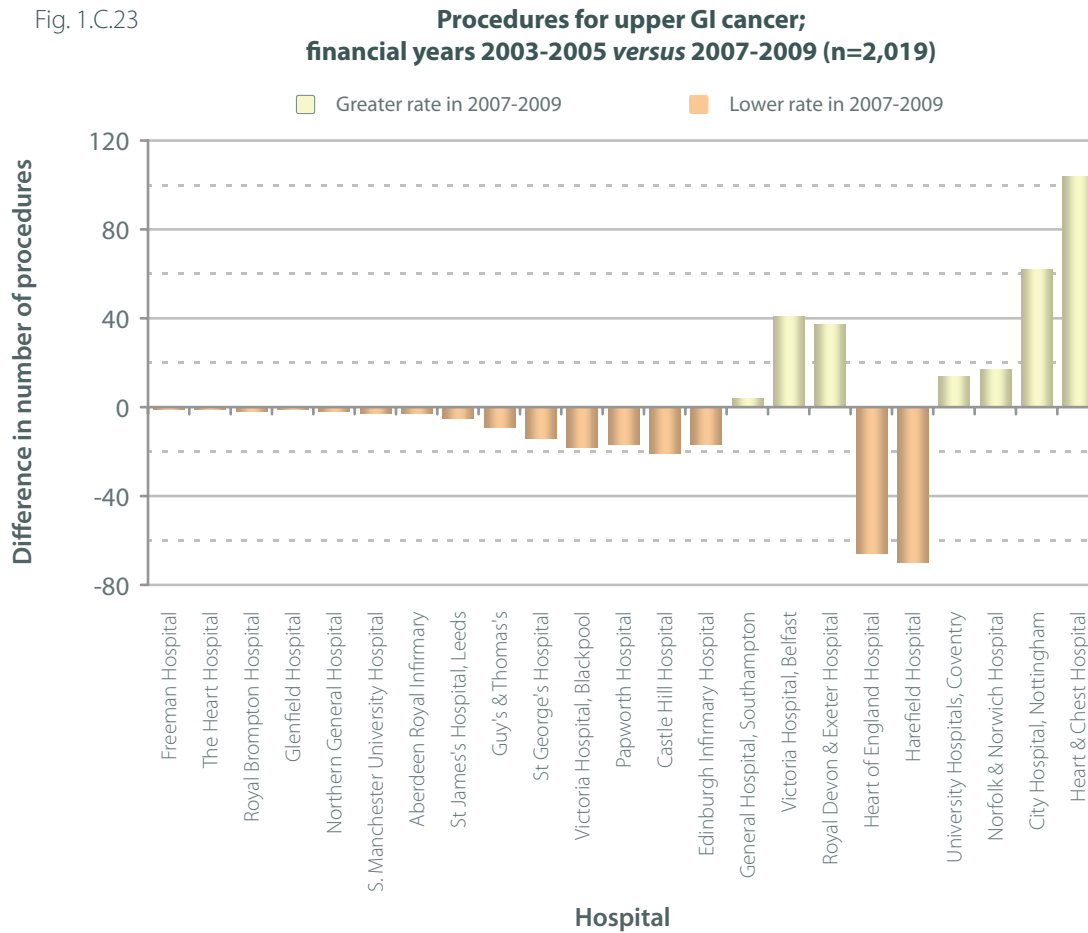






Resections for upper GI cancer

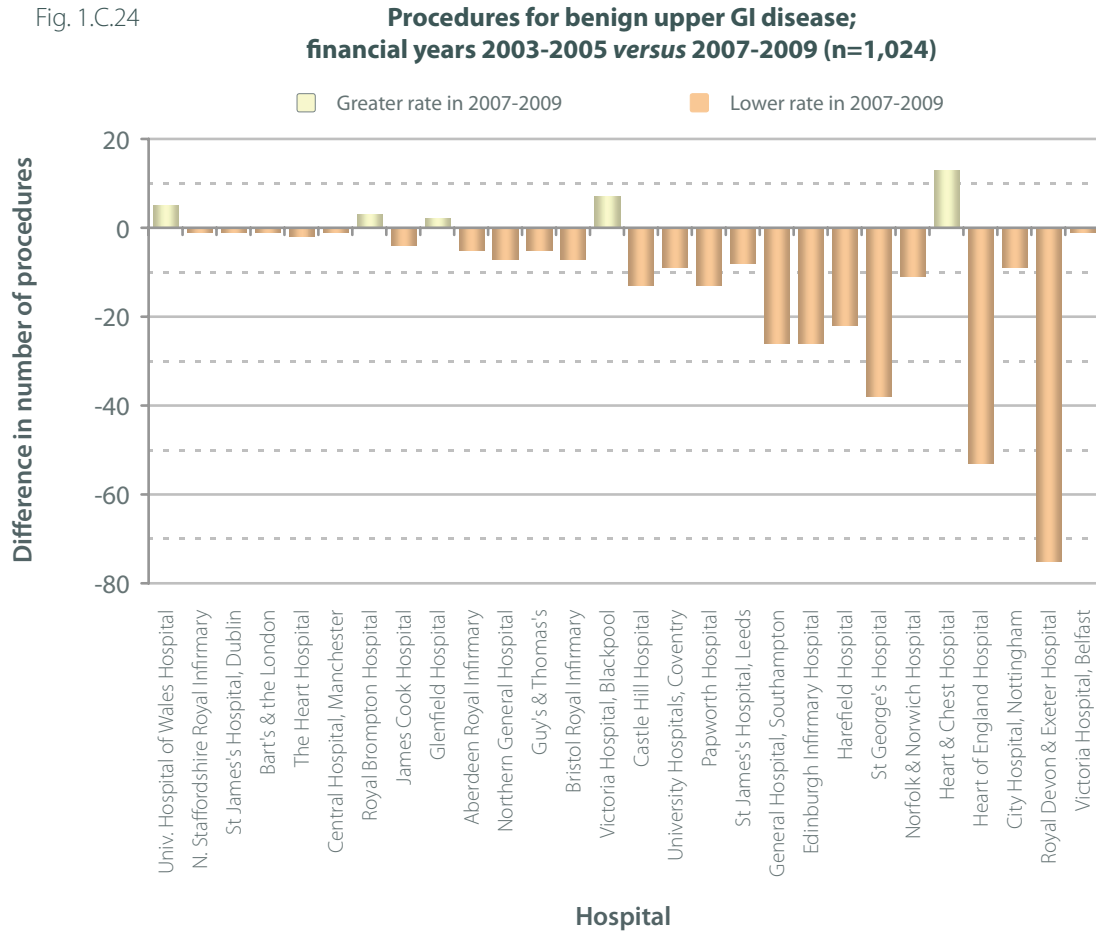
Fig. 1.C.23





Other major oesophagogastric surgery

Comparisons to previous report









# **The Thoracic Surgical Database**



## The SCTS Thoracic Surgical Database

### Background

In common with many other areas of surgery, and despite the success of the Thoracic Surgical Register, many thoracic surgeons have recognised the benefits to be gained by a more detailed audit of their activities. In 2002 a National Thoracic Dataset for patients was agreed (see Appendix 3). It was designed to capture patient-specific information for all operations carried out by thoracic surgeons, with additional details for patients having lung resections for primary cancer. It was hoped (as happened in cardiac surgery at the end of the last millennium) that it would replace the Thoracic Register and provide a more comprehensive audit of thoracic surgical activity. Unfortunately, to date, this aspiration has not been possible given the poor overall development of prospective data collection in thoracic surgical units. This lack of development is explained by a number of factors:

1. Lack of infrastructure in thoracic units for surgical audit, mainly in terms of the staffing of audit and IT departments.
2. Difficulties in merging information from differing methods of data collection between Units
3. Absence of immediate tangible benefits of detailed patient-specific audit to the thoracic surgical community.
4. Belief that the National Lung Cancer Audit can fulfil the audit needs of thoracic surgeons.
5. Reluctance to commit more fully to audit by thoracic surgeons due to the perception of adverse effects of the reporting of surgeon-specific results within the speciality of cardiac surgery.

Nevertheless, many Units have made progress and have been able to send useful data to a central data collection point, which, up to the present, has been the Clinical Audit department at the Liverpool Heart and Chest Hospital (LHCH). Information from this project has been presented at the annual national SCTS meeting and the Thoracic Surgical Forum. However, this report contains the first published data from the SCTS thoracic surgical audit project.

### Methodology

As with the Thoracic Register the aim of the database is to collect details on all patients who are subjected to an operative procedure. It does not include information on patients managed by thoracic surgeons who do not have an operation in theatre. Although there are various systems in place for data collection in all cases patient details are entered prospectively at the time of their surgery on hospital-based IT networks. Post-operative details are added at the time of the patients' discharge from hospital. Currently this information is collated on an annual basis and information sent to the LHCH audit department.

The following units have been able to send information for central analysis at some point since the start of the project:

- Bart's & the London
- Dublin Mater Misericordiae Hospital
- Essex Cardiothoracic Centre
- Heart & Chest Hospital, Liverpool
- James Cook Univ. Hospital, Middlesbrough
- New Cross Hospital, Wolverhampton
- Northern General Hospital, Sheffield
- Royal Devon & Exeter Hospital
- South Manchester University Hospitals
- The Heart Hospital, London
- Univ. Hospitals Coventry & Warwickshire
- Victoria Hospital, Blackpool

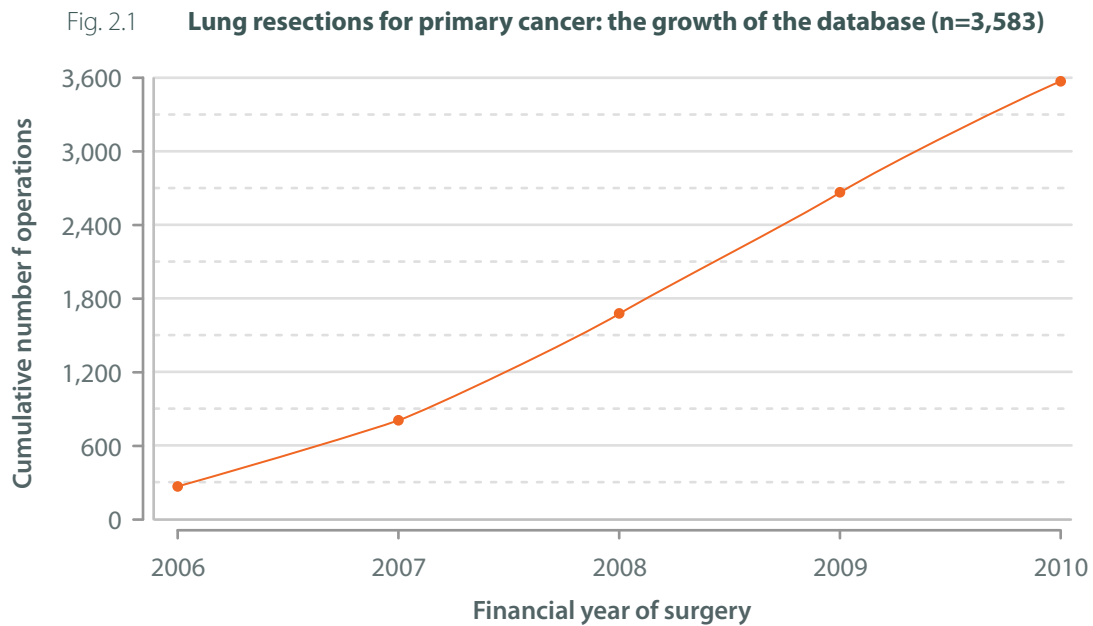
These hospitals comprise 12 out of the known 41 currently active thoracic surgical units in the United Kingdom & Ireland listed in the previous sections. The SCTS is aware of prospective data collection ongoing in many other units and it is hoped that this data will become increasingly available for central collection and analysis.

Information from units is sent to the LHCH as an annual report in the form of an Excel spreadsheet. Data are then checked for repetition, conflicts and consistency and combined into a patient-specific database. Unfortunately only procedures for resections of primary lung cancer have been suitable for meaningful analysis. Information on other procedures has been patchy, with many data fields missing from the annual submissions. It may be possible to resolve these omissions in the future but the current report contains only information on lung resections for primary lung cancer.

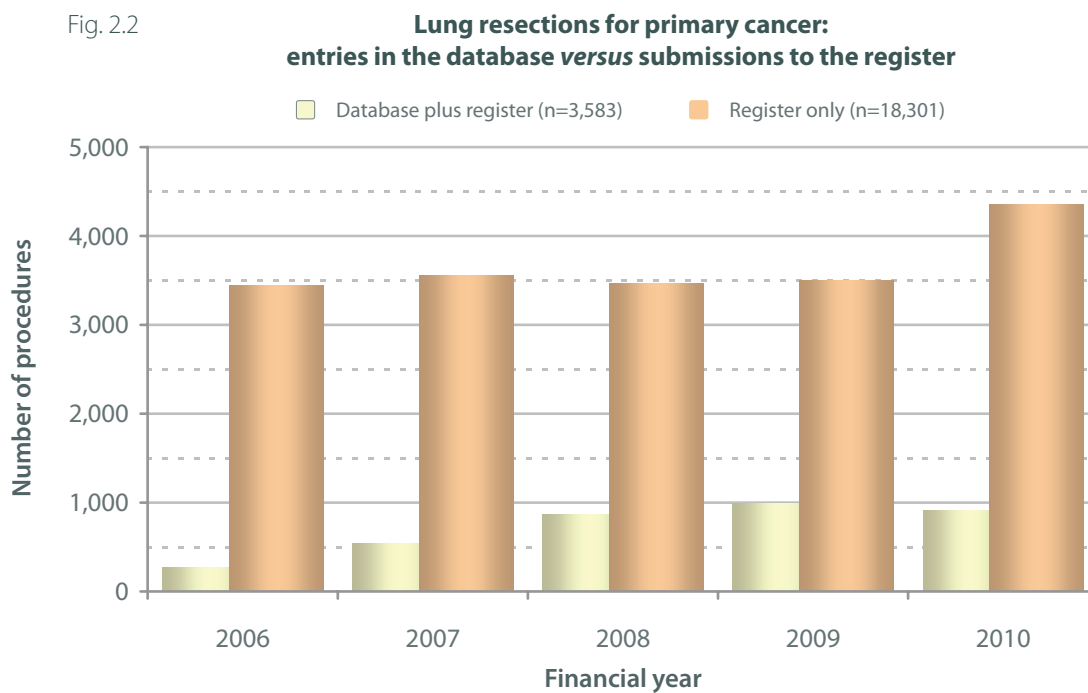


**Completeness of the database**

**The growth of the database**



**Entries in the database *versus* returns to the register**

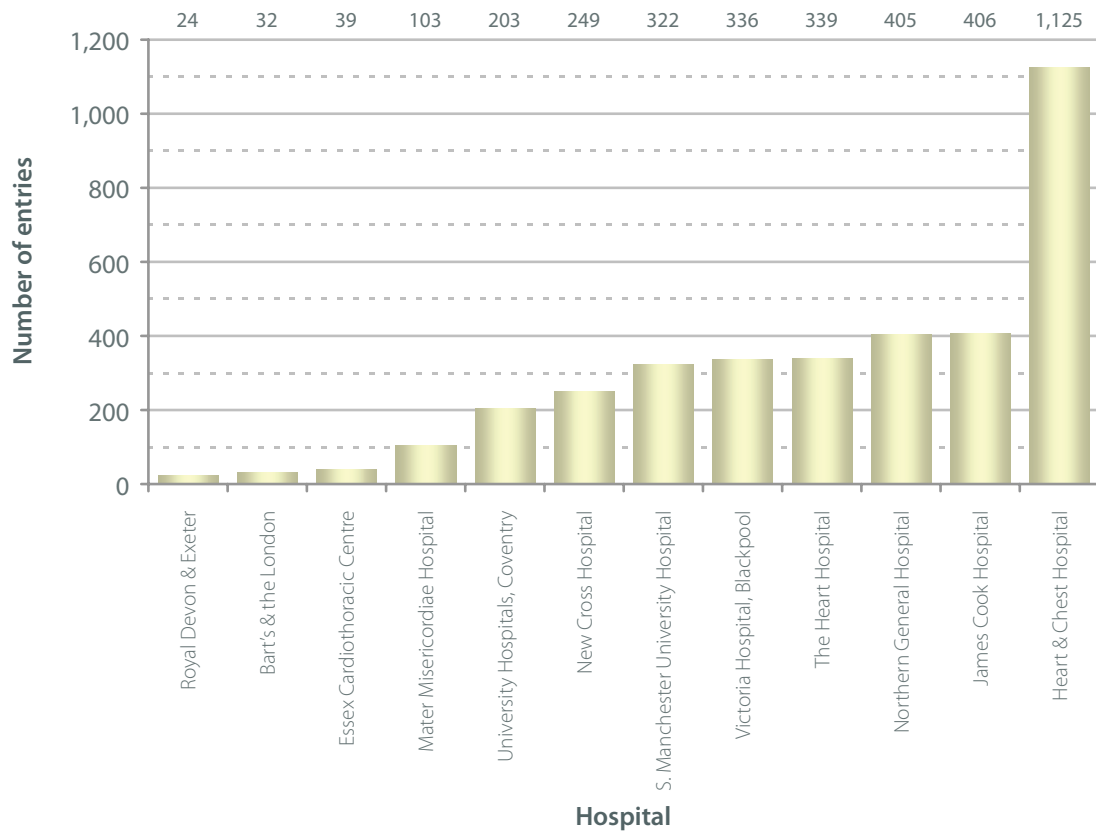




### Contributing units

It can be seen that although some units are able to submit data every year since the project started in 2006, others have either missed years or have only commenced submissions recently. Also, it has been necessary to exclude some records due to inconsistencies and conflicts within the data submitted. For example, although some parts of a record may suggest a resection for primary lung cancer, this is contradicted by the fact that no actual lung resection was carried out as part of the record, or that the resection was for benign disease. In the interests of accuracy and cleanliness of data we have felt it more appropriate to exclude these records from the database to ensure that patient descriptors and outcomes that have been reported are meaningful.

Fig. 2.3 Lung resections for primary cancer: total entries for each year of submission; financial years 2006-2010 (n=3,583)



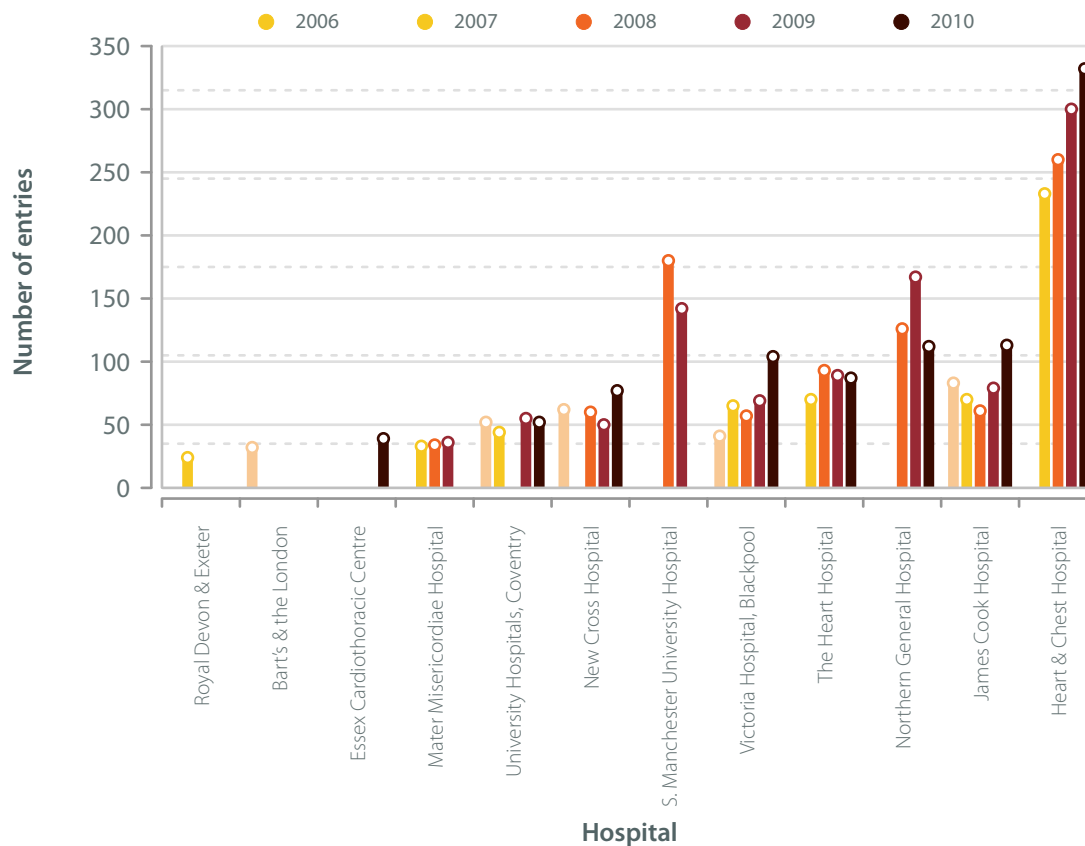




Annual contributions to the database

Hospital	Financial year ending				
	2006	2007	2008	2009	2010
Bart's & the London	●				
Essex Cardiothoracic Centre					●
Heart & Chest Hospital, Liverpool		●	●	●	●
James Cook Univ. Hospital, Middlesbrough	●	●	●	●	●
Mater Misericordiae Hospital, Dublin		●	●	●	
New Cross Hospital, Wolverhampton	●		●	●	●
Northern General Hospital, Sheffield			●	●	●
Royal Devon & Exeter Hospital		●			
South Manchester University Hospital			●	●	
The Heart Hospital, London		●	●	●	●
Univ. Hospitals Coventry & Warwickshire		●		●	●
Victoria Hospital, Blackpool	●	●	●	●	●

Fig. 2.4 Lung resections for primary cancer: entries for each year of submission; financial years 2006-2010 (n=3,583)

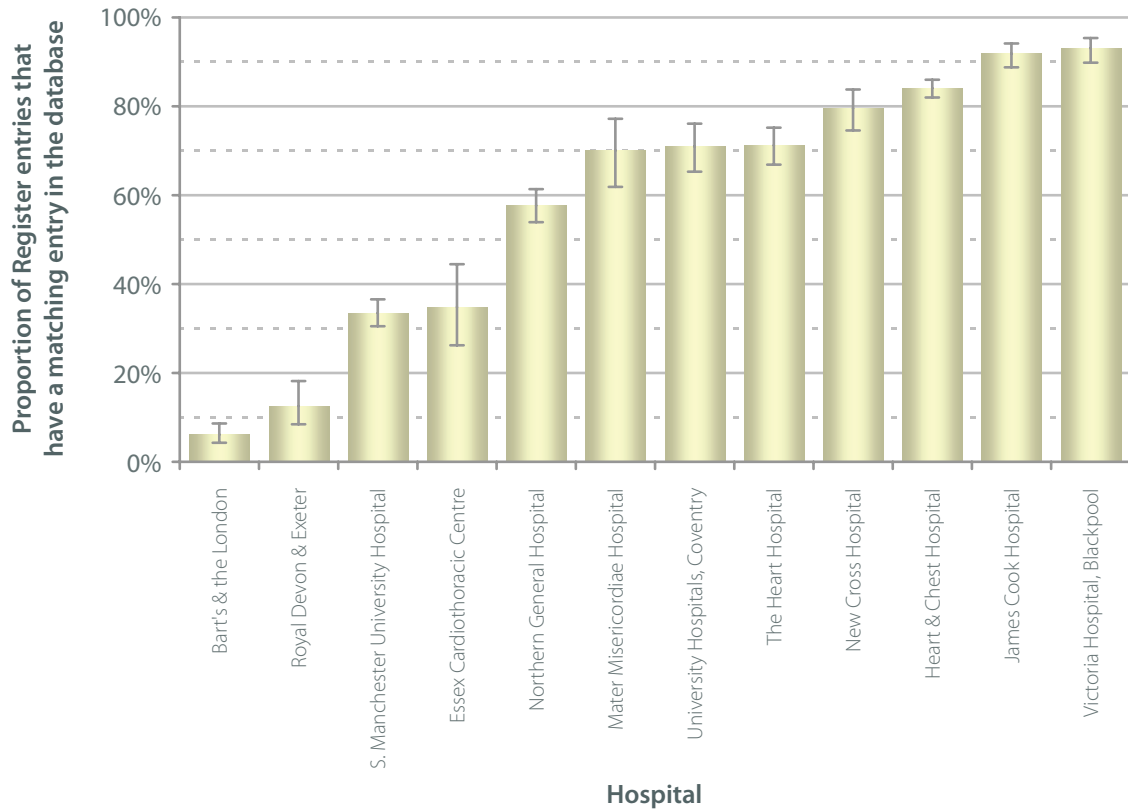




Database submissions as a proportion of returns to the Register

The gap between the *Register* and the *Database* numbers relates mainly to the lack of complete submissions of the database for the 5 years analysed. For Blackpool and Middlesbrough, which are the only two 5 star units with 5 years of complete dataset returns, there has been a slight attrition in numbers of patients available in the dataset due to conflicts in the data of some of the patients, as explained previously on page 102

Fig. 2.5 Lung resections for primary cancer: proportion of operations represented in the Register also in the Database; financial years 2006-2010





### Geographical location of patients

The following diagram is useful description of which parts of the country are represented in the Database, based on the patients' postcodes. This necessarily does not include patients being treated in Ireland where postcodes are not used.





**Pre-operative patient profiles**

It is clear that characteristics of patients having lung resections for primary cancer are remarkably similar throughout the country, although pre-operative pulmonary function for Essex Cardiothoracic Centre patients is poorer than in other units.

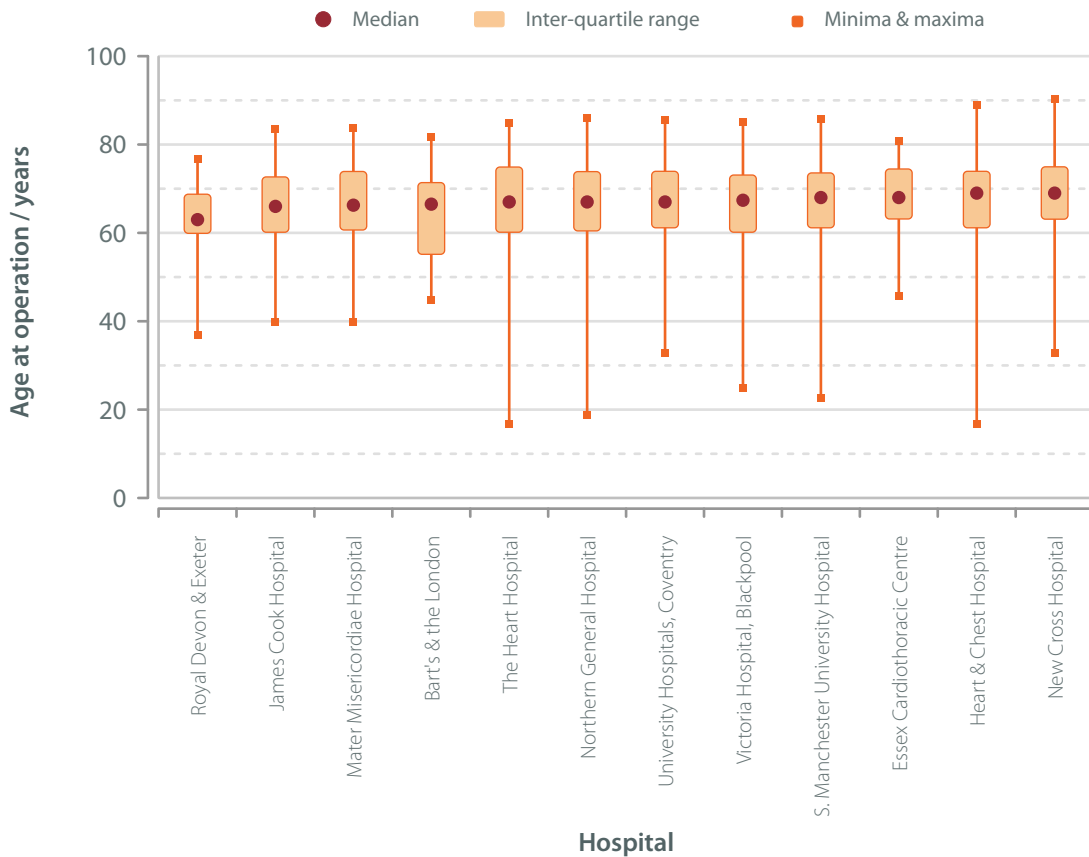
**Age at operation**

Age at operation

Hospital	Age data / years					
	Minimum	Q1	Median	Q3	Maximum	Count
Bart's & the London	44	55	67	72	82	32
Essex Cardiothoracic Centre	45	63	68	75	81	39
Heart & Chest Hospital	16	61	69	74	90	1,125
James Cook Hospital	39	60	66	73	84	406
Mater Misericordiae	39	61	66	74	84	103
New Cross Hospital	32	63	69	75	91	249
Northern General Hospital	18	60	67	74	87	405
Royal Devon & Exeter	36	60	63	69	77	24
S. Manchester University Hospital	22	61	68	74	87	322
The Heart Hospital	16	60	67	75	86	339
University Hospital, Coventry	32	61	67	74	86	203
Victoria Hospital, Blackpool	24	60	67	73	86	336

Fig. 2.6

**Lung resections for primary cancer: age at operation; financial years 2006-2010 (n=3,583)**

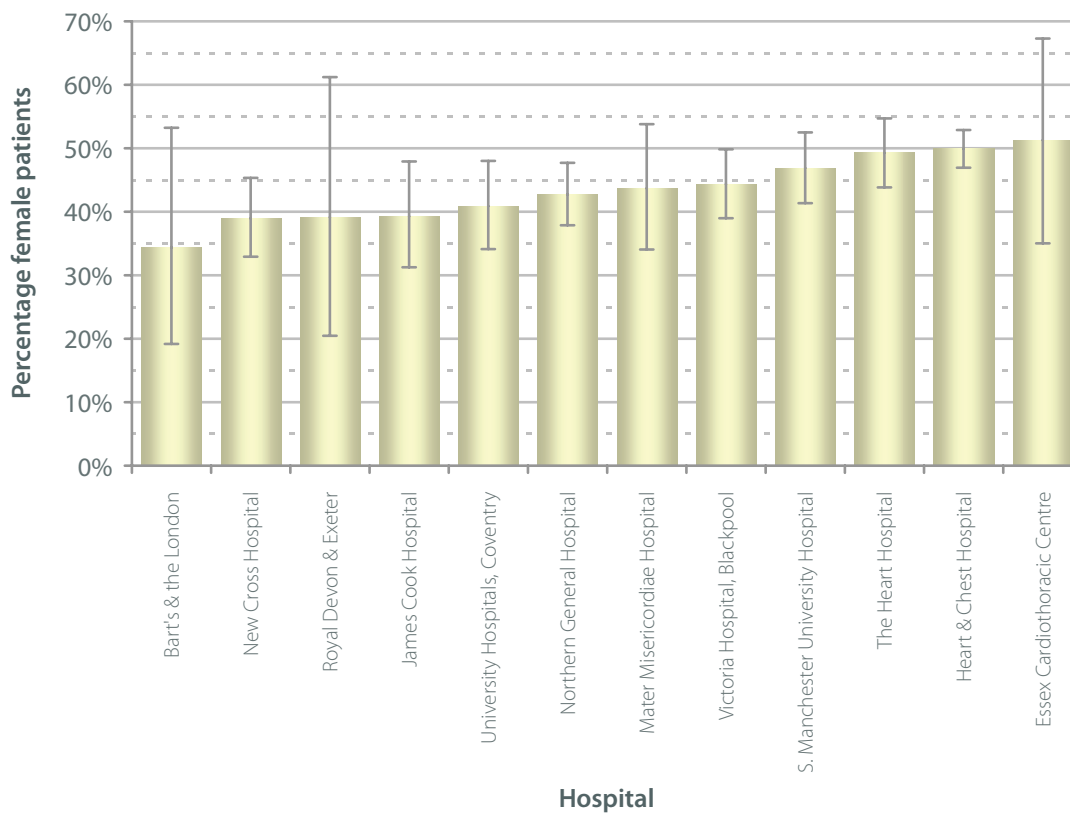




Gender

Fig. 2.7

Lung resections for primary cancer: gender;  
 financial years 2006-2010 (n=3,313)





**Pulmonary function**

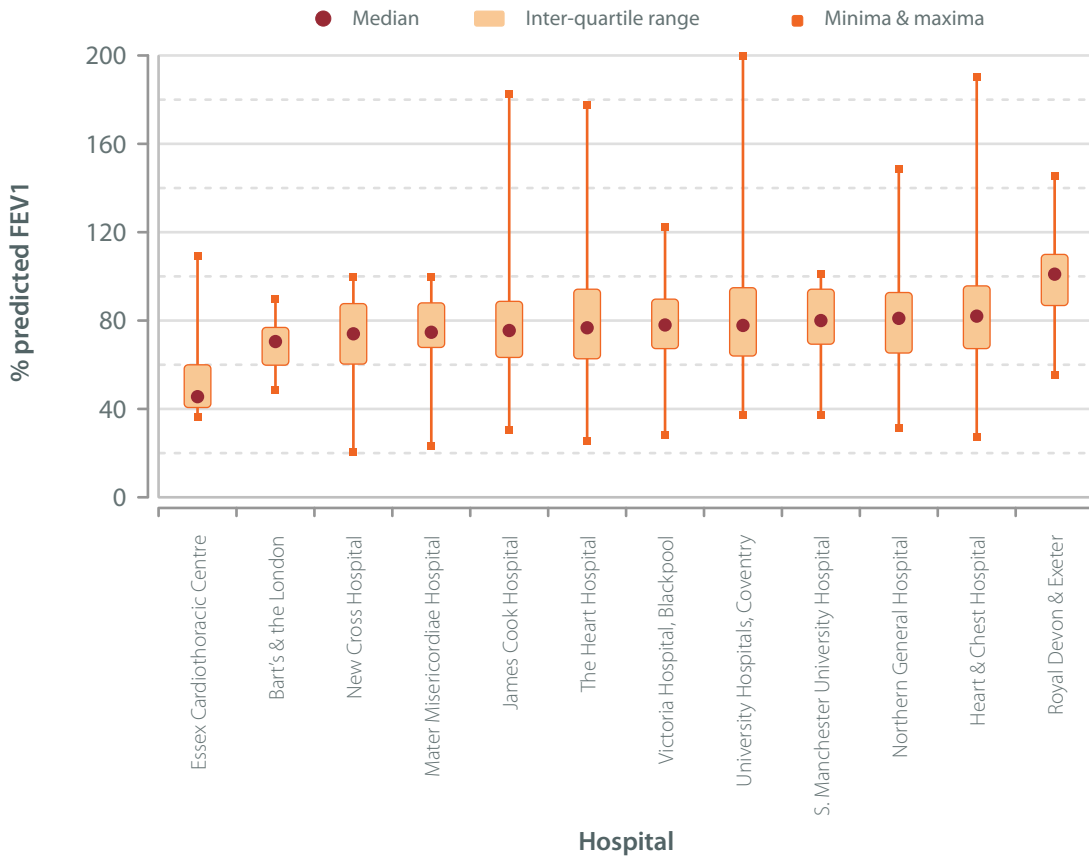
Pre-operative % predicted FEV 1

Pulmonary function: percentage predicted FEV1

Hospital	Percentage predicted FEV1 data					
	Minimum	Q1	Median	Q3	Maximum	Count
Bart's & the London	48%	60%	71%	77%	90%	12
Essex Cardiothoracic Centre	36%	40%	46%	60%	110%	20
Heart & Chest Hospital	27%	67%	82%	96%	191%	1,042
James Cook Hospital	30%	63%	76%	89%	183%	400
Mater Misericordiae	23%	68%	75%	88%	100%	88
New Cross Hospital	20%	60%	74%	88%	100%	220
Northern General Hospital	31%	65%	81%	93%	151%	361
Royal Devon & Exeter	55%	87%	101%	110%	145%	24
S. Manchester University Hospital	37%	69%	80%	95%	100%	247
The Heart Hospital	25%	62%	77%	95%	178%	131
University Hospital, Coventry	37%	64%	79%	95%	200%	126
Victoria Hospital, Blackpool	28%	67%	78%	90%	123%	284

Fig. 2.8

**Lung resections for primary cancer: pulmonary function; financial years 2006-2010 (n=2,955)**





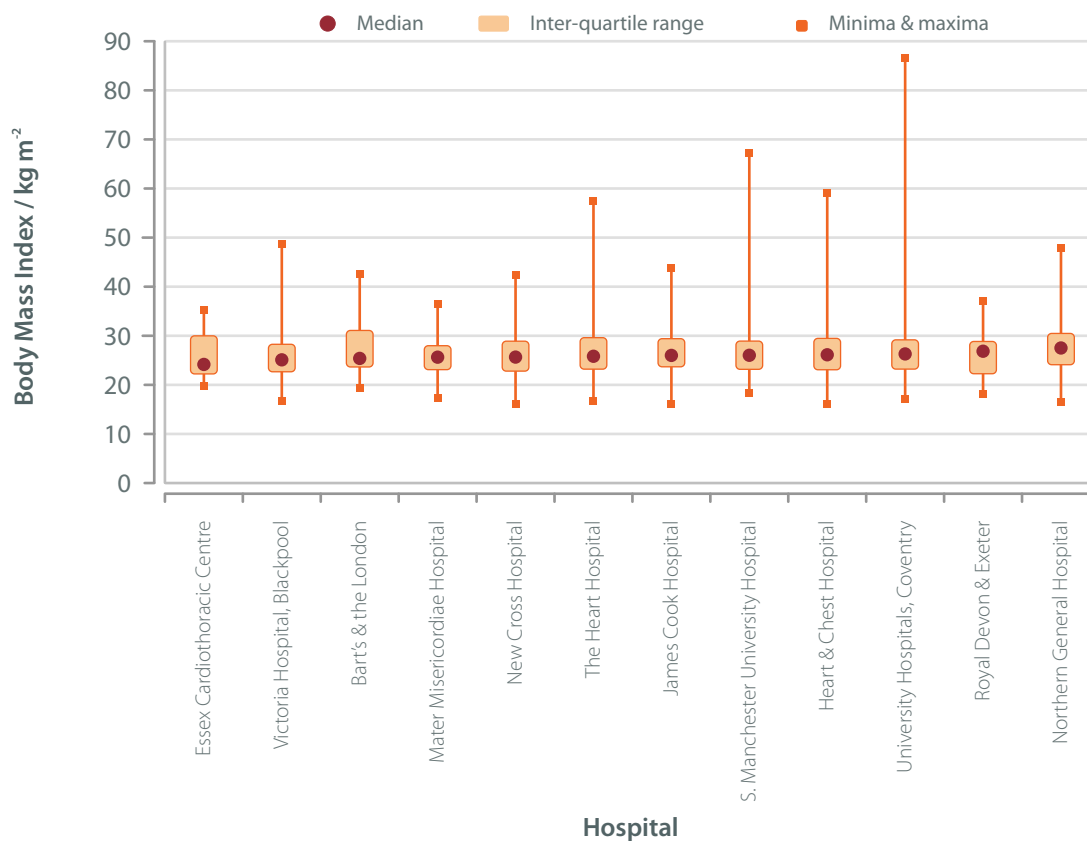
Body Mass Index

Body Mass Index

		Body Mass Index / kg m <sup>-2</sup>					
		Minimum	Q1	Median	Q3	Maximum	Count
Hospital	Bart's & the London	19.1	23.5	25.4	31.2	42.7	17
	Essex Cardiothoracic Centre	19.5	22.1	24.2	30.1	35.4	21
	Heart & Chest Hospital	16.0	22.9	26.1	29.6	59.4	1,043
	James Cook Hospital	16.0	23.0	26.0	29.0	44.0	396
	Mater Misericordiae	17.1	23.0	25.6	28.3	36.6	99
	New Cross Hospital	16.0	22.7	25.7	29.0	42.6	242
	Northern General Hospital	16.4	24.0	27.5	30.6	48.0	211
	Royal Devon & Exeter	18.0	22.1	26.9	29.0	37.2	23
	S. Manchester University Hospital	18.1	23.0	26.0	29.1	67.4	133
	The Heart Hospital	16.5	23.1	25.8	29.7	57.7	230
	University Hospital, Coventry	17.0	23.1	26.3	29.3	86.7	167
	Victoria Hospital, Blackpool	16.5	22.5	25.1	28.4	48.9	329

Fig. 2.9

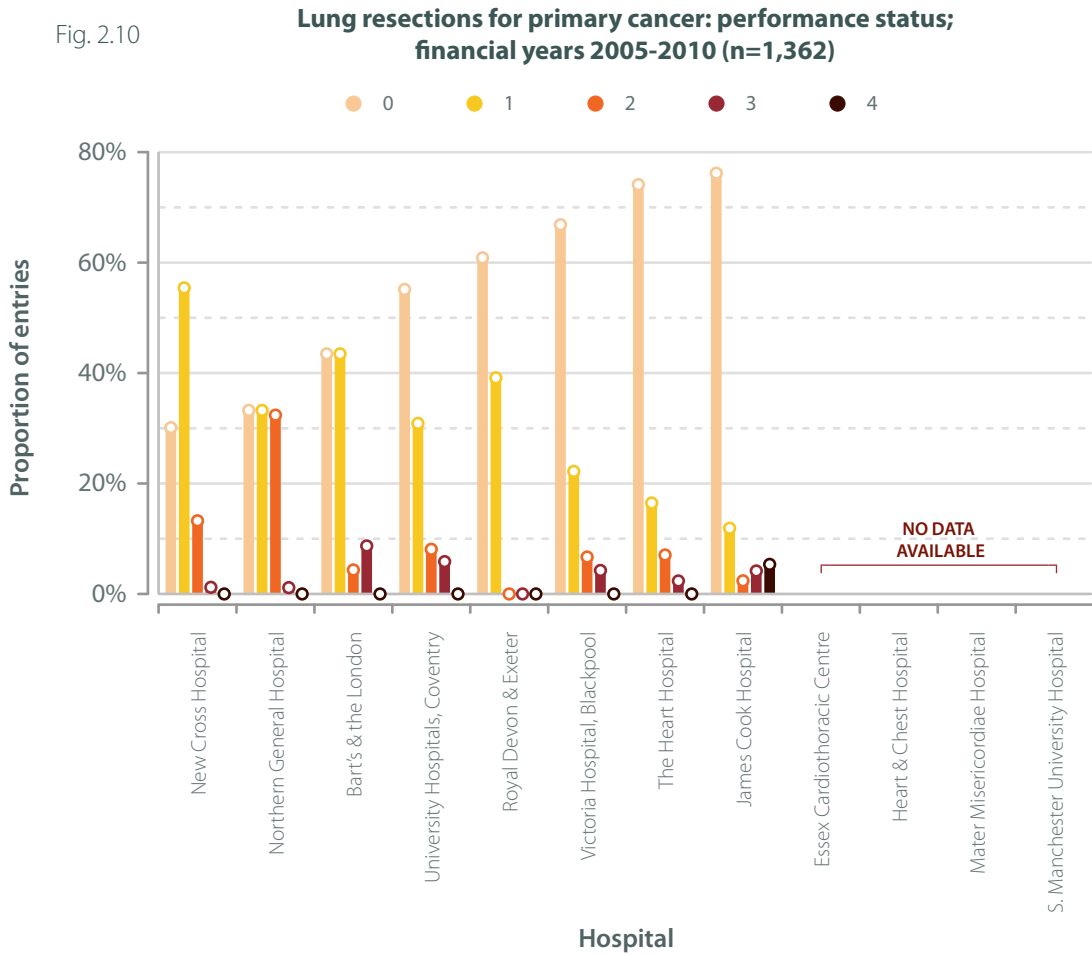
Lung resections for primary cancer: Body Mass Index; financial years 2006-2010 (n=2,911)





Performance status

Fig. 2.10



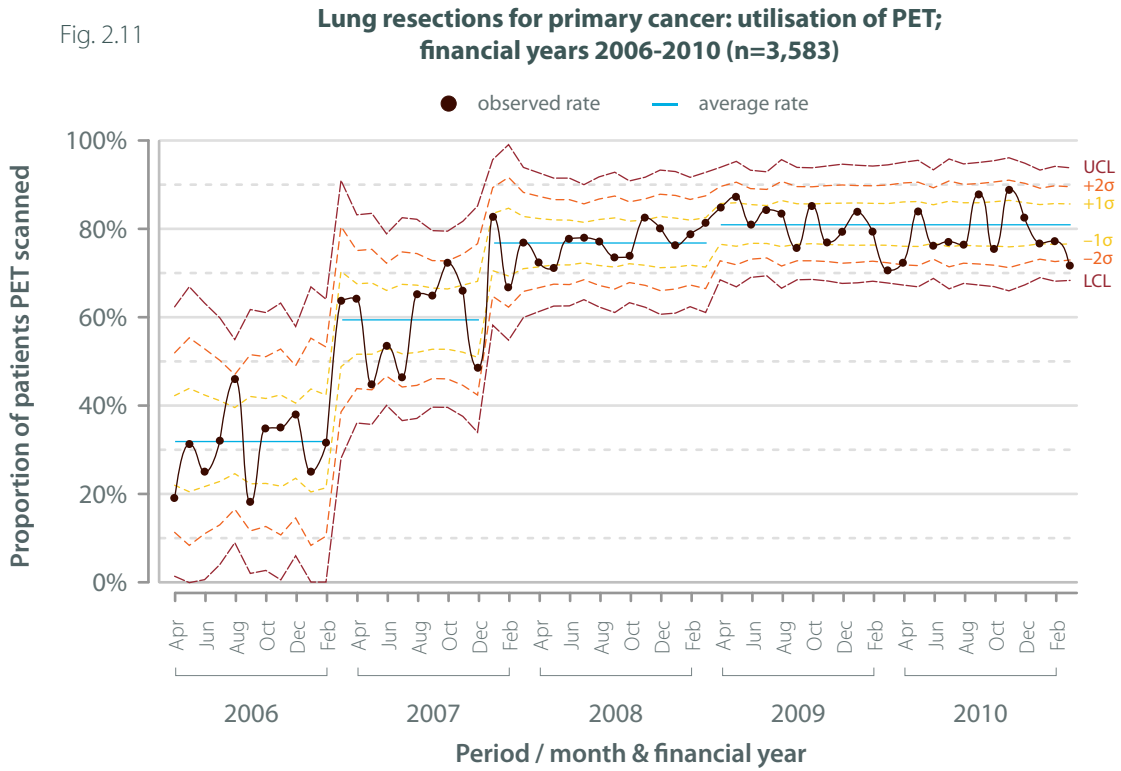




## Investigations prior to surgery

### Utilisation of PET over time

PET scanning became widely available from 2006 onwards and now is the standard of care for the staging patients being assessed for radical treatment of primary lung cancer in England.

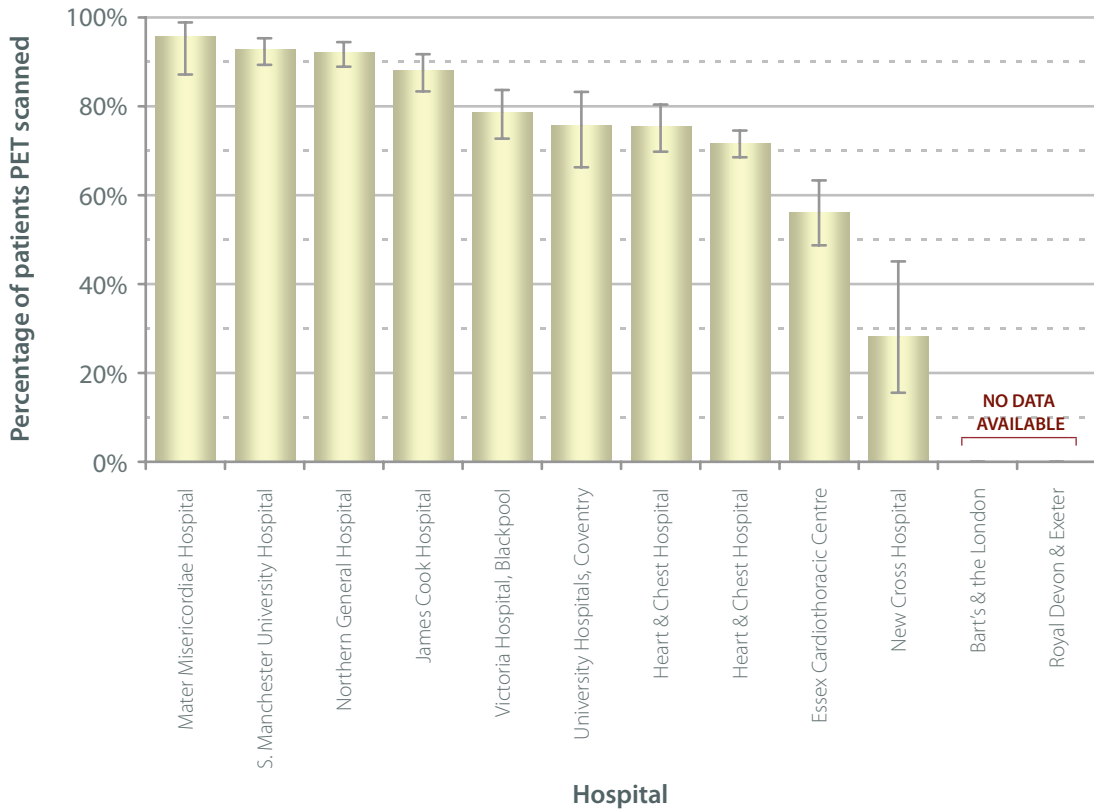




### Rates of PET usage in contributing hospitals

The following chart describes the proportion of patients having a PET prior to their lung cancer resection. It covers only patients treated after 2007 when PET became the standard of care in the work-up of surgical patients. The fact that this does not approach 100% in all units is presumably explained by a lack of entry of this information in the PET field of the database.

Fig. 2.12 Lung resections for primary cancer: rate of PET scanning at each hospital; financial years 2006-2010 (n=2,774)



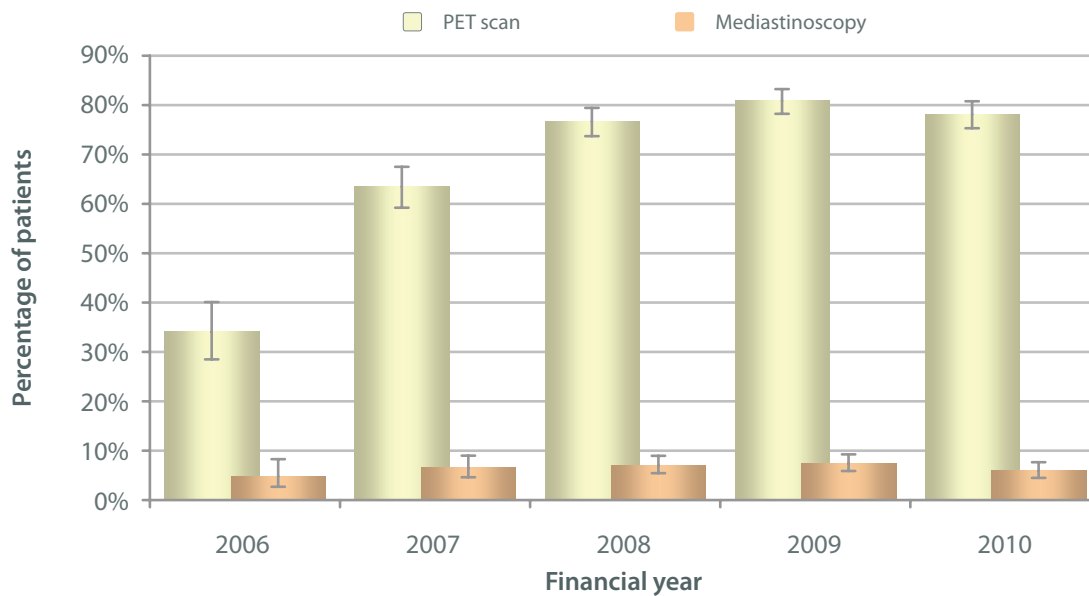


### Rates of mediastinoscopy usage in contributing hospitals

Despite the introduction of PET scanning the number of patients having mediastinoscopy as part of their work-up for lung cancer surgery has remained largely unchanged.

Fig. 2.13

**Lung resections for primary cancer: changes in PET scanning and mediastinoscopy rates (n=3,583)**





**Patient flows**

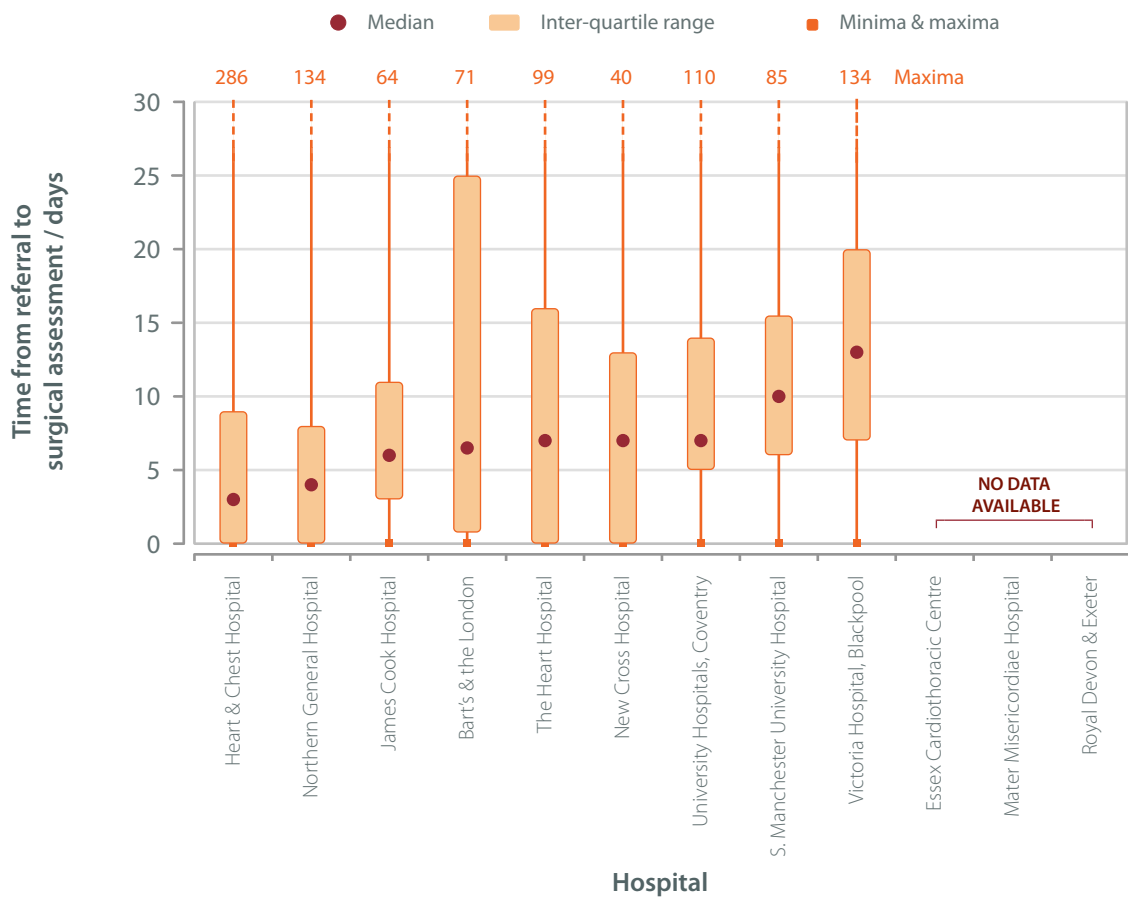
**Time from referral to surgical assessment**

In the database this refers to the interval between the time when a request for a surgical assessment is made (usually by a chest physician) and the time when the first surgical assessment takes place (usually a surgical clinic).

Time from referral to surgical assessment

		Time from referral to surgical assessment data / days					
		Minimum	Q1	Median	Q3	Maximum	Count
Hospital	Bart's & the London	0.0	0.8	6.5	25.0	71.0	20
	Essex Cardiothoracic Centre	NO DATA AVAILABLE					
	Heart & Chest Hospital	0.0	0.0	3.0	9.0	286.0	889
	James Cook Hospital	0.0	3.0	6.0	11.0	64.0	378
	Mater Misericordiae	NO DATA AVAILABLE					
	New Cross Hospital	0.0	0.0	7.0	13.0	40.0	248
	Northern General Hospital	0.0	0.0	4.0	8.0	134.0	377
	Royal Devon & Exeter	NO DATA AVAILABLE					
	S. Manchester University Hospital	0.0	6.0	10.0	15.5	85.0	135
	The Heart Hospital	0.0	0.0	7.0	16.0	99.0	313
	University Hospital, Coventry	0.0	5.0	7.0	14.0	110.0	113
	Victoria Hospital, Blackpool	0.0	7.0	13.0	20.0	134.0	290

Fig. 2.14 Lung resections for primary cancer: time from referral to surgical assessment; financial years 2006-2010 (n=2,769)





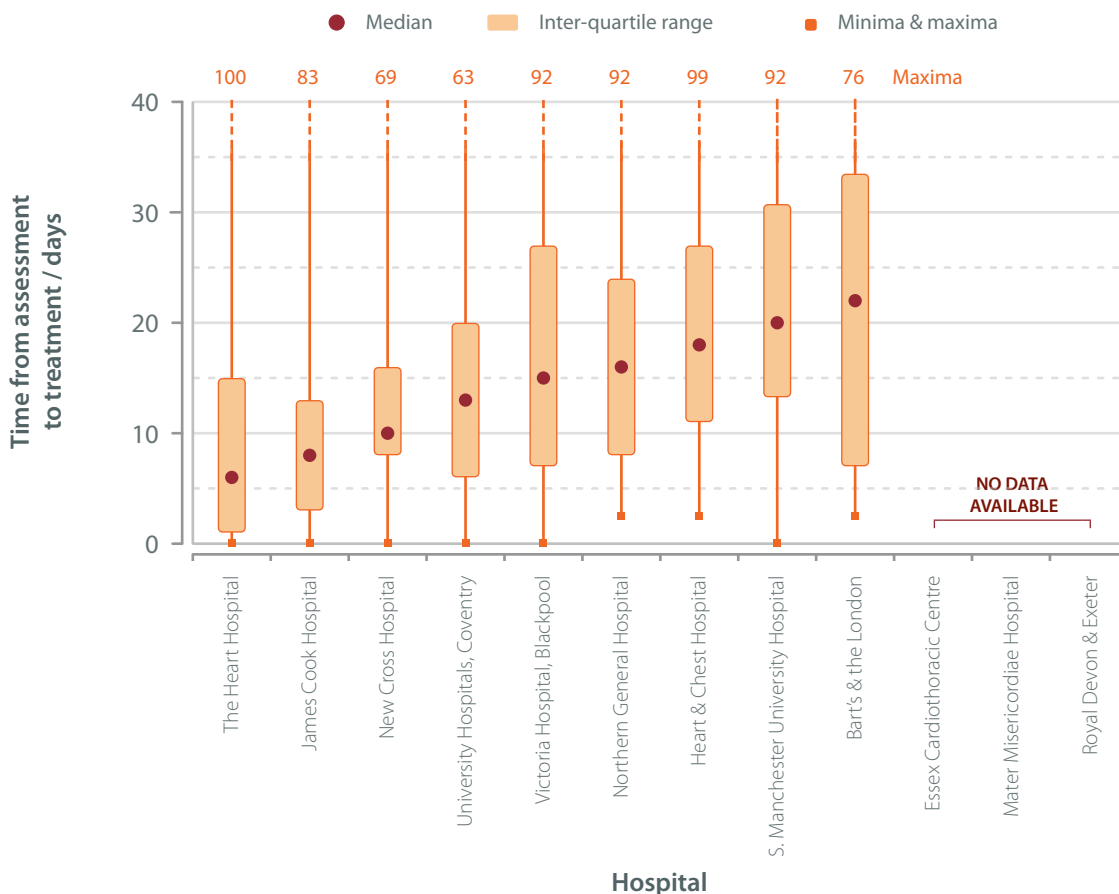
### Time from assessment to treatment

This refers to the time interval between the first surgical assessment of the patient and the date of the patients' surgery.

Time from assessment to treatment

Hospital	Time from assessment to treatment data / days					
	Minimum	Q1	Median	Q3	Maximum	Count
Bart's & the London	1	7	22	34	76	19
Essex Cardiothoracic Centre	NO DATA AVAILABLE					
Heart & Chest Hospital	1	11	18	27	99	975
James Cook Hospital	0	3	8	13	83	384
Mater Misericordiae	NO DATA AVAILABLE					
New Cross Hospital	0	8	10	16	69	248
Northern General Hospital	1	8	16	24	92	380
Royal Devon & Exeter	NO DATA AVAILABLE					
S. Manchester University Hospital	0	13	20	31	92	146
The Heart Hospital	0	1	6	15	100	332
University Hospital, Coventry	0	6	13	20	63	123
Victoria Hospital, Blackpool	0	7	15	27	92	303

Fig. 2.15 Lung resections for primary cancer: time from assessment to treatment; financial years 2006-2010 (n=2,916)



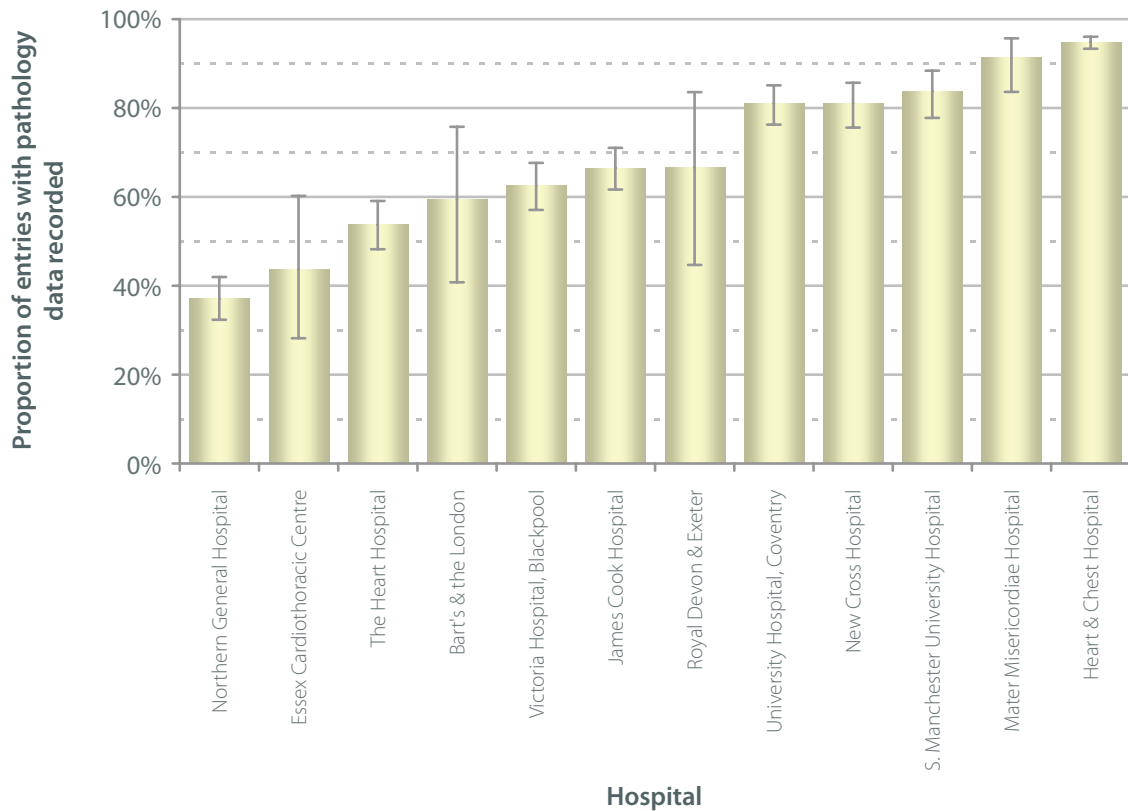


### Post-operative pathology

#### Pathology recorded

Although in many cases details of post-operative staging are missing from the database, it is gratifying to see that the majority of patients having lung cancer surgery are those with early stage (I and II) tumours. This reflects the accuracy of pre-operative selection given current scanning techniques.

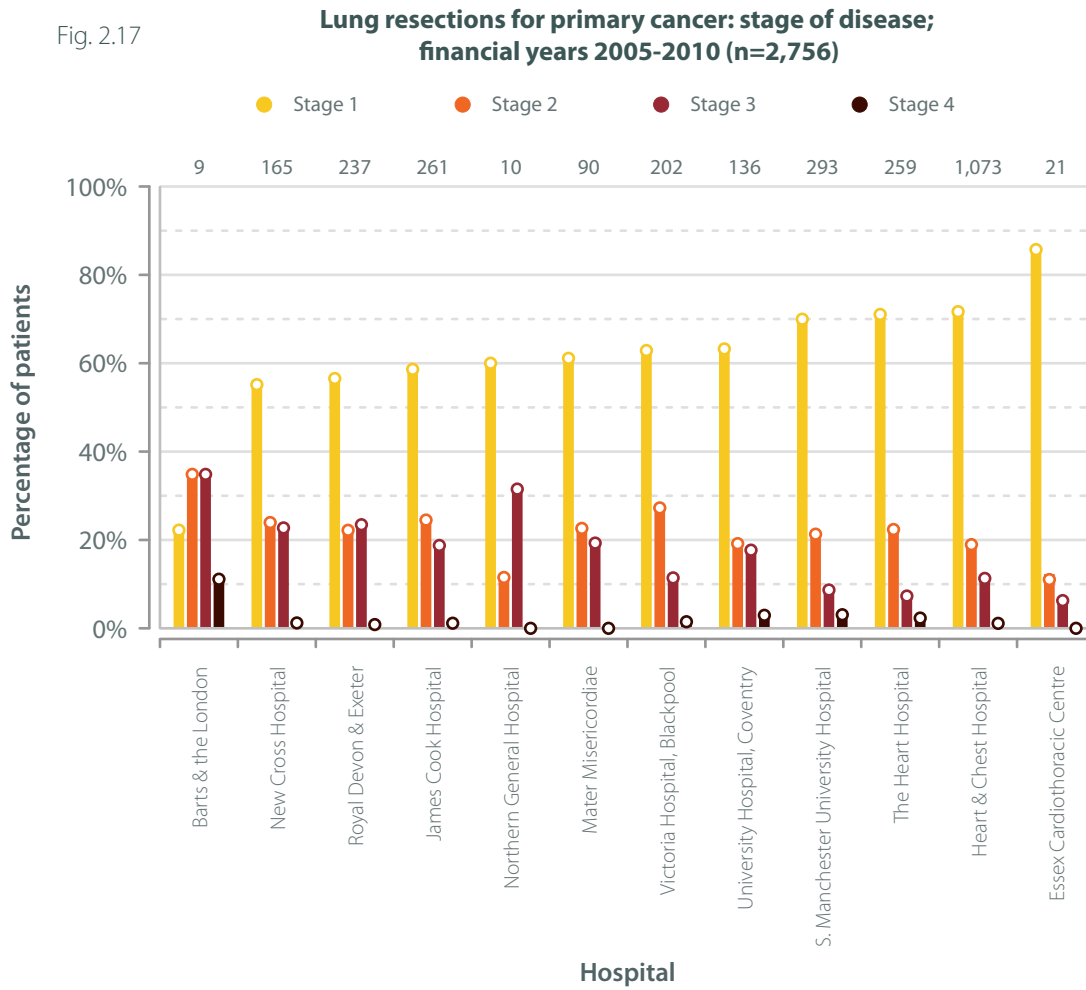
Fig. 2.16 Lung resections for primary cancer: completeness of pathology data; financial years 2006-2010 (n=3,583)





Stage of disease

Fig. 2.17





Post-operative outcomes

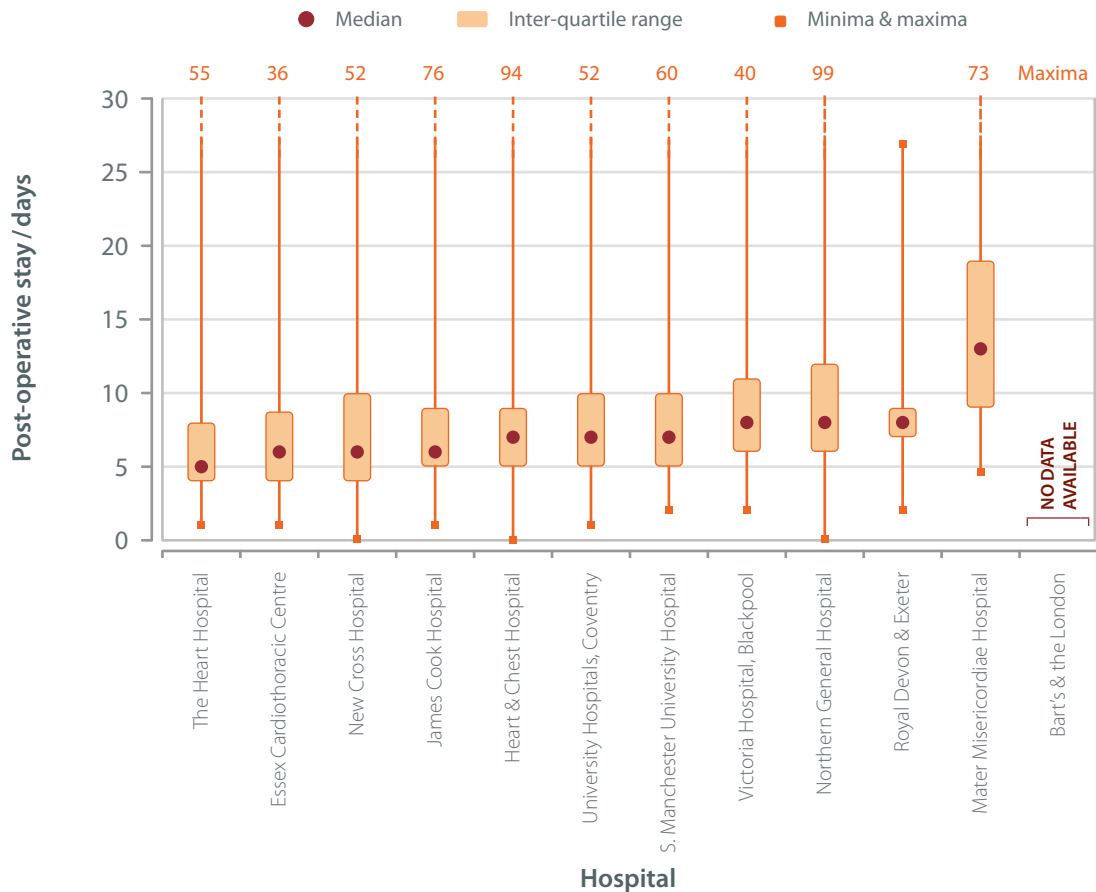
Length of in-hospital stay after surgery

Post-operative stay

Hospital	Post-operative stay data / days					
	Minimum	Q1	Median	Q3	Maximum	Count
Bart's & the London	NO DATA AVAILABLE					
Essex Cardiothoracic Centre	1	4	6	9	36	38
Heart & Chest Hospital	0	5	7	9	94	1124
James Cook Hospital	1	5	6	9	76	393
Mater Misericordiae	4	9	13	19	73	101
New Cross Hospital	0	4	6	10	52	249
Northern General Hospital	0	6	8	12	99	398
Royal Devon & Exeter	2	7	8	9	27	13
S. Manchester University Hospital	2	5	7	10	60	309
The Heart Hospital	1	4	5	8	55	338
University Hospital, Coventry	1	5	7	10	52	203
Victoria Hospital, Blackpool	2	6	8	11	40	335

Fig. 2.18

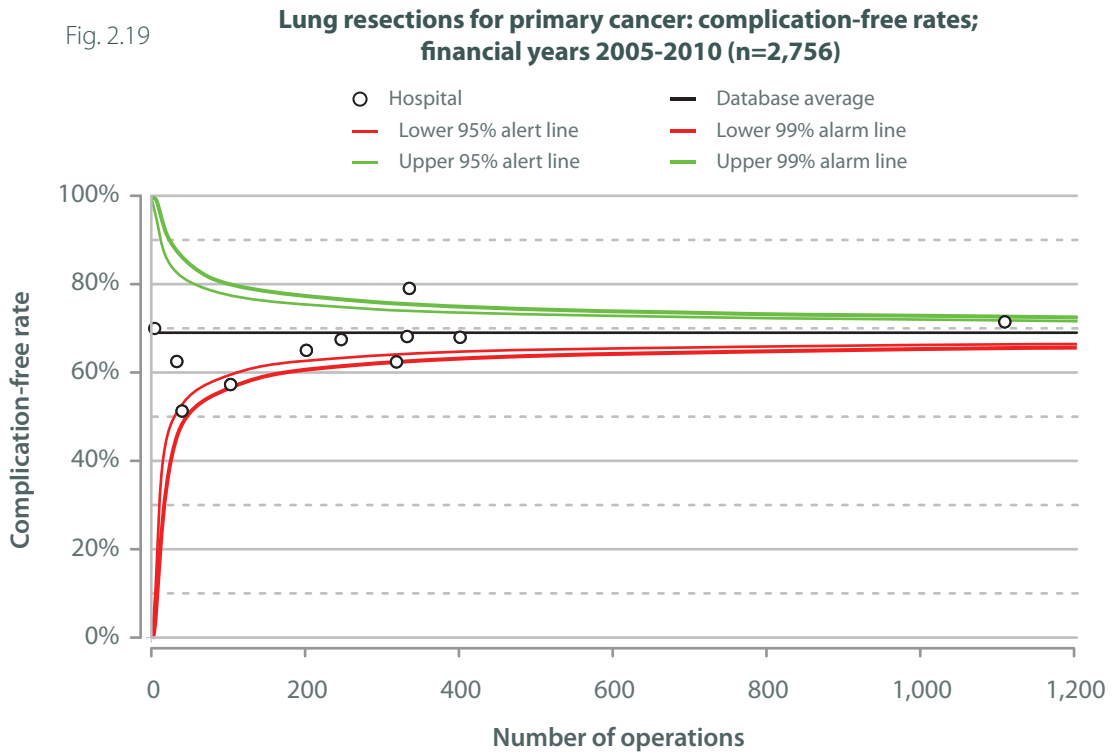
Lung resections for primary cancer: post-operative stay; financial years 2006-2010 (n=3,508)







Complications



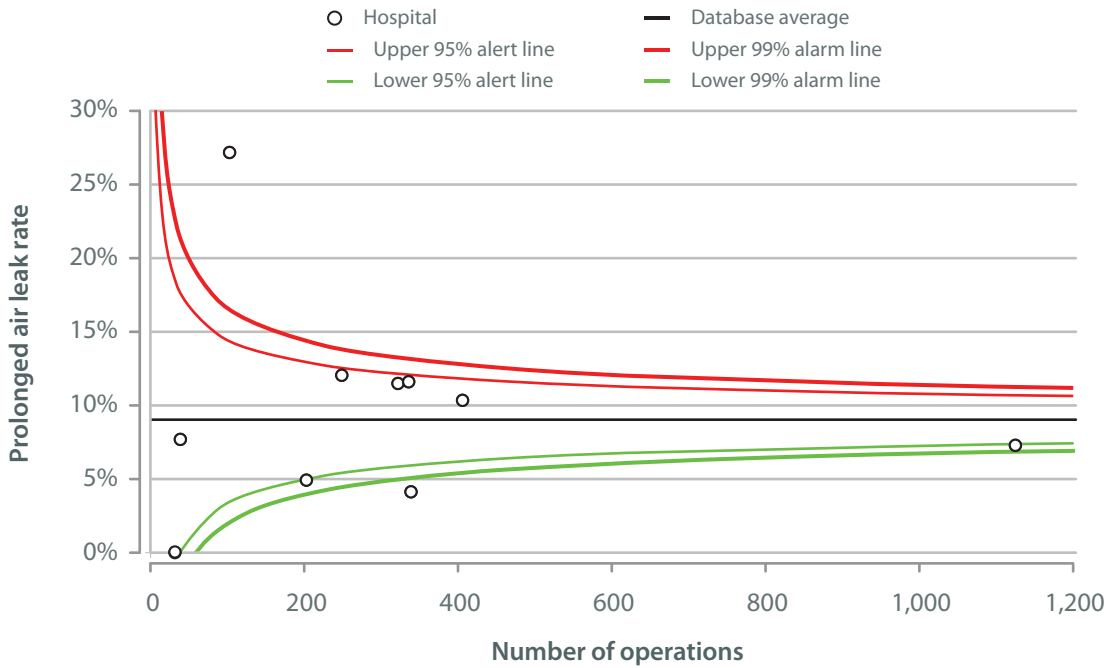


### Prolonged air leak

Air leak: this is defined in the dataset dictionary as the need for pleural drainage of more than seven days after surgery due to leakage of air from the patients' pleural drains.

Fig. 2.20

**Lung resections for primary cancer: prolonged air leak;  
financial years 2005-2010 (n=3,154)**

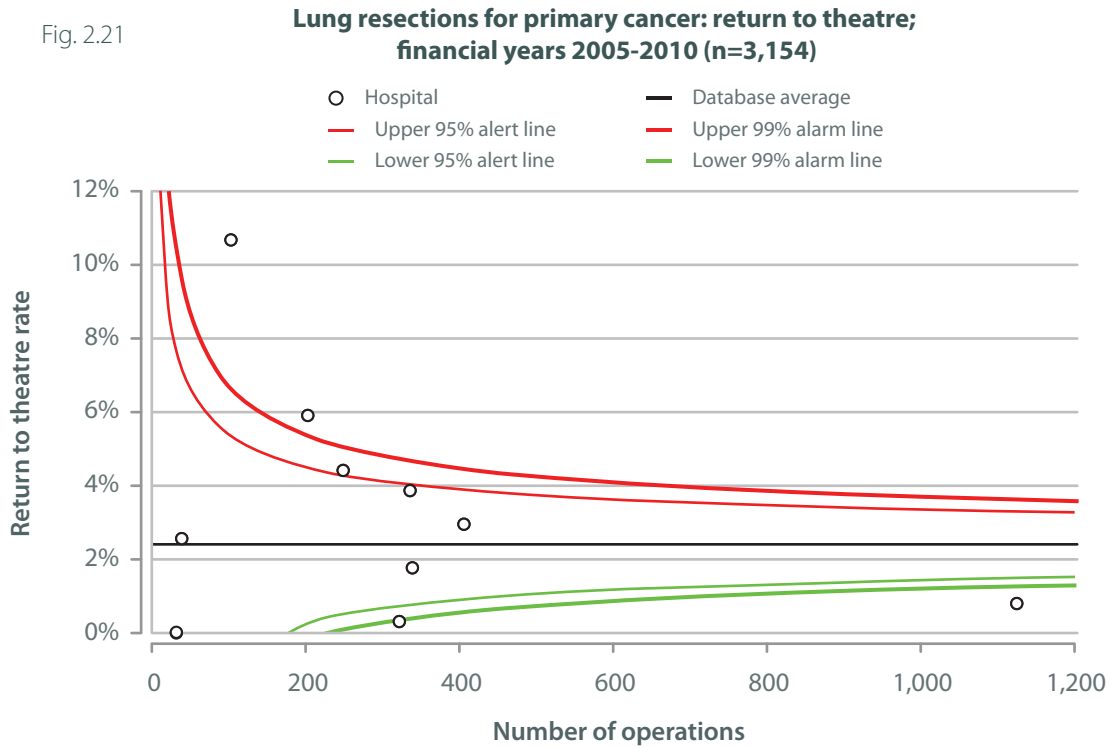




**Return to theatre**

Return to theatre: this data field aims to capture returns to theatre for complications requiring a second operation, such as excessive post-operative bleeding. It excludes returns to theatre for suction bronchoscopy or insertion of a drain.

Fig. 2.21







# **The National Lung Cancer Audit**



## The National Lung Cancer Audit

The National Lung Cancer Audit (NLCA) was conceived by the Royal College of Physicians of London following a Department of Health snapshot of lung cancer care in the late 1990s, which suggested fewer patients had access to lung cancer surgery and that overall survival was poorer than that reported in the USA and Europe. The Audit aimed to clarify the national picture in more detail with the intention of highlighting differences of care in the United Kingdom and drive an improvement in services. It is often referred to as LUCADA although this really means only the *Lung Cancer Database*, the repository for the information rather than the actual project.

Data collection commenced in 2004 as a joint initiative with what is now known as the Health Quality Improvement Partnership (HQIP) along with the National Health Service Information Centre (NHIC). The first report was published in 2006. The Audit aims to collect information on all aspects of the care of patients suffering from lung cancer in the United Kingdom. Although it initially concentrated on data obtained from English hospitals, in the latest report data from all four principalities are presented. Data is collected locally by the multidisciplinary lung cancer teams based in virtually all acute district general hospitals and either entered directly on the NLCA website or *via* regular uploads of data. The audit has developed over the years and produces an annual report, the latest being published in May 2011<sup>5</sup>, relating to 37,158 patients diagnosed and treated throughout the calendar year 2009. This represents at least 95% of new patients diagnosed with lung cancer during the year, making the NLCA one of the most comprehensive audits on lung cancer in the world.

The data is presented as a national summary and is broken down initially by Regional Cancer Network (currently 28 in England, 3 in Wales, 3 in Scotland, 1 for Northern Ireland and 1 for Jersey) and then ultimately by individual hospital Trusts. The latter represent the 193 lung cancer MDTs within the country from where care is principally organised and from where data for the Audit originates. Data are analysed by the *place first seen* for each patient: almost always this represents the MDT where the first treatment decision is made. This method has the potential to lead to difficulties in the interpretation of data on the activity and performance of tertiary referral centres especially those carrying out thoracic surgery. For the last two years the reports have been standardised and the data is presented as follows for each level of care:

1. Data completeness
  - a. Numbers of patients, comprehensiveness of data entry
2. Process, nursing, imaging and clinical outcomes
  - a. Performance status
  - b. Investigations (*e.g.*, CT scan, bronchoscopy, histological confirmation of tumour)
  - c. Stage of tumour
  - d. Whether discussed at an MDT and seen by a specialist nurse
  - e. Number of patients having specific anticancer treatment (*surgery, radiotherapy, etc.*)
  - f. Number of patients receiving surgery, radiotherapy and chemotherapy

## Surgery and the NLCA

In recent years there has been significant focus within the report and in the discussions that have followed its publication on the numbers of patients having surgical treatment of their cancers, specifically the surgical resection rate. This figure is best expressed in the following way:

$$\text{Percentage resection rate} = \frac{\text{Numbers of patients having cancer resections}}{\text{Total numbers of cancers}} \times 100\%$$

From a surgeon's point of view, the numerator in the equation means the numbers of lung resections carried out with the therapeutic aim of curing a primary lung cancer. This is necessarily limited to operations consisting of pneumonectomy, lobectomy (and its variants such as a sleeve or VATS lobectomy) or sublobar resection for what turns out on final pathological analysis to be a primary lung cancer. It should obviously exclude resections for other pathologies such as non-malignant disease, secondary cancer or mesothelioma, regardless of whether the working diagnosis prior to surgery was primary lung cancer. It should also exclude diagnostic operations even if a section of lung has been removed (*e.g.*, VATS lung biopsy, mediastinotomy, *etc.*) and exploratory thoracotomy when tumour resection was not possible.

Again, from a surgeon's standpoint, the denominator will mean the number of patients with newly-diagnosed cancers presenting within a certain time frame for the population from which patients having lung cancer surgery are selected.



Although the resection rate is a very simple mathematical calculation, the accuracy of the figure clearly depends on the accuracy of the numerator and denominator in the equation. Unfortunately in the real world of caring for patients with lung cancer and in attempting to carry out a prospective audit it is difficult to pin down either figure with certainty. The NLCA is the one of the best population-based audits in the world and is a very valuable addition to the science of the overall management of lung cancer. However, the way the data are presented highlights a particular problem with diagnosis of lung cancers which are often relatively inaccessible in terms of gaining material for pathological analysis. This does not apply to most other malignancies such as breast and colorectal cancers where tissue is easily accessible.

The NLCA presents three types of diagnosis for patients with suspected or proven lung cancer:

1. All lung cancers. For the purposes of the national audit this section deliberately includes small cell lung cancer and malignant mesothelioma, the aim being to study the management of all primary intrathoracic cancers
2. All presumed non-small cell cancers, excluding mesothelioma and small cell.
3. Histologically proven non-small cell lung cancers

All three of these diagnoses have the potential to be altered by the results obtained by pathological analysis of a surgically resected lung or part of a lung. In previous reports where resection rates have been reported internationally, it is the rate in histologically proven non-small cell lung cancers that is usually quoted.

Regarding the numerator for the equation this clearly depends on a linkage within the audit of information available regarding post-operative pathology from thoracic surgical units. The default pattern of entry is *via* the originating MDT's for the patients, although how exactly this happens will vary depending on local arrangements. Thus, when a patient with surgically treatable disease is referred to a surgical unit the information relating to the operation needs to be fed back to the MDT for the data to be entered on to the database in order to complete the episode of care. Although it is possible to enter an operation for lung cancer retrospectively onto the database this requires the additional entry of the initial referral date to be added, which may be difficult for the surgical centre to identify.

The surgical resection rate is described in the published annual report based around the regional cancer networks and individual MDTs. Three types of resection rate are described relating to the above three definitions.

There is significant variation in these rates throughout the country with an almost two-fold variation between the areas with the highest resection rates when compared with the areas with the lowest. This variation remains when corrected for differences in age, gender, stage, performance status and deprivation index. Data from the latest NLCA report published in May 2011<sup>5</sup> relates to patients treated throughout 2009 and is described in the following tables and charts:

Table 3.1 Resection rates; English and Welsh Cancer Networks

		Resection rate		
		All cancers	NSCLC	Histologically proven NSCLC
<b>Statistics</b>	Minimum	9.1%	8.5%	12.5%
	Lower quartile	11.4%	11.6%	15.8%
	Median	14.1%	13.9%	18.0%
	Upper quartile	15.1%	15.1%	20.6%
	Maximum	19.9%	20.3%	23.5%

Table 3.2 Resection rates; English and Welsh Trusts (i.e., lung cancer MDTs)

		Resection rate		
		All cancers	NSCLC	Histologically proven NSCLC
<b>Statistics</b>	Minimum	0.0%	0.0%	0.0%
	Lower quartile	9.7%	9.5%	13.3%
	Median	12.4%	12.7%	16.9%
	Upper quartile	16.1%	15.9%	21.7%
	Maximum	76.9%	100.0%	100.0%



The National Lung Cancer Audit

Fig. 3.1

National Lung Cancer Audit: resection rate for all cancers

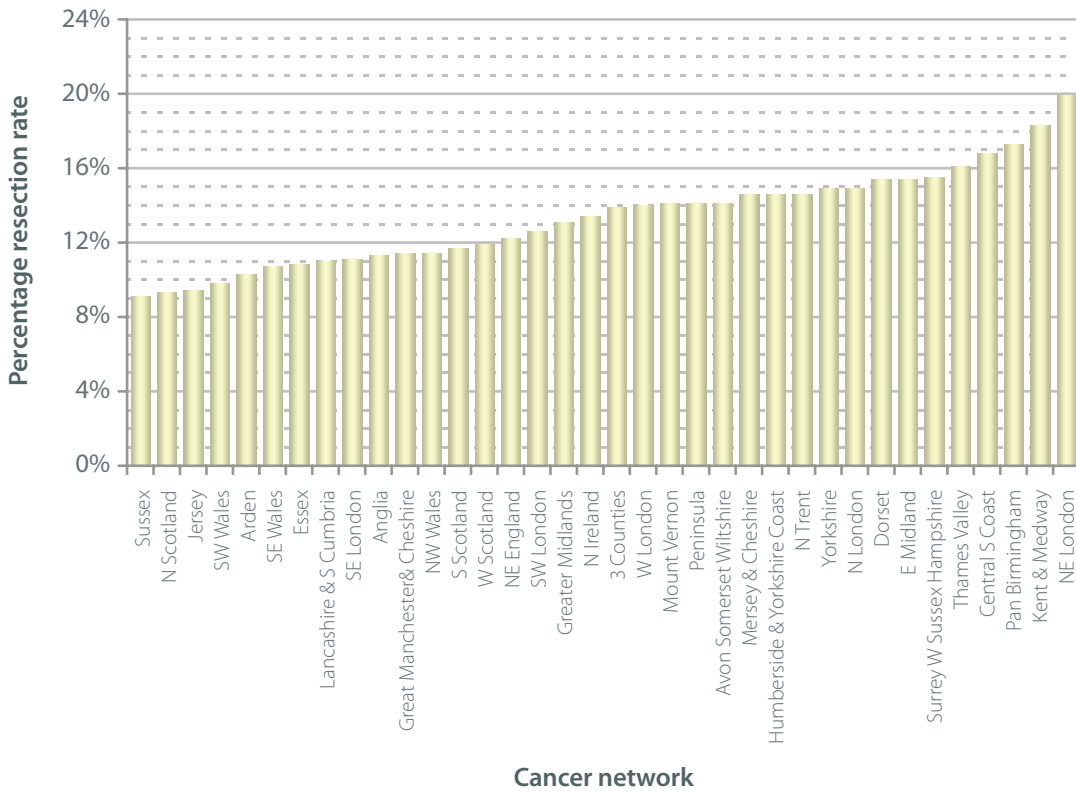
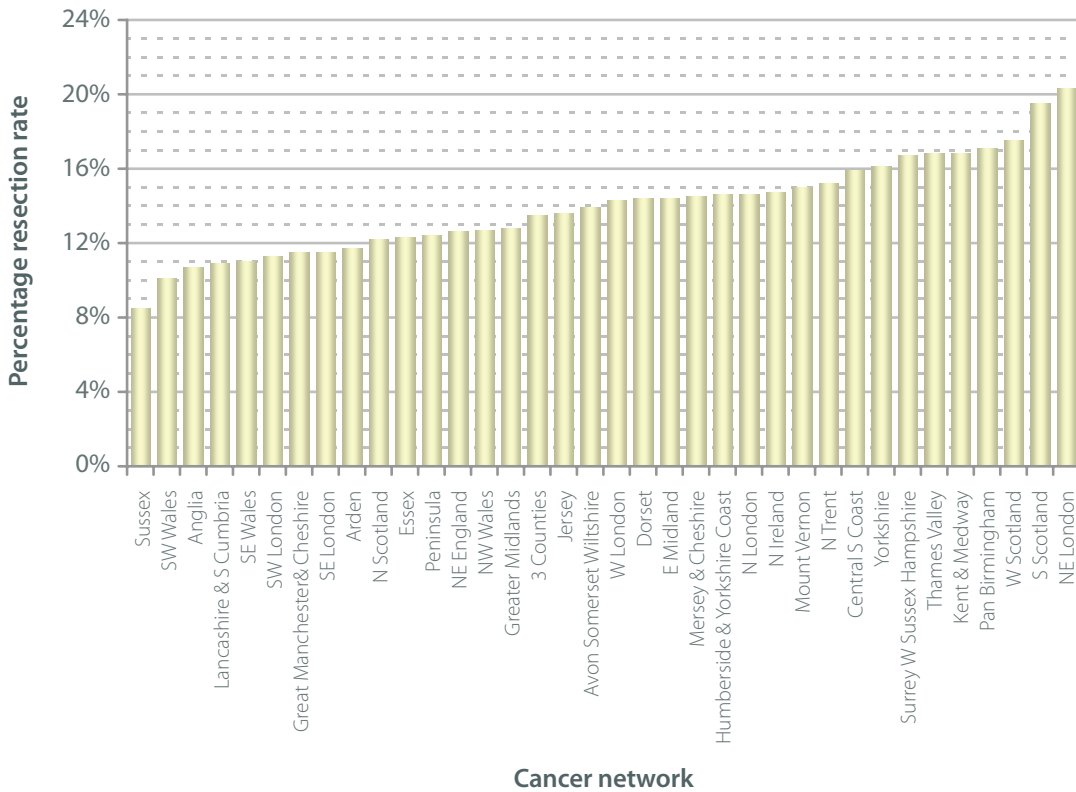
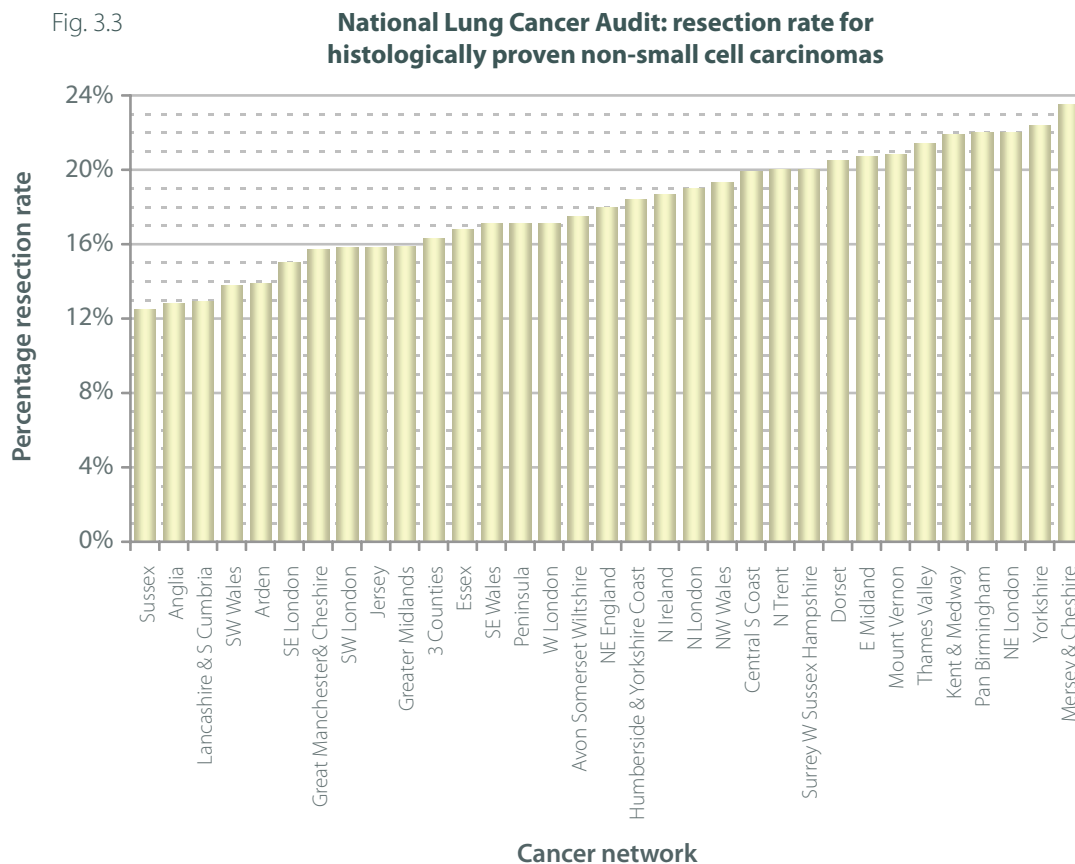


Fig. 3.2

National Lung Cancer Audit: resection rate for non-small cell carcinomas







It can be seen especially from the charts that by all definitions there is two-fold variation in the frequency of lung cancer surgery throughout the country, and this variation remains regardless of the exact definitions used. It is likely that this variation is real and not primarily due to problems with data. Nevertheless, there will be some inaccuracies in recording of data, which may explain some of the variations, especially when looking at data for individual Trusts as opposed to Cancer Networks. This particularly applies to the usefulness of data when attempting to analyse small numbers. For example, the Trust with the 100% resection rate (the maximum value in Table 3.2) for histologically confirmed cancer is the Royal Brompton Hospital, where only nine patients were registered as the primary hospital for management in this category. The Brompton is a specialist thoracic surgical unit and the nine patients who were managed in this way are clearly not illustrative of the generality of lung cancer treatment.

Thoracic surgeons obviously have a part to play in influencing the resection rate for lung cancer. Their presence at the lung cancer MDT meetings will facilitate decision making as to how patients are investigated and whether they should be seen in a thoracic surgical clinic for assessment. It is possible to determine the anatomy and resectability of a tumour (based on its detailed staging information obtained by the numerous tests currently available) with much more accuracy than even only five years ago, such that the appropriateness of primary surgical treatment from the tumour standpoint is usually a straightforward decision. In contrast the medical fitness of a patient to withstand a lung resection is an area of conflicting opinions, as is the case in all branches of surgery where the risk/benefit of cancer surgery can be difficult to define. In addition more patients are being treated in a multi-modality fashion especially using the combination of chemotherapy plus surgery. This requires a close cooperation between thoracic surgeons and thoracic oncologists. Although numerous factors will have an influence on the resection rate it is likely that some of the variations in the resection rate throughout the country are a reflection of differing access to thoracic surgery for patients and differences in the willingness of thoracic surgeons to offer patients with borderline fitness an operation.



## Conclusion

This report shows once again the value of comprehensive data when analysing temporal and geographical variations in practice. The willingness of thoracic surgeons to engage in the process of data collection is to their credit and the SCTS and its members can take pride in this latest illustration of their work.

Regarding the future of thoracic surgical data collection it is highly relevant that approximately half of patients managed by thoracic surgeons (which includes those having assessment in the outpatient clinic, invasive diagnostic procedures as well as lung cancer surgery) will have proven or suspected primary lung cancer. Many of these will have a therapeutic resection carried out, which is often the only chance the patients have of achieving a cure for their disease. It is incumbent on all members of the lung cancer MDT but particularly thoracic surgeons to ensure that as many patients as possible can benefit from surgery. Information to calculate the outcome measure to describe this process (the surgical resection rate regardless of its exact definition) should be as accurate as possible so that real differences in treatment throughout the country can be identified and, if necessary, rectified. The SCTS has a rich history of data collection for surgical patients especially those being treated for primary lung cancer. The NLCA has unique information on the totality of lung cancer in the United Kingdom and its management. With respect to surgical treatment it seems clear that the two data projects should work together to ensure accuracy of data and to explore outcomes in more detail. This joint partnership has already been established and the subject of surgical resection rate for primary lung cancer will be presented in more detail in a separate report in the near future.

For the patients with diseases other than primary lung cancer the Thoracic Register captures their surgical activity and it has been argued that there is no need to collect any specific details for them in a separate database such as information on their pre-operative profiles, investigations and details of in-hospital outcomes. This issue continues to be the subject of debate, but the SCTS takes the view that the information we have on our patients should be as comprehensive as possible to optimise their management, which is the exact same philosophy held by the cardiothoracic surgeons who created the SCTS Cardiac and Thoracic Surgical Registers over thirty years ago. It is only right that the Society remains committed to building on their work in the future.







## **Appendices**





## Contributors

The data for the report was collected by the thoracic surgical audit leads at hospitals throughout the United Kingdom & Ireland:

Mr Doug Aitchison,	Essex Cardiothoracic Centre, Basildon
Mr Khalid Amer	Southampton General Hospital
Mr John Au	Victoria Hospital, Blackpool
Mr Tim Batchelor	Bristol Royal Infirmary
Mr David Beggs	Nottingham City Hospital
Mr Richard Berrisford	Royal Devon & Exeter NHS Trust
Mr Moninder Bhabra	New Cross Hospital, Wolverhampton
Mr Ed Black	John Radcliffe Hospital, Oxford
Mr Andy Chukwuemeka	Imperial College Healthcare, London
Mr Aman Coonar	Papworth Hospital, Papworth Everard
Mr Michael Cowen	Castle Hill Hospital, Hull
Mr Ranjit Deshpande	Kings College Hospital, London
Mr Jonathan Edwards	Northern General Hospital, Sheffield
Mr Hussein El-Shafei	Aberdeen Royal Infirmary
Mr Jonny Ferguson	James Cook Hospital, Middlesbrough
Mr Peter Froeschle	Royal Devon & Exeter NHS Trust
Mr Shilly Ghosh	North Staffordshire Royal Infirmary, Stoke
Mr John Hinchion	Cork University Hospital
Mr Ian Hunt	St George's Hospital, London
Mr Mark Jones	Victoria Hospital, Belfast
Mr Maninder Kalkat	Heart of England Hospital, Birmingham
Ms Juliet King	Guy's and St Thomas's Hospital, London
Mr Alan Kirk	Golden Jubilee Hospital, Glasgow
Mr Shyam Kolvekar	The Heart Hospital, London
Ms Margaret Kornaszewska	University Hospital of Wales, Cardiff
Mr Eric Lim	Royal Brompton Hospital, London
Mr Adrian Marchbank	Derriford Hospital, Plymouth
Mr Joseph Marzouk	University Hospitals, Coventry & Warwickshire
Mr Jim McCarthy	Mater Misericordiae University Hospital, Dublin
Prof. Chris McGregor	The Heart Hospital, London
Mr Richard Milton	St James' Hospital, Leeds
Mr Nicholas Odom	Central Manchester Hospitals
Mr Peter O'Keefe	University Hospital of Wales, Cardiff
Mr Richard Page	Liverpool Heart and Chest Hospital
Mr Prakash Pujabi	Imperial College Healthcare, London
Mr Sri Rathinam	Glenfield Hospital, Leicester
Mr Rana Sayeed	John Radcliffe Hospital, Oxford
Mr Rajesh Shah	South Manchester University Hospital
Mr Sasha Stamenkovic	Freeman Hospital, Newcastle
Mr Michael Tolan	St Vincent's Hospital, Dublin
Mr Edward Townsend	Harefield Hospital
Mr Marc Van Leuvan	Norfolk & Norwich University Hospital
Mr Dave Verasingham	University Hospital, Galway
Mr William Walker	Edinburgh Royal Infirmary
Mr David Waller	Glenfield Hospital, Leicester
Mr Kit Wong	Barts' & the London Hospitals
Mr Freddie Wood	Mater Misericordiae University Hospital, Dublin
Mr Aprim Youhana	Morrison Hospital, Swansea
Mr Vincent Young	St James' Hospital, Dublin



## Appendix 1: results from the SCTS Thoracic Register 2010

Proportion of centres contributing to the Register = 40 / 41.

### Open procedures

#### A. Lung resections: primary-malignant

	totals	deaths	mortality
1. Pneumonectomy including sleeve pneumonectomy	462	30	6.5%
2. Lobectomy, bilobectomy	3,233	64	2.0%
3. Sleeve resection lobectomy	116	3	2.6%
4. Segmentectomy, wedge resection	603	4	0.7%
5. Any pulmonary resection with resection of chest wall, diaphragm etc.	129	4	3.1%
6. Exploratory thoracotomy - no resection	99	4	4.0%

#### B. Lung resections: other

1. Pneumonectomy	38	3	7.9%
2. Lobectomy, bilobectomy	460	11	2.4%
3. Sleeve resection lobectomy	30	0	0.0%
4. Segmentectomy, wedge resection	1,110	4	0.4%
5. Any pulmonary resection with resection of chest wall, diaphragm etc.	49	0	0.0%
6. Open lung volume reduction surgery for emphysema	39	1	2.6%
7. Other pulmonary procedure	104	1	1.0%

#### C. Mesothelioma surgery (therapeutic)

1. Extra-pleural pneumonectomy (pleura, lung, diaphragm, pericardium)	12	0	0.0%
2. Radical decortication (pleura, diaphragm, pericardium)	54	1	1.9%
3. Pleurectomy / decortication	97	1	1.0%

#### D. Pleural procedures: other

1. Thoracotomy + decortication for empyema	745	20	2.7%
2. Thoracotomy+ pleural symphysis ± closure of air leak	318	6	1.9%
3. Thoracotomy + other pleural procedures	656	18	2.7%

#### E. Chest wall / diaphragmatic procedures

1. Correction of pectus deformity	241	0	0.0%
2. Resection of primary chest wall tumour (not lung cancer)	125	0	0.0%
3. Other major	306	1	0.3%
4. Minor	486	3	0.6%

#### F. Mediastinal procedures

1. Thymectomy for thymoma	136	0	0.0%
2. Thymectomy for myasthenia gravis	48	0	0.0%
3. Thyroidectomy	84	0	0.0%
4. Resection of other mediastinal mass / tumour	177	2	1.1%
5. Mediastinoscopy / mediastinotomy	3,020	15	0.5%
6. Other mediastinal procedure	119	3	2.5%

#### G. Oesophageal / gastric procedures

1. Oesophago-gastric resection - malignant	330	9	2.7%
2. Oesophago-gastric resection - non-malignant	34	1	2.9%
3. Other major oesophagogastric	104	3	2.9%
4. Exploration only by any route for inoperable tumour	16	2	12.5%
5. Minor oesophagogastric	147	1	0.7%

#### H. Tracheal surgery (includes carinal resection)

1. Tracheal resection - tumour	6	0	0.0%
2. Tracheal resection - non-tumour	21	0	0.0%

#### I. Other procedures

1. Major	398	13	3.3%
2. Minor	1,521	37	2.4%





## Video Assisted Thoracic Surgery (VATS)

	totals	deaths	mortality
<b>A. Lung resections: primary-malignant</b>			
1. Wedge resection	272	1	0.4%
2. Lobectomy	447	6	1.3%
3. Pneumonectomy	3	0	0.0%
<b>B. Lung resections: other</b>			
1. Wedge resection - therapeutic (includes resection of an isolated nodule)	625	1	0.2%
2. Wedge resection - diagnostic for diffuse disease or multiple nodules	750	2	0.3%
3. Lobectomy	71	1	1.4%
4. Pneumonectomy	0	0	0.0%
5. Bullectomy (not pneumothorax)	56	0	0.0%
6. Lung volume reduction surgery for emphysema	57	1	1.8%
<b>C. Pleural procedures</b>			
1. Pneumothorax surgery (closure of air leak +/- pleural symphysis)	1,882	20	1.1%
2. Pleurectomy / decortication for mesothelioma	194	6	3.1%
3. Any other pleural procedures	3,376	57	1.7%
<b>D. Chest wall / diaphragmatic procedures</b>			
1. Sympathectomy	87	0	0.0%
2. Correction of pectus deformity	33	0	0.0%
3. Other chest wall procedure	25	0	0.0%
<b>E. Mediastinal conditions</b>			
1. Resection of mediastinal mass / tumour	67	0	0.0%
2. Other mediastinal procedure	152	5	3.3%
<b>F. Oesophageal / gastric procedures</b>			
1. Therapeutic - cancer resection	19	0	0.0%
2. Diagnostic	73	0	0.0%
3. Therapeutic - other	46	0	0.0%
<b>G. Other procedures</b>			
1. All	360	8	2.2%
<b>Total surgery</b>	<b>24,268</b>	<b>373</b>	<b>1.5%</b>

## Endoscopic Procedures (not VATS)

	totals	deaths	mortality
<b>A. Endoscopic procedures (not VATS)</b>			
1. 1 Therapeutic bronchoscopy	2,414	25	1.0%
2. 2 Therapeutic oesophagoscopy	902	6	0.7%
<b>Grand total</b>	<b>27,584</b>	<b>401</b>	<b>1.5%</b>



## Appendix 2: SCTS National Dataset for Thoracic Surgery

### Data definitions

1. Centre identification (enter as text or as pre-defined code. This should be an automatic part of a local system).
2. Surgeon identifier (consultant surgeon GMC number. Required for revalidation issues).
3. NHS number (enter as 10 digit number with no spaces or import from hospital PAS. This will enable tracking to death certification).
4. Hospital number (until we all use NHS numbers this will be needed to send back to you cases for data verification etc. Enter in local format or import from Hospital PAS).
5. Post code (this has two purposes. One is that you know where your cases come from. The other is that any secondary use for research will allow us to link to deprivation indices).
6. Date of birth (enter as DDMMYYYY or import from Hospital PAS. Used to calculate age in years at surgery by subtracting from Date of Operation).
7. Sex (enter M or F).
8. Date of operation (date on which the primary procedure takes place; enter as DDMMYYYY. This dataset is built around a surgical procedure).
9. Time of operation (refers to time operation commences. Enter in 24-hour format *e.g.*, 1335).
10. Date of surgical referral (DDMMYYYY).
11. Date of first surgical assessment (DDMMYYYY).

### Operative priority

Select a single choice (Enter 1) from:

12. Elective (booked admission for surgery).
13. Urgent (decision to operate on next available list).
14. Emergency (operation arranged outside scheduled lists).

### Surgical strategy

Reasons for the operation taking place. There may be more than one, so enter 1 to each that applies.

15. Diagnostic (to diagnose the condition).
16. Staging or assessment (to stage a neoplasm or to assess the progress of the condition).
17. Therapeutic (to cure, alleviate or palliate).

More than one is allowed, for example:

- Mediastinoscopy: maybe diagnostic and/or staging.
- VATS pleural biopsy and talc pleurodesis: diagnostic and therapeutic.
- Thoracotomy, frozen section of nodes and tumour, and lobectomy: diagnostic, staging and therapeutic.

### Pathological category

This is the pathological category (based on what used to be called the surgical sieve) of the aetiology of the condition for which surgery is being performed. It includes specific commonly occurring thoracic diagnoses. The field should be entered at the time of surgery and revised as necessary in the light of information from pathology at the time of discharge. Multiple answers are allowed. Enter 1 to all that are applicable

18. Congenital.
19. Trauma/accident.
20. Primary cancer lung (known or probable).
21. Upper GI cancer.
22. Mesothelioma.
23. Other primary thoracic malignancy.



24. Malignant disease other (secondary, recurrent or metastatic).
25. Carcinoid.
26. Benign neoplasms.
27. Empyema (include all aetiologies of pleural sepsis).
28. Parenchymal lung disease (as the pathology of interest – not comorbidity).
29. Vascular lesion.
30. Pneumothorax.
31. Pleural effusion.
32. Other (write in).

An example of a multiple entry would be an empyema where the initiating problem was trauma (stabbing, for example). Both are worth retrieving to count trauma and to count empyema so enter both. The data analyst can recognise that the operative episode was single.

### Procedure type

Multiple entries are appropriate if performed in the same session. Select the options that best describe the operation as a whole – if there was more than one procedure, enter each. The data analyst can see that they are part of a single operative episode. Enter 1 if applicable.

33. Endoscopy (bronchoscopy / oesophagoscopy ± biopsy).
34. Endoscopy (bronchoscopy / oesophagoscopy + any other procedure).
35. Drain insertion.
36. Other minor procedure (of the scale of node biopsies).
37. Mediastinoscopy and / or mediastinotomy.
38. Other intermediate procedure (of a similar order of magnitude to a rib resection).
39. VATS.
40. Thoracotomy.
41. Median sternotomy.
42. Other major incision.

### Primary organ / system targeted

Select the main target organ(s) of the operation. This is an anatomical list.

More than one may be entered (*e.g.*, lung and trachea / main bronchi for bronchoplastic lung resections) but coincidental surgery, such as chest wall if that is purely the route of access, or main bronchus division for a simple pneumonectomy will not be helpful in data analysis. Enter 1 if applicable

43. Aorta and / or great vessels.
44. Chest wall.
45. Diaphragm.
46. Lung.
47. Mediastinum.
48. Oesophagus.
49. Pericardium.
50. Pleura.
51. Thymus.
52. Thyroid.
53. Trachea and / or main bronchi.
54. Other.



### Named operations

Select the procedure(s) performed at this operation. Thus pleural biopsy and pleurodesis can both be entered. This is not a comprehensive list but is designed to capture the commonest and most well-defined operations. Enter 1 if applicable

55. Lobectomy / bilobectomy (any indication).
56. Lobectomy / bilobectomy (complex) with chest wall resection, airway resection etc.
57. Pneumonectomy (any indication).
58. Sub lobar lung resection wedge or segmentectomy.
59. Mediastinoscopy / mediastinotomy.
60. Pneumothorax surgery (any technique).
61. Lung volume reduction.
62. Bullectomy.
63. Pleurodesis.
64. Pleural biopsy (any technique).
65. Decortication.
66. Upper GI resection (any).
67. Hiatus hernia surgery (any).
68. Pectus surgery.
69. Sympathectomy.
70. Thymectomy for myasthenia.
71. Thymectomy for thymoma.
72. Thyroid surgery.
73. Bronchoscopy.
74. Oesophagoscopy.
75. Chest drain insertion.
76. Other (enter text).

### Pre-operative risk factors

Although previously required only for lung cancer resections, we feel that this information is useful for all thoracic procedures. If available it should be entered for all procedures.

### Pulmonary

77. Measured FEV1.
78. % Predicted FEV1.
79. Measured FVC.
80. % Predicted FVC.
81. Diffusion capacity (% predicted KCO).
82. Never smoked (Enter 1 if applicable).
83. Pack years.
84. Dyspnoea score:
  - Grade 1 dyspnoea on strenuous exercise,
  - Grade 2 when hurrying or walking uphill,
  - Grade 3 walks slower than contemporaries on level ground because of breathlessness or has to stop for breath when walking at own pace,
  - Grade 4 stops for breath after walking about 100 meters or after a few minutes on level ground,
  - Grade 5 too breathless to leave the house or breathless when dressing or undressing
85. COPD (FEV1 / FVC ration <0.7 after bronchodilator therapy).



### Non-pulmonary

86. Height (patient's height in centimetres; enter an integer).
87. Weight (patient's weight in kilograms; enter to one decimal place).
88. Urea ( $\text{mmol l}^{-1}$ ).
89. Creatinine ( $\mu\text{mol l}^{-1}$ ).
90. Hb ( $\text{g dl}^{-1}$ ).
91. Insulin dependent diabetes.
92. Ischaemic heart disease.
93. Cardiac failure.
94. Previous stroke.
95. Steroid therapy.
96. Anticoagulation with warfarin or equivalent therapy.
97. Performance status (ECOG).
98. ASA grade (American Society of Anaesthetists grade).
99. Previous cancer of history (includes cancers treated many years previously, but does not include non-melanoma skin cancer or premalignant conditions such as cervical dysplasia or Barrett's disease).
100. Hypertension (treated, or higher than 140/90 on more than one occasion).
101. Peripheral vascular disease (carotid occlusion or > 50% stenosis; previous or planned surgery on abdominal aorta, limb arteries or carotids).
102. Alcoholism.
103. Hyperlipidaemia (treated, or current or previous cholesterol > 5.2  $\text{mmol l}^{-1}$ ).

### Lung cancer surgery

104. Is this operation a resection for primary lung cancer? Enter 1 for yes or leave blank for no. If the answer is *No* proceed to *Discharge section*. If the answer is *Yes* please answer the specialised questions for lung cancer surgery. Omit where data is not available. Do not estimate. If the data is too incomplete to analyse it is better that we know that.

### Pre-operative primary lung cancer diagnostic staging tests

Enter 1 if applicable (*i.e.*, if the test has been carried out as part of pre-operative staging).

105. CT.
106. MRI.
107. PET.
108. Pre-operative tissue diagnosis made (by any method *e.g.*, bronchoscopy, CT guided core biopsy or FNA, EBUS *etc.*). Enter 1 for yes, leave blank for no.

### Primary lung cancer histological diagnosis

Update after surgery if it changes. This is not an audit of the pre-operative diagnostic accuracy. The definitive histology is what we need. Enter 1 if applicable.

109. Small cell.
110. NSCLC.
111. Squamous.
112. Adeno.
113. Undifferentiated.
114. Bronchoalveolar.
115. Other or further information (write in).



### Primary lung cancer preoperative staging

- 116. T stage.
- 117. N stage.
- 118. M stage.

### Primary lung cancer neo-adjuvant therapy

Enter 1 if applicable.

- 119. Chemotherapy pre-operatively.
- 120. Radiotherapy pre-operatively.

### Primary lung cancer surgical resection performed

Combinations are allowed to make up pneumonectomies, or lobectomy plus part of adjacent lobe. Enter 1 to all that are applicable.

- 121. Frozen section taken for diagnosis.
- 122. Frozen section for staging.
- 123. Left upper lobe.
- 124. Left lower lobe.
- 125. Right upper lobe.
- 126. Middle lobe.
- 127. Right lower lobe.
- 128. Sublobar resection (whether wedge or segment).

### Primary lung cancer pathological (post-op) TNM staging

- 129. T stage.
- 130. N stage.
- 131. M stage.

### Discharge data

- 132. No complications (enter 1 if applicable. If the patient suffered any complications then leave blank).
- 133. Date of ITU readmission (only include admissions because of complications as opposed to the elective use of ITU or HDU after surgery).
- 134. Date of discharge from ITU (as above).
- 135. IPPV (enter 1 if applicable. Again only applies to complications as opposed to elective ventilation as part of primary surgery).
- 136. Air leak >7 days (enter 1 if applicable).
- 137. Infection requiring extension of hospital stay (enter 1 if applicable).
- 138. Return to theatre within the same admission (enter 1 if applicable. Do not include suction bronchoscopy or insertion of chest drain).
- 139. Date of discharge / transfer / death.
- 140. Death (enter 1 if applicable).



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**Notes**

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# The Society for Cardiothoracic Surgery in Great Britain & Ireland's Second National Thoracic Surgical Report

This book focuses on data collected by thoracic surgeons over the last thirty years on behalf of their professional Society for the purposes of comparing activity and outcomes between surgical hospitals in different parts of the United Kingdom & Ireland. Although written by surgeons for surgeons the data will be of increasing interest to many others involved directly or indirectly with healthcare provision, especially with regard to the management of lung cancer. Highlights from the report are:

- data on over 440,000 individual patient records
- over 95% complete for the period 1980-2010
- steady increase in overall activity, especially over the last 5 years
- a 60% increase in the number patients treated with surgery for primary cancer between 2001 and 2010
- significant reductions in operative mortality
- increased use of minimally invasive surgery
- patient specific characteristics and outcomes for lung cancer surgery presented for the first time
- a commentary on surgical aspects of the National Lung Cancer Audit

As with their previous reports the Society acknowledges that there are a number of potential flaws and deficiencies in the data given the methodology of collection. Nevertheless, the comprehensiveness and clinical focus of the report makes it a unique contribution to many areas of care for patients undergoing thoracic surgery. Data such as this is an essential contribution to many of the underlying principles of good healthcare namely achieving access to appropriate treatment for patients and ensuring that the care they receive is of a high standard. The Society is proud to report that the outcomes for patients undergoing thoracic surgery in the United Kingdom & Ireland are comparable with reported international standards.



The Society for Cardiothoracic Surgery  
Mr Richard Page  
Consultant Thoracic Surgeon  
Liverpool Heart & Chest Hospital  
Thomas Drive  
Liverpool L14 3PE  
United Kingdom

Phone +44 (0) 151 600 1456  
Fax +44 (0) 151 600 1696  
email richard.page@lhch.nhs.uk



Dendrite Clinical Systems  
Dr Peter K.H. Walton  
Managing Director  
The Hub, Station Road  
Henley-on-Thames  
Oxfordshire RG9 1AY  
United Kingdom

Phone +44 (0) 1491 411 288  
Fax +44 (0) 1491 411 377  
email publishing@e-dendrite.com