Royal College of Physicians

Society for Cardiothoracic Surgery in Great Britain and Ireland

Lung cancer clinical outcomes publication 2018

(for surgical operations performed in 2016)

December 2018

In association with:

British Thoracic Oncology Group

National Lung Cancer Forum for Nurses NLCFN

Roy Castle Lung Cancer Foundation

Public Health England

The University of Nottingham
UNITED KINGDOM · CHINA · MALAYSIA

HQIP
Healthcare Quality Improvement Partnership

The Royal College of Physicians

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The Society for Cardiothoracic Surgery in Great Britain and Ireland

The Society for Cardiothoracic Surgery in Great Britain and Ireland (SCTS) was founded in 1934. A self-funding organisation, it is the representative body for thoracic and cardiac surgery in the UK and Ireland.
The SCTS has pioneered the collection and publication of surgical outcomes data. It has maintained and published a registry of thoracic surgery since 1980, through a network of audit leads in each thoracic surgical unit across Britain and Ireland. The SCTS currently contributes to national audits in children's and adult heart surgery, and lung cancer surgery.

Healthcare Quality Improvement Partnership

The Healthcare Quality Improvement Partnership (HQIP) is led by a consortium of the Academy of Medical Royal Colleges, the Royal College of Nursing and National Voices. Its aim is to promote quality improvement in patient outcomes, and in particular, to increase the impact that clinical audit, outcome review programmes and registries have on healthcare quality in England and Wales. HQIP holds the contract to commission, manage and develop the National Clinical Audit and Patient Outcomes Programme (NCAPOP), comprising around 40 projects covering care provided to people with a wide range of medical, surgical and mental health conditions. The programme is funded by NHS England, the Welsh Government and, with some individual projects, other devolved administrations and crown dependencies. www.hqip.org.uk/national-programmes.

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Document purpose	To disseminate results on the outcomes of lung cancer surgery for patients who had operations between 1 January and 31 December 2016
Title	*Lung cancer clinical outcomes publication 2018 (for surgical operations performed in 2016)*
Authors	Royal College of Physicians, Care Quality Improvement Department; Society for Cardiothoracic Surgery in Great Britain and Ireland
Publication date	December 2018
Target audience	NHS staff in lung cancer multidisciplinary teams; hospital managers and chief executives; commissioners; lung cancer researchers; lung cancer patients, their families and their carers
Description	This is the fifth lung cancer clinical outcomes publication on individual activity of surgeons or their specific contribution to lung care. The data relate to patients diagnosed with lung cancer who underwent surgery during the period between 1 January and 31 December 2016.
Related publications	National Lung Cancer Audit annual reports: **www.rcplondon.ac.uk/NLCA**
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Commissioned by:

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Thank you to all the lung cancer surgical teams that have contributed data to the audit; without your considerable efforts, this report would not be possible. Thanks also to Amy Kerr, nurse specialist at Heartlands Hospital Birmingham, for facilitating Chris Donough's patient narrative.

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Key messages

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Foreword

We are delighted to see the publication of the fifth LCCOP report which represents another year of successful collaboration between the National Lung Cancer Audit and the Society of Cardiothoracic Surgeons, as well as our other partners.

Once again, the number of annual lung cancer operations has increased, yet the short-term survival is still extraordinarily good. It has been known for some time that survival drops considerably between 90 days and 1 year, and for the first time, we have been able to analyse the causes of death, and how these change across the first year after surgery.

Last year we reported for the first time on robotically-assisted operations, and although interestingly the numbers have decreased this year, we see that the number of minimally-invasive (VATS – video-assisted thoracic surgery) operations has exceeded 50% for the first time. This is good news for patients who benefit from a procedure that is less likely to cause morbidity, has a shorter length of hospital stay and which has a faster recovery time.

We are constantly looking for new measures that will be relevant to patients, and this year we report on readmissions to hospital. The overall rate of 43% is surprisingly high, and further work will be needed to unpick whether these are non-elective events reflecting complications of the surgery, or other events picked up through coding.

In a small number of units, survival falls below the level that would be expected. Similarly, there are some units with high rates of pneumonectomy or readmission to hospital. Hidden in the detail of the report is the commitment of the thoracic surgeons across England to open and transparent analysis and publication of these outcome data, and the work they do to validate the data to make it accurate and useful. As a result, we are confident that all units will use these results constructively in the pursuit of ever improving outcomes for our patients.

Dr Paul Beckett
Senior clinical lead, National Lung Cancer Audit

Mr Doug West
Thoracic surgery audit lead, the Society for Cardiothoracic Surgery

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Introduction

The lung cancer clinical outcomes publication (LCCOP) is an NHS England initiative, commissioned by the Healthcare Quality Improvement Partnership (HQIP), to publish quality measures at unit level and at the level of individual consultant doctors, using national clinical audit and administrative data. The aims of publishing these results are to:

- reassure patients that the quality of clinical care is high
- assist patients in having an informed conversation with their consultant, GP or healthcare professional about the procedure or operation that they may have
- provide information to individuals, teams and organisations to allow them to monitor and improve the quality of the clinical care that they provide locally and nationally
- inform the commissioning of NHS lung cancer services.

This is the fifth report on the individual activity of surgeons and their contribution to lung cancer care. The data relate to patients diagnosed with lung cancer (including non-small-cell lung cancer, carcinoid and small-cell lung cancers) who underwent surgery during the period between 1 January and 31 December 2016. Data for this report is based on patient-level information collected by the NHS, as part of the care and support of cancer patients. The data is collated, maintained and quality assured by the National Cancer Registration and Analysis Service (NCRAS), which is part of Public Health England (PHE). Validation of local data, and collection of data on surgical approach, has been performed in collaboration with the Society for Cardiothoracic Surgery (SCTS) and their network of local audit leads.

Outcome measures

In addition to publishing the number of operations performed by hospitals and by individual consultant surgeons, the following outcomes are reported:

- the proportion of patients who survive at 30 days, 90 days and 1 year after their operation for each unit
- the median length of stay in hospital following an operation
- the proportion of patients who were readmitted within 90 days of hospital discharge
- the pooled resection rates for the lung cancer team meetings (MDTs) which a surgical unit serves.

The survival results have been adjusted to take into account the patient casemix, which may affect the outcome of the operation. For example, the age and fitness of a patient before surgery affects the risk that they will face from undergoing surgery.

The full data are available on www.scts.org, NHS Choices and My NHS (www.nhs.uk). Full data tables are also available for download.

Methods

Patients undergoing lung resection for primary lung cancer within the English NHS are included. In contrast to previous years we have not included small-cell lung cancers (SCLC) since surgery is not usually the primary treatment for this subtype. Diagnostic or staging operations and resections for metastatic disease are not included. Lung cancer operations are extracted from the National Cancer Registration and Analysis Service (NCRAS) data, and sent to local SCTS audit leads within each surgical unit for local validation. The records are cross-referenced to Hospital Episode Statistics (HES) data to obtain some comorbidity and other data. Named consultants are cross-referenced against the General Medical Council (GMC) Specialist Register.

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Casemix adjustment and outlier notification

Survival outcomes are adjusted using comorbidity and demographic data from HES and COSD, and presented as odds ratios relative to pooled national data. Units with odds ratios for survival beyond 95% confidence intervals (alert) level are notified directly and units at the 99.8% (alarm) level are notified and identified in the LCCOP report. HQIP's *Technical Manual for Clinical Outcomes Publications* was used to guide the development of LCCOP. The full methodology report can be accessed at www.hqip.org.uk/resource/clinical-outcomes-publication-technical-manual/

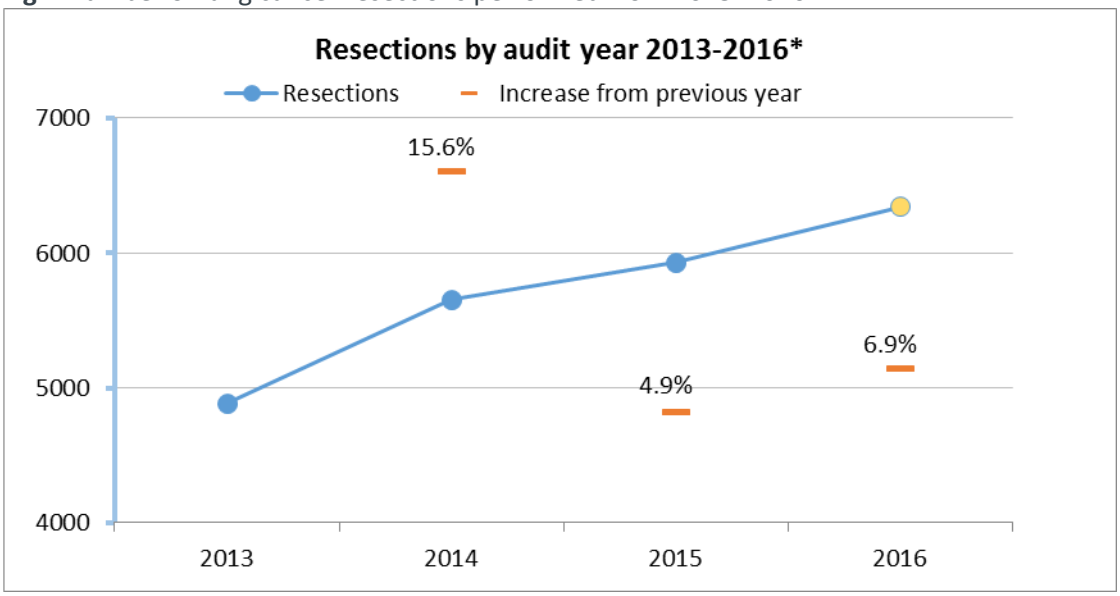
The audit period includes procedures performed in the calendar year 2016.

Results

Activity

A total of 6,343 resections for lung cancer were reported, an increase of 6.9% on the 5,936 resections reported last year (5,842 of which were for non-small-cell lung cancer (NSCLC) or carcinoid). Between 2015 and 2018, lung cancer resections have risen by 29.7%, from 4,892.

Fig 1 Number of lung cancer resections performed from 2013–2016



*small-cell lung cancer resections were not included in LCCOP from 2016 onwards (denoted by the yellow dot).

Small-cell lung cancer (SCLC) resections have been excluded from LCCOP this year. This is because surgical resection for SCLC is rare, with only 94 cases reported in the 2017 (2015 data) LCCOP report, 1.6% of all resections that year.

Twenty-eight units performed lung cancer surgery in 2016. The Royal Devon and Exeter NHS Foundation Trust unit closed during the audit period. We were not able to locally validate data for this trust, but every other surgical unit locally validated their data, coordinated by the SCTS network of thoracic audit leads. Of the 27 units performing lung cancer surgery that still existed at the end of 2016, the median number of resections per unit was 203 (interquartile range (IQR) 166–278). Six units (22%) did not perform the minimum unit case volume of 150 resections recommended in the NHS England service specification for thoracic surgery.[1]

A total of 125 (verified) consultant surgeons were identified as performing lung cancer resections in 2016. The median number of cases performed by each surgeon was 46 (IQR 31–70), similar to the median of 49 reported in LCCOP 2017, and considerably above the 30 cases per surgeon reported in 2012.

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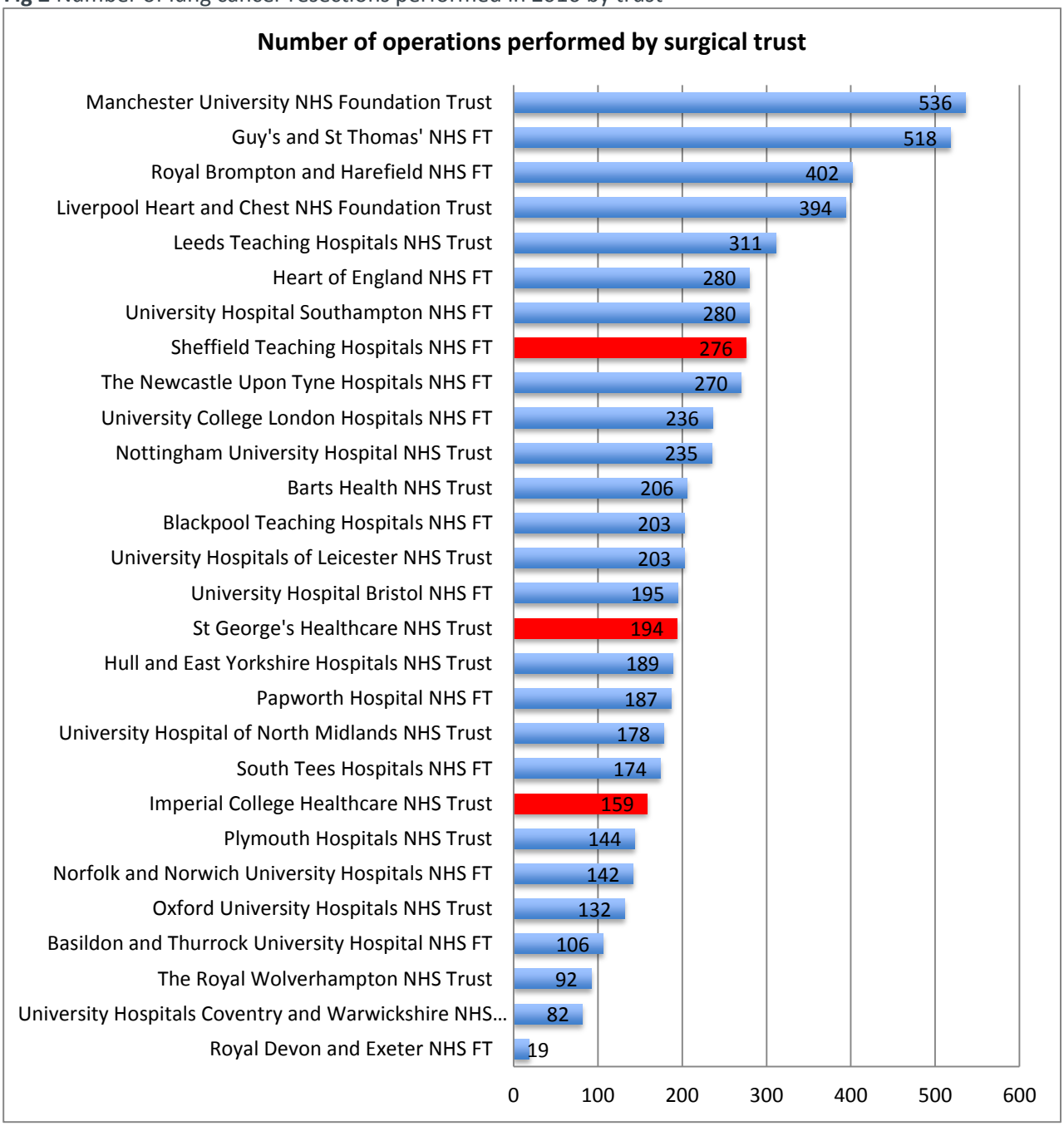
Fig 2 Number of lung cancer resections performed in 2016 by trust



*The Royal Devon and Exeter Hospital in Exeter ceased to perform lung cancer surgery during the audit period with services transferred to Plymouth. Its data therefore do not represent a whole year's activity.
**Trusts in red are those closest to the first, second and third quartiles with Exeter excluded.

A small number of surgeons named by trusts were not practising thoracic or cardiothoracic surgeons (evidenced by cross-referencing to the GMC online register and cross-checking with audit leads). These clinician's names do not appear in LCCOP, although cases initially linked to them remain generically assigned to their trust. Non-NHS surgery, and lung resections for other conditions such as secondary (metastatic) tumours are not included in LCCOP.

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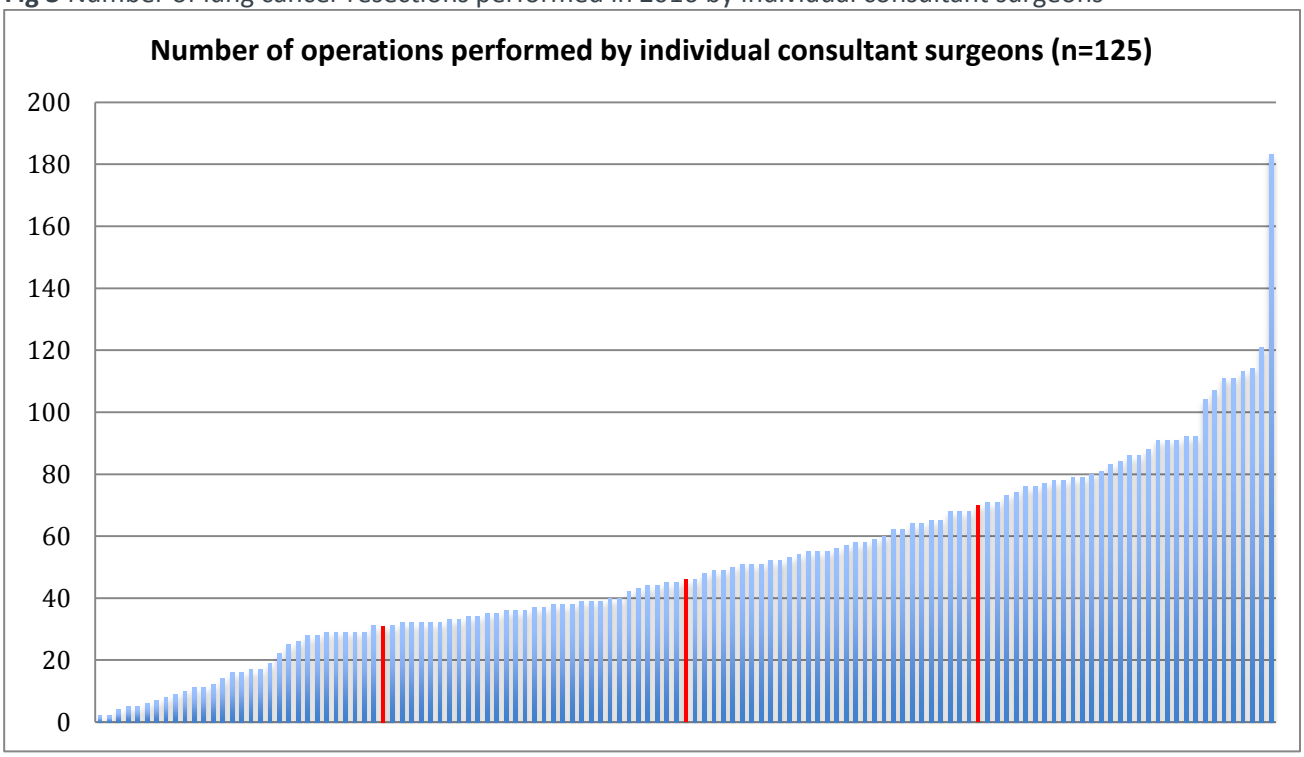
Fig 3 Number of lung cancer resections performed in 2016 by individual consultant surgeons



*Red lines mark quartiles (1st, median, 3rd)

Demographics

Analysis of the data submitted to the audit allows a detailed description of the population of patients who had lung cancer surgery in 2016:

- **Age**
  The mean age of a patient having a lung cancer operation in 2016 was 68.4; the interquartile age range was 63–75 years.
- **Gender**
  There were more female than male patients: 51.5% female, 48.5% male.

Performance status (PS)

The World Health Organization (WHO) PS is a standardised method of assessing a patient's overall fitness. The score ranges from 0 (no symptoms) to 4 (bed-bound). Although simple to calculate, the PS correlates well with the risk of complications after surgery, with less fit patients at higher risk.

The majority of operations are done in relatively fit patients. Only 9.5% of patients with a documented PS had a PS of two or more.

Types of lung cancer operated on in 2016

The majority (93%) of surgery for lung cancer is performed for NSCLC. However, resection of carcinoid tumours is increasing, from 226 operations in 2014, to 343 in 2015 and 422 in this year's report (2016 data). This is an 87% increase over only 2 years, suggesting a change in the management of these relatively unusual tumours.

Stage of cancer

81% of resections were for stage one or two lung cancer, while 12.9% (819 cases) were for stage IIIA disease. There was no cancer stage recorded for 1.9% (121 cases) (Fig 5).

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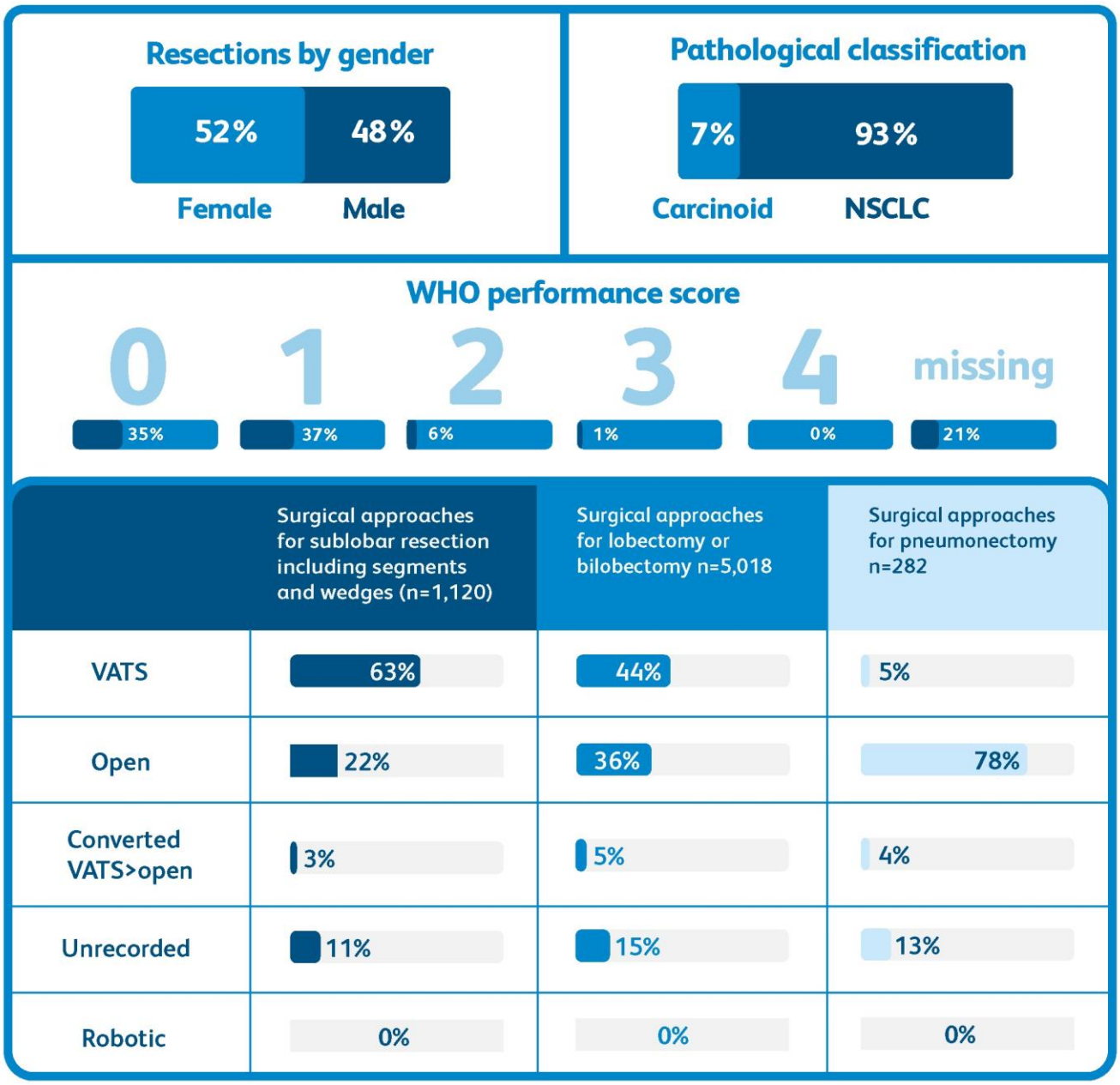
Fig 4 Demographic and surgical data



NB small-cell lung cancer surgery was excluded from LCCOP in 2018. This is because surgical resection for small-cell lung cancer surgery is rare, with only 94 cases reported in the 2017 (2015 data) LCCOP report, 1.6% of all resections that year.[2]

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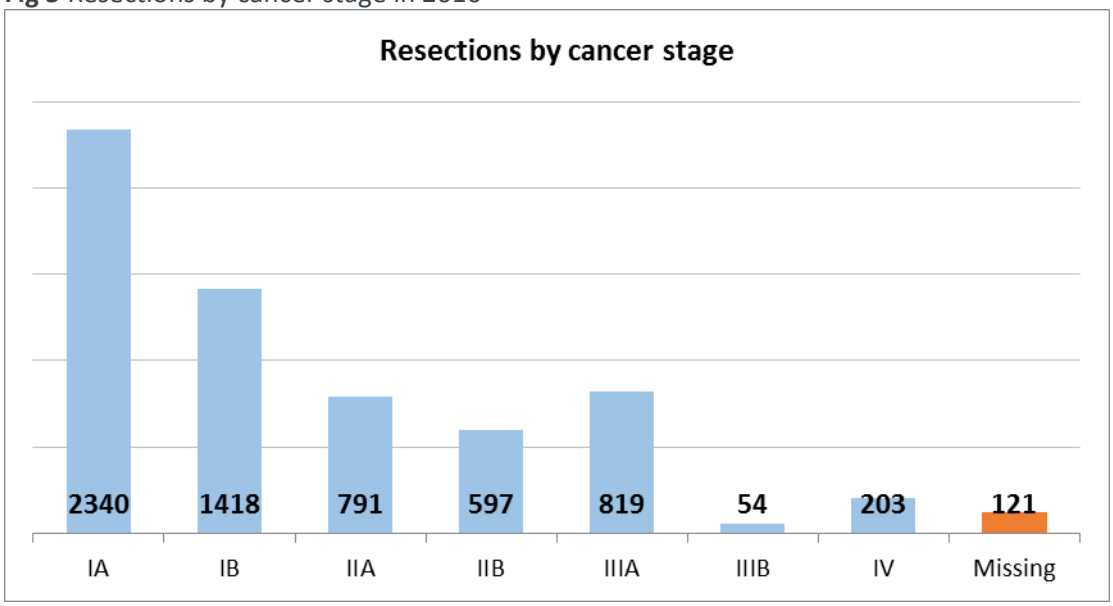
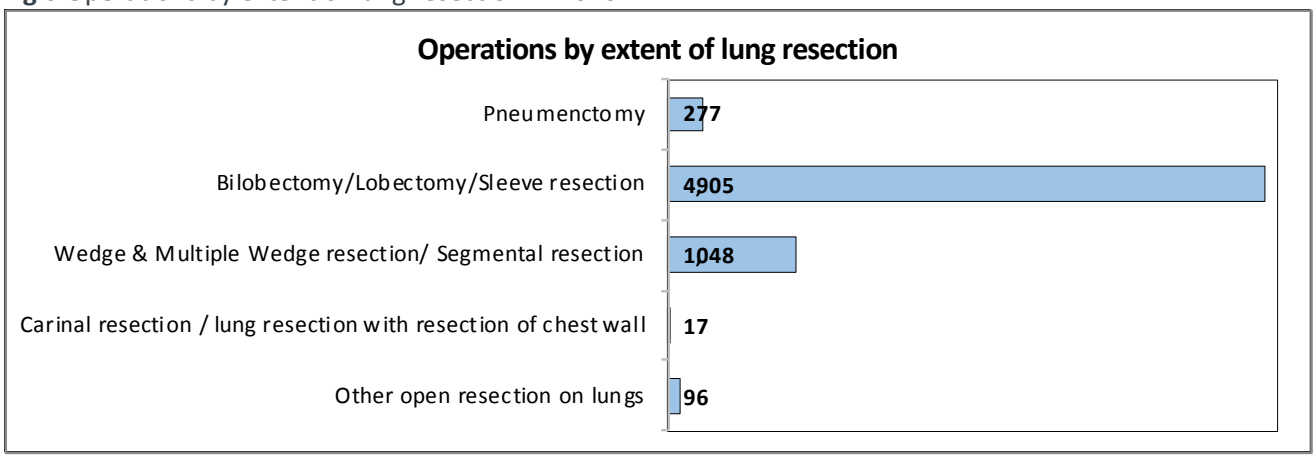
Fig 5 Resections by cancer stage in 2016



Types of lung cancer operations in 2016

More than 77% of all resections for lung cancer were lobectomy or bilobectomy procedures. Only 277 pneumonectomy operations were performed, 4% of overall activity. Pneumonectomy operations are associated with lower survival rates, both early and late after surgery. 17% of operations (1,048) were sublobar resections, either wedge resection procedures or segmentectomies. Current NICE guidelines suggest that these are generally reserved for less fit patients, who may be at higher risk of complications after lobectomy.

Fig 6 Operations by extent of lung resection in 2016



Survival

We report adjusted survival at three time points; 30, 90 and 365 days after surgery.

A total of 98.2% of patients (6,228 of 6,343 resections) were alive 30 days after surgery, very slightly higher than the 98.1% reported in LCCOP 2017. In two trusts (University Hospitals Coventry and Warwickshire NHS Trust and Oxford University Hospitals NHS Trust), all patients were alive at 30 days. Both of these trusts were positive or 'good practice' outliers, with survival significantly better than national data. Leeds Teaching Hospitals NHS Trust was a negative outlier with an adjusted survival rate of 93.6%.

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By 90 days, 6,119 (96.5%) patients remained alive. The Royal Wolverhampton NHS Trust was a negative outlier with an adjusted mortality of 89.3%.

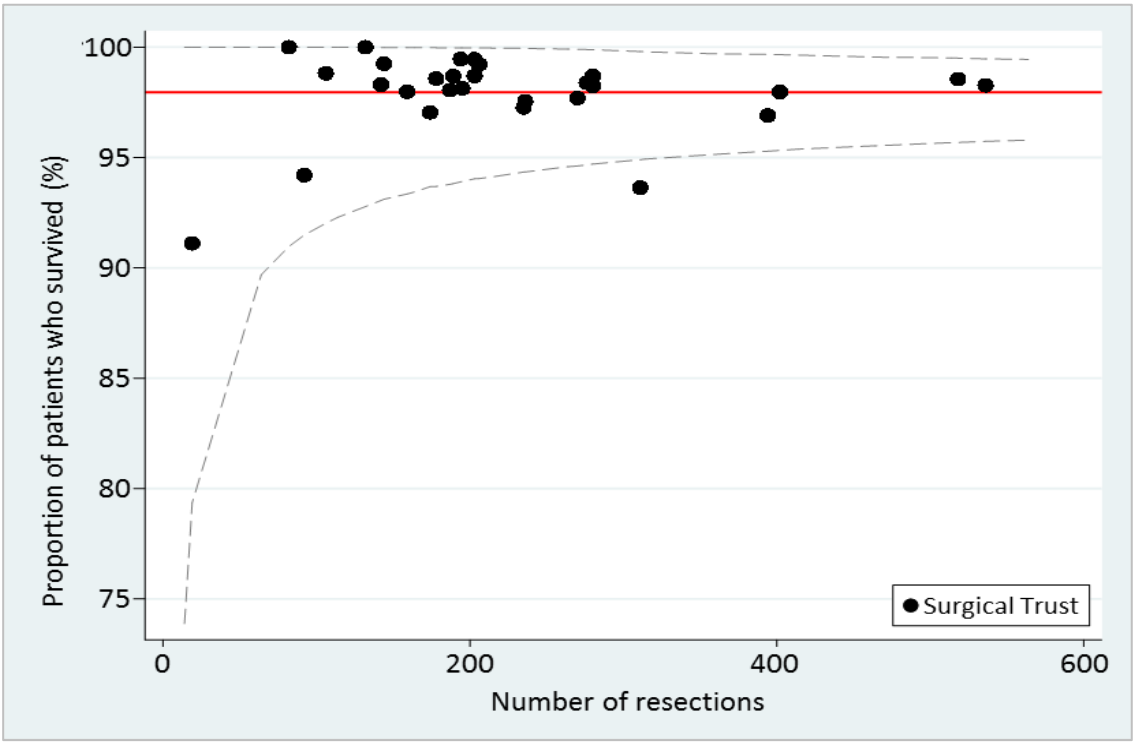
By 1 year after surgery, 5,623 patients (88.7%) were still alive, with all hospital results lying within the expected range.

Figs 7, 8 and 9 are funnel plots showing adjusted 30-day, 90-day and 1 year survival rates by surgical unit. The dotted lines signify the level of survival that would be outside the expected range. Full data for all trusts and all outcomes are available on https://scts.org or, NHS Choices and My NHS (www.nhs.uk). Full data are also available for download.

The plotted control limits in Figs 7, 8 and 9 represent 99.8% confidence intervals of the adjusted odds ratios. The Y axis shows adjusted survival. The survival data was adjusted for the composition of the population in terms of age, sex, performance status, stage, laterality, FEV1 (forced expiratory volume in the first second) percentage, comorbidity and socioeconomic status.

It should be noted that the single negative outlier shown in each of Figs 7, 8 and 9 represents different trusts – as noted above. The RCP routinely reaches out to trusts to provide assistance in reviewing their practice compared with peers in order to improve outcomes. Trusts identified as negative outliers are required to undertake a formal internal review of their data to establish whether results are due to chance alone, poor quality data, or represent genuine divergence from expected outcomes. At the time of writing the report, the Royal Wolverhampton NHS Trust had confirmed that it had started its internal review.

Fig 7 Adjusted 30-day postoperative survival



At 30 days, 98.2% of patients (6,228 of 6,343 resections) remained alive, with one unit outside 99.8% confidence limits.

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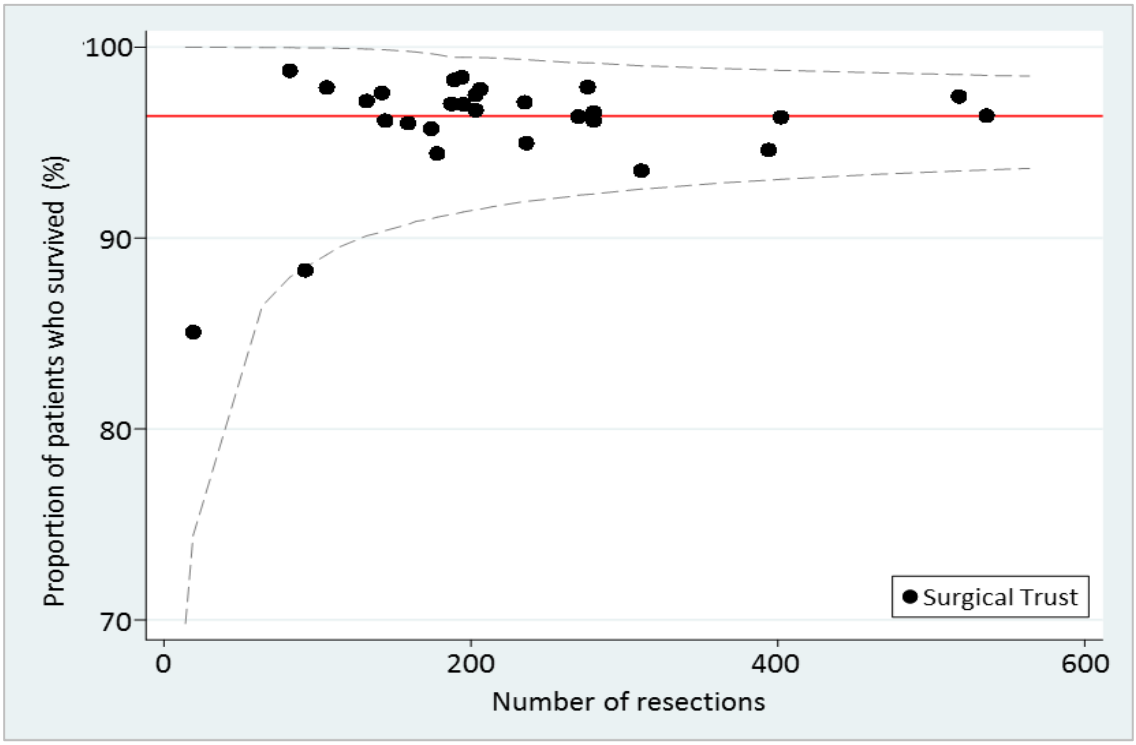
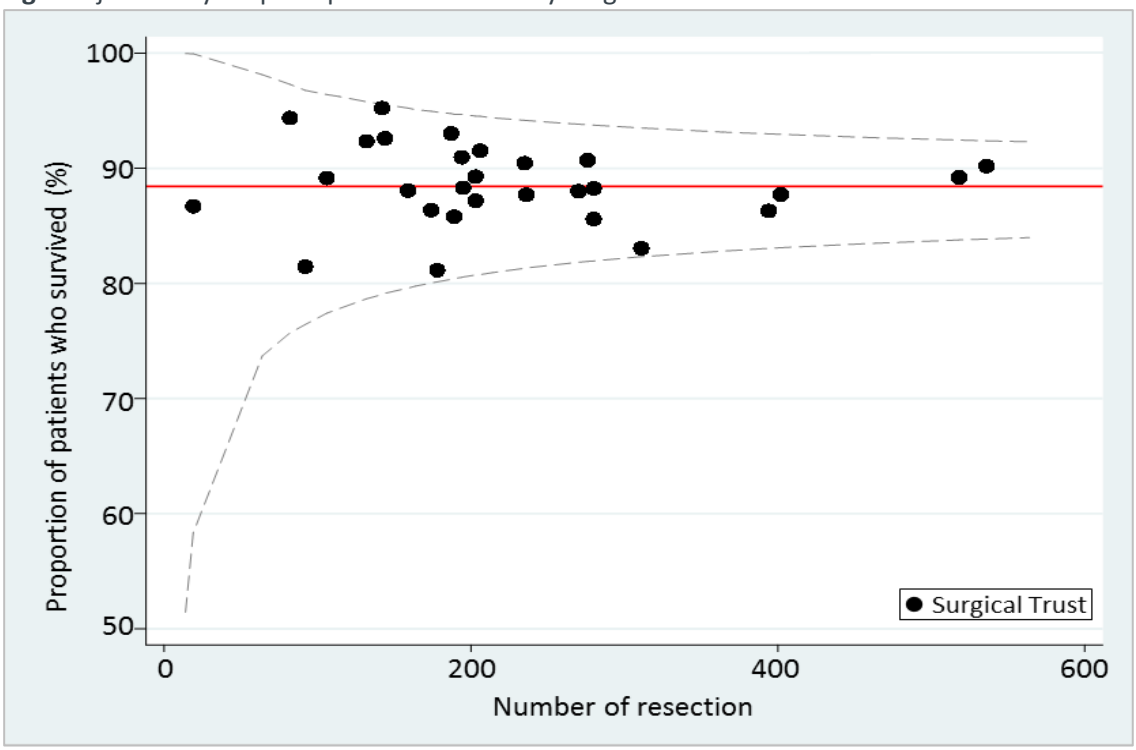
Fig 8 Adjusted 90-day postoperative survival



By 90 days after surgery, 96.5% of patients were alive (6,119 of 6,343 resections), slightly higher than last year's results. One unit's adjusted survival was outside 99.8% confidence limits (see data charts).

Fig 9 Adjusted 1-year postoperative survival by surgical unit



At 1 year, 88.7% of patients were still alive (5,623 of 6,343; see Fig 10), compared with 87.9% in the 2017 (2015 data) report.

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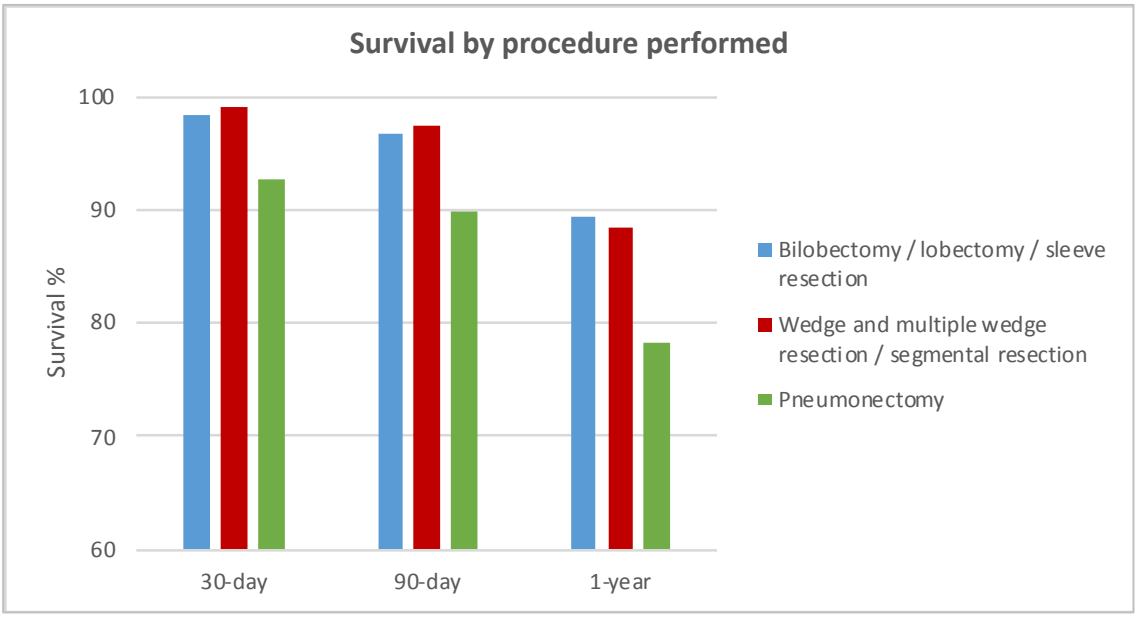
Fig 10 Survival at 30, 90 and 365 days



The extent of lung resection performed has a significant impact on survival, with pneumonectomy patients experiencing lower unadjusted survival rates than lobectomy and sublobar excisions at every time point examined. Although accounting for only 4% of lung resections, 17% of all deaths within 30 days occur after pneumonectomy.

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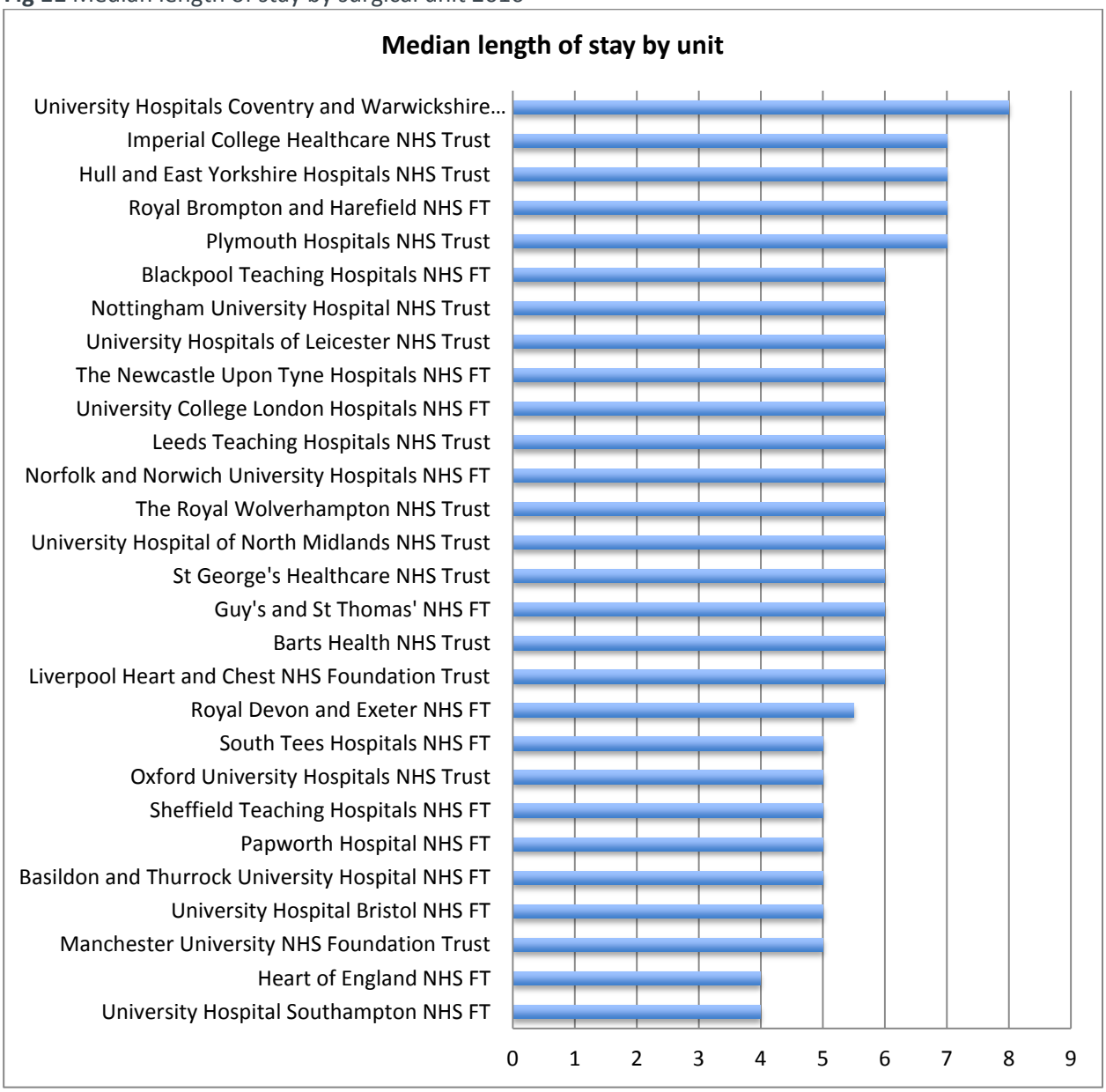
Length of stay and readmission

Median length of hospital stay was 6 days (IQR 4–9 days, based on 6,104 available records; see Fig 11). This data is obtained from the Hospital Episodes Statistics (HES) dataset and is not adjusted for patient factors. Significant disparities are seen in this outcome, with a range from 4–8 days. Length of stay can be an important driver of healthcare costs. Initiatives such as day of surgery admission (DOSA), enhanced recovery (ERAS) and minimal access surgery have been associated with shorter lengths of stay.

Fig 11 Median length of stay by surgical unit 2016



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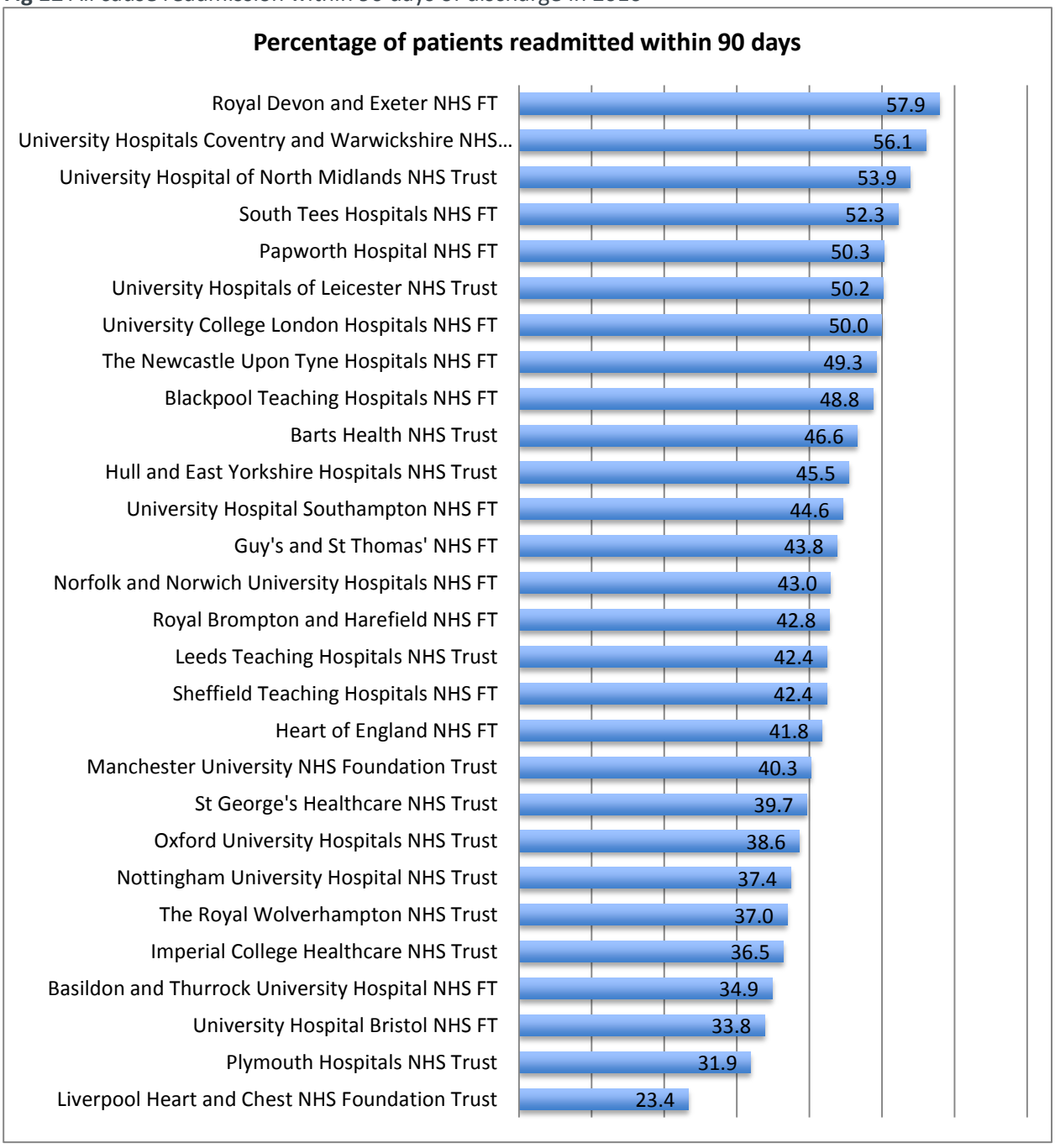
For the first time this year we have included data on all-cause readmissions to any NHS hospital within 90 days (see Fig 12). The data, derived from HES, shows surprisingly high rates of readmission across units, with a median of 42.9% (IQR 38.3%, 49.4%). This data is not adjusted for patient factors.

Fig 12 All cause readmission within 90 days of discharge in 2016



Causes of perioperative mortality

A consistent finding in previous LCCOP reports has been that 90-day mortality is around double that of 30-day mortality. Again this year we have seen a mortality rate of 1.8% of patients by 30 days, and an additional 1.7% between 30 and 90 days. These deaths often occur after discharge and are therefore often not included in morbidity and mortality reviews or other hospital review processes. It may, however, be possible to reduce these deaths by changes to perioperative care.

This year we report the primary causes of death for patients in LCCOP by ICD-10 codes (see Fig 13).

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Miscellaneous codes were common: 21% of all cases at 30 days and 20% at 90 days. The six commonest codes at 30 days are shown in Fig 13. Respiratory codes predominated at both 30 and 90 days, with peri-procedural respiratory complications (J95) the most frequent system-specific code at 30 days (21%), and pneumonia the most common at 90 days (15%).

Infectious disease codes including pneumonia and sepsis were both within the seven most frequent diagnoses at both 30 and 90 days. Cardiovascular codes were less common, but vascular disorders of the intestine (5%) and chronic ischaemic heart disease (4%) were respectively sixth and ninth most frequent specific codes at 30 days.

Further study of the causes of perioperative deaths would help to direct perioperative quality improvements in future.

Fig 13 Principal cause of death by ICD-10 code at 30 and 90 days

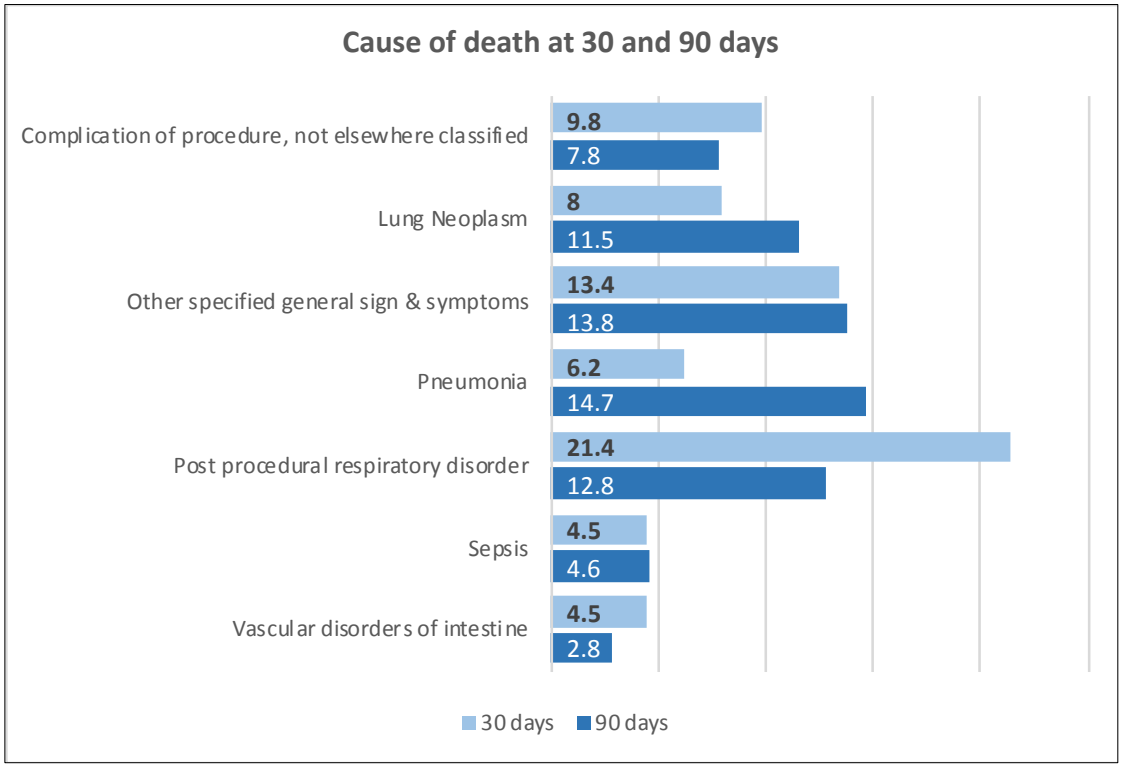

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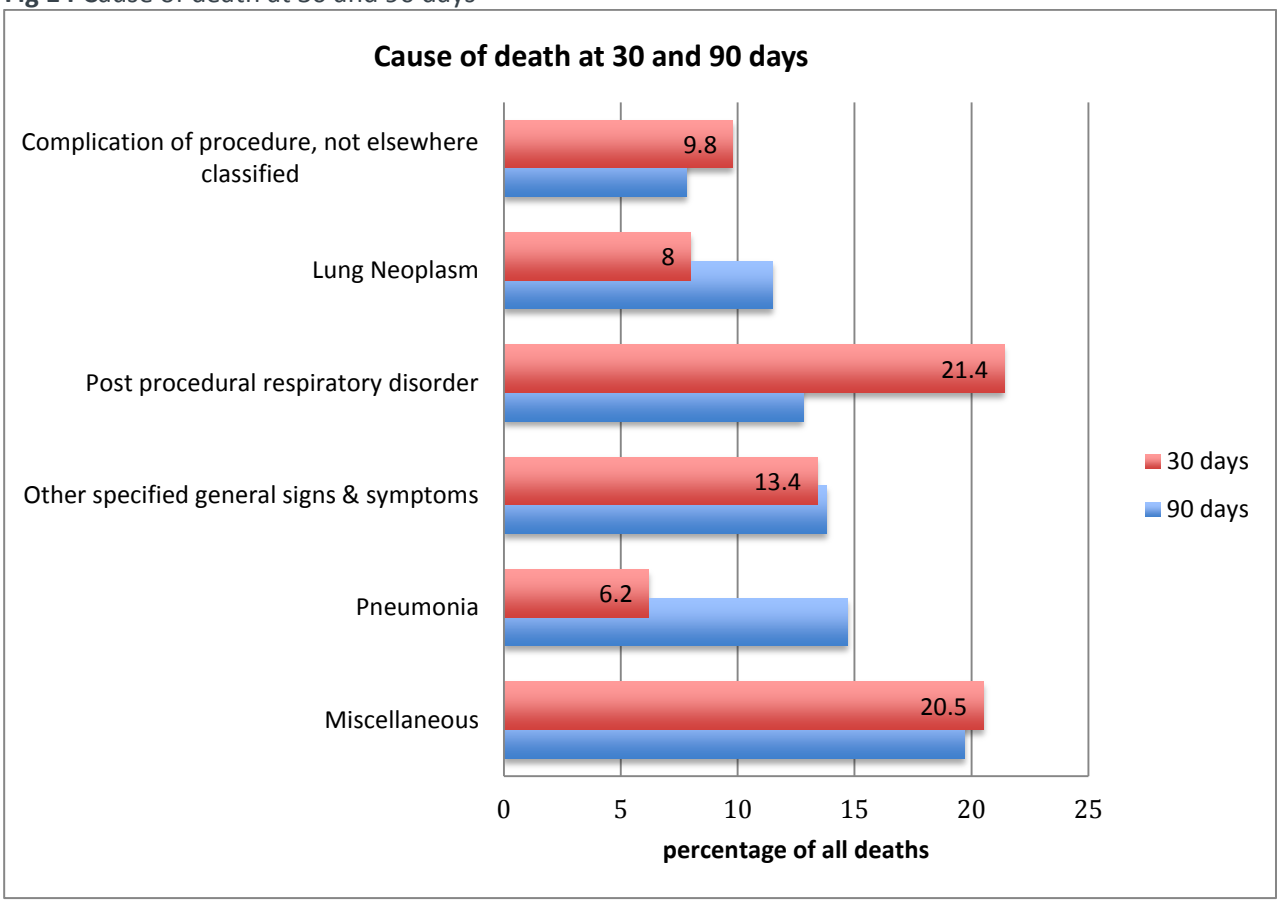
Fig 14 Cause of death at 30 and 90 days



Resection rates

The LCCOP report has always tried to link local resection rates to the outcomes achieved by surgical units. Resection rates are calculated in the main National Lung Cancer Audit (NLCA) report, and are reported by 'trust first seen' (the trust hosting the lung cancer MDT).

This creates some challenges when calculating a resection rate for a surgical unit, which invariably covers more than one MDT. When a surgical unit is the only provider for a group of MDTs then the number of patients undergoing surgery is divided by all patients diagnosed in the group of MDTs. The situation is more complex when 'trusts first seen' send patients to more than one surgical unit. Although the patients operated upon can be easily assigned to the surgical unit that treated them, there is no absolute way to assign the patients who did not have an operation, since in most cases they were never assessed in a surgical centre.

Last year we simply asked surgical units which trusts they covered, and then published the NLCA's resection rates for those trusts in LCCOP.

This year we have taken another approach, and have produced pooled resection rates for surgical units. To calculate this for trusts served by more than one surgical unit, we divided the number of cases not operated upon in the same proportion as those that were operated on between the surgical units. This approach has provided a single value for each unit's resection rate, which accounts for the differences in the size of the MDTs covered. However, for surgical units that share cover of a trust, this approach may mask differences in management between the two surgical providers. Since only 10 of 148 trusts (6.8%) had more than one surgical provider, this approximation was felt to be reasonable. It is also acknowledged that so-called 'tertiary trusts' have unusual referral patterns, and their resection rates may not be directly comparable with other MDTs. Surgical units that serve tertiary MDTs are highlighted in yellow in Fig 15.

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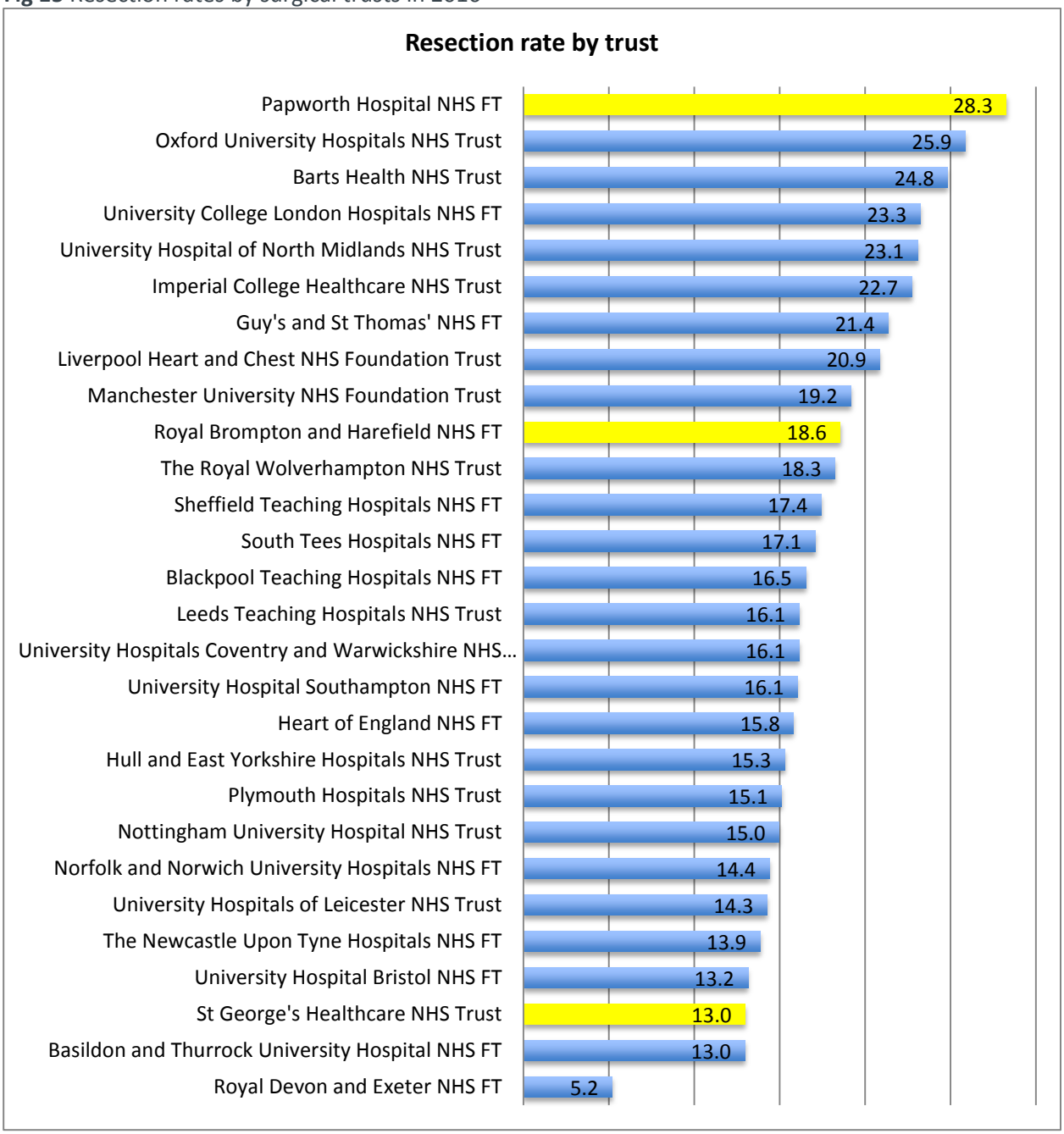
Fig 15 Resection rates by surgical trusts in 2016



*Surgical units which cover NLCA-defined tertiary trusts are denoted in yellow. Referral patterns for tertiary trusts are often not geographic, and direct comparisons with other trusts may not be accurate.
**Exeter ceased thoracic surgery during this period, and its resection rate cannot be compared with other trusts. These MDTs were taken on by Plymouth, and therefore this resection rate should also be interpreted cautiously.

The pooled national resection rate was 17.5%.

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A patient's perspective

Chris Donough has had surgery for lung cancer. He shares his experience of the challenges of getting fit for surgery, the ups and downs of recovery, stopping smoking, recovering at home and finally getting back to enjoying life with family and friends.

It came as no surprise to me to be told, at the age of 68, that I had lung cancer.

My family were more upset with the news than I was, perhaps because they had been trying to persuade me to give up smoking for over 50 years.

Having agreed to have the surgery, I further agreed to participate in my consultant's research project. This involved getting me as fit and otherwise healthy as possible prior to the operation with lots of physical exercises.

I was also strongly advised by everyone to stop smoking. I'm afraid I failed to heed their advice.

I had my VATS and lobectomy operation in January 2016. However, due to pneumonia I was kept in the hospital for 9 days instead of the usual 3 or 4, and was then re-admitted to hospital 10 days later for a further 10 days.

During this time I was apparently quite ill and lost nearly four stone in weight.

However, I made a remarkable recovery. I am convinced that this was mainly as a result of refusing to give in, to feel sorry for myself or to believe that there was anything wrong with me.

What is even more remarkable is that as a result of being so ill for nearly a month, I forgot that I used to smoke! Yes, truly, I forgot and now over two and a half years later, I still haven't had or even wanted a cigarette.

I continue to lead a very active life. This includes playing with my four grandchildren, and swimming and cycling nearly every day.

I'm showing off now, but I'm pleased that in the last 2 years my wife and I have been able to visit Venice, Menorca, Amsterdam, Sicily, Lakes Como and Lugano, Majorca, Madeira, the Maldives, Barcelona, Valencia and Ibiza.

Thank you to all the NHS staff who have looked after me so well.

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Highlighting best practice

An important function of the LCCOP project is to identify trusts whose results are better than expected, and to help spread best practice when identified. We asked several clinicians in units that have shown evidence of good practice or patient-focused innovation to reflect on their practice. We present three of these here.

1. Short lengths of stay at University Hospitals Southampton

Since LCCOP began reporting length of stay, the team at University Hospitals Southampton have consistently reported very low median lengths of stay of 4 days. Consultant thoracic surgeon Edwin Woo reflects on how they have achieved this.

Southampton has adopted the principles of enhanced recovery. Striving for marginal gains and synergism created by the collaborative efforts of every member of the team. We are supported by an engaged management team that react and adapt to the ever-changing patient care landscape.

Patients are all under the care of a thoracic surgeon, with no mixed practice surgeons. A single preoperative visit to Southampton is common for assessment by the surgeon, anaesthetist, nursing team and recently, physiotherapy. Our case management and pre-assessment teams ensure that all investigations are satisfied.

All of our patients are admitted on their day of surgery, except for clinical needs. Over 85% of our lung cancer resections are done by VATS. Standardised practice permits streamlined care with a common set of investigations minimising clinical cancellation. We run a regular complex patient MDT meeting attended by surgical, anaesthetic, nursing and physiotherapy staff for patients with the most demanding surgical and support needs. Extra work up and optimisation necessary are organised and the ward is primed.

The operating theatre is dedicated to thoracic surgery. There is strong leadership to a specialist, motivated and cohesive scrub team. It provides an optimal and familiar environment during surgery. There are regular visits to other units to learn from best practices.

Our single specialty ward has built up a wealth of specialism. Standardised patient care together with the use of electronic chest drain management allows the nursing and medical team to deliver care with confidence. Routine lung resections are nursed on our ward, avoiding competition with other services for critical care access. This is only possible with support from our specialist thoracic anaesthetists who are involved throughout the patient's journey.

Continuous postoperative regional anaesthesia is used routinely. This, together with portable suction units and proactive physiotherapists, promotes early patient mobilisation.

We have 7-day thoracic advanced nursing practitioner (ANP) cover during core hours, providing continuity of care. They run a ward review clinic to support our ambulatory care programme. Patients are discharged once medically fit. Those with ongoing air leak are managed with a flutter valve. Our ANPs also support management of wounds and indwelling pleural catheters.

Patients are supported by the specialist nursing team with pastoral care on the ward and via telephone after discharge. There is pharmacist clinical input on the ward to provide a priority service for discharge medicine. It is usually on the ward the night before expected discharges to minimise delay.

Our successful surgical training programme attracts high calibre trainees, who provide an invaluable contribution to patient care. All staff are supported by access to a consultant opinion at all times with cross cover.

Southampton has co-location of all clinical services. Patients have immediate access to input from oncology, respiratory medicine and others including specialist cardiothoracic and interventional radiology.
A hands-on bed management team ensure timely inpatient transfer and repatriation. Our Complex Discharge Team take care of Southampton patients with compound needs.

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2. Developing the thoracic advanced nurse practitioner role at Oxford University Hospitals (OUH)

The thoracic team at Oxford have achieved high resection and survival rates, while pioneering innovations including nurse-led cancer follow-up clinics. Thoracic advanced nurse practitioner Jenny Mitchell tells us how her role has evolved at OUH.

The advanced nurse practitioner (ANP) role was introduced in Oxford in 2011 with the aim of enhancing the patient pathway. An early focus was to facilitate improvements to the patient pathway. The ANP provided clinical support to the trust theatre admission ward, allowing introduction of day of surgery admission for almost all our elective patients. This has been very successful with 99% of elective patients now admitted on the day of operation. A similar process of support and education with staff in the recovery unit and the cardiothoracic ward has led to improvements to the recovery pathway and a reduction in the number of patients who require admission to intensive care after surgery. The ANP provides specialist support and review for all thoracic surgical inpatient clinical areas and runs a helpline for community health professionals and patients at home needing advice. The ANP led the introduction of electronic chest drains in 2012 and continues to provide ongoing support and education to the clinical areas. More recently, charitable funding was successfully secured to upgrade the electronic chest drains to the latest version.

An early priority was to set up a weekly nurse-led clinic for reviewing patients discharged home with chest drains. This was set up in 2011 and has evolved to include any patient who requires early review after discharge. Patients discharged with a chest drain remain the main focus of the clinic but patients who need early chest X-ray review or who have other concerns can be referred.

Since 2013 the ANP has attended the consultant-led follow-up clinics, seeing patients autonomously. We introduced a postoperative lung cancer CT follow-up programme in 2013. The ANP leads on the management of this group of patients, triaging imaging results, presenting patients at the lung cancer MDT and ensuring patients are reviewed in the most appropriate clinic. The ANP introduced a telephone follow-up clinic as additional capacity for the long-term follow-up pathway in 2017. This clinic allows patients with normal imaging results to be phoned once the CT is reported – in the past they had to attend the consultant-led clinic for results. This has been very well received by patients as it reduces the number of times they travel to the hospital and provides continuity of care. This initiative has also allowed us to increase clinic capacity within our service at minimal cost to commissioners.

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3. The Thoracic Complex Case Review Meeting at University Hospitals Bristol

The perioperative management of lung cancer patients can be complex. Preoperative team review meetings are one way of optimising operative planning and providing real-time peer review. Dr Natasha Joshi, consultant anaesthetist at University Hospitals Bristol describes her experience establishing a preoperative complex case review meeting.

The Thoracic Complex Case Review Meeting (CCRM), was implemented at University Hospitals Bristol NHS Foundation Trust in 2015. The aim of the CCRM is to discuss and review our highest risk thoracic patients in a weekly multidisciplinary forum, to meticulously plan their perioperative journey so that they are informed, fully optimised for surgery and cared for in the most appropriate postoperative setting. Our thoracic surgeons utilise pooled operating lists for 80% of patients who enter a complex pre-treatment pathway. The CCRM therefore provides a robust line of communication between all members of the preoperative MDT, while facilitating surgical peer-review and consensus decision-making.

All patients listed for thoracic surgery undergo preoperative assessment by a consultant anaesthetist. This information is integrated into a standardised anaesthetic review with the results of investigations, and specialist input, eg cardiology/haematology/neurology. The anaesthetic review forms the basis of CCRM discussion together with surgical assessment and radiological staging. The meeting is coordinated by a consultant anaesthetist with specialist expertise in preoperative assessment and thoracic anaesthesia and attended by consultant surgeons, clinical nurse specialists, waiting list and cancer MDT coordinators. Criteria for referral to the CCRM include: patients undergoing a pneumonectomy or bilobectomy, those with a predicted postoperative FEV1/DLCO<40%, intermediate/high risk CPET, surgical or anaesthetic request and patients requiring postoperative critical care for any other indication. Following discussion at the CCRM, outcomes include modification of the surgical procedure, eg sub-lobar resection versus lobectomy, further investigations, specialist assessment and treatment, prehabilitation, frank discussion with the patient exemplifying the high-risk nature of surgery and alterations to the planned postoperative destination. Criteria for postoperative critical care admission were adapted from the ERS/ESTS guidelines on fitness for radical therapy in lung cancer patients[3] and the BTS guidelines on the radical management of patients with lung cancer.[4]

We have reviewed 750 patients at the CCRM since its implementation, equating to five per week, of which 72% received modifications to their perioperative care. Critical care utilisation has decreased by 7%, without compromising patient safety, morbidity and mortality metrics. The meeting has been well received by patients and their carers. It has reinforced MDT partnerships, communication and is a valuable educational resource for surgical and anaesthetic trainees. We are continuously refining and improving our processes and have recently launched a preoperative patient video programme, to record simple measures of fitness and functionality with patients' consent.

The key challenges faced were a lack of administrative support and recognition of the time taken to coordinate the meeting and follow-up patients in consultant anaesthetist and surgeons' job plans. We would advise that it is essential to have strong lines of communication with patients and their carers throughout to explain the CCRM process.

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2 Royal College of Physicians. *Lung cancer clinical outcomes publication 2017 (for surgical operations performed in 2015).* London: RCP, 2017.

3 Brunelli A *et al*. ERS/ESTS clinical guidelines on fitness for radical therapy in lung cancer patients (surgery and chemo-radiotherapy). *Eur Resp Journal* 2009;34:17–41.

4 Lim E *et al*. Guidelines on the radical management of patients with lung cancer. *Thorax* 2010;65(Suppl III): iii1eiii27.

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Appendix 1: Glossary

Bilobectomy	Removal of two of the three lobes of the right lung, either upper and middle together or lower and middle.
Biopsy	Removal and examination of tissue, usually microscopic, to establish a precise (**pathological**) **diagnosis**.
Carinal resection	Removal of part of the windpipe at the point where it divides into the left and right lungs.
Casemix	Refers to the different characteristics of patients seen in different hospitals (for example age, sex, disease stage, social deprivation and general health). Knowledge of differing casemix enables a more accurate method of comparing quality of care (see also **casemix adjustment**).
Casemix adjustment	A statistical method of comparing quality of care between organisations that takes into account important and measurable patient characteristics.
Diagnosis	Confirming the presence of the disease (see also **pathological diagnosis**).
Enhanced recovery pathway	Initiatives to improve patient outcomes and speed up a patient's recovery after surgery.
FEV1	Forced expiratory volume in the first second – a measurement of lung capacity used to determine how healthy a patient's lungs are. It can be measured as an absolute amount, or as a percentage predicted (based on gender, age, height).
Hospital trust	An organisation providing secondary healthcare services in England. A hospital trust may be made up of one or several hospitals within a region.
Length of stay	Total number of nights spent in hospital during an admission for lung cancer surgery, both before and after the operation.
Lobectomy	Removal of one lobe of the lung. This is the commonest type of lung cancer operation.
MDT	Multidisciplinary team; a group of healthcare professionals working in a coordinated manner for patient care.
NLCA	National Lung Cancer Audit.
Non-small-cell lung cancer (NSCLC)	A group of types of lung cancer sharing certain characteristics, which make up 85–90% of all lung cancers. Includes squamous carcinoma and adenocarcinoma (see also **small-cell lung cancer**).
Odds ratio (OR)	Refers to the chance of an outcome happening after risk adjustment, compared with the national average.
Pathological diagnosis	A diagnosis of cancer based on pathological examination of a tissue (histology) or fluid (cytology), as opposed to a diagnosis based on clinical assessment or non-pathological investigation.
Performance status (PS)	The World Health Organization's systematic method of recording the ability of an individual to undertake the tasks of normal daily life compared with that of a healthy person.
Perioperative care	The care that is given before, during and after surgery.
Pneumonectomy	Removal of a whole lung.
Resection	Surgical treatment of a lung cancer, where a surgeon removes a tumour.

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RCP	Royal College of Physicians, the professional body of doctors practising general medicine and its subspecialties.
Sleeve resection	Removal of a lobe of lung or a whole lung, together with a 'sleeve' of main airway or pulmonary artery, the ends of which are then stitched together. Sleeve lobectomy can sometimes be used to avoid removing a whole lung (see **pneumonectomy**).
Small-cell lung cancer (SCLC)	A type of lung cancer making up around 10–15% of all lung cancers (see also **non-small-cell lung cancer**).
SCTS	Society for Cardiothoracic Surgery in Great Britain and Ireland. This is the specialty organisation representing cardiac and thoracic surgery in the UK and Ireland.
Staging/stage	The anatomical extent of a cancer.
Surgical resection	An operation to remove abnormal tissues or organs.
Surgical unit	A department within a hospital that provides surgery for lung cancer patients.
Tertiary trust	Hospitals that specialise in diagnosis and treatment of specific conditions, often handling very complex cases. Other hospitals may refer patients to these centres for specialist treatment.
VATS	Video-assisted thoracic surgery. Uses a surgical telescope attached to a video camera and specially made instruments to perform surgery through 1–4 small incisions, usually without spreading the ribs.
Wedge resection	A lung resection in which only the lesion and a small piece of lung are removed. The artery, vein and airway supplying that piece of lung are not dissected (as distinct from a **lobectomy** or segmentectomy).

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Appendix 2: Society for Cardiothoracic Surgery unit audit leads

Name	Hospital trust
Doug Aitchison	Basildon and Thurrock University Hospitals
Jitendra Parmar	University Hospitals, Coventry & Warwickshire NHS Trust
Joel Dunning	James Cook University Hospital
Robert George	University College Hospital London
Sri Rathinam	Glenfield Hospital
Elizabeth Belcher	John Radcliffe Hospital
Ehab Bishay	Heart of England NHS Trust
Alex Brunelli	Leeds Teaching Hospitals
Shilly Ghosh	North Staffordshire Royal Infirmary
Kelvin Lau	St Bartholomew's Hospital
Kandadai Rammohan	South Manchester University Hospital
Sasha Stamenkovic	Freeman Hospital
Carol Tan	St George's Hospital
Marc VanLeuvan	Norfolk and Norwich University Hospital
Juliet King	Guy's and St Thomas' Hospital
Steve Wooley	Liverpool Heart and Chest Hospital
Tim Batchelor	Bristol Royal Infirmary
Andy Chukwuemeka	Imperial College Healthcare
Giuseppe Aresu	Papworth Hospital
John Duffy	Nottingham City Hospital
Manoj Purohit	Blackpool Teaching Hospitals
John Edwards	Northern General Hospital
Eric Lim	Royal Brompton and Harefield Hospitals
Mahmoud Loubani	Castle Hill Hospital
Adrian Marchbank	Derriford Hospital
Edwin Woo	Southampton General Hospital
Patrick Yiu	Royal Wolverhampton Hospitals NHS Trust

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