National Lung Cancer Audit: Lung Cancer Clinical Outcome Publication (2018 data)

Analysis methods

Overall aim

This audit will deliver the 7th lung cancer clinical outcomes publication (LCCOP). The LCCOP is an NHS England initiative, commissioned by the Healthcare Quality Improvement Partnership (HQIP). It aims to publish quality measures at unit level, using national clinical audit data locally validated by clinicians, together with administrative data in order 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

The indicators for the LCCOP 2018 analysis were:

- Number of operations for each surgeon
- Unit surgery type (including proportion of pneumonectomy)
- Unit 30 day survival
- Unit one year survival
- Unit resection rates (for each hospital that a surgeon attends the lung cancer MDT)
- All lung cancer patients
- Patients with stage I-II NSCLC with PS 0-2 (new metric)
- Median unit length of stay in hospital post-surgery
- Readmission rates within 90 days of surgery
- Unit length of stay post readmission after first surgery
- Minimal access lobectomy rate in stage I-II NSCLC

The outlier measures for the LCCOP 2018 analysis were

- Surgical unit based 30 day survival
- Surgical unit based 1 year survival

Case-mix adjustment has been completed. We have adjusted our analyses for age, sex, performance status, co-morbidity, stage, lung function, laterality, pneumonectomy procedure and socioeconomic status. To ensure clarity around the design of the audit being delivered

Collection and validation of data

Data for surgical resections carried out at the 27 surgical units between 1 January and 31 December 2018 were extracted by Karen Linklater, National Cancer Registration and Analysis Service (NCRAS), from the cancer registry data and the Hospital Episodes Statistics (HES) data. The data included all patients from England, as well as a number of patients from Wales, the Isle of Man, and the Channel Islands that underwent resections at the units. The cases for each unit were sent out securely by Karen to the units for validation. The units were given six weeks to validate the data, amend as required and include any additional resections they had carried out in 2018.

Reasons from Trust for deletion	Records
Duplicate surgery	53
Private patient	39
Operation not curative / did not occur	27
Metastases	20
Biopsy or diagnostic only	17
Not lung cancer / no cancer	17
Operation performed elsewhere	12
No reason for deletion given	10
Patient not found at Trust	7
No consultant	6
Small cell carcinoma	2
Unwanted morphology	1
Total	211

Reasons added records not sent to Trusts	Records
Duplicate	38
Metastases	31
Small cell carcinoma	25
Not registered on Encore	21
In situ	16
Not lung cancer / no cancer	7
Invalid NHS number	3
Operation performed elsewhere	3
Recurrence	3
No record of operation at this Trust	2
Operation not curative / did not occur	2
Unwanted morphology	2

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2019 registration	1
Operation not in 2018	1
Operation not in required range	1
Provisional	1
Total	**157**

Upon return, the data were amalgamated, cleaned and quality assured. As well as hospital trusts excluding patients, the dataset was examined for other data cleaning issues. Other exclusion reasons were invalid or inconsistent identifier, surgery and diagnosis were in 2017, no valid surgery recorded, and records were duplicated. Where patients had multiple operations recorded on different days these were all included, identified by the same patient identifier. If two operations took place on the same day, only the more invasive one was included.

An anonymised data extract was then produced containing all required data items and transferred to the analysis team at the University of Nottingham. From NCRAS, Karen Linklater and Eleanor Fitzgerald were involved in the extract.

Statistical analysis

The data were analysed in the Division of Epidemiology and Public Health at the University of Nottingham by Research Fellow Dr Onosi Ifesemen and Prof Richard Hubbard.

There is no well-established risk adjustment model available for assessing the risks of lung cancer surgery. For this reason we have taken a standard approach by adjusting for likely important confounders. This is the same approach as would be used in the initial devising of a standardized risk adjustment model.

The dataset provided 6,984 observations for 6,897 patients with proven or presumed non-small cell lung cancer (NSCLC), carcinoids and small-cell lung cancer (SCLC) who underwent surgical resection between 1 January 2018 and 31 December 2018 in 27 surgical trusts in England.

Surgical operations were identified with the Office of Populations Census and Surveys Classification of Interventions and Procedures version 4 (OPCS-4) codes for each patient indicating thoracic surgical procedure with curative intent. The surgical procedures were categorised as 1) pneumonectomy, 2) lobectomy, including sleeve and bilobectomy, 3) sub-lobar resections, comprising segment and wedges, 4) complex resection and others. We excluded 90 observations for patients with multiple observations and had the date of death before date of surgery. The final cohort analysed consisted of 6,894 resections for 6,894 patients.

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The proportion of patients alive at 30 days and one year were calculated for each unit and compared to the average proportion of deaths for England as a whole. We then used multivariable logistic regression to control of the effects of age, sex, performance status, stage, laterality, co-morbidity (HES derived Charlson score), FEV 1 % and socioeconomic status. The findings are displayed graphically in our report using a combination of funnel plots and caterpillar plots with 2 & 3 standard deviations or 95% & 99.8% confidence intervals to allow identification of alert and alarm outliers.

During local validation, 133 clinicians were identified as performing lung cancer surgery. The data was checked on return, and cross referenced to the online GMC register (www.gmc-uk.org). Cross-checking identified 5 surgeons who were mis-identified as thoracic surgeons. One was not on the specialist register for any specialty, 2 were on the specialist register for general surgery but not cardiothoracic surgery, and 2 were confirmed by their units as practising purely cardiac surgery with no lung cancer practice. For each of the five surgeons, a single case (a total of 5 cases) had been attributed to them in error.

These appeared to be data entry errors which were not identified during local data validation, and this was confirmed by the local audit leads who responded to an email query.

4 duplicate entries were identified and merged.

These five clinicians were removed, leaving 128 surgeons in the final report. The 5 cases originally attached to their names remain associated with the units involved, but not with an individual surgeon.

Summary

The NLCA has used standard statistical methods, in keeping with advice provided in the HQIP COP manual, to compare mortality between surgical units in England.
The analysis uses a multivariate logistic regression model to determine the probability that a result is significantly different from the national mean. Following analysis two levels of significance are determined – an "alert" level of 2 standard deviations from the mean, and an "alarm" level of 3 standard deviations from the mean. These correspond to significance levels of 95% and 99.8% respectively.