SCAN
South East Scotland Cancer Network

NHS SCOTLAND

Working regionally to improve cancer services

SOUTH EAST SCOTLAND CANCER NETWORK
PROSPECTIVE CANCER AUDIT

Lung Cancer 2021
QPI Comparative Audit Report

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Report number: SA L0823W

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Document History

Version	Circulation	Date	Comments
Version 1	Lead Clinicians	August 2022	Draft results and outliers circulated in individual SCAN Health Boards.
Version 1.1	Lead Clinician & Regional Audit/Sign Off Sub Group	10/11/2022	To clarify actions and provide and/or agree outstanding clinical commentary prior to National Lung Cancer Meeting, 18th November 2022. To SCAN Lung Group (Excel doc) for final comment prior to national meeting.
Version 2	To Lead Clinician	02/03/2023	Delayed due to additional demands associated with National Lung Cancer Meeting reporting. Report (Word doc) to Lead Clinician to provide “Chair Summary”.
Version 3	To SCAN Lung Group.	16/05/2023	To SCAN Lung Group (Word doc) for information.
Final SCAN Report Index SA L0823	SCAN Lung Group SCAN Governance Framework SCAN Action Plan Board Leads	08/06/2023	Any potentially disclosive data to be removed prior to publication on SCAN Website.
Version 4W	Report published to SCAN Website	June 2024	

Chair Summary

SCAN Lung Cancer 2021
Quality Performance Indicators (QPI) Comparative Report
Comment by Chair of the SCAN Lung Group

QPIs help us drive up standards by reviewing our processes and particularly examining unexplained variance. Quality Performance indicators tell us a great deal about the patient pathway and access to treatments but not yet about outcomes e.g. survival (with Public Health Scotland (PHS)) or timelines on that pathway (devolved to waiting times initiative and collected separately). QPIs should be seen within that context and with careful note of any harm (e.g. 30- and 90-day mortality) against any potential benefit.

QPI 12 (Systemic anti-cancer treatment (SACT) rates for small cell lung cancer (SCLC)) have been a concern over several years, particularly for NHS Lothian for 3 out of the previous 4 years and concerns have been raised that patients with SCLC may have too long a pathway to diagnosis and deteriorate before they can be offered palliative SACT. Following a detailed audit in last year's report, to give the best possible chance of treatment a 'SCLC' alert system from pathology (Lothian, but also some Dumfries & Galloway and, Border patients having endobronchial ultrasound (EBUS) for pathology) to oncology was implemented in October 2020 to tighten this pathway further. This has seen QPI 12 passed in all health boards for the first time in many years in this review.

Pathological diagnosis remains challenging nationally for lung cancer and I am grateful for the audit work by Dr Tracie Plant and Dr Megan Turner looking at Herder score, using positron emission tomography (PET) data, as an alternative. This gives comfort that patients with a high probability of lung cancer from a high Herder score are being given treatment. Use of Herder score as an alternative to histology in selected cases will be taken to the next formal QPI review.

Likewise, I am grateful for the detailed audit in appendix 3 by Dr Adam Marshall examining whether patients with early-stage tumours but no pre-treatment pathology had lesions suitable for navigational bronchoscopy. As we move forward with more nodules being discovered, this work will be increasingly important. More access to navigational bronchoscopy has been part of NHS Lothian's successful bid around the optimal lung cancer pathway work in Scotland announced in December 2022.

QPIs are always a work in progress and the second round (after year 7 of reporting) of lung cancer QPI reviews led to the publication of Formal Review Cycle 2 (FR2) amendments, pertaining to lung cancer QPIs applicable to 2020/2021 reporting. We make some references to the changed and new QPIs throughout the document. These new QPIs acknowledge new treatment options, for example immunotherapy. QPI 4 in particular has been changed to include a timeline which has been challenging to meet on this first year of reporting. An audit is underway of this timeline to review if any improvements to the PET pathway can be made.

The QPI data have been collected, checked, considered, and critiqued across the Network by many hard-working individuals and my sincerest thanks to them.

With all my thanks and best for the coming year,

Melanie Mackean, May 2023

Clinical Action Plans

2021 Action Plan

QPI	Action required	Person Responsible	Date for update
Key Category Section (Appendix 1)	TNM staging and Performance Status data should be recorded at local multi-disciplinary team (MDT) meetings. Results for NHS Dumfries & Galloway have declined over the 3-year period 2019-2021. All health boards (HBs) should ensure that these data items are reported due to these being important selection criteria for several QPI denominators.	NHS Dumfries & Galloway for action plan	SCAN Lung Group meeting May 2023
QPI 1	MDT Discussion: The target was narrowly missed in 'local' results for Royal Infirmary of Edinburgh (RIE) in NHS Lothian reporting. To understand this better, a mini audit was undertaken looking at 2021 results. The majority of patients seen via other specialties are discussed by MDT but local teams should ensure that no patients are missed and that all patients seen via other specialties, as inpatients, being tracked or seen in respiratory or oncology clinics, and those discussed at more locally based or ward-level clinical meetings must also be discussed at MDT meetings.	This has been actioned by RIE respiratory team with education sessions for on call respiratory at RIE.	Annual update to SCAN QPI Lung Cancer Report Sign-off Meetings.
QPI 2 (i) and QPI 15 (i) & (ii)	Pathological Diagnosis: The target continues to be challenging. Recommendation that Herder score should be documented at MDM for patients with PET CT nodules >8mm and <30mm. Auditing this data will give valuable guidance when designing streamline pathways to cope with increasing numbers of lung nodule referrals when lung cancer screening services are in place.	Borders: Dr Kris Skwarski D&G: Dr Jane Gysin Fife: Dr Iain Murray Lothian: Dr Phil Reid (WGH) Dr John McCafferty (RIE) Dr Tracie Plant (SJH)	Audit presented to SCAN Lung group meeting May 2023
QPI 2 (ii)	This QPI (non-small cell lung cancer (NSCLC) sub-typing) is being consistently met. Improved immunochemistry methods in pathological diagnostics are resulting in fewer NSCLC not otherwise specified (NOS) rates and sub-typing, which is required for oncogenic mutation profiling or PDL1 immunotherapy testing to enable patient-targeted treatments, is consistently surpassing target levels and achieving high success rates. Re-assess the relevance of this QPI and discuss the option of archiving at the next formal review.	Clinical Lead to take to QPI Formal Review process.	Formal Review Cycle 3 Date: tbc

QPI	Action required	Person Responsible	Date for update
QPI 7	An outcome of the Outliers' Review, in NHS Lothian, recommends a change to clinical practice at Surgical Review MDT meetings. Information on the stations sampled is be discussed and minuted so that where there are less than 3 stations sampled, it will be possible to prospectively assess the reasons and action as appropriate at that juncture.	Cardiothoracic surgical team responsible to re-audit 2022 QPI7 results with new recording system implemented in Jan 2022 for NHS Lothian lung cancer MDT for nodal harvest for all post-op surgical cases for NHS Lothian & NHS Borders.	SCAN Lung QPI sign off meeting for 2022 data
QPI 13	Discussion on how to accommodate curative treatment 'packages' within 30- and 90-day mortality analyses and reporting is to be taken to the next formal review process. For example, a patient has chemoradiotherapy plus adjuvant immunotherapy where death is attributable to immunotherapy induced pneumonitis. Note: All SACT mortality and morbidity will shortly be reported via ChemoCare and is no longer included in Audit QPI reporting. Curative 'packages' include surgery plus adjuvant SACT, chemoradiotherapy plus adjuvant immunotherapy, etc.	Clinical Lead to take to QPI Formal Review process.	Formal Review Cycle 3 Date: tbc
QPI 15 (i)	There is a group of patients who undergo surgery without pre-surgical pathology in place who are found to have benign lesions when the resected tissue is examined microscopically. Data is not currently collected so the full extent of this cannot be explored. The MDT are interested in collecting data on patients who radiologically are believed to have lung cancer but at surgery are found to have benign lesions. For discussion at the next formal review.	Clinical Lead to take to QPI Formal Review process.	Formal Review Cycle 3 Date: tbc
QPI 15 (i) & (ii)	Biopsy contraindications were examined for all patients who did not have pre-treatment histology and/or cytology. While in the majority of cases these reasons are clinically valid, further work was required to understand why attaining the set target for this QPI suite is proving to be so challenging. Action Plan 2021: It was agreed that an audit should be carried out to look at the standardisation of risk aversity to biopsy.	Dr Adam Marshall	SCAN Lung Group meeting May 2023

2020 Action Plan

QPI	Action required	Person Responsible	Date for update
QPI 1	Continued education around respiratory advice to acute medical services (A&E, Medicine of the Elderly (MoE), General Medicine (GenMed), etc) that *all* patients with suspected lung cancer to be referred to and discussed at multi-disciplinary team meeting (MDM).	All clinical staff	Ongoing
QPI 17	Clinical Trials: continuation – SCAN clinicians to ensure that they register trials with Scottish Cancer Research Network (SCRN). SCRN should share their lists of current open trials between the Networks to allow the possibility of cross network trial access. NRCN funding of oncology clinicians undertaken in 2018 to improve access to clinician-driven realistic trials.	All clinical staff	Ongoing

Historical action plans are available in previous SCAN Comparative Lung Cancer QPI Reports which can be found on the SCAN website (www.scan.scot.nhs.uk).

Lung Cancer QPI Attainment Summary 2021		Target %	Borders		D&G		Fife		Lothian		SCAN	
QPI 1 MDT discussion		95	N 89 D 89	100%	N 131 D 133	98.5%	N 318 D 321	99.1%	N 701 D 730	96.0%	N 1239 D 1273	97.3%
QPI 2 Pathological Diagnosis	All patients with lung cancer	80	N 37 D 68	54.4%	N 79 D 106	74.5%	N 161 D 200	80.5%	N 374 D 485	77.1%	N 651 D 859	75.8%
	NSCLC with sub-type identified	90	N 33 D 35	94.3%	N 69 D 72	95.8%	N 156 D 168	92.9%	N 331 D 349	94.8%	N 589 D 624	94.4%
	Non-Squamous, III-IV: Oncogenic Profiling	80	N 19 D 22	86.4%	N 31 D 35	88.6%	N 79 D 87	90.8%	N 141 D 148	95.3%	N 270 D 292	92.5%
	NSCLC IIIB-IV: PDL1 testing	80	N 21 D 24	87.5%	N 45 D 50	90.0%	N 114 D 127	89.8%	N 219 D 231	94.8%	N 399 D 432	92.4%
QPI 4 PET CT for NSCLC within 10 days from request to report		95	N 1 D 13	7.7%	N 5 D 23	21.7%	N 15 D 47	31.9%	N 19 D 146	13.0%	N 40 D 229	17.5%
QPI 5 Nodal Sampling to confirm Mediastinal Malignancy		80	N 4 D 5	80.0%	N 9 D 10	90.0%	N 8 D 12	66.7%	N 42 D 51	82.4%	N 63 D 78	80.8%
*QPI 6 Surgical resection in NSCLC	All NSCLC	20	N 10 D 35	28.6%	N 14 D 72	19.4%	N 29 D 168	17.3%	N 88 D 349	25.2%	N 141 D 624	22.6%
	NSCLC stage I-II	60	N 9 D 11	81.8%	N 11 D 12	91.7%	N 22 D 32	68.8%	N 77 D 109	70.6%	N 119 D 164	72.6%
*QPI 7 Lymph node assessment for NSCLC patients having pneumonectomy or lobectomy		80	Analysis is by Hospital of Surgery – RIE						N 107 D 136	78.7%	n/a	
QPI 8 Radiotherapy (including SABR) for inoperable lung cancer		35	N 7 D 21	33.3%	N 5 D 14	35.7%	N 26 D 73	35.6%	N 95 D 202	47.0%	N 133 D 310	42.9%
QPI 9 Chemoradiotherapy for locally advanced NSCLC		50	N 1 D 1	100%	N 0 D 0	n/a	N 2 D 3	66.7%	N 10 D 16	62.5%	N 13 D 20	65.0%
QPI 10 Chemoradiotherapy for limited stage SCLC		70	N 0 D 0	n/a	N 1 D 1	100%	N 2 D 2	100%	N 2 D 4	50.0%	N 5 D 7	71.4%

Lung Cancer QPI Attainment Summary 2021		Target %	Borders		D&G		Fife		Lothian		SCAN	
QPI 11 SACT for patients with NSCLC	All types of SACT for NSCLC	35	N 14 D 25	56.0%	N 19 D 49	38.8%	N 48 D 125	38.4%	N 93 D 238	39.1%	N 174 D 437	39.8%
	Targeted Therapy for NSCLC, stages IIIB-IV	80	N 1 D 1	100%	N 3 D 3	100%	N 9 D 10	90.0%	N 11 D 13	84.6%	N 24 D 27	88.9%
	Immunotherapy for NSCLC, stages IIIB-IV	40	N 6 D 13	46.2%	N 6 D 13	46.2%	N 18 D 45	40.0%	N 27 D 66	40.9%	N 57 D 137	41.6%
QPI 12 SACT for patients with SCLC	All types of chemotherapy for SCLC	70	N 3 D 3	100%	N 6 D 8	75.0%	N 14 D 19	73.7%	N 46 D 65	70.8%	N 69 D 95	72.6%
	Palliative chemotherapy for SCLC for treatment with non-curative intent	50	N 3 D 3	100%	N 2 D 4	50.0%	N 11 D 16	68.8%	N 41 D 58	70.7%	N 57 D 81	70.4%
*QPI 13.1 30 Day Mortality After Treatment	*Surgery	<5	Analysis is by Hospital of Surgery – RIE						N 4 D 157	2.5%	n/a	
	Radical Radiotherapy	<5	N 1 D 8	12.5%	N 0 D 12	0.0%	N 1 D 30	3.3%	N 1 D 93	1.1%	N 3 D 143	2.1%
	Chemoradiotherapy	<5	N 0 D 2	0.0%	N 0 D 6	0.0%	N 1 D 10	10.0%	N 0 D 26	0.0%	N 1 D 44	2.3%
	Adjuvant Chemotherapy	<5	Centralised reports will be available from ChemoCare in due course.									
	Palliative Chemotherapy (NSCLC)	<10										
	Palliative Chemotherapy (SCLC)	<15										
	Biological Therapy (NSCLC)	<10										
*QPI 13.2 90 Day Mortality After Treatment	*Surgery	<5	Analysis is by Hospital of Surgery – RIE:						N 6 D 156	3.8%	n/a	
	Radical Radiotherapy	<5	N 1 D 8	12.5%	N 0 D 12	0.0%	N 2 D 29	6.9%	N 1 D 93	1.1%	N 4 D 142	2.8%
	Chemoradiotherapy	<5	N 0 D 2	0.0%	N 0 D 6	0.0%	N 2 D 10	20.0%	N 1 D 26	3.8%	N 3 D 44	6.8%
QPI 14 SABR for Inoperable Lung Cancer with Stage I Disease		35	N 4 D 10	40.0%	N 4 D 6	66.7%	N 9 D 36	25.0%	N 47 D 110	42.7%	N 64 D 162	39.5%

Lung Cancer QPI Attainment Summary 2021		Target %	Borders		D&G		Fife		Lothian		SCAN	
QPI 15 Cytological / Histological Diagnosis Prior to Definitive Treatment	i. Surgery	75	N 5 D 10	50.0%	N 12 D 15	80.0%	N 18 D 28	64.3%	N 60 D 93	64.5%	N 95 D 146	65.1%
	ii. Radical Radiotherapy	75	N 2 D 8	25.0%	N 7 D 11	63.6%	N 14 D 29	48.3%	N 45 D 93	48.4%	N 68 D 141	48.2%
QPI 16 Contrast CT/MRI for N2 Patients Prior to Definitive Treatment		95	N 4 D 4	100%	N 5 D 6	83.3%	N 7 D 7	100%	N 31 D 32	96.9%	N 47 D 49	95.9%
Clinical Trials Patients consented to trials/research and held on SCRN database.		15	Centralised report will be available from the Clinical Trials Team in due course.									

Target Met	Target Not Met	Not applicable

* D&G patients have surgery at Golden Jubilee Hospital, Clydebank and are therefore included in WOSCAN's (West of Scotland Cancer Network) report for QPIs 7, 13(i) and 13(ii) – all being reported by HOSPITAL OF SURGERY.
All patients in NHS Borders, Fife and Lothian have thoracic surgery at the Royal Infirmary of Edinburgh (RIE).
Some patients from outwith the SCAN area have surgery at RIE, e.g. patients referred from Tayside. These are identified throughout the report as required.
SCAN totals are therefore not appropriate for QPIs 7 & 13(i) & 13(ii) and are marked as "n/a".

Detailed information regarding PS, TNM and staging can be found in Appendices 3, 4 and 5 respectively.

Note: Allowance should be made where small numbers and variation may be due to chance and manifest as disproportionate percentages, which can distort results both positively and negatively. These should be viewed with a degree of caution.

See appendix 2 for historical Lung Cancer QPI Attainment Summary 2020

Introduction & Methods

Cohort

This report presents analyses of data collected on patients who are newly diagnosed with lung cancer between 1st January and 31st December 2021 and who were treated in one of the four constituent health board (HB) areas; comprising South East Scotland Cancer Network (SCAN) – Borders, Dumfries & Galloway (D&G), Fife, Lothian, and the Edinburgh Cancer Centre (ECC). The results contained within this report are generally presented by NHS board of diagnosis with the exception of surgical outcomes which are presented by hospital of surgery.

Datasets & Definitions

Quality Performance Indicators (QPIs) have been developed collaboratively with the three Regional Cancer Networks; Public Health Scotland (PHS); and Healthcare Improvement Scotland (HIS).

The overarching aim of the cancer quality work programme is to ensure that activity at NHS board level is focused on areas most important in terms of improving survival and patient experience whilst reducing variance and ensuring safe, effective and person-centred cancer care. Following a period of development, public engagement and finalisation, each set of QPIs has been published by HIS[1]. Accompanying datasets and measurability criteria for QPIs are published on the PHS (previously ISD) website[2]. NHS boards are required to report against QPIs as part of a mandatory and publicly reported programme at a national level.

QPI reporting for patients diagnosed with lung cancer was implemented on 01/04/2013. This is now the eighth publication of QPI results for lung cancer patients diagnosed in the SCAN region. QPIs are kept under regular review to be responsive to changes in clinical practice and emerging evidence: Baseline Review after year 1; Formal Review 1 (FR1) after years 2, 3 & 4 (implemented at Year 5: 2017); and FR2 after years 5, 6 & 7. FR2 developments were unfortunately disrupted by the COVID pandemic and consequently QPIs with new data items and/or codes were deferred to 2021 reporting whereas QPIs with existing data items were available for reporting in year 8 (2020).

Year 8, 2020	QPIs: 1, 2(i), 2(ii), 2(iv), 6, 7, 8, 9, 10, 12, 13, 14, 15, 16
Year 9, 2021	QPIs:2(iii), 4, 5, 11

The following QPIs have been updated at Formal Review, Cycle 2:

QPI	Change	Year of reporting
1	**Numerator:** Deleted the requirement *prior to definitive treatment.* FR2 Numerator: Number of patients with lung cancer discussed at the MDT meeting.	2020
2 (i)	**Exclusions:** PS 3 and PS 4 have become exclusions.	2020
2 (ii)	**Numerator:** NSCLC subtypes extended to include code 31: combination of non-small cell components (e.g. Adenosquamous).	2020
2 (iii)	**Denominator:** Staging changed from *IIIB-IV* to *III-IV* to include all stage III patients. New data item [PROFILE] (Yes/No)	2021
2 (iv)	**New QPI:** to measure PDL1 testing. This QPI uses existing data items and codes.	2020
4	**QPI** amended to include timing element: *the report is available within 10 days of radiology request*. New data items; [PETREQDATE] & [PETREPORTDATE]	2021

[1] QPI documents are available at www.healthcareimprovementscotland.org
[2] Datasets and measurability documents are available at https://www.isdscotland.org/Health-Topics/Cancer/Cancer-Audit/

QPI	Change	Year of reporting
5	**Archived at Baseline Review. Reinstated in amended format** Change to Dataset, unable to report in year 8.	2021
6 (i) & (ii)	**Exclusions:** Exclusions deleted: *patients who decline surgery* and *patients undergoing SABR*.	2020
8	**Denominator:** Staging changed from *III* to *I-IIIA*. **Exclusions:** Stage IV removed from exclusions. Stage is now specified in the	2020
10	**Denominator:** Staging changed from *I-IIIB* to *I-IIIA*	2020
11 (i)	**Data Set:** New data values (Codes 8, 9 & 10) added to data item [CHEMTYPE1-3].	2021
11 (ii)	**QPI:** amended to measure targeted therapy (TKIs[3]) New data value (Code 8) added to data item [CHEMTYPE1-3]. Target changed from 60% to 80%	2021
11 (iii)	**New QPI:** To measure immunotherapy and chemoimmunotherapy. New data values (Codes 8 & 9) added to data item [CHEMTYPE1-3].	2021
13.1 (v)-(vii)	**New standardised 30-day SACT Mortality QPI:** across all tumour types using data from ChemoCare to provide results for all lung cancer patients undergoing palliative SACT annually.	TBC
15 (i) & (ii)	**Numerator:** Treatment specified as *first* has been changed to *definitive*.	2020

QPI 15 (iii): Pathology prior to Chemoradiotherapy was archived at FR2. At FR1 QPI 3: Bronchoscopy and QPI 5: Mediastinal malignancy were archived. QPI 5 has been re-introduced (and amended) at FR2 and will be reported in year 9, i.e.2021.

The standard QPI format is shown below:

QPI Title:	**Short title of Quality Performance Indicator (for use in reports etc.)**	
Description:	Full and clear description of the Quality Performance Indicator.	
Rationale and Evidence:	Description of the evidence base and rationale which underpins this indicator.	
Specifications:	Numerator:	Of all the patients included in the denominator those who meet the criteria set out in the indicator.
	Denominator:	All patients to be included in the measurement of this indicator.
	Exclusions:	Patients who should be excluded from measurement of this indicator.
	Not recorded for numerator:	Include in the denominator for measurement against the target. Present as not recorded only if the patient cannot otherwise be identified as having met/not met the target.
	Not recorded for exclusion:	Include in the denominator for measurement against the target unless there is other definitive evidence that the record should be excluded. Present as not recorded only where the record cannot otherwise be definitively identified as an inclusion/exclusion for this standard.
	Not recorded for denominator:	Exclude from the denominator for measurement against the target. Present as not recorded only where the patient cannot otherwise be definitively identified as an inclusion/exclusion for this standard.
Target:	Statement of the level of performance to be achieved.	

[3] TKI: Tyrosine Kinase Inhibitors attack cancer cells to prevent them from growing and dividing.

Audit Process
Data was collected and analysed by audit staff in each NHS board according to the dataset and measurability documentation provided by PHS. SCAN data was collated by Ailsa Patrizio, SCAN Cancer Information Analyst for Lung Cancer; and this report compiled.

Patients are mainly identified through registration at weekly multi-disciplinary team meetings (MDMs) also referred to as MDT, and through checks made against pathology listings, General Register Office (GRO) records; and via a data mart from PHS: Acute Cancer Deaths and Mental Health (ACaDMe). Oncology data is available electronically via ARIA database downloads and the ChemoCare database.

Patients living closer to either Dundee or Carlisle may opt to have their oncology treatment outwith the SCAN region or Scotland respectively. Collecting complete audit data for these patients remains a challenge.

The process remains dependent on audit staff for capture and entry of data, and for data quality checking. Data is entered and interrogated on a national system used by all health boards across NHS Scotland: Electronic-Cancer Audit Support Environment (e-Case) and analysed via SQL Server Reporting Services (SSRS).

Lead Clinicians & Audit Personnel

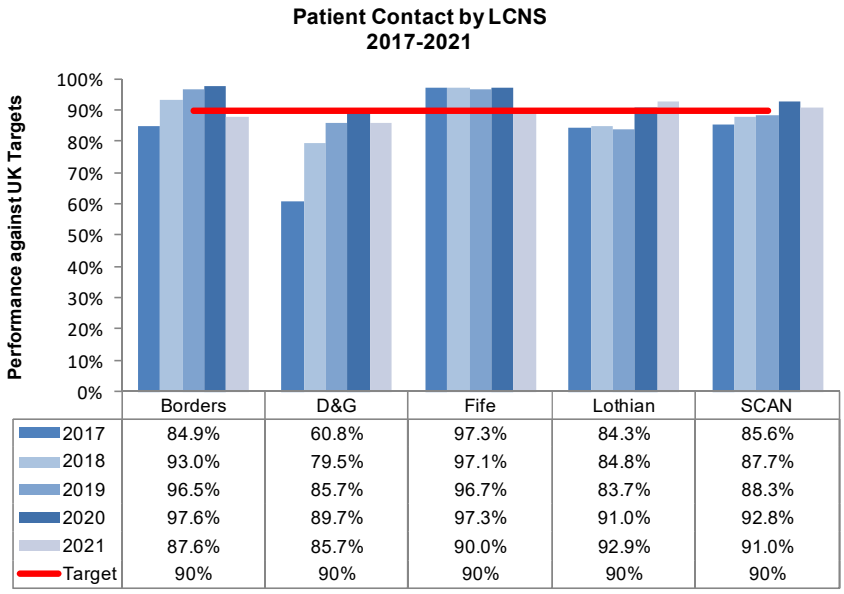
SCAN Region	Hospital or Designation	Lead Clinician	Audit Support
SCAN	Clinical Lead Chair of SCAN Lung Group	Dr Melanie Mackean	Ailsa Patrizio
NHS Borders	Borders General Hospital (BGH)	Dr Kris Skwarski Dr Hosni El Taweel	Leanne Robinson
NHS Dumfries & Galloway	Dumfries & Galloway Royal Infirmary (DRI)	Dr Jane Gysin	Campbell Wallis Jenny Bruce
NHS Fife	Queen Margaret Hospital (QMH) Victoria Hospital (VHK)	Dr Iain Murray	Mimi Bjelorgrlic
NHS Lothian	Royal Infirmary of Edinburgh (RIE) Western General Hospital (WGH) St John's Hospital (SJH)	Dr Phil Reid	Ailsa Patrizio
SCAN & NHS Lothian	Edinburgh Cancer Centre (ECC)	Dr Colin Barrie Dr Kirsty MacLennan Dr Tamasin Evans Dr Sorcha Campbell	

Key Categories
Reporting on specific QPIs drives improvement in patients' pathways and outcomes but this should not be the sole benchmark for measuring patient care and nor should it be viewed in isolation. Key categories facilitate the measurement of data not specifically included in the QPI process. The SCAN Lung Group agreed an approach which takes into consideration a selection of *key categories* which are analysed and mainly reported in appendix 1. Salient aspects are exemplified in the analyses below.

In the absence of a QPI to measure Lung Cancer Clinical Nurse Specialist (LCNS) performance, reference is made to the NLCA Report and to National Institute for Health and Care Excellence (NICE) guidelines (England & Wales); both of which recommend that *every patient with suspected or confirmed lung cancer should have access to a lung cancer clinical*

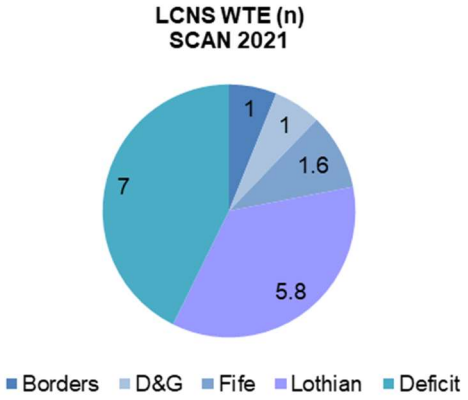
nurse specialist[4]. The Scottish Cancer Plan, the Lung Cancer Forum for Nurses (LCFN), NLCA and NICE all agree that 90% of patients should have access to a Lung Cancer CNS at diagnosis and throughout their pathway. The Roy Castle Lung Cancer Foundation view the role of the LCNS as *crucial in the provision of optimal patient care; providing support from initial presentation, through investigations to diagnosis, to treatment and thereafter*[5].

Results by health board between 2017 and 2021 are shown below and set against the recommended target of 90%:



	Borders	D&G	Fife	Lothian	SCAN
2017	84.9%	60.8%	97.3%	84.3%	85.6%
2018	93.0%	79.5%	97.1%	84.8%	87.7%
2019	96.5%	85.7%	96.7%	83.7%	88.3%
2020	97.6%	89.7%	97.3%	91.0%	92.8%
2021	87.6%	85.7%	90.0%	92.9%	91.0%
Target	90%	90%	90%	90%	90%

In 2021, the proportion of patients seen by a LCNS is slightly reduced in 3 of the 4 health boards in the SCAN region. It remains challenging to meet the increasing demands of a busy service with a deficit in resource. CNS provision in SCAN for circa 1270 patients stands at 9.4 WTE[6], equivalent to one nurse for every 135 new patients. The NLCA Report 2018 quotes the national commissioning guidance recommendation, *that there should be the equivalent of 1 whole-time-equivalent specialist nurse for every 80 patients*[7]. This equates to an ideal of 15.9 WTE for SCAN region based on the 2021 cohort (and demonstrated in the pie opposite), which falls below the recommended level and results in a deficit of 7 WTE nurses.

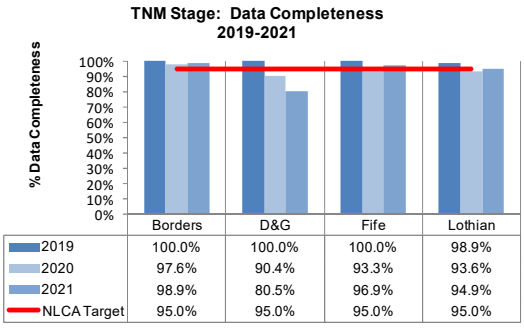


At the time of reporting, NHS Fife have recruited an additional CNS which, in 2022, will raise Fife's WTE to 2.2 and consequently, SCAN will at that time have a deficit of 5.9 WTE.

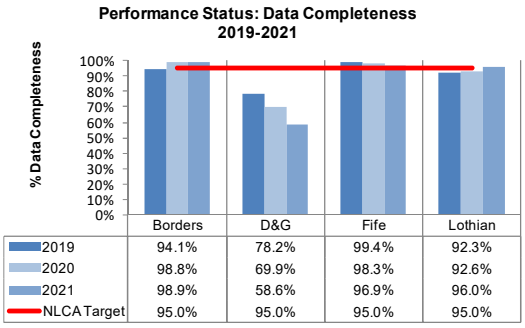
Key categories are vital to endorse standards of care and drive improvements, for example: performance status (PS), viewed in conjunction with staging, are key parameters for the selection of optimal management. High data completeness rates for staging and PS ensure

[4] NICE (2012, updated 2019): *Lung Cancer in Adults, Quality Standard [QS 17]* https://www.nice.org.uk/guidance/qs17/chapter/Quality-statement-3-Lung-cancer-clinical-nurse-specialist
[5] The Roy Castle Lung Cancer Foundation & National Lung Cancer Forum for Nurses (January 2013) *Understanding the Value of Lung Cancer Nurse Specialists.*
[6] WTE: Whole Time Equivalent
[7] NLCA 2018 Report: https://nlca.azurewebsites.net/AnnualReport

thorough and more accurate analyses. There is not a Scottish 'standard' but if we align with National Lung Cancer Audit (NLCA)[8], data completeness targets for staging and PS are recommended as being at least 95% of cases. Data completeness results by health board in 2019 - 2021 are as follows:



	Borders	D&G	Fife	Lothian
2019	100.0%	100.0%	100.0%	98.9%
2020	97.6%	90.4%	93.3%	93.6%
2021	98.9%	80.5%	96.9%	94.9%
NLCA Target	95.0%	95.0%	95.0%	95.0%

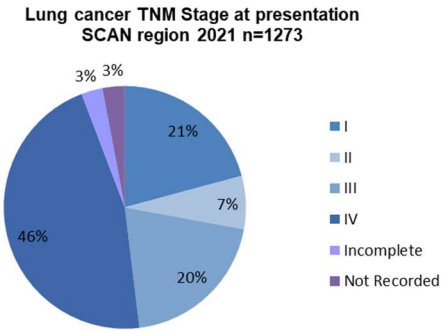


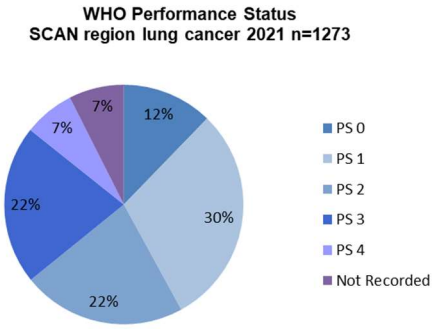
	Borders	D&G	Fife	Lothian
2019	94.1%	78.2%	99.4%	92.3%
2020	98.8%	69.9%	98.3%	92.6%
2021	98.9%	58.6%	96.9%	96.0%
NLCA Target	95.0%	95.0%	95.0%	95.0%

Many of the QPIs' denominators specify staging and performance status criteria, and it is vital that these data items should be recorded to ensure comprehensive QPI measurement. Results are generally favourable with the exception of NHS Dumfries & Galloway. An Action has been recommended that these data items are recorded at local MDT meetings.

Action: all TNM stage and performance status should be recorded at local MDT meetings to be implemented in NHS Dumfries & Galloway; and continued by all.

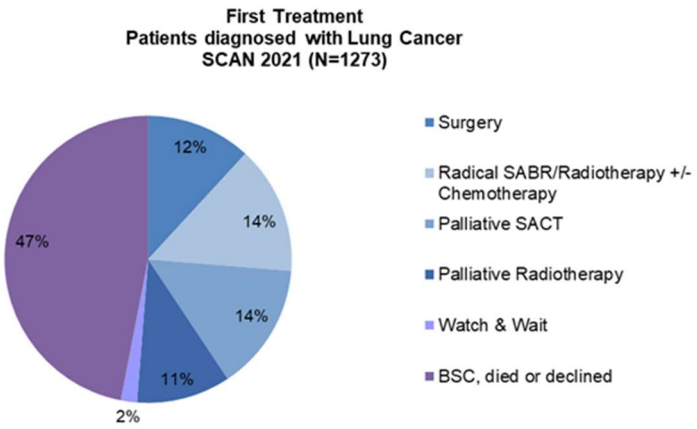
Overall in SCAN region in 2021, patients with lung cancer were diagnosed at an advanced stage (46%) and tended to be frail with 58% WHO PS 2 or above.





[8] The NCLA analyses and reports on data in England & Wales, with submissions from Northern Ireland and Guernsey. Scotland no longer submits data because the QPI method of reporting is not compatible with measurements and reporting utilized in the NLCA Report.

Summary of all patients and first treatments in SCAN

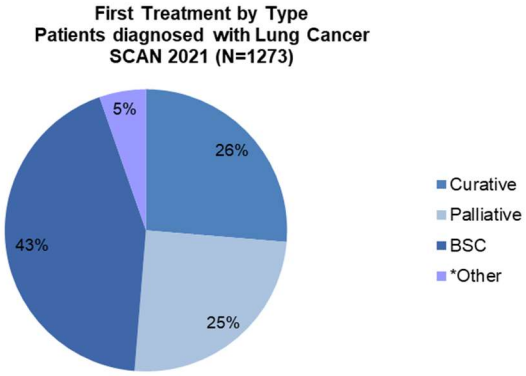


(Treatment by health board and stage are included in Appendix 1)

The pie chart on the left illustrates first treatment rates. It clearly shows that, sadly in SCAN, for just fewer than 45% of patients, the commonest experience of lung cancer is that they are too unwell for any active interventions and receive Best Supportive Care (BSC).

This gives a clear message that more needs to be done to detect lung cancer early ((DCE): a Scottish Government Campaign[9]) which includes the undertaking of a targeted lung cancer screening pilot due to start in 2022 in NHS Lothian.

- Curative treatment includes surgery, radical radiotherapy and chemoradiotherapy.
- Palliative treatment includes palliative radiotherapy, and palliative SACT which includes palliative chemotherapy, targeted therapy, immunotherapy and chemoimmunotherapy.
- *Other covers watch & wait, declined treatment and patients who died before treatment.



Data Quality & Case Ascertainment

Case Ascertainment & Scottish Cancer Registry

Case ascertainment levels are assessed by comparing the number of new cases identified by Audit with those identified by Scottish Cancer Registry. Comparisons, however, are not straightforward but are subject to a small amount of variation. The 'year' in Audit is based on the date of diagnosis whereas cancer registration defines their cohort as the date the patient first became known to secondary healthcare.

Estimated case ascertainment is based on the most recent 5-year average available from Scottish Cancer Registry data and excludes death certificate only registrations.

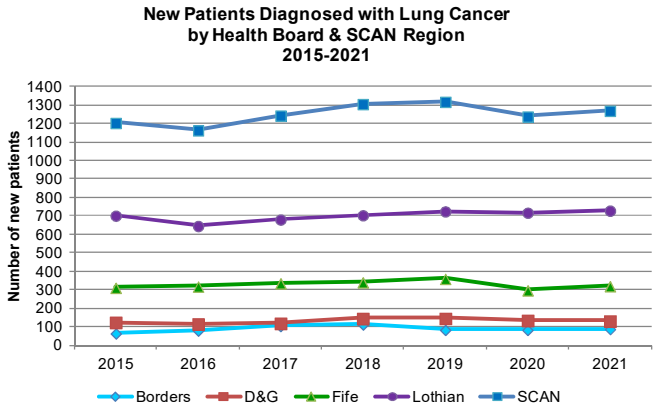
High levels of case ascertainment provide confidence in the completeness of audit recording and contribute to the reliability of results presented. Cases that have been diagnosed in the private sector but received any part of their treatment in NHS hospitals are included.

[9] Information regarding the DCE Scottish Government Campaign can be found at https://www.isdscotland.org/Health-Topics/Cancer/Detect-Cancer-Early/

In the most recent period (1st January to 31st December 2021) 1273 patients were diagnosed with lung cancer (ICD-codes: C33, C34) in the SCAN region.

Number of patients recorded in audit:

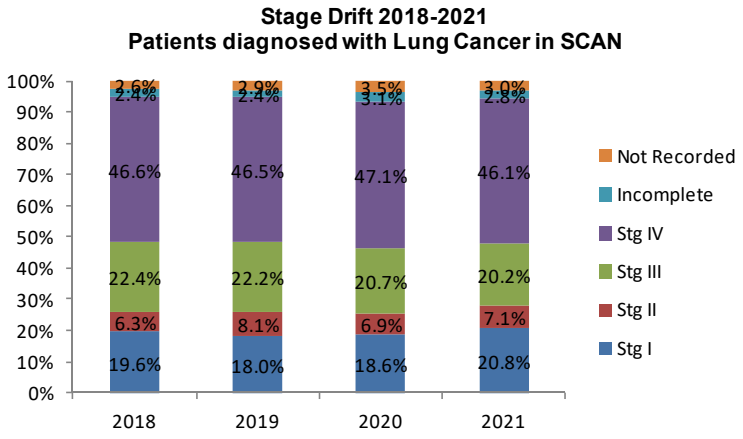
	Patients diagnosed 01/01/2021 to 31/12/2021				
	Borders	D&G	Fife	Lothian	SCAN
Number of cases in audit cohort	89	133	321	730	1273



Numbers of patients mainly fell in 2020, likely as a consequence of the Covid-19 pandemic, though appear to have mostly recovered as demonstrated in the chart above. The Covid-19 pandemic had a wide impact on all cancer types in Scotland with widespread disruption from the end of March 2020. The "Detect Cancer Early Staging Data (Year 10) & Impact of COVID-19" official statistics were published by Public Health Scotland (PHS) on 25th October 2022. Key impacts on lung cancer services, more particularly on diagnosis and its influence on the number of cases in 2020 and 2021 are reproduced below:

- *the initial lockdown and advice for patients to 'stay at home' and 'protect the NHS' in the first few months of the pandemic;*
- *that GPs switched to mainly telephone consultations for initial appointments, which added to the confusion caused by the overlapping 'persistent cough', breathlessness and fatigue symptoms between COVID-19 and lung cancer. This may have led to some patients being hospitalised for COVID-19 instead of being referred for suspected lung cancer;*
- *respiratory staff, in particular, were redeployed to treat and care for COVID-19 patients, with many facilities reallocated for these patients in 2020;*
- *restrictive social distancing in both 2020 and 2021;*
- *extensive hygiene protocols in both 2020 and 2021.*

Reassuringly early-stage rates (stage I and II) in 2021 are 27.9% of cases compared to 25.5%, 26.1% and 25.9% in the previous 3 years.



Estimate of case ascertainment is calculated using the average of the most recent available 5 years of Cancer Registry data (2016-2020) and measured against the most recent year (2021) in audit.

	Borders	D&G	Fife	Lothian	SCAN
Number of cases from audit	89	133	321	730	1273
Cases from Cancer Registry (2016-2020)	109	154	359	756	1378
Estimated Case Ascertainment 2021	**81.7%**	**86.4%**	**89.4%**	**96.6%**	**92.4%**

Source: Scottish Cancer Registry, PHS. Data extracted from ACaDMe: 06/11/2022.

Historical case ascertainment results by HB are as follows:

Estimate of case ascertainment

Performance by Health Board 2015 – 2019	Borders	D&G	Fife	Lothian	SCAN
2020	81.0%	88.3%	82.8%	95.2%	90.1%
2019	80.2%	94.8%	102.0%	95.3%	95.8%
2018	114.4%	99.3%	99.1%	91.7%	96.0%
2017	112.8%	83.9%	98.8%	89.3%	92.8%
2016	88.0%	75.8%	96.1%	87.7%	88.8%

Quality Assurance
All hospitals participate in a Quality Assurance (QA) programme appraised by PHS to investigate the accuracy of recording of lung cancer data items which are used to report against national QPIs and, to highlight where data definitions may require further clarification. The most recent QA of lung data was conducted in August 2020: *Assessment of Lung Cancer QPI Dataset, Patients Diagnosed January to December 2018, Scotland Summary*. SCAN results are shown by health board below:

Performance by Health Board	Percent
Borders	97.1%
Dumfries and Galloway	95.8%
Fife	100.0%
Lothian	99.8%

All SCAN health boards exceeded the PHS recommended minimum standard of 90%.

Clinical Sign-off
This report compares current and historical data jointly and separately for each of the four SCAN Health Boards. The collated SCAN results are reviewed jointly by lead clinicians in SCAN to assess variances and provide comments on results as per the following processes:

- Individual health board results are reviewed and signed-off locally.
- Collated results were presented and discussed at the SCAN Lung Sign off Meeting on 10th November 2022, at which point clinical recommendations were agreed.
- The final draft, complete with agreed amendments from the Sign-off meeting, was circulated to the SCAN Lung Group on 16/11/2022 for final comment.
- The Final report was circulated to Clinical Governance Groups and SCAN Action Plan Board Leads on 08/06/2023.
- The report will be placed on the SCAN website once it has been fully signed-off and checked for disclosive material.

Actions for Improvement
Lung cancer teams in SCAN (clinicians, nurses, and audit staff) work collaboratively to review data regularly to identify possible areas for improvement and to actively participate in driving improvements and, where appropriate, making changes to the ways care is delivered. Action plans and details of their progress are completed at health board level.

Acknowledgements
Thanks must go to the Lung Cancer Multi-Disciplinary Team: respiratory, radiology, pathology, cardio-thoracic surgery consultants, the Edinburgh Cancer Centre consultant oncologists, the lung cancer nurse specialists' team, and to audit colleagues for their collaborations and enthusiasm which have resulted in a very comprehensive report. For a full list of those who have contributed to this report, see appendix 7.

Quality Performance Indicators
Diagnosis and Staging Investigations

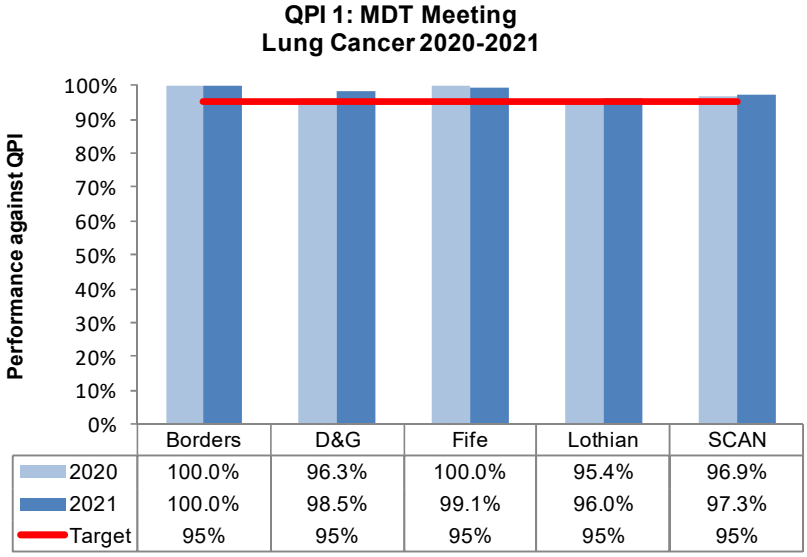
QPI 1 Multi-disciplinary Team (MDT) Meeting — Target = 95%

Numerator = Number of patients with lung cancer discussed at MDT.
Denominator = All patients with lung cancer (no exclusions).

Target 95%	Borders	D&G	Fife	Lothian	SCAN
2021 cohort	89	133	321	730	1273
Ineligible for this QPI	0	0	0	0	0
Numerator	89	131	318	701	1239
Not recorded for numerator	0	0	0	0	0
Denominator	89	133	321	730	1273
Not recorded for exclusions	0	0	0	0	0
Not recorded for denominator	0	0	0	0	0
% Performance	**100.0%**	**98.5%**	**99.1%**	**96.0%**	**97.3%**

Comment
The QPI was passed by all health boards in the SCAN region 2021 although was narrowly missed in 'local' results for RIE in NHS Lothian (94.1% (17 cases)). To understand this better a mini audit was undertaken looking at 2021 results. These patients had mainly presented to A&E and were admitted to various specialties including Medicine of the Elderly, General Medicine and a small number to Respiratory and Oncology; and had been identified by Audit via General Registry Office records. All patients had advanced disease, were not fit and many had significant comorbidities and, were for supportive care only. Interestingly 5 of these patients had been tracked on the system though not brought to MDT discussion.

Action: The majority of patients seen via other specialties are discussed by MDT but local teams should ensure that no patients are missed and that all patients seen via other specialties, as inpatients, being tracked or seen in respiratory or oncology clinics, and those discussed at more locally based or ward-level clinical meetings must also be discussed at MDT meetings.



Formal Review Cycle 2: Revision
Numerator Amendment: from 2020, this indicator measures explicitly whether or not patients have been discussed at MDM and no longer references *prior to definitive treatment*.
Comparable data are not available prior to 2020.

QPI 2 Pathological Diagnosis

2 (i) Pathological Diagnosis of Lung Cancer **Target = 80%**

Numerator = Number of patients with lung cancer who have a pathological diagnosis (including following surgical resection).
Denominator = All patients with lung cancer.
Exclusions = Patients who decline investigations or surgical resection and patients with performance status 3 or 4.

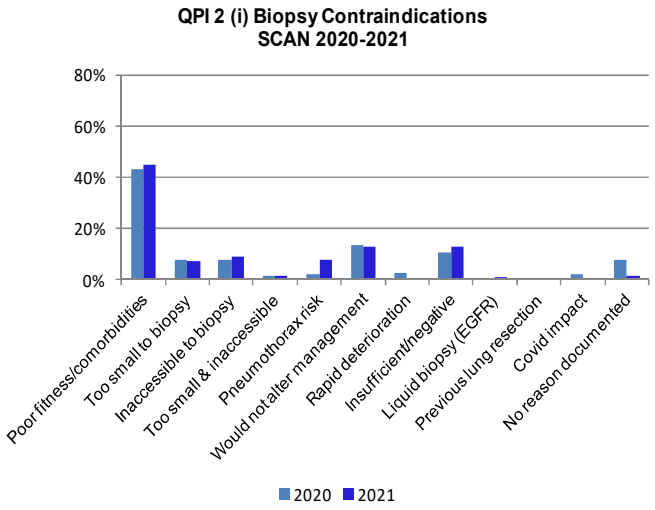
Target 80%	Borders	D&G	Fife	Lothian	SCAN
2021 cohort	89	133	321	730	1273
Ineligible for this QPI	21	27	121	245	414
Numerator	37	79	161	374	651
Not recorded for numerator	0	0	0	0	0
Denominator	68	106	200	485	859
Not recorded for exclusions*	1	46	8	26	81
Not recorded for denominator	0	0	0	0	0
% Performance	**54.4%**	**74.5%**	**80.5%**	**77.1%**	**75.8%**

Comment

Analyses[10] have shown there exist a group of patients who cannot undergo invasive investigations due to poor fitness levels and/or comorbidities and sadly, treatment choices can be limited. Invasive procedures, with a risk of harm (e.g., bleeding, pneumothorax) have been shown not to improve outcomes for this vulnerable group. It is in this context we should view this QPI; so that we do not strive to attain targets which might drive clinically inappropriate or potentially unsafe outcomes for patients; which additionally are redundant when pathology would not influence or alter clinical management or patient outcomes.

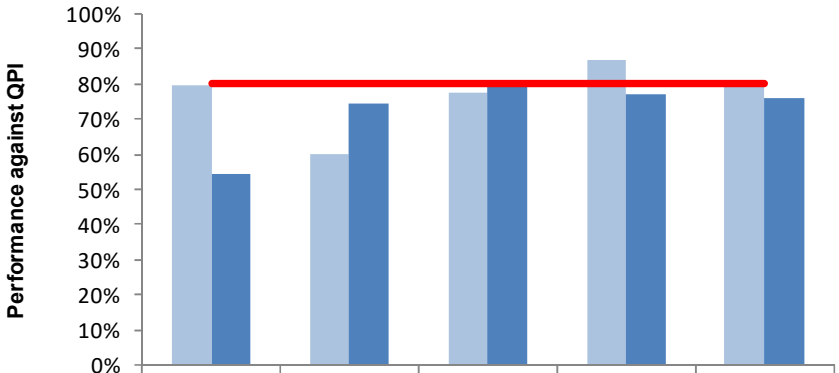
In 2021, NHS Fife attained the target. The target was not met by NHS Borders, D&G or Lothian with shortfalls of 25.4% (31 cases); 5.5% (27 cases); and 2.9% (111 cases) respectively. In 2021 in SCAN there were a total of 198 outliers accounting for 23.1% of eligible patients compared to 23.8% in 2020. It should be acknowledged that while improvement is a key objective in QPIs, it is always dependent on the overall fitness and/or comorbid conditions of the patient cohort and on whether it is appropriate and safe to go ahead with invasive investigative procedures.

	Borders	D&G	Fife	Lothian
Poor fitness/comorbidity	21	13		42
Too small	-	2		10
Inaccessible	3	2		10
Too small/inaccessible	-	-		3
Pneumothorax risk	-	-		13
No change to management	-	8	Not applicable	14
Rapid deterioration	-	-		1
Insufficient/Negative	7	2		22
Liquid (blood) biopsy[11]	-	-		2
Previous lung resection	-	-		-
Covid impact	-	-		-
No reason documented	-	-		3
Total	31	27		111



[10] Bain L et al, 2020: *Lung Cancer Patients Without Tissue Diagnosis in NHS Lothian 2016 – 2018.*
[11] Liquid Biopsy: Blood samples can be used for molecular testing (EGFR status) and can usefully provide pathological diagnosis. These are not yet included in Audit criteria. It is anticipated they will be considered as a relevant basis of diagnosis going forward.

QPI 2 (i): Pathological Confirmation Rate
Lung Cancer 2020-2021



	Borders	D&G	Fife	Lothian	SCAN
2020	79.7%	59.8%	77.4%	86.7%	80.3%
2021	54.4%	74.5%	80.5%	77.1%	75.8%
Target	80%	80%	80%	80%	80%

Formal Review Cycle 2: Revision
The QPI previously measured against all patients diagnosed with lung cancer. At FR2 the denominator was amended to exclude patients with performance status 3 and 4. Comparable data are therefore not available prior to 2020.

The above change aligns Scottish reporting to that of NHS England & Wales, and NHS Northern Ireland which report pathological confirmation rates specifically for patients with PS0-2. Results generally compare favourably to the NHS England rate of 72% of patients with pathological confirmation rate.

All patients are discussed fully by MDTs so that all approaches are considered and that all proper processes take their course. All investigative procedures are discussed as appropriate, including PET CT. A previous local study by Bain et al[12] recommended the use of Herder Score (based on PET, size, characteristics of the tumour and smoking status) which looks at the probability of cancer as an alternative non-invasive option in confirming the likelihood of malignancy. The action plan in 2019 recommended the recording of Herder scores by MDTs and Audit for all relevant patients. Recording, however, is not yet routine practice at all MDT meetings or by all Audit staff and it is hoped that Herder reporting will be embedded in practice for patients diagnosed in 2022 who are being considered for either surgical intervention or radical radiotherapy. An Audit has been carried out at St John's Hospital in Livingston[13] based on this year's cohort (2021) to assess whether the St John's Hospital Lung Cancer MDT was adherent to the British Thoracic guideline regarding the assessment of patients with pulmonary nodules, with specific interest in the appropriate use of the Herder model. Preliminary results are summarised as follows:

During 2021, 153 St John's patients were referred and discussed in the MDT. Of these, 26 had pulmonary nodules, both solitary or multiple. Fifteen (58%) were shown to have a documented Herder score either in the notes, MDM outcome or radiology report. All of these patients entered the appropriate pathway, based on their score, receiving appropriate treatment as per the national guideline. However, not all were recorded within the MDT notes themselves, with 3 appearing only in outpatient clinic letters at a later date.
Of those with no Herder documentation, (11 patients), appropriate investigations and outcomes are

[12] Bain L, Hainey S, Henderson W, Reid PA (Respiratory, Western General Hospital, Edinburgh), 2020: *Lung Cancer Patients Without Tissue Diagnosis in NHS Lothian 2016 – 2018*. The full Audit can be found in the 2020 Lung Cancer QPI Report which is available on the SCAN website.
[13] Turner, M, Plant, T (Respiratory, St John's Hospital, Livingston) 2023: *Preliminary Assessment of the Herder Model for the Investigation and Treatment of Patients with Pulmonary Nodules at St John's Hospital Livingston 2021*. The full audit and results will be available in due course.

documented, and the assumption is therefore that expertise in the field meant that a risk score was likely not deemed necessary. 7 of these patients did not have a Herder score recorded due to the MDT suggesting best supportive care due to frailty or co-morbidities. Of interest, only 2 patients had a documented Brock score, neither of whom went on to have investigation or treatment.

In conclusion, 58% of patients had the appropriate use and documentation of Herder model, correctly documented in the MDT clinic letter. It would therefore be our recommendation that the cancer tracker accurately records a lesion as 'nodule' (for sizes >8mm and <30mm) not using inaccurate terms such as 'mass' alongside the Brock and the Herder scores. Furthermore, we suggest that the Respiratory Physician should document the Brock score for patients in the clinic letter and the Herder score might be documented by the radiologist reporting the PET CT. This work will become increasingly important when lung cancer screening services are in place. Auditing this data will give us valuable guidance when designing streamline pathways to cope with increasing numbers of lung nodule referrals.

Locally patients with nodules and Herder > 90% without a tissue diagnosis can be offered radical therapy. Out of the 26 nodules there were 8 with Herder scores > 90% and all received curative treatment: 4 SABR, 1 radical radiotherapy and 2 resections. Of the 2 resections, post-surgical pathology confirmed lung cancer. This sample size is too small to draw solid conclusions, but this approach is consistent with the literature and practice elsewhere. We would however recommend that a larger sample size is looked at and a local policy is written. We also recommend that all nodules therefore should have a Herder score recorded.

Action: It is recommended that Herder score should be documented at MDM for patients with PET CT nodules >8mm and <30mm.

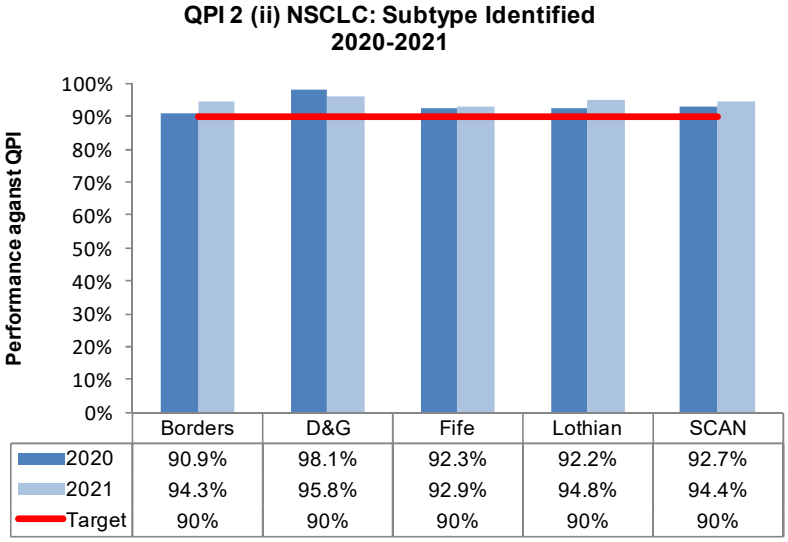
2 (ii) Pathological Diagnosis of NSCLC: Sub-type Identified Target = 90%

Numerator = Number of patients with a pathological diagnosis of Non-Small Cell Lung Cancer (NSCLC) who have a tumour sub-type identified[14].
Denominator = All patients with a pathological diagnosis of NSCLC (no exclusions).

Target 90%	Borders	D&G	Fife	Lothian	SCAN
2021 cohort	89	133	321	730	1273
Ineligible for this QPI	54	61	153	381	649
Numerator	33	69	156	331	589
Not recorded for numerator	0	0	0	0	0
Denominator	35	72	168	349	624
Not recorded for exclusions	0	0	0	0	0
Not recorded for denominator	0	0	0	0	0
% Performance	**94.3%**	**95.8%**	**92.9%**	**94.8%**	**94.4%**

Comment

The QPI was passed by all health boards in the SCAN region in 2021 and no action is required.



Formal Review Cycle 2: Revision
Numerator: criterion has been extended to include code 31: combination of non-small cell components (e.g., Adenosquamous).
Comparable data are therefore not available prior to 2020.

This QPI was consistently met prior to and has been met since FR2 changes were implemented, i.e., before and after the inclusion of code 31 in the numerator. Improved immunochemistry methods in pathological diagnostics result in fewer "not otherwise specified" (NOS) rates and sub-typing, which is required for oncogenic mutation profiling or PDL1 testing to enable patient-targeted treatments, is consistently surpassing targets, and achieving high success rates.

Action: Re-assess the relevance of this QPI and discuss the option of archiving at the next formal review.

[14] NSCLC sub types = Squamous, Adenocarcinoma, Other Specific NSCLC and Combination of non-small cell components, i.e., does not include NSCLC (NOS), as specified in *Lung Cancer Measurability of Quality Performance Indicators, Version 4.0*: ISD Scotland: January 2020.

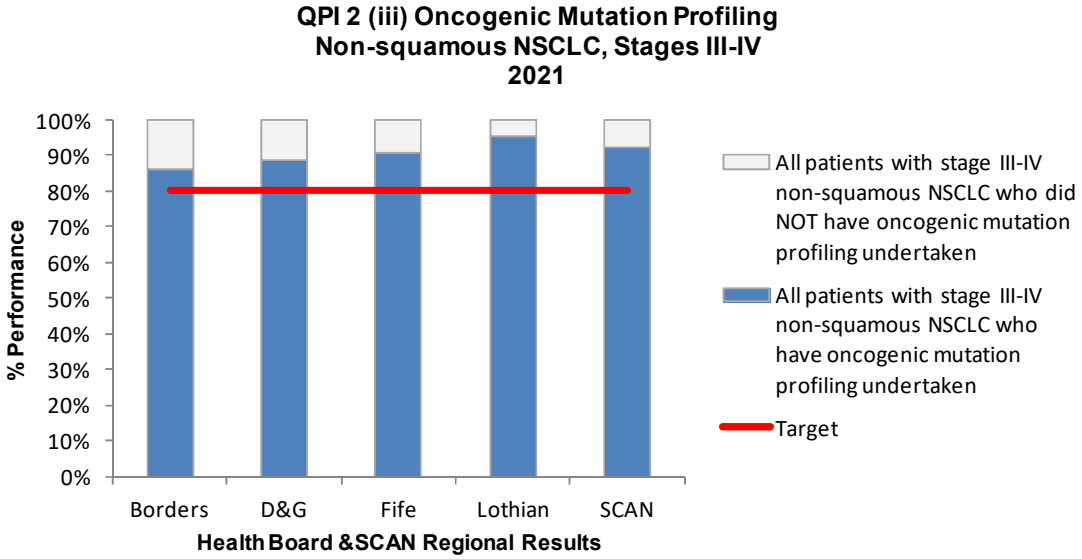
QPI 2 (iii) Non-Squamous, Stage IIIB to IV: Molecular Profiling Analyses Target 80%

Numerator = Number of patients with a pathological diagnosis of stage III-IV non-squamous NSCLC who have oncogenic mutation profiling undertaken.
Denominator = All patients with a pathological diagnosis of stage III-IV non-squamous NSCLC.
Exclusions = Patients with performance status 4.

Target 80%	Borders	D&G	Fife	Lothian	SCAN
2021 cohort	89	133	321	730	1273
Ineligible for this QPI	67	91	230	579	967
Numerator	19	31	79	141	270
Not recorded for numerator	0	0	0	0	0
Denominator	22	35	87	148	292
*Not recorded for exclusions	0	11	3	0	14
**Not recorded for denominator	0	7	4	3	14
% Performance	**86.4%**	**88.6%**	**90.8%**	**95.3%**	**92.5%**

Comment

The QPI was passed by all health boards in the SCAN region in 2021 and no action is required.



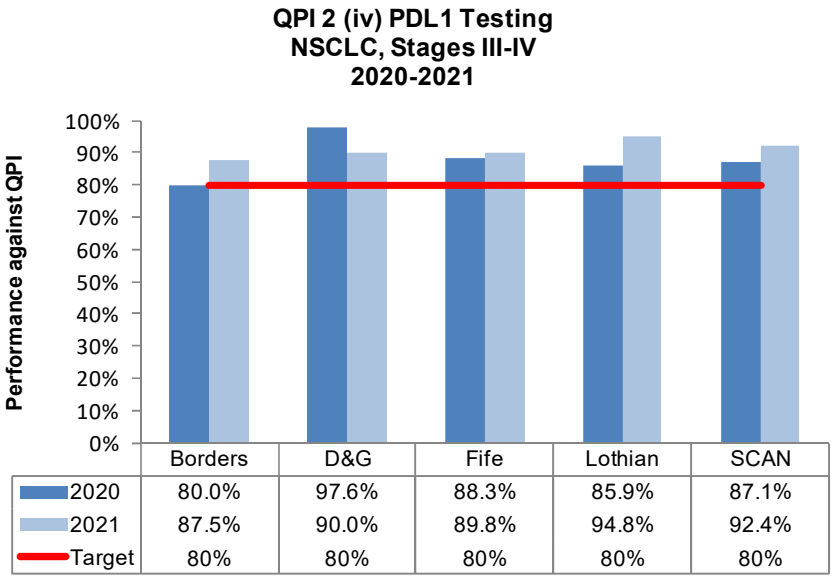
Formal Review 2: New QPI introduced
Measures overall oncogenic mutation profiling in non-squamous NSCLC, stages III-IV.
No comparable historic data are available.

QPI 2 (iv) PDL1 Testing for patients diagnosed with NSCLC, Stages III-IV Target 80%

Numerator = Number of patients with a pathological diagnosis of stage III-IV NSCLC who have PDL1 testing undertaken.
Denominator = All patients with a pathological diagnosis of stage III-IV NSCLC.
Exclusions = Patients with performance status 4.

Target 80%	Borders	D&G	Fife	Lothian	SCAN
2021 cohort	89	133	321	730	1273
Ineligible for this QPI	65	73	189	496	823
Numerator	21	45	114	219	399
Not recorded for numerator	0	0	0	0	0
Denominator	24	50	127	231	432
Not recorded for exclusions	0	11	4	0	15
Not recorded for denominator	0	10	5	3	18
% Performance	**87.5%**	**90.0%**	**89.8%**	**94.8%**	**92.4%**

Comment
This QPI was passed by all health boards in the SCAN region in 2021 and no action is required.



	Borders	D&G	Fife	Lothian	SCAN
2020	80.0%	97.6%	88.3%	85.9%	87.1%
2021	87.5%	90.0%	89.8%	94.8%	92.4%
Target	80%	80%	80%	80%	80%

Formal Review Cycle 2: New QPI in 2021
Introduced to measure PD-L1 testing in patients with a pathological diagnosis of stage III-IV NSCLC (all subtypes). Previous measurement of PDL1 was against a diagnosis of “non-squamous” NSCLC. As such there are no comparable data prior to 2020.

QPI 4 Patients having Radical Treatment: PET CT Reported within 10 Days

Target 95%

Numerator = Number of patients with NSCLC who receive curative treatment (surgical resection, chemoradiotherapy or radical radiotherapy) that undergo PET (Positron Emission Tomography) CT prior to start of treatment where the report is available within 10 days of radiology request.
Denominator = All patients with NSCLC who receive curative treatment (surgical resection, radical chemoradiotherapy or radical radiotherapy) that undergo PET CT prior to start of treatment (no exclusions).

Target 95%	Borders	D&G	Fife	Lothian	SCAN
2021 cohort	89	133	321	730	1273
Ineligible for this QPI	76	110	274	584	1044
Numerator	1	5	15	19	40
Not recorded for numerator	0	0	4	1	5
Denominator	13	23	47	146	229
Not recorded for exclusions	0	0	0	0	0
Not recorded for denominator	0	0	0	0	0
% Performance	**7.7%**	**21.7%**	**31.9%**	**13.0%**	**17.5%**

Comment

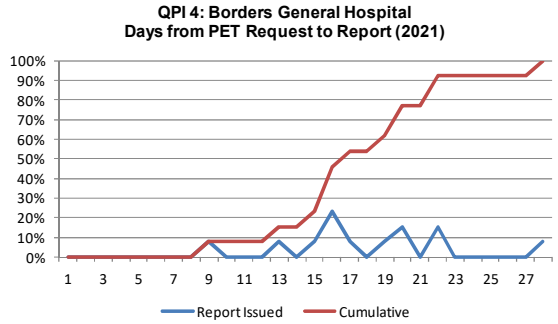
This QPI was not met by any of the SCAN region health boards. This is the first year of reporting PET CT within a designated time scale.

	Borders	D&G	Fife	Lothian		
				WGH	SJH	RIE
Performance (%)	7.7%	21.7%	31.9%	11.7%	11.1%	16.0%
Shortfall (%)	87.3%	73.3%	63.1%	83.3%	83.9%	79.0%
Nº of Outliers	12	18	32	53	32	42
Denominator	13	23	47	60	36	50

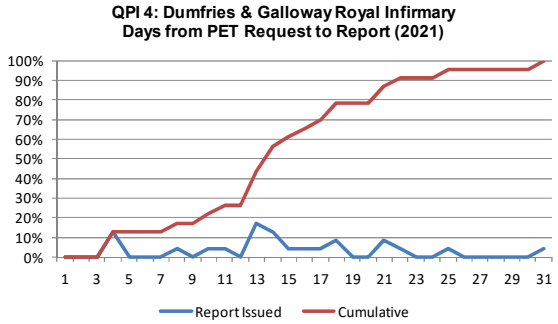
Although results in all health boards are disappointing the median number of days is not much longer and over 90% achieve this target (90% compliance) by 21 days (3 weeks).
Results appear somewhat better in NHS Fife compared to other SCAN health boards/hospitals. Patients generally have investigations undertaken in the cancer network in which they reside while patients in Fife can be referred to either Lothian **or** to Ninewells Hospital in Dundee (outwith SCAN) for PET CT scans. If this remains apparent in further reports it would be prudent to separate Tayside PET for reporting.

The number of days taken for this QPI is not linear and shows a rapid rise between 2 and 3 weeks such that most patients have a PET result within 3 weeks of request.

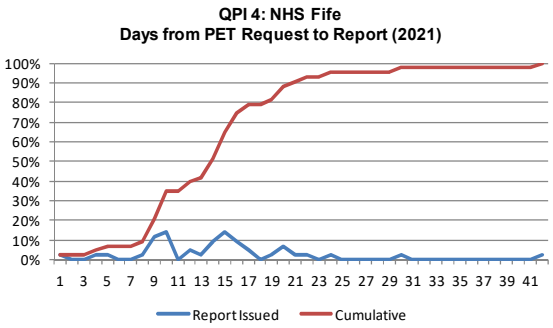
Number of Days from PET Request to Report by NHS Board & by Hospital in NHS Lothian



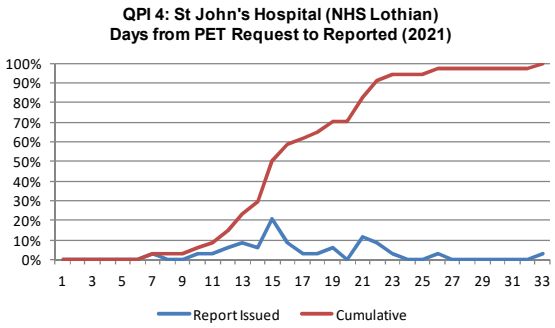
Median: 17 Range: 9-28 days



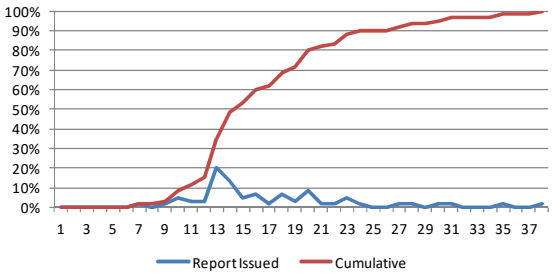
Median: 14 Range: 4-31 days



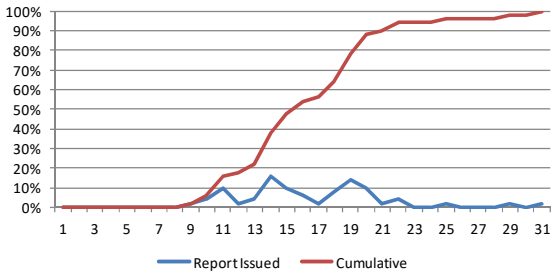
Median: 14 Range: 1-42 days



Median: 14 Range: 6-32 days



Median: 14 Range: 6-37 days



Median: 15 Range: 8-30 days

External factors will also influence outcomes for this QPI. PET CT scans use radio isotopes or tracers, most commonly FDG (F-fluorodeoxyglucose). FDG supplies have recently faced delays nationally and this impacts on the availability of FDG PET CT scans for patients.

QPI 5 Patients with Nodal Spread on PET CT should undergo Nodal Sampling Target 80%

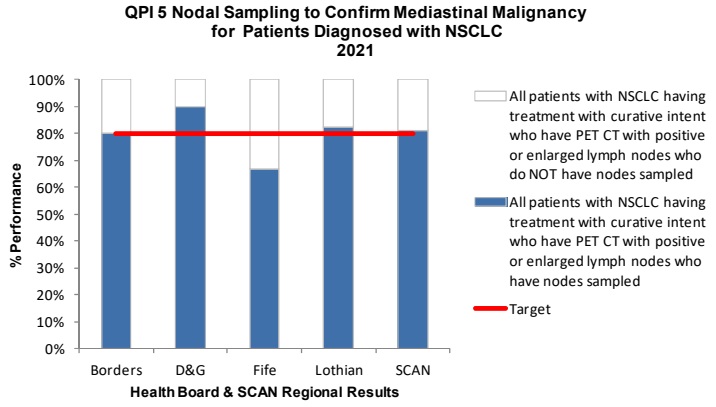
This QPI had formed part of the original QPI suite in 2013 but was archived at Formal Review 1. At that time, it had proved to be too complex in terms of obtaining meaningful and accurate measurement and, moreover it did not adequately reflect clinical practice. It has been modified to make it relevant and includes nodal sampling which encompasses mediastinal (N2), mediastinal N3, hilar (N1/N3) and SCF (N3).

Numerator = Number of patients with NSCLC undergoing treatment with curative intent (surgical resection, chemoradiotherapy or radical radiotherapy) who have a PET CT scan that shows enlarged or positive hilar (N1/N3), mediastinal (N2/N3) or SCF nodes (N3), that have invasive nodal staging (assessment /sampling) performed[15] and nodes sampled.
Denominator = All patients with NSCLC undergoing treatment with curative intent (surgical resection, chemoradiotherapy or radical radiotherapy) who have a PET CT scan that shows enlarged or positive hilar (N1/N3), mediastinal (N2/N3) or SCF nodes (N3).
Exclusions = Patients with stage IV[16] disease or who decline investigation.

Target 80%	Borders	D&G	Fife	Lothian	SCAN
2021 cohort	89	133	321	730	1273
Ineligible for this QPI	84	123	309	679	1195
Numerator	4	9	8	42	63
Not recorded for numerator	0	0	0	0	0
Denominator	5	10	12	51	78
Not recorded for exclusions	0	1	1	0	2
Not recorded for denominator	0	0	0	0	0
% Performance	**80.0%**	**90.0%**	**66.7%**	**82.4%**	**80.8%**

Comment

This QPI was met in NHS Borders, D&G and Lothian. The target was not met in Fife with a shortfall of 13.3% (4 cases). Sampling was contraindicated by poor PFTs[17] for 1 patient. The remaining 3 patients all had T4 staging, i.e., the tumour was invading the mediastinum. In these cases, sampling would not have altered treatment management since already the volume of disease was felt to be too large and therefore not encompassable within a radical radiotherapy field. Further sampling was not required to delineate the palliative options. These are valid clinical reasons for not pursuing sampling in these cases and no further action is required.



Formal Review 2: New reporting
This QPI has been modified and reintroduced to the QPI suite in this reporting period.

[15] Methods of sampling include Neck US guided or direct biopsy (core or FNA), EBUS, EUS-B, EUS, mediastinoscopy or VATS (Video-Assisted Thoracoscopic Surgery).
[16] Stage IV: M1, M1a, M1b, or M1c disease.
[17] PFTs: Pulmonary Function Tests – to assess the lungs by measuring lung volume, capacity, rates of flow and gas exchange.

Treatment Management

QPI 6 Surgical Resection in Non-Small Cell Lung Cancer
6 (i) NSCLC and Surgical Resection

Target = 20%

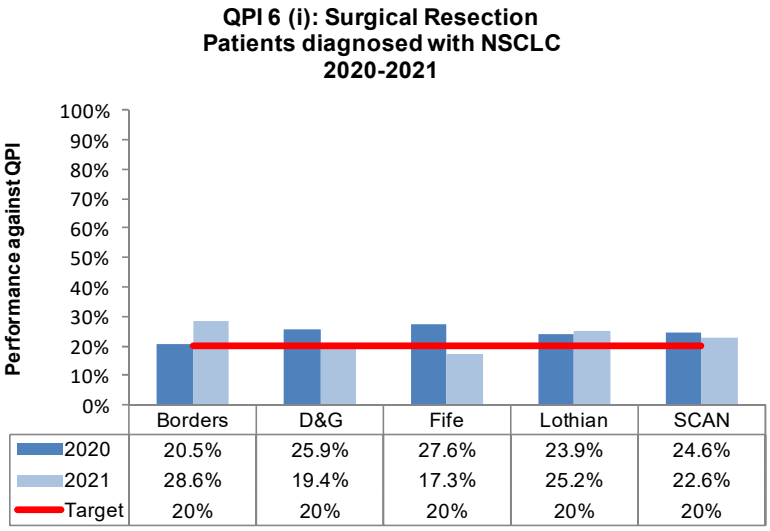
Numerator = Number of patients with NSCLC who undergo surgical resection.
Denominator = All patients with NSCLC.
Exclusion = Patients who die before surgery.

Target 20%	Borders	D&G	Fife	Lothian	SCAN
2021 cohort	89	133	321	730	1273
Ineligible for this QPI	54	61	153	381	649
Numerator	10	14	29	88	141
Not recorded for numerator	0	0	0	0	0
Denominator	35	72	168	349	624
Not recorded for exclusions	0	0	0	0	0
Not recorded for denominator	0	0	0	0	0
% Performance	**28.6%**	**19.4%**	**17.3%**	**25.2%**	**22.6%**

Comment
This QPI was passed by NHS Borders and Lothian and, by SCAN overall. The target fell short in NHS D&G with a shortfall of 0.6% and in NHS Fife with 2.7%; with surgery not appropriate due to poor fitness and/or comorbid conditions.

Lung cancer surgery includes pneumonectomy, lobectomy, segmentectomy, and wedge resection. Wedge procedures are kept to a minimum. Any patients referred for surgical resection that are only suitable for wedge resection should be re-evaluated. The patient should be referred back to the MDT and alternative and less invasive radiotherapy treatment, i.e., SABR, should be considered.

Additionally, patients considered borderline for surgery due to poor fitness or comorbid conditions might be better suited to conventional radical radiotherapy or SABR. Indeed, this accounts for the shortfalls noted above (D&G: 7 and, Fife: 16 patients) It was not in the patients' best interests to pursue surgery in these cases and no further process is required.



Formal Review 2: Revision
The exclusion criteria were amended. Change implemented in 2020.

The tolerance level within this target accounts for the fact that not all patients are suitable for surgical resection due to extent of disease, for example, patients with stages IIIA-B do not have a surgical option but are radically treatable with chemoradiotherapy. Other patients with more advanced disease, and/or poor fitness or comorbidities can be offered oncology treatment options.

6 (ii) NSCLC, Stage I-II and Surgical Resection — Target = 60%

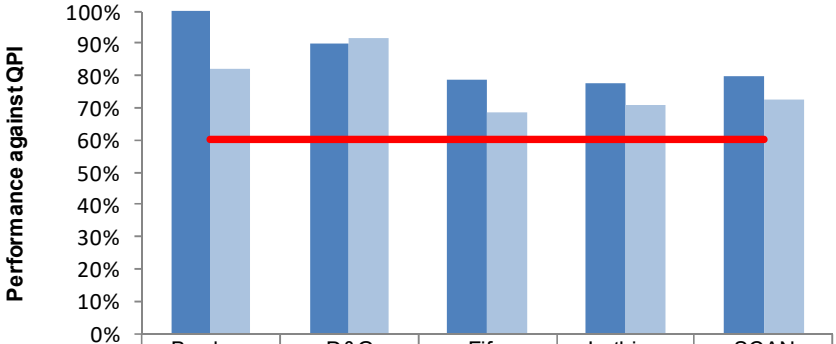
Numerator = Number of patients with NSCLC, Stage I-II[18] who undergo surgical resection.
Denominator = All patients with NSCLC, Stage I-II only.
Exclusion = Patients who die before surgery.

Target 60%	Borders	D&G	Fife	Lothian	SCAN
2021 cohort	89	133	321	730	1273
Ineligible for this QPI	78	114	287	619	1098
Numerator	9	11	22	77	119
Not recorded for numerator	0	0	0	0	0
Denominator	11	12	32	109	164
Not recorded for exclusions	0	0	0	0	0
Not recorded for denominator	0	7	2	2	11
% Performance	**81.8%**	**91.7%**	**68.8%**	**70.6%**	**72.6%**

Comment

The QPI was passed by all SCAN health boards in 2021. This reflects good patient selection for primary surgery and no action is required.

QPI 6 (ii): Surgical Resection
Patients diagnosed with NSCLC, Stages I-II
2020-2021



	Borders	D&G	Fife	Lothian	SCAN
2020	100.0%	90.0%	78.6%	77.4%	79.7%
2021	81.8%	91.7%	68.8%	70.6%	72.6%
Target	60%	60%	60%	60%	60%

Formal Review Cycle 2: Revision
Exclusion*: patients who decline surgery* and *patients undergoing SABR* have been excluded.
Implemented and reported in 2020.

[18] Stage I-II: T1 (mi) or T1 or T1a-1c N0 M0; or T2 or T2b N0 M0; or T1a-c or T2a-b N1 M0; or T3N0M0.

QPI 7 Lymph Node Assessment **Target = 80%**

Numerator = Number of patients with NSCLC undergoing surgical resection by lobectomy or pneumonectomy that have at least 1 node from at least *3 x N2 stations* sampled at the time of resection or at previous mediastinoscopy.
Denominator = All patients with NSCLC undergoing surgical resection by lobectomy or pneumonectomy (no exclusions).

Royal Infirmary of Edinburgh (RIE)

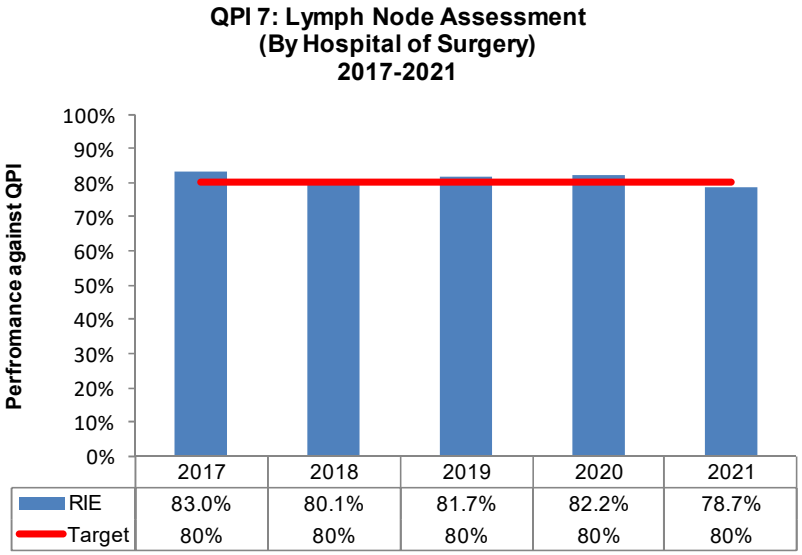
Target 80%	2017	2018	2019	2020	2021
Numerator	137	121	107	111	107
Not recorded for numerator	0	14	0	0	2
Denominator*	165	151	131	135	136
Not recorded for exclusions	0	0	0	0	0
Not recorded for denominator	0	0	0	0	0
% Performance	**83.0%**	**80.1%**	**81.7%**	**82.2%**	**78.7%**

* The denominator includes 32 (2017); 43 (2018); 24 (2019); 15 (2020); and 20 (2021) patients who were diagnosed in NHS Tayside and had surgery at RIE. Patients diagnosed in NHS Dumfries & Galloway are not included here; these patients have surgery at the Golden Jubilee Hospital, Clydebank and are reported by WoSCAN.

Comment

QPI 7 is analysed by *Hospital of Surgery* as compared to most other QPIs which are analysed by Board of Diagnosis. Surgical outcomes are the responsibility of the hospital where the surgery was undertaken. Responsibility does not lie with the Health Board who referred patients (often outwith their HB area) for surgical resection outcomes.

The target has been consistently met in the 4 years previous but was narrowly missed in 2021 with a shortfall of 1.3%.



Formal Review Cycle 2
No changes to numerator, denominator, or exclusions. All data above are comparable.

An audit was carried out by the cardiothoracic team at the Royal Infirmary of Edinburgh and all outliers were reviewed. The focus was on outcomes associated with actual nodal harvest as compared to those established by microscopic examination; the latter being the measurement used for this QPI. Interpretation of nodal outcome was found to be complex:

- It was acknowledged that challenges existed at surgical level to determine 'by eye' if sufficient sampling had been undertaken to meet the QPI criteria.
- Moreover, at pathological level, it is not possible to distinguish between "sample not sent" and "site sampled but no nodal tissue or only fatty tissue" obtained.
- Ultimately, it is the number of nodes microscopically identified in the piece of tissue submitted irrespective of the number of metastatic deposits sampled.

Good surgical practice was evidenced in the audit. If no lymph nodes are seen in a particular station then sampling does not occur whereas consistent sampling is undertaken for blocks or areas of multiple nodes, with a view to accomplishing comprehensive sampling. Resection of lymph nodes is therefore undertaken in good faith although sometimes without the desired outcome. It remains challenging given the possibility that nodes might not be identified *microscopically* in the tissue blocks submitted.

Action: An outcome of the Review, which has now been implemented, is a change to pathology form reporting at lung cancer MDT meetings to ensure that information on the stations sampled is minuted so that where there are less than 3 stations sampled, it will be possible to prospectively assess the reasons and action as appropriate at that juncture.

QPI 8 Radiotherapy for Inoperable Lung Cancer Target = 35%

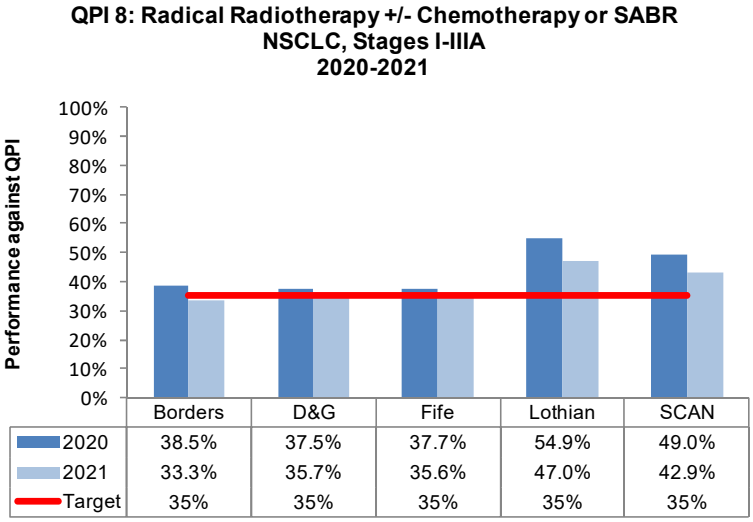
Numerator = Number of patients with stages I-IIIA lung cancer not undergoing surgery who receive radical radiotherapy[19] +/- chemotherapy, or SABR.
Denominator = All patients with stages I-IIIA lung cancer not undergoing surgery.
Exclusions = Patients with SCLC, patients who decline radiotherapy, or who die prior to treatment.

Target 35%	Borders	D&G	Fife	Lothian	SCAN
2021 cohort	89	133	321	730	1273
Ineligible for this QPI	68	102	243	501	914
Numerator	7	5	26	95	133
Not recorded for numerator	0	0	0	0	0
Denominator	21	14	73	202	310
Not recorded for exclusions	0	0	0	0	0
Not recorded for denominator**	0	17	5	27	49
% Performance	**33.3%**	**35.7%**	**35.6%**	**47.0%**	**42.9%**

** Not recorded for denominator are those patients where TNM stage was not recorded.

Comment

The QPI was passed by 3 out of 4 SCAN health boards. The target was not met by NHS Borders with a shortfall of 1.7% (14 cases). In all cases it was noted that radiotherapy was not a treatment option due to poor fitness levels and comorbid conditions. Numbers in NHS Borders are small which can distort percent levels and it was agreed that no action is required. It should be noted that variation in such circumstances can be due to chance.



Formal Review Cycle 2: Revision
Denominator: Now specifies stage as I-IIIA.
Exclusion: Stage is now specified; consequently stage IV is no longer necessary under exclusions.

Over the 2-year period charted above, higher levels were noted in NHS Lothian compared to the other 3 constituent health board areas in SCAN. Anecdotally, this is felt to reflect the effects of access and of travel issues associated with the regular travel requirements associated with radiotherapy treatments for patients from outwith Lothian, more especially those from rural locations.

19 Radical Radiotherapy = Dose given for NSCLC ≥54Gy.

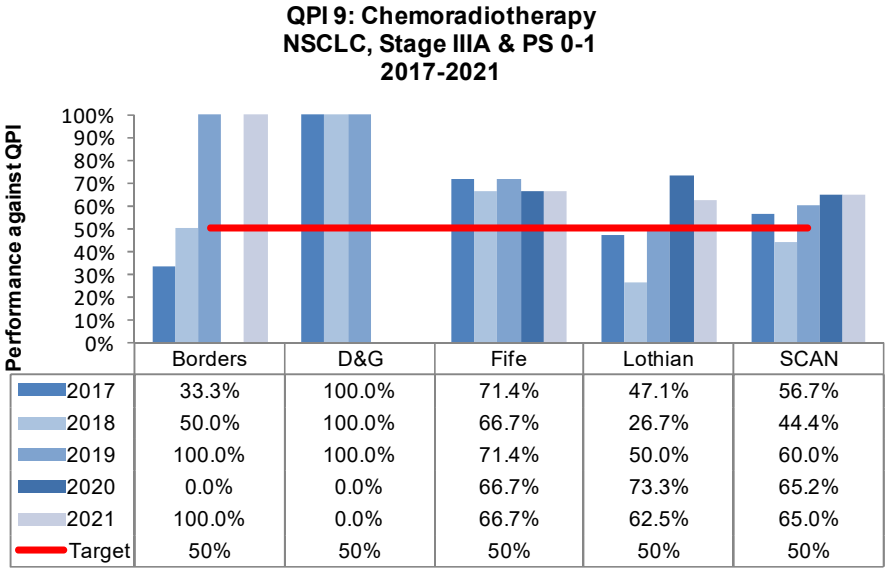
QPI 9 Chemoradiotherapy: Locally Advanced NSCLC Target = 50%

Numerator = Number of patients with NSCLC, Stage IIIA[20] and PS 0-1, not undergoing surgery and who receive Chemoradiotherapy[21].
Denominator = All patients with NSCLC, Stage IIIA and PS 0-1 not undergoing surgery who receive radical radiotherapy[22].
Exclusions = Patients who decline chemotherapy, patients who die before treatment, patients who receive Continuous Hyperfractionated Radiotherapy (CHART).

Target 50%	Borders	D&G	Fife	Lothian	SCAN
2021 cohort	89	133	321	730	1273
Ineligible for this QPI	88	132	318	714	1253
Numerator	1	0	2	10	13
Not recorded for numerator	0	0	0	0	0
Denominator	1	0	3	16	20
Not recorded for exclusions	0	0	0	0	0
Not recorded for denominator	0	1	0	0	1
% Performance	**100.0%**	**n/a**	**66.7%**	**62.5%**	**65.0%**

Comment

The QPI was passed by NHS Borders, Fife and Lothian in 2021. There were no patients who met the denominator criteria in D&G where the result is reported as not applicable.



	Borders	D&G	Fife	Lothian	SCAN
2017	33.3%	100.0%	71.4%	47.1%	56.7%
2018	50.0%	100.0%	66.7%	26.7%	44.4%
2019	100.0%	100.0%	71.4%	50.0%	60.0%
2020	0.0%	0.0%	66.7%	73.3%	65.2%
2021	100.0%	0.0%	66.7%	62.5%	65.0%
Target	50%	50%	50%	50%	50%

Formal Review Cycle 2
No changes to numerator, denominator, or exclusions. All data above are comparable.

Zero results do not always represent the same outcome. In 2020 in NHS Borders and D&G the zero represents 0 out of 1 patient in both cases, i.e., target not met. This is compared to D&G's 'not applicable' status in 2021 where no patients met denominator criteria. Additionally, when reviewing results, allowance should be made where numbers are small and variation may be due to chance. No action is required.

[20] Stage IIIA NSCLC includes: T1a-c N2 M0; T1b N2; T2a-b N2M0; T3 N1 M0; T4 N0-1 M0.
[21] NSCLC Chemoradiotherapy: radiotherapy ≥ 54Gy and concurrent or sequential chemotherapy.
[22] Radical radiotherapy: dose given for NSCLC ≥ 54Gy.

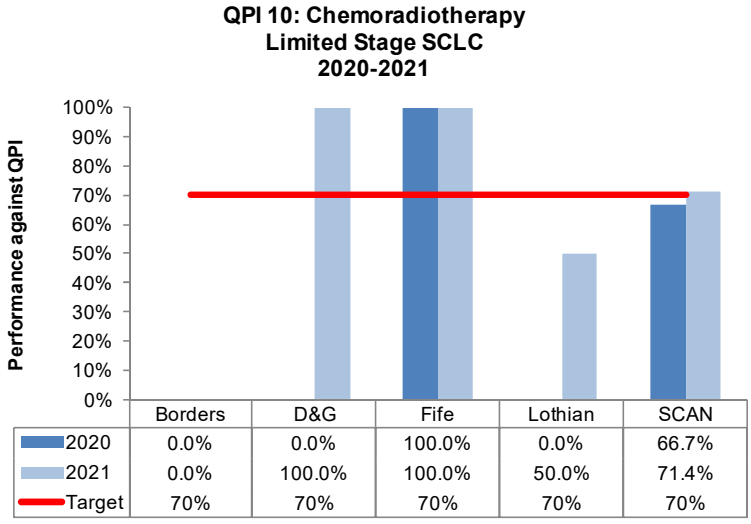
QPI 10 Chemoradiotherapy in Limited Stage Small Cell Lung Cancer Target = 70%

Numerator = Number of patients with SCLC, Stage I-IIIA[23] and PS 0-1 who receive chemoradiotherapy[24].
Denominator = All patients with SCLC, Stage I-IIIA and PS 0-1.
Exclusions = Patients who decline radiotherapy, who die before treatment, or those who undergo surgical resection.

Target 70%	Borders	D&G	Fife	Lothian	SCAN
2021 cohort	89	133	321	730	1273
Ineligible for this QPI	89	132	319	726	1266
Numerator	0	1	2	2	5
Not recorded for numerator	0	0	0	0	0
Denominator	0	1	2	4	7
Not recorded for exclusions	0	0	0	0	0
Not recorded for denominator	0	0	0	0	0
% Performance	**n/a**	**100.0%**	**100.0%**	**50.0%**	**71.4%**

Comment

This QPI was passed by 3 of the 4 health boards in SCAN in 2021. The target was not met in NHS Lothian although it should be noted that denominator numbers are very small and results can fluctuate either way in these circumstances. The target was not achieved with only 2 of the 4 patients in the denominator having chemoradiotherapy. Of the remaining patients, the radiotherapy component was contraindicated for 1 patient due to pulmonary fibrosis. The other patient was unable to have platinum chemotherapy due to having renal and vascular comorbidities. These represent valid clinical contraindications, and no action is therefore required.



Formal Review Cycle 2: Revision
Denominator: Now specified as stages I-IIIA; previously I-IIIB.

The very small numbers who are eligible for this QPI mean that results can be sparse and vary showing no representation in some years. There were no patients who met the denominator criteria in D&G in 2020 or in NHS Borders in either 2020 or 2021. The zero demonstrated in NHS Lothian in 2020, accounts for 0 out of 1 patient, i.e., a missed target, where a solitary patient in the denominator did not receive chemoradiotherapy.

[23] Patients with TxN0-N1M0 disease will be included within the measurement of this QPI. Stage I-IIIA includes T1aN0 – T4N1M0; T1a-T2bN2M0.
[24] SCLC Chemoradiotherapy: radiotherapy ≥ 40Gy and concurrent or sequential platinum-based chemotherapy.

QPI 11 Systemic Anti-Cancer Therapy (SACT) in Non-Small Cell Lung Cancer

At Formal Review Cycle 2, the QPI 11 suite was revised to accommodate changes in oncology treatment management for patients diagnosed with NSCLC who receive SACT, as well as to provide more comprehensive reporting.

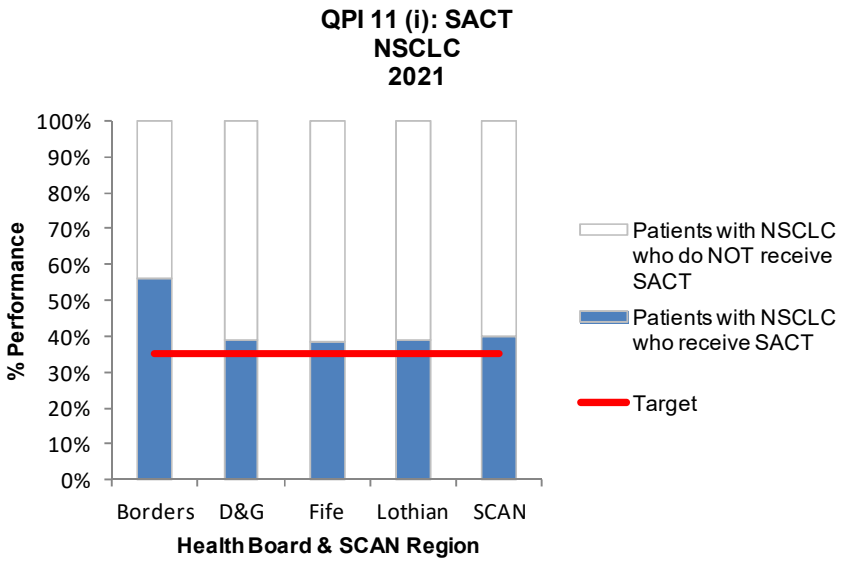
QPI 11 (i) considers all types of SACT treatment overall; QPI 11 (ii) focuses on targeted therapy; and QPI 11 (iii) reports on patients who receive immunotherapy either solely or as part of their chemoimmunotherapy treatment. New data items were introduced to the Lung Cancer Dataset and were available for reporting from 1st January 2021.

11 (i) Patients with NSCLC who receive SACT — Target 35%

Numerator = Number of patients with NSCLC not undergoing surgery who receive SACT.
Denominator = All patients with NSCLC not undergoing surgery.
Exclusions = Patients who decline SACT treatment or who die before treatment.

Target 35%	Borders	D&G	Fife	Lothian	SCAN
2021 cohort	89	133	321	730	1273
Ineligible for this QPI	64	84	196	492	836
Numerator	14	19	48	93	174
Not recorded for numerator	0	0	0	0	0
Denominator	25	49	125	238	437
Not recorded for exclusions	0	0	0	0	0
Not recorded for denominator	0	0	0	0	0
% Performance	**56.0%**	**38.8%**	**38.4%**	**39.1%**	**39.8%**

Comment
This QPI was passed by all health boards in the SCAN region in 2021 and no action is required.



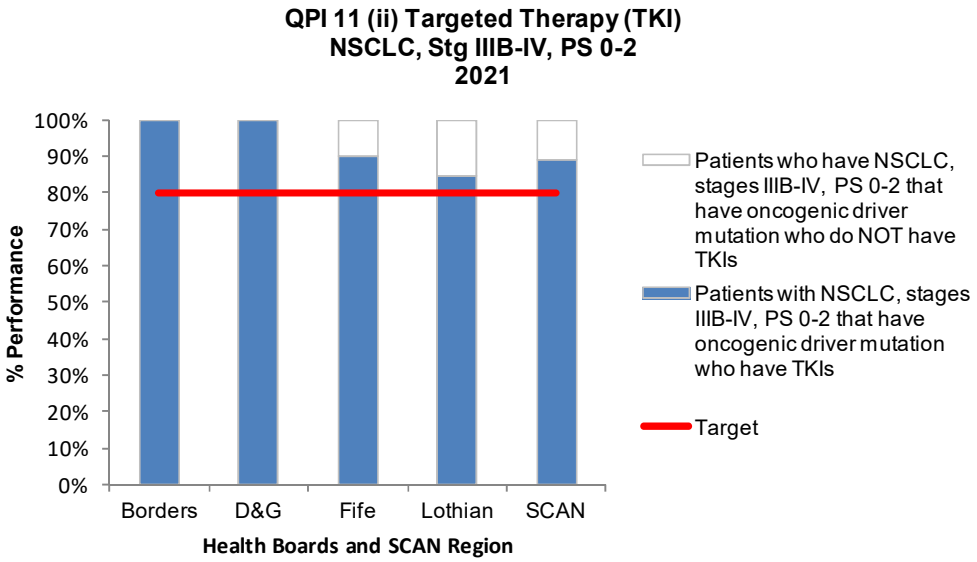
Formal Review Cycle 2: New QPI introduced
This QPI is new to reporting and therefore only one year's data is available.

11 (ii) NSCLC, Stage IIIB, IIIC or IV who receive Targeted Therapy Target 80%

Numerator = Number of patients with NSCLC, stages IIIB-IV with performance status 0-2 not undergoing surgery that have an oncogenic driver mutation who receive targeted therapy[25]
Denominator = All patients with NSCLC not undergoing surgery that have an oncogenic driver mutation.
Exclusions = Patients who decline SACT treatment, who die before treatment or who are participating in a clinical trial.

Target 80%	Borders	D&G	Fife	Lothian	SCAN
2021 cohort	89	133	321	730	1273
Ineligible for this QPI	88	130	311	717	1246
Numerator	1	3	9	11	24
Not recorded for numerator	0	0	0	0	0
Denominator	1	3	10	13	27
Not recorded for exclusions	0	0	0	0	0
Not recorded for denominator	0	0	0	0	0
% Performance	**100.0%**	**100.0%**	**90.0%**	**84.6%**	**88.9%**

Comment
This QPI was passed by all health boards in the SCAN region in 2021 and no action is required.



Formal Review Cycle 2: New QPI introduced
This QPI is new to reporting and therefore only one year's data is available.

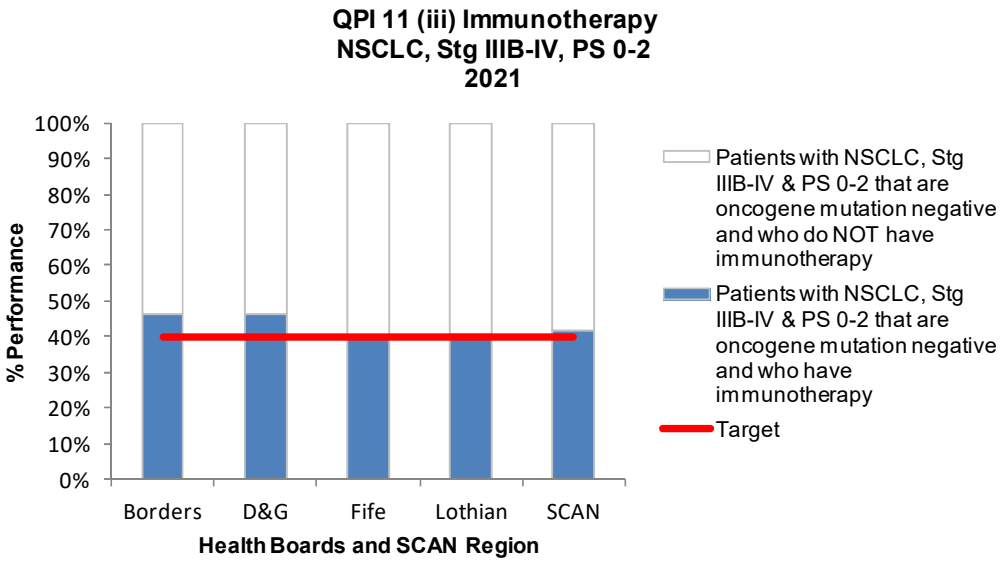
[25] Targeted Therapy: TKIs (Tyrosine Kinase Inhibitors)

11 (iii) NSCLC, Stage IIIB, IIIC or IV who receive Immunotherapy Target 40%

Numerator = Number of patients with NSCLC, stages IIIB-IV with performance status 0-2 not undergoing surgery that are oncogenic mutation negative who receive immunotherapy.
Denominator = All patients with NSCLC not undergoing surgery that are oncogenic mutation negative.
Exclusions = Patients who decline SACT treatment, who die before treatment or who are participating in a clinical trial.

Target 40%	Borders	D&G	Fife	Lothian	SCAN
2021 cohort	89	133	321	730	1273
Ineligible for this QPI	76	114	275	663	1128
Numerator	6	6	18	27	57
Not recorded for numerator	0	0	0	0	0
Denominator	13	13	45	66	137
Not recorded for exclusions	0	0	0	0	0
Not recorded for denominator	0	6	1	1	8
% Performance	**46.2%**	**46.2%**	**40.0%**	**40.9%**	**41.6%**

Comment
This QPI was passed by all health boards in the SCAN region in 2021 and no action is required.



Formal Review Cycle: New QPI introduced
This QPI is new to reporting and therefore only one year's data is available.

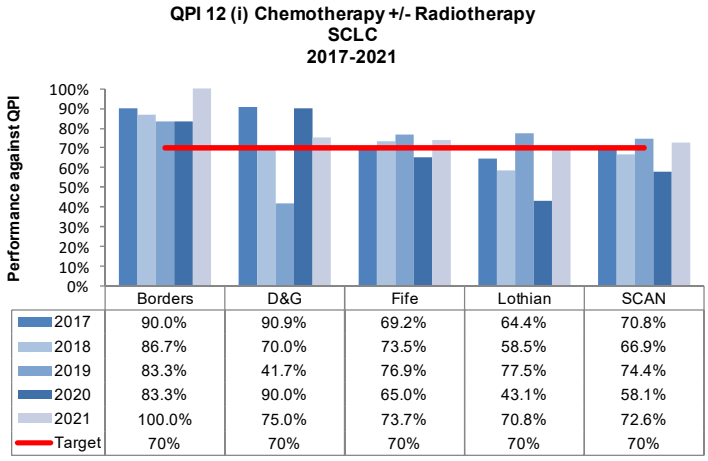
QPI 12 Chemotherapy for Small Cell Lung Cancer

QPI 12 (i) Patients with SCLC who receive chemotherapy ± radiotherapy Target = 70%

Numerator = Number of patients with SCLC who receive chemotherapy[26] ± radiotherapy.
Denominator = All patients with SCLC.
Exclusions = Patients who decline chemotherapy, patients who die before treatment and patients who are participating in clinical trials.

Target 70%	Borders	D&G	Fife	Lothian	SCAN
2021 cohort	89	133	321	730	1273
Ineligible for this QPI	86	125	302	665	1178
Numerator	3	6	14	46	69
Not recorded for numerator	0	0	0	0	0
Denominator	3	8	19	65	95
Not recorded for exclusions	0	0	0	0	0
Not recorded for denominator	0	0	0	0	0
% Performance	**100.0%**	**75.0%**	**73.7%**	**70.8%**	**72.6%**

Comment
This QPI was passed by all health boards in the SCAN region in 2021 and no action is required.



	Borders	D&G	Fife	Lothian	SCAN
2017	90.0%	90.9%	69.2%	64.4%	70.8%
2018	86.7%	70.0%	73.5%	58.5%	66.9%
2019	83.3%	41.7%	76.9%	77.5%	74.4%
2020	83.3%	90.0%	65.0%	43.1%	58.1%
2021	100.0%	75.0%	73.7%	70.8%	72.6%
Target	70%	70%	70%	70%	70%

Formal Review Cycle 2
No changes to numerator, denominator, or exclusions. All data are comparable.

The chart illustrates that this QPI has been challenging. Work to ascertain why and processes to aid resolution of these challenges became key factors in driving improvement in this area. As part of the action plan process, an audit[27] was carried out to assess why this might be and concluded that:

> *The high number of patients diagnosed with SCLC who did not receive chemotherapy in Lothian in 2018 reflects the rapidity in which this disease causes relentless deterioration in an already frail patient group as opposed to concerns with a protracted patient pathway.*

Consequent to this audit, a 'SCLC Alert' was set up in NHS Lothian in October 2020 to alert oncology clinicians to all new diagnoses of small cell lung cancer, independent of MDM, to enable pre-booking of urgent new patient appointments in oncology for these patients. The success of the 'SCLC Alert' is evidenced in the 2021 results and it is envisaged that results will continue to improve as this is embedded in clinical practice.

[26] Chemotherapy includes neoadjuvant, adjuvant, chemoradiotherapy or palliative chemotherapy.
[27] Audit undertaken by Dr Ashley Pheely, *Understanding the pathway for patients diagnosed with small cell lung cancer who did not receive chemotherapy in 2018 in NHS Lothian*. The full Audit is available in the 2020 Lung Cancer QPI Report which is available on the SCAN website.

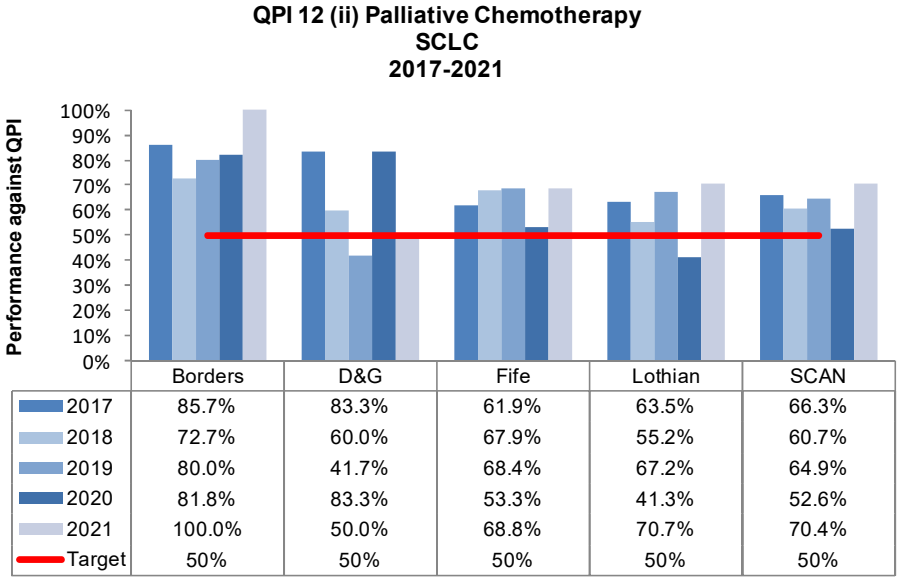
QPI 12 (ii) Palliative Chemotherapy: Patients with SCLC Target = 50%

Numerator = Number of patients with SCLC not undergoing treatment with curative intent who receive palliative chemotherapy.
Denominator = All patients with SCLC not undergoing treatment with curative intent.
Exclusions = Patients who decline chemotherapy, patients who die before treatment and patients who are participating in clinical trials.

Target 50%	Borders	D&G	Fife	Lothian	SCAN
2021 cohort	89	133	321	730	1273
Ineligible for this QPI	86	129	305	672	1192
Numerator	3	2	11	41	57
Not recorded for numerator	0	0	0	0	0
Denominator	3	4	16	58	81
Not recorded for exclusions	0	0	0	0	0
Not recorded for denominator	0	0	0	0	0
% Performance	**100.0%**	**50.0%**	**68.8%**	**70.7%**	**70.4%**

Comment

This QPI was passed by all health boards in the SCAN region in 2021 and no action is required



	Borders	D&G	Fife	Lothian	SCAN
2017	85.7%	83.3%	61.9%	63.5%	66.3%
2018	72.7%	60.0%	67.9%	55.2%	60.7%
2019	80.0%	41.7%	68.4%	67.2%	64.9%
2020	81.8%	83.3%	53.3%	41.3%	52.6%
2021	100.0%	50.0%	68.8%	70.7%	70.4%
Target	50%	50%	50%	50%	50%

Formal Review Cycle 2
No changes to numerator, denominator, or exclusions. All data are comparable.

QPI 13 Mortality following Active Treatment: 30- and 90-Day

All patients who die within 30- and 90-days of treatment completion are discussed and reported at regularly held Mortality and Morbidity (M&M) meetings. It is standard QPI practice to report reasons only for outliers but for completeness, and in line with M&M protocols, reasons are given here for *all* patients who die within 30- and 90-days of treatment regardless of whether results remain within the accepted parameters or if they are exceeded. Patients for whom 30- or 90-days have not passed since treatment are not included in the denominator.

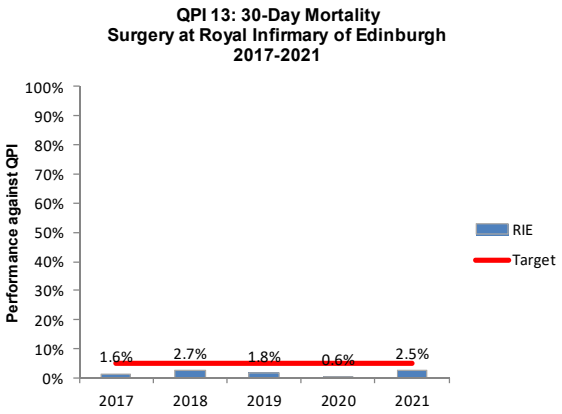
QPI 13 (i) A: Surgery: 30-Day Mortality — Target <5%

Numerator = Number of patients who receive surgery who die within 30 days of treatment.
Denominator = All patients with lung cancer who receive surgery (no exclusions).

Royal Infirmary of Edinburgh

30 Day Target <5%	2017	2018	2019	2020	**2021**
Numerator	3	5	3	1	4
NR* numerator	0	0	0	0	0
Denominator[28]	192	188	166	172	157
NR exclusions	0	0	0	0	0
NR denominator	0	0	0	0	0
% Performance	**1.6%**	**2.7%**	**1.8%**	**0.6%**	**2.5%**

*NR: Not Recorded

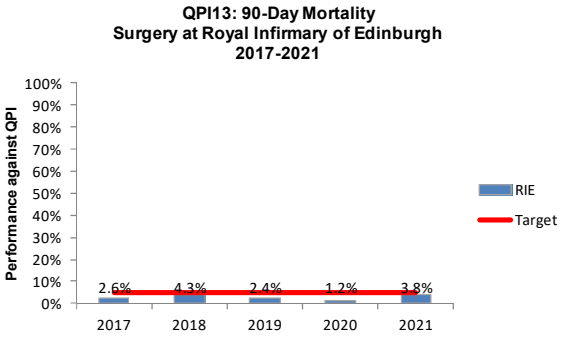


QPI 13 (i) B: Surgery: 90-Day Mortality — Target <5%

Numerator = Number of patients who receive surgery who die within 90 days of treatment.
Denominator = All patients with lung cancer who receive surgery (no exclusions).

Royal Infirmary of Edinburgh

90 Day Target <5%	2017	2018	2019	2020	**2021**
Numerator	5	8	4	2	6
NR* numerator	0	0	0	0	0
Denominator	192	187	164	172	156[29]
NR exclusions	0	0	0	0	0
NR denominator	0	0	0	0	0
% Performance	**2.6%**	**4.3%**	**2.4%**	**1.2%**	**3.8%**



[28] The denominator in both 30- and 90- day mortality analyses include patients diagnosed in NHS Tayside (44 (2017); 52 (2018); 35 (2019); and 29 (2020)) who had surgery in Edinburgh. Patients from NHS D&G are not included in the denominator; they have surgery at the Golden Jubilee Hospital, Clydebank and are reported by WoSCAN.

[29] The difference in denominator totals (1 less patient in 90-day reporting in 2018 and 2021 compared to 30-day) is accounted for by the number of days which have passed since the date of surgery to the date of analysis/reporting. If less than 90 days have passed since the date of surgery, the patient will not appear in the 90-day report but providing 30 days have passed they will be pertinent to the 30-day report.

Comment: Surgical Resection 30- and 90-Day Mortality

Surgical outcomes are the responsibility of the hospital where the surgical procedure was undertaken and not of the health board that referred patients for surgical resection (in many cases to hospitals outwith their health board area). As a consequence, 30- and 90-day mortality post-surgery are analysed by *Hospital of Surgery*. In SCAN, surgery is performed at the Royal Infirmary of Edinburgh.

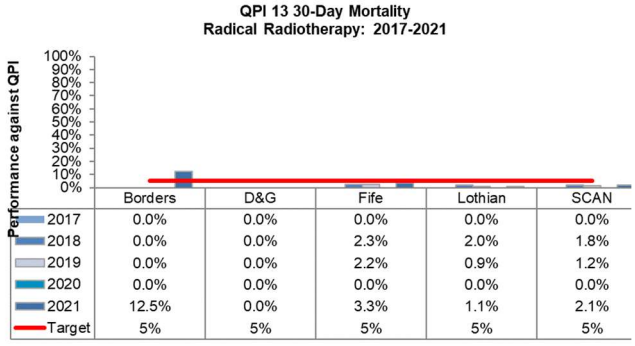
There were 6 deaths which occurred within 90 days of surgery, 4 of whom died within 30-days post-surgery. Results remain within the accepted target parameters and as such are in line with good clinical practice. 3 out of the 6 were patients with pre-existing pulmonary fibrosis, which is known to be a higher risk for surgical mortality.

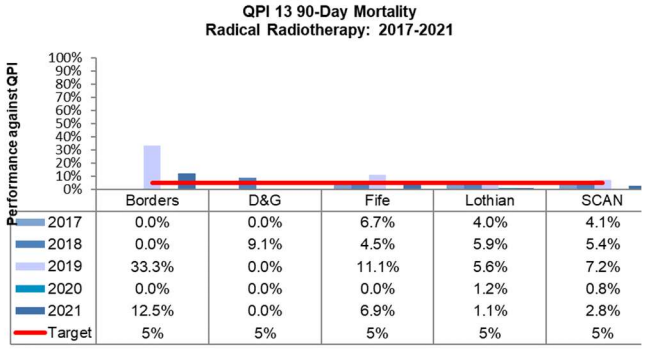
QPI 13 (ii) Radical Radiotherapy: 30- & 90- Day Mortality **Target <5%**

Numerator = Number of patients who receive radical radiotherapy[30] who die within 30 and 90 days of treatment.
Denominator = All patients with lung cancer who receive radical radiotherapy (no exclusions).

Target <5%	Borders		D&G		Fife		Lothian		SCAN	
	30	90	30	90	30	90	30	90	30	90
2021 cohort	89	89	133	133	321	321	730	730	1273	1273
Ineligible for this QPI	81	81	121	121	291	292	637	637	1130	1131
Numerator	1	1	0	0	1	2	1	1	3	4
Not recorded for numerator	0	0	0	0	0	0	0	0	0	0
Denominator	8	8	12	12	30*	29*	93	93	143	142
Not recorded for exclusions	0	0	0	0	0	0	0	0	0	0
Not recorded for denominator	0	0	0	0	0	0	0	0	0	0
% Performance	**12.5**	**12.5**	**0.0**	**0.0**	**3.3**	**6.9**	**1.1**	**1.1**	**2.1**	**2.8**

*The denominator in Fife for 30-day is 30 compared to 29 for 90-day mortality. 90 days had not elapsed since treatment for 1 patient who is therefore not included in the 90-day denominator.





Comment: Radical Radiotherapy 30- & 90-Day Mortality

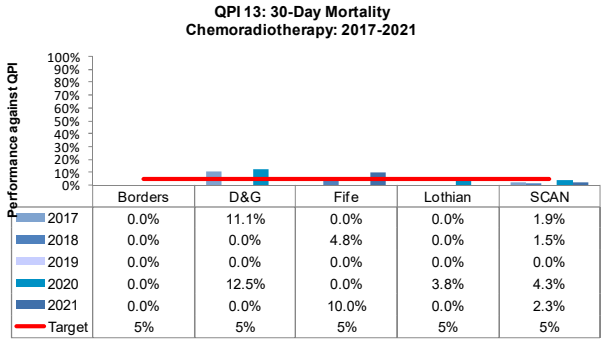
There was1 death within 30- and 90-days of patients receiving radical radiotherapy in NHS Borders. While results show the accepted target parameters appear to be exceeded, numbers are very small (1 in 8) and readers should be cognisant of the 'exaggerated' percentages which can be a consequence of analyses involving small numbers. This result should, therefore, be viewed with a degree of caution. Results for the remaining three health boards in SCAN remain within accepted parameters while no deaths occurred in Dumfries and Galloway within the set timescales.

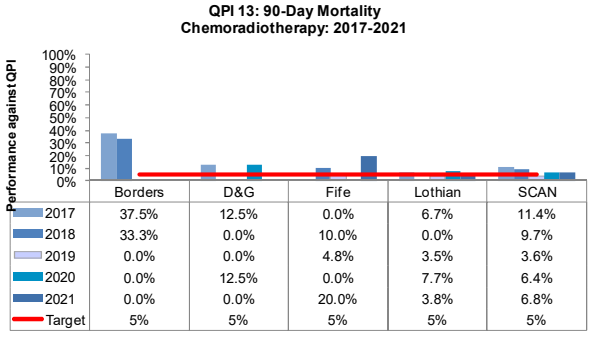
[30] Radical radiotherapy includes conventional radical radiotherapy and SABR.

QPI 13 (iii) Chemoradiotherapy: 30-and 90-Day Mortality **Target <5%**

Numerator = Number of patients who receive chemoradiotherapy who die within 30- and 90-days of treatment.
Denominator = All patients with lung cancer who receive chemoradiotherapy (no exclusions).

Target <5%	Borders		D&G		Fife		Lothian		SCAN	
	30	90	30	90	30	90	30	90	30	90
2021 cohort	89	89	133	133	321	321	730	730	1273	1273
Ineligible for this QPI	87	87	127	127	311	311	704	704	1229	1229
Numerator	0	0	0	0	1	2	0	1	1	3
Not recorded for numerator	0	0	0	0	0	0	0	0	0	0
Denominator	2	2	6	6	10	10	26	26	44	44
Not recorded for exclusions	0	0	0	0	0	0	0	0	0	0
Not recorded for denominator	0	0	0	0	0	0	0	0	0	0
% Performance	**0.0**	**0.0**	**0.0**	**0.0**	**10.0**	**20.0**	**0.0**	**3.8**	**2.3**	**6.8**





Comment: Chemoradiotherapy 30- & 90-Day Mortality

The disproportionately high percentages witnessed in the 90-day mortality analyses for NHS Borders in 2017 (3 out of 8 [33.3%]) and 2018 (4 out of 12 [37.5%]); and NHS Fife in 2021 (2 out of 10 [20.0%]) must be viewed with a degree of caution due to the impact small numbers can have on overall results. The consequences of small numbers' analyses while evident in relatively high results of 12.5% in NHS D&G and 10.0% in NHS Fife, should also not be a cause for unwarranted concern.

In NHS Fife 1 patient died within 30 days of completion of chemoradiotherapy with a further 1 patient dying within 90 days. As outlined above, the inflated percentage outcomes are a consequence of small numbers. Performance in NHS Lothian lies within accepted parameters. There were no deaths within 30- or 90-days post chemoradiotherapy in either NHS Borders or NHS D&G.

The QPI 13 suite was set up to examine treatment related mortality as a marker of the quality and safety of the whole service provided by the MDT and to provide a record, within the QPI setting, of outcomes of treatment specifically concerning treatment related morbidity and mortality. The NHS Lothian case discussed above raises interesting questions regarding the methodology of reporting deaths resulting from curative treatment 'packages'.

As outlined below, it was concluded that QPI SACT mortality and morbidity would be best served if reported by the oncology community using the electronic chemotherapy prescribing system 'ChemoCare'. The objective being to provide an accurate picture of *all* patients undergoing all types of SACT, instead of merely reporting on the subset of those diagnosed in the Audit year cohort alone.

This would leave only the curative treatment 30- and 90-day mortality analyses and reporting (surgery, radical radiotherapy and chemoradiotherapy) within the remit of the Audit QPI process. However, no methodology has yet been discussed or considered where curative treatment is given as a 'package', for example surgery plus adjuvant SACT or chemoradiotherapy plus adjuvant immunotherapy (as in the example described above where the patient's death was related to immunotherapy induced pneumonitis and not the initial chemoradiotherapy component of this 'package' of treatment with curative intent).

Action: Discussion around accommodating curative treatment 'packages' within 30- and 90-day mortality analyses and reporting, is to be taken to the next formal review process.

QPI 13: 30-Day Mortality: Palliative SACT & 30-Day Mortality: Adjuvant SACT

These QPIs are to be replaced with a standardised 30-day SACT Mortality QPI across all the tumour types covered by the QPI programme although, reference has been made in this report to adjuvant SACT where relevant to 30- and 90-day mortality post chemoradiotherapy where patients have also received adjuvant immunotherapy.

Measurement is being revised to use data from ChemoCare (an electronic chemotherapy prescribing system) in order to utilise existing data and provide an accurate picture of all patients with lung cancer undergoing SACT.

The development of a national reporting tool is currently underway through a collaboration with Public Health Scotland (PHS) and the 3 Cancer Networks: NCA, SCAN and WoSCAN. This is to ensure that reporting is consistent throughout Scotland. Progress has been complicated by the differences in the 5 instances of ChemoCare across Scotland and a date for initial reporting is yet to be confirmed at the time of writing this report.

Mortality within 30 days of SACT is subject to M+M peer review on a regular basis (as per CEL 30) and action plans are developed each year. These are reported separately for all tumour types to the SACT lead. There were no cases requiring escalation for external review identified for cases in 2021.

QPI 14 SABR in Inoperable Stage I Lung Cancer — Target = 35%

Numerator = Number of patients with Stage I[31] lung cancer not undergoing surgery who receive SABR[32].
Denominator = All patients with Stage I lung cancer not undergoing surgery.
Exclusions = Patients with SCLC, patients who decline SABR and patients who die before treatment.

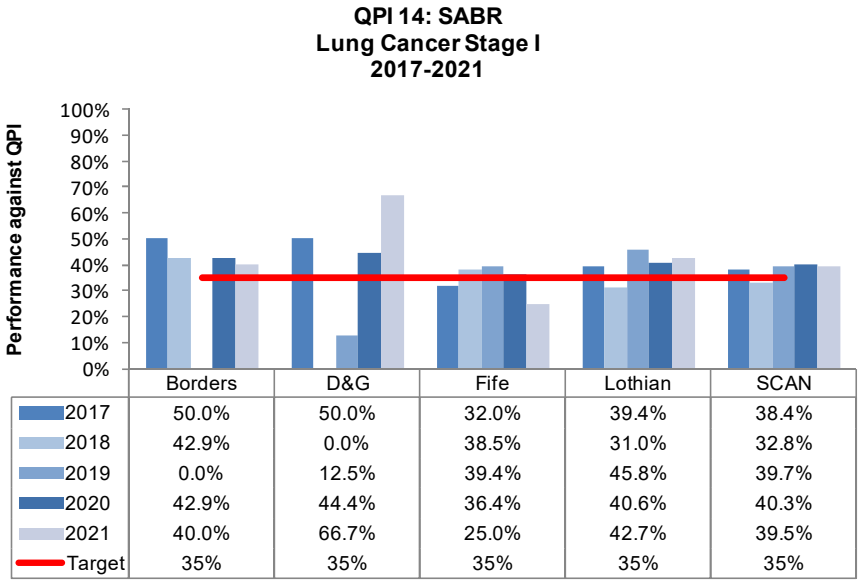
Target 35%	Borders	D&G	Fife	Lothian	SCAN
2021 cohort	89	133	321	730	1273
Ineligible for this QPI	79	111	280	596	1066
Numerator	4	4	9	47	64
Not recorded for numerator	0	0	0	0	0
Denominator	10	6	36	110	162
Not recorded for exclusions	0	0	0	0	0
Not recorded for denominator*	0	16	5	24	45
% Performance	**40.0%**	**66.7%**	**25.0%**	**42.7%**	**39.5%**

Comment

As the population ages so the incidence of lung cancer is increasing. Often these patients have multiple medical co-morbidities which preclude surgical resection or patients may decide to decline surgery. Radical radiotherapy, including SABR, provides an alternative treatment to these patients.

The QPI was passed by 3 of the 4 SCAN health boards in 2021.

The target was not met in NHS Fife with a shortfall of 10.0% (27 cases). Of these patients, 19 were for best supportive care (18 due to frailty and/or comorbidities and/or patient wishes; and 1 patient due to rapid progression to metastatic disease.), 1 patient was under a 'watch and wait' approach at the time of reporting; and the remaining 7 patients had conventional radical radiotherapy due to location (6) or tumour movement (1) making SABR targeting not technically possible.



	Borders	D&G	Fife	Lothian	SCAN
2017	50.0%	50.0%	32.0%	39.4%	38.4%
2018	42.9%	0.0%	38.5%	31.0%	32.8%
2019	0.0%	12.5%	39.4%	45.8%	39.7%
2020	42.9%	44.4%	36.4%	40.6%	40.3%
2021	40.0%	66.7%	25.0%	42.7%	39.5%
Target	35%	35%	35%	35%	35%

Formal Review Cycle 2
No changes to numerator, denominator, or exclusions. All data are comparable.

[31] Stage I: T1(mi) –T2a N0 M0
[32] SABR: Stereotactic Ablative Radiotherapy

QPI 15 Pre-Treatment Diagnosis

It is desirable to have confirmation of a cancer diagnosis prior to proceeding to definitive radical treatment. Appropriate treatment depends on accurate diagnosis which should be confirmed by cytology or histology and, it is important to inform patients and carers about the nature of the disease, the likely prognosis and treatment choices[33].

QPI 15 (i) Cytology or Histology Prior to Thoracic Surgery — Target = 75%

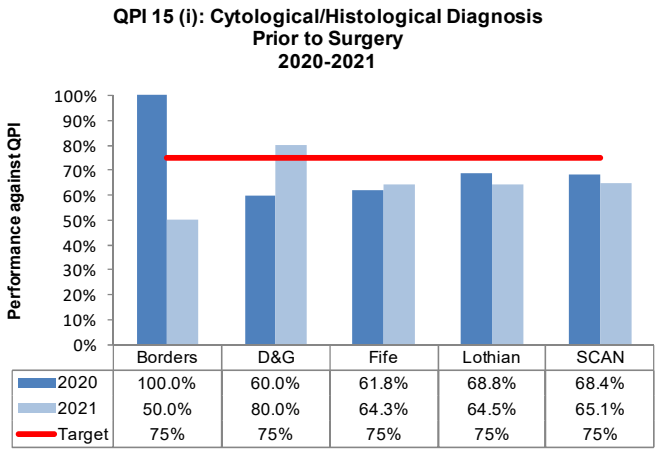
Numerator = Number of patients with lung cancer receiving surgery who have a cytological / histological diagnosis prior to definitive treatment.
Denominator = All patients with lung cancer who receive surgery.
Exclusions = Patients who decline investigations.

Target 75%	Borders	D&G	Fife	Lothian	SCAN
2021 cohort	89	133	321	730	1273
Ineligible for this QPI	79	118	293	637	1127
Numerator	5	12	18	60	95
Not recorded for numerator	0	0	0	0	0
Denominator	10	15	28	93	146
Not recorded for exclusions	0	0	0	0	0
Not recorded for denominator	0	0	0	0	0
% Performance	**50.0%**	**80.0%**	**64.3%**	**64.5%**	**65.1%**

Comment

This QPI was passed by NHS D&G in 2021 but was not met by the other 3 health boards: NHS Borders had a shortfall of 25% (5 cases); NHS Fife of 10.7% (10 cases); and NHS Lothian's shortfall was 10.5% (33 cases). Valid clinical reasons have been provided:

Pathology Investigation Contraindications	**Borders**	**Fife**	**Lothian**
Too small to biopsy	-	-	11
Inaccessible to biopsy	2	7	6
Too small & inaccessible	1	-	6
High risk or pneumothorax: at biopsy	1	-	3
Attempted biopsy: insufficient or negative pathology	1	2	5
Lengthy EBUS waiting list – straight to surgery	-	1	-
Suspected carcinoid	-	-	2
Total	5	10	33



Formal Review Cycle 2: Revision
Numerator: Treatment is now specified as *definitive*. This facilitates analyses where first treatment is reported as *watch & wait* and definitive treatment is *surgery*.

[33] "Rationale and Evidence" from Scottish Government and Healthcare Improvement Scotland: *Scottish Cancer Taskforce: Lung Cancer Clinical Quality Performance Indicators (Version 4.1: September 2021).*

It should be noted that obtaining histology or cytology prior to surgery is not always considered the most appropriate course of action nor always in the patient's best interest. Lesions might be too small or peripheral therefore inaccessible to biopsy and, it can be hard to justify multiple invasive attempts which all demonstrate negative or inconclusive histologies. All patients are discussed fully at MDM so that all approaches are considered and that all proper processes take their course.

There are a group of patients who undergo surgery, without pre-surgical pathology in place, who are found to have benign lesions when the resected tissue is examined microscopically. Data is not currently collected so the full extent of this cannot be explored.

Action: The MDT are interested in collecting data on patients who radiologically are believed to have lung cancer but at surgery are found to have benign lesions. For discussion at the next formal review.

A study by Bain, L et al[34] recommended the use of Herder Score (based on PET, size, characteristics of the tumour and smoking status). The Herder Score looks at the probability of cancer as an alternative non-invasive option in confirming the likelihood of malignancy. The action plan in 2019 recommended the recording of Herder scores at MDM for all patients who did not have pathology though had a PET CT and, were being referred for surgical resection. Recording is not yet routine practice at all MDMs or by all Audit staff and it is hoped that Herder reporting will be embedded in practice for patients diagnosed in 2022 and who are being considered for either surgical intervention or radical radiotherapy.

For this year's report, an additional audit was carried out, based on 2021 results, for patients undergoing surgery and radical radiotherapy[35] (see appendix 3). A summary of this audit is also contained in the commentary sited below QPI 15 (ii); which evaluates histology prior to radical radiotherapy.

[34] Bain L, Hainey S, Henderson W, Reid PA (Respiratory dept, Western General Hospital, Edinburgh), 2020: *Lung Cancer Patients Without Tissue Diagnosis in NHS Lothian 2016 – 2018*. The full Audit can be found in the 2020 Lung Cancer QPI Report which is available on the SCAN website.

[35] Marshall, A. *QPI 15 Audit: Lung Cancer Pre-Treatment Pathological Confirmation: prior to Surgery and Radical Radiotherapy 2021* (see Appendix 3).

QPI 15 (ii) Cytology or Histology prior to Radical Radiotherapy Target = 75%

Numerator = Number of patients with lung cancer receiving radical radiotherapy who have a cytological/histological diagnosis prior to definitive treatment.
Denominator = All patients with lung cancer who receive radical radiotherapy.
Exclusions = Patients who decline investigations.

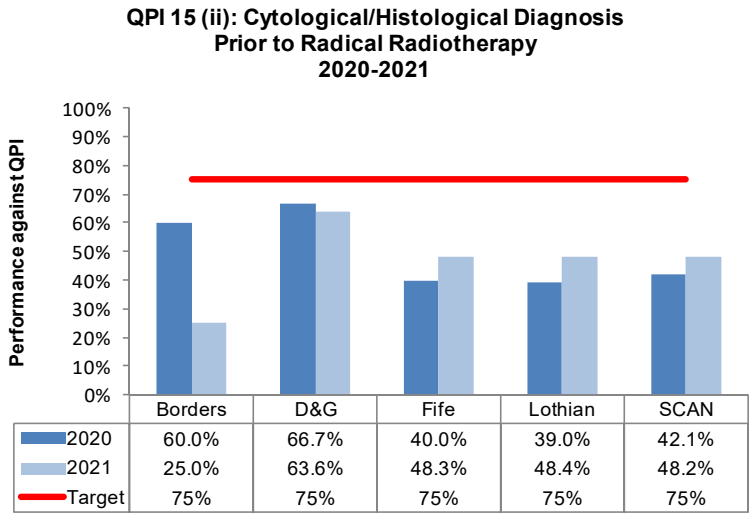
Target 75%	Borders	D&G	Fife	Lothian	SCAN
2021 cohort	89	133	321	730	1273
Ineligible for this QPI	81	122	292	637	1132
Numerator	2	7	14	45	68
Not recorded for numerator	0	0	0	0	0
Denominator	8	11	29	93	141
Not recorded for exclusions	0	0	0	0	0
Not recorded for denominator	0	0	0	0	0
% Performance	**25.0%**	**63.6%**	**48.3%**	**48.4%**	**48.2%**

Comment

Allowances should be made where small numbers and variation may be due to chance. Aggregation of results over time may be useful to clarify results where numbers are small. It should be noted that disproportionate percentages are often a consequence in the analyses of small number cohorts.

The target was not met across the SCAN region in 2020 or 2021 and this QPI continues to be challenging although the impact of small numbers should not be ignored, more particularly regarding the percentage values evidenced in 'shortfalls'. NHS Borders had a shortfall of 50% (6 cases); D&G of 11.4% (4 cases); NHS Fife 26.7% (15 cases); and NHS Lothian 26.6% (48 cases). Valid clinical reasons were provided for the majority of patients excepting 5 patients (6.8%) where no reason was documented.

Pathology Investigation Contraindications	**Borders**	**D&G**	**Fife**	**Lothian**
Poor fitness & comorbidities	3	2	1	3
Too small to biopsy	-	-	-	8
Inaccessible to biopsy	2	-	-	14
Too small & inaccessible	-	-	8	3
High risk of pneumothorax	-	1	-	12
Attempted: insufficient or negative pathology	1	1	2	7
No reason documented	0	0	4	1
Total	6	4	15	48



Formal Review Cycle 2: Revision
Numerator: Treatment was previously specified as *first* whereas is now specified as *definitive* This facilitates analyses where first treatment is reported as *watch & wait* and definitive treatment is *radical radiotherapy*.

Similarly to QPI 15 (i), obtaining histology or cytology prior to radical radiotherapy is not always considered the most appropriate course of action nor always in the patient's best interest. All patients are discussed fully at MDM so that all approaches are considered and that all proper processes take their course. This includes the recording of Herder scores which look at the probability of cancer as an alternative option to cytology or histology and its use has been recommended as a reliable indicator of the presence of malignancy.

Biopsy contraindications were examined for all patients who did not have pre-treatment histology and/or cytology as described in the comments section above. While in the majority of cases these reasons are clinically valid, further work was required to understand why attaining the target for this QPI suite is proving to be so challenging.

Action: It was agreed that an audit should be carried out to look at the standardisation of risk aversity to biopsy.

An audit was carried out by Dr Adam Marshall[36] based on 2021 results, of patients who did not have pre-treatment histology and/or cyctology undertaken prior to undergoing surgery or receiving radical radiotherapy and why this might be the case. The full audit can be found in appendix 3 while main findings are summarised below:

- The audit demonstrated that as the primary lesion reduces in size, it becomes more challenging to gain a histological or cytological diagnosis. Lesions below 3cm (T1) in size seemed to be challenging with the majority not having tissue diagnosis. Further analysis of diagnostics by lesion size across SCAN sites revealed a predictable pattern of increasing diagnostic proportion in-step with index lesion size.
- Generally rates of pre-treatment tissue diagnosis were better for patients who received surgery compared with radical radiotherapy, which is likely to reflect a fitter patient population more suitable to undergo diagnostic procedures existing in the surgical group.

QPI 15 (iii) Cytology or Histology prior to Radical Chemoradiotherapy

This QPI had been consistently achieved historically. Moreover, given that it is good medical practice to give chemotherapy *only with pathology in place* and additionally, that pathology is required to indicate the appropriate chemotherapy agent(s) to be administered, it was agreed this QPI was obsolete to requirements and it was archived at Formal Review 2.

[36] Marshall, A. *QPI 15 Audit: Lung Cancer Pre-Treatment Pathological Confirmation: prior to Surgery and Radical Radiotherapy 2021* (see Appendix 3).

QPI 16 Brain Imaging for Lung Cancer Patients with N2 Disease Target = 95%

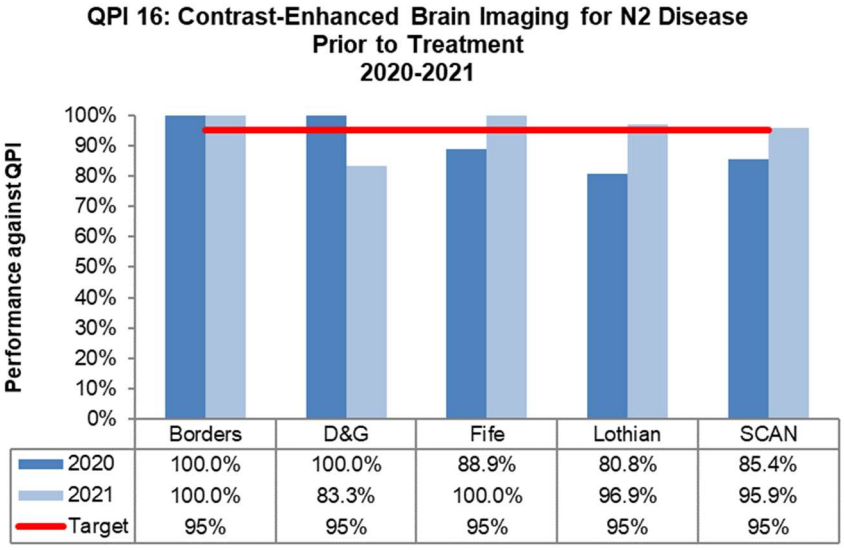
Numerator = Number of patients with lung cancer N2 disease who receive curative treatment that undergo contrast enhanced CT/MRI scanning prior to the start of definitive treatment.
Denominator = All patients with lung cancer N2 disease who receive curative treatment[37].
Exclusions = Patients who decline brain imaging and patients diagnosed with SCLC.

Target 95%	Borders	D&G	Fife	Lothian	SCAN
2021 cohort	89	133	321	730	1273
Ineligible for this QPI	85	127	311	697	1217
Numerator	4	5	7	31	47
Not recorded for numerator	0	1	0	0	1
Denominator	4	6	7	32	49
Not recorded for exclusions	0	2	0	0	2
Not recorded for denominator	0	0	3	1	6
% Performance	**100.0%**	**83.3%**	**100.0%**	**96.9%**	**95.9%**

Comment

The denominator criteria for QPI 16 generate very small cohorts. Results should therefore be viewed with a degree of caution as they may simply be a consequence of small numbers and, it should be recognised that variation may be due to chance.

QPI 16 was passed by 3 of the 4 SCAN health boards. The target was not met by NHS D&G where there was a shortfall of 11.7% (1 case). This patient had CT head performed after treatment had started. It should be noted that it may be clinically appropriate to go ahead with emergency and urgent treatment (undertaken prior to CT Head) for best patient outcomes.



Formal Review Cycle 2: Revision
Numerator: Treatment type was changed to *definitive* to facilitate analyses where first treatment is reported as *watch & wait* and definitive treatment is *radical*.
Exclusion: The standard treatment protocol for patients with limited SCLC is chemoradiotherapy followed by PCI. A CT Head prior to treatment, as such, is not a prerequisite for SCLC patients and, patients with a diagnosis of SCLC are therefore now excluded from this QPI.

[37] Curative treatment: radical radiotherapy, radical chemoradiotherapy or surgical resection.

QPI 17: Clinical Trials

This QPI is to be replaced with a standardised and centralised report across all tumour sites which will be reported via the NHS Research Scotland Central Management Team in due course.

Further information on clinical trials and reporting in the SCAN region can be obtained from Dorothy Boyle, Cancer Research Network Manager, dorothy.boyle@nhslothian.scot.nhs.uk

Discussions by the SCAN Lung Cancer Group have considered the inclusion of diagnostic and outcome trials in respiratory medicine and surgery. These, however, are not registered on the SCRN[38] database which is the source endorsed by PHS to measure the clinical trials QPI. Discussions are ongoing regarding capturing data for these trials. In the meantime, using SCRN data allows for comparison with CSO (Chief Scientist Office) published data and ensures capture of all clinical trials activity. The principal benefit of this approach is that this data is already collected using a robust mechanism[39].

There are also studies that consent via BioResource which are not classified as 'true' clinical trials in that they offer no 'direct' benefit to the patient. Patients donate samples for laboratory research and to all intents and purposes the tissue is the research subject and not the patient.

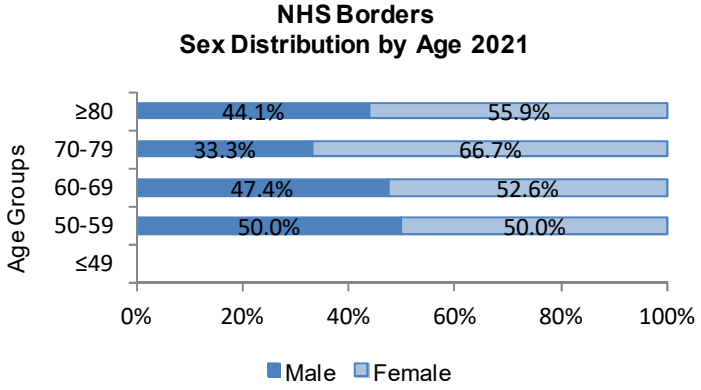
Total recruitment remains very low. Lung clinical trial eligibility criteria are complex and challenging which prevents many patients from entering trials. Traditionally most lung cancer trials have been geared towards targeted therapies and funded commercially, but going forward new trials for palliative patients, and with less exclusion criteria, are becoming available.

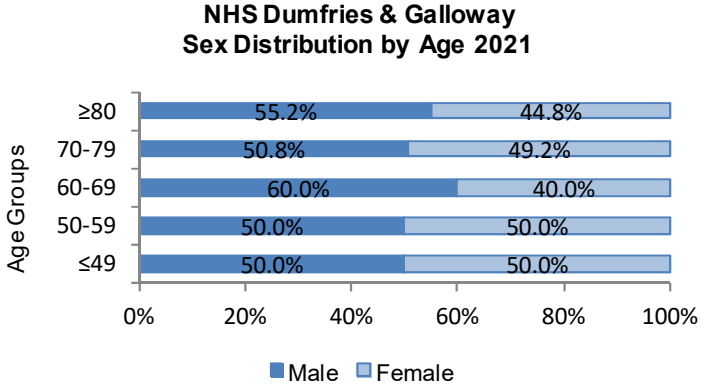
[38] SCRN: Scottish Cancer Research Network
[39] Clinical Trial & Research Access Quality Performance Indicators published by HIS; updated to v.2, October 2017.

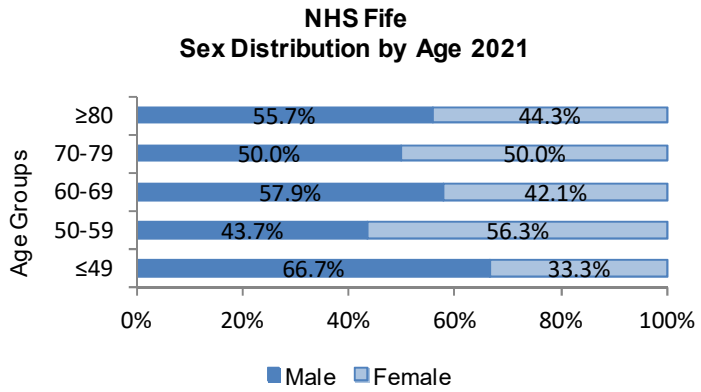
Appendices
Appendix 1: Key Categories

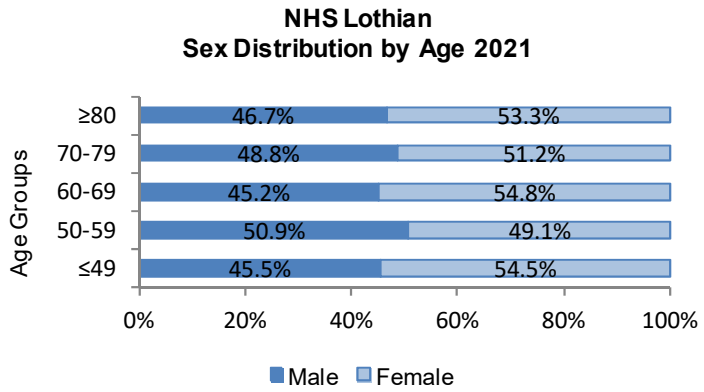
Tables: Patients diagnosed with lung cancer January to December 2021
Charts: Patients diagnosed with lung cancer January to December 2021 or cumulative results over a series of years as indicated.

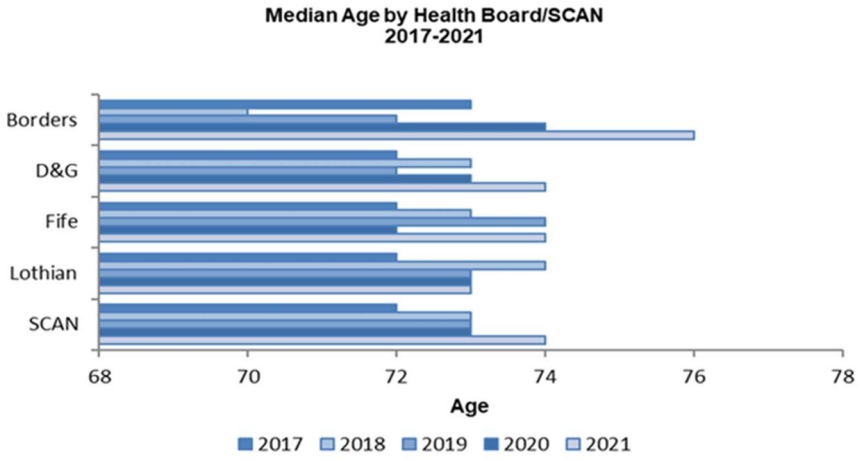
Age & Sex Distribution 2021	Borders	D&G	Fife	Lothian	SCAN
Age: Median	76	74	74	73	74
Age: Range	50-95	40-98	36-96	35-97	35-98

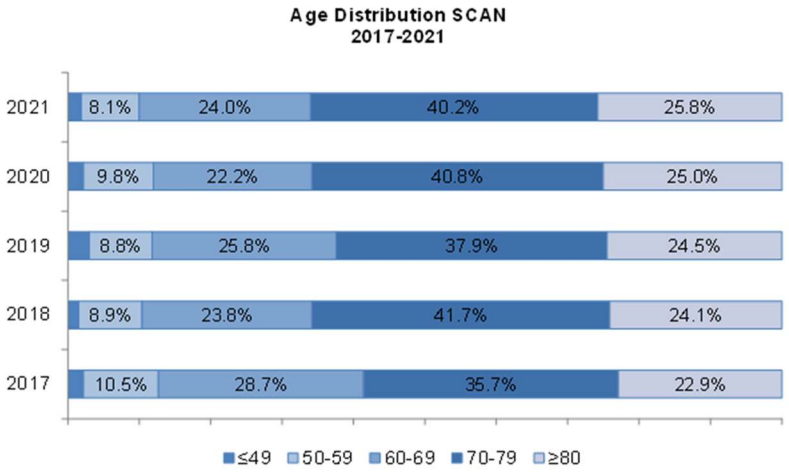






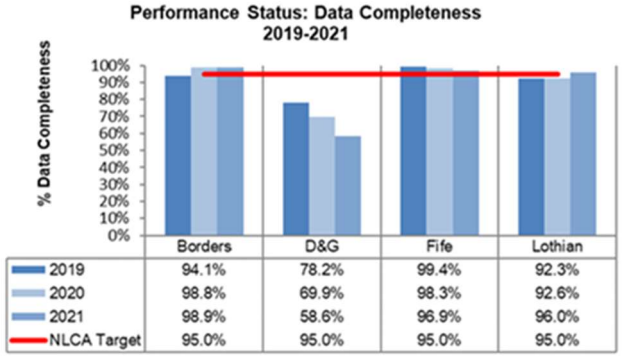






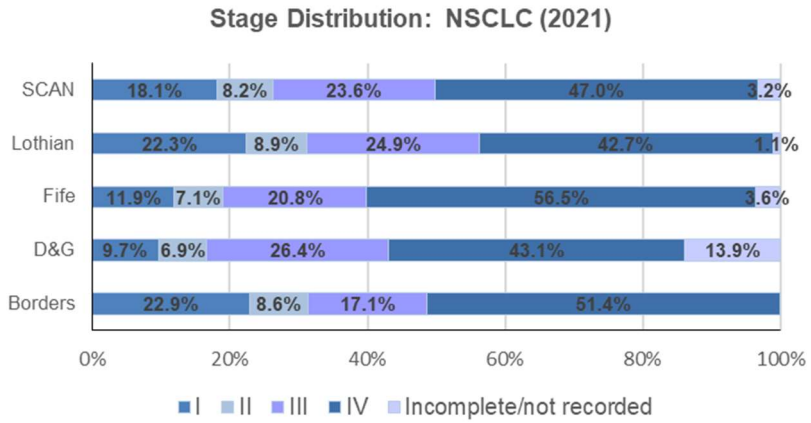
Performance Status (PS): All patients diagnosed with lung cancer
2021

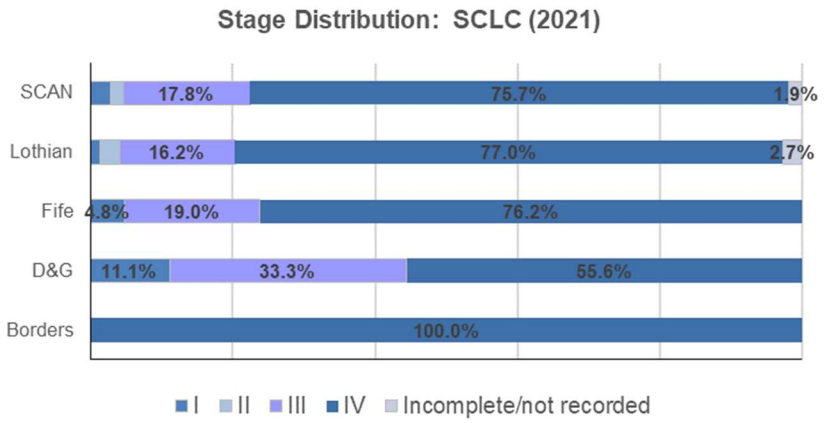
	Borders		D&G		Fife		Lothian		SCAN	
PS 0	6	6.7%	17	12.8%	31	9.7%	102	14.0%	156	12.3%
PS 1	37	41.6%	26	19.5%	86	26.8%	230	31.5%	379	29.8%
PS 2	27	30.3%	24	18.0%	79	24.6%	152	20.8%	282	22.2%
PS 3	16	18.0%	9	6.8%	94	29.3%	155	21.2%	274	21.5%
PS 4	2	2.2%	2	1.5%	21	6.5%	62	8.5%	87	6.8%
Not recorded	1	1.1%	55	41.4%	10	3.1%	29	4.0%	95	7.5%
Total	**89**		**133**		**321**		**730**		**1273**	

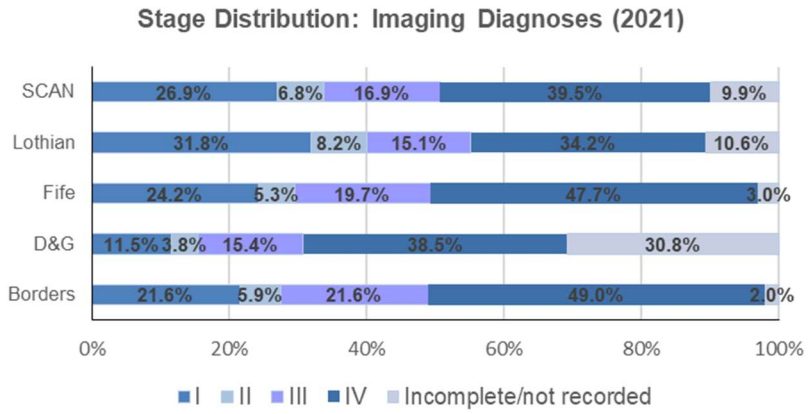


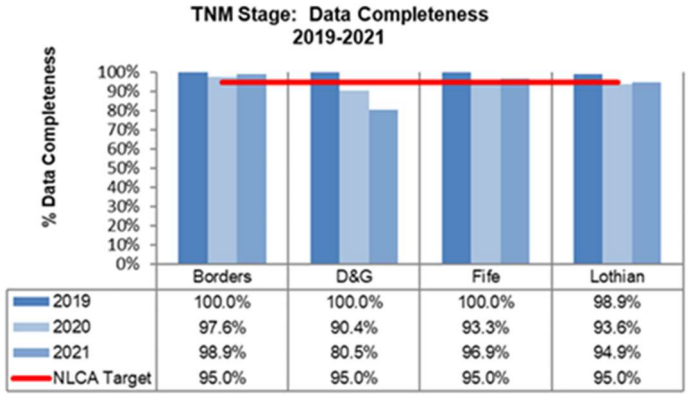
Data completeness is useful in providing a benchmark for robust and comprehensive results. It is therefore vital that high levels should be maintained. Recording of performance status has steadily fallen in Dumfries and Galloway over the last 3 years and an action has been put in place, as part of this Report, to encourage more complete PS reporting at MDT meetings. Improvements are anticipated in 2022 and 2023 results.

Stage Grouping: All patients diagnosed with lung cancer 2021	Borders		D&G		Fife		Lothian		SCAN	
I	19	21.3%	14	10.5%	53	16.5%	179	24.5%	265	20.8%
II	6	6.7%	7	5.3%	19	5.9%	58	7.9%	90	7.1%
III	17	19.1%	30	22.6%	65	20.2%	145	19.9%	257	20.2%
IV	46	51.7%	56	42.1%	174	54.2%	311	42.6%	587	46.1%
Incomplete	1	1.1%	17	12.8%	17	12.8%	12	1.6%	36	2.8%
Not recorded	-	-	9	6.8%	9	6.8%	25	3.4%	38	3.0%
Total	**89**		**133**		**321**		**730**		**1273**	



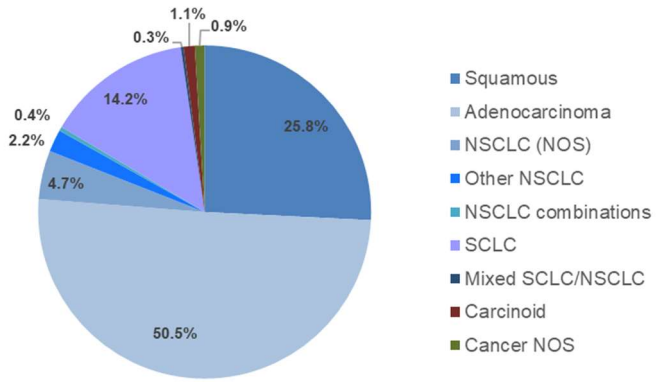




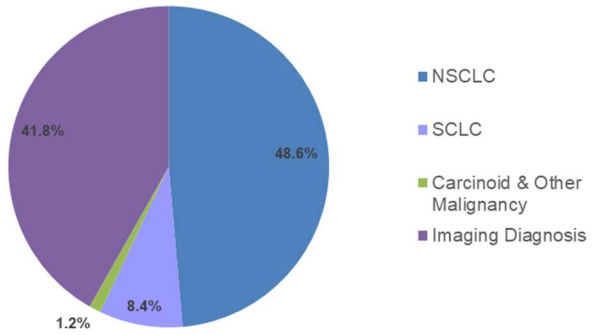


Pathology Type										
2021	**Borders**		**D&G**		**Fife**		**Lothian**		**SCAN**	
Squamous	7	7.9%	20	15.0%	51	15.9%	113	15.5%	191	15.0%
Adenocarcinoma	21	23.6%	45	33.8%	102	31.8%	206	28.2%	374	29.4%
NSCLC (NOS)	2	2.2%	3	2.3%	12	3.7%	18	2.5%	35	2.7%
Other specific NSCLC	-	-	4	3.0%	3	0.9%	9	1.2%	16	1.3%
NSCLC combination	-	-	-	-	-	-	3	0.4%	3	0.2%
SCLC	3	3.4%	8	6.0%	21	6.5%	73	10.0%	105	8.2%
SCLC/NSCLC mixed	-	-	1	0.8%	-	-	1	0.1%	2	0.2%
Carcinoid	-	-	-	-	-	-	8	1.1%	8	0.6%
Other malignancy	-	-	-	-	-	-	7	1.0%	7	0.5%
Negative Pathology	6	6.7%	2	1.5%	8	2.5%	20	2.7%	36	2.8%
Declined Investigation	1	1.1%	15	11.3%	7	2.2%	37	5.1%	60	4.7%
No Pathology	49	55.1%	35	26.3%	117	36.4%	235	32.2%	436	34.2%
Not recorded	-	-	-	-	-	-	-	-	-	-
Total	**89**		**133**		**321**		**730**		**1273**	
NSCLC	30	33.7%	72	54.1%	168	52.3%	349	47.8%	619	48.6%
SCLC	3	3.4%	9	6.8%	21	6.5%	74	10.1%	107	8.4%
Carcinoid & other	-	-	-	-	-	-	15	2.1%	15	1.2%
Radiological diagnosis	56	62.9%	52	39.1%	132	41.1%	292	40.0%	532	41.8%

Pathology Subtypes Lung Cancer 2021
SCAN Region (n=741)

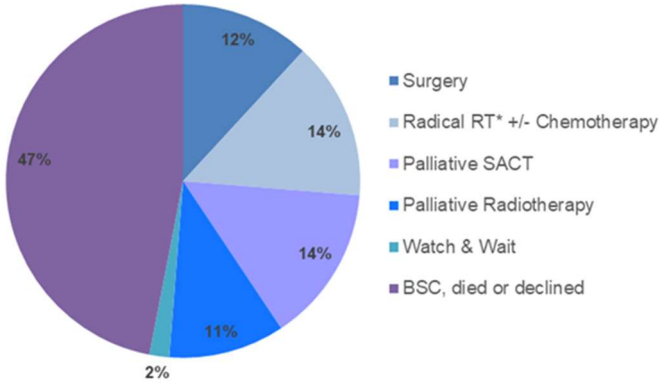


Pathological Diagnosis Lung Cancer 2021
SCAN Region (n=1273)

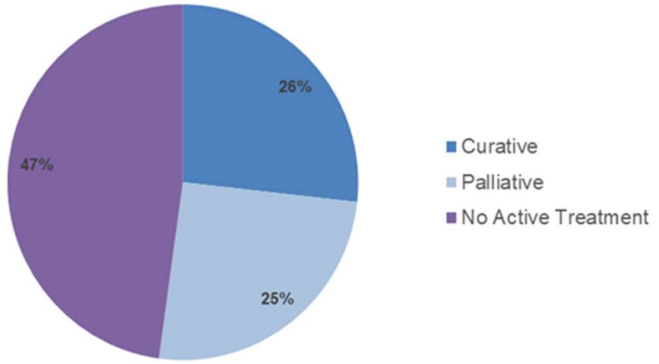


First Treatment 2021	Borders		D&G		Fife		Lothian		SCAN	
Surgery	10	11.2%	15	11.3%	30	9.3%	96	13.2%	151	11.9%
SABR	3	3.4%	3	2.3%	10	3.1%	51	7.0%	67	5.3%
Radical Radiotherapy	5	5.6%	8	6.0%	18	5.6%	42	5.8%	73	5.7%
Chemoradiotherapy	2	2.2%	6	4.5%	10	3.1%	26	3.6%	44	3.5%
Palliative Chemotherapy	4	4.5%	5	3.8%	14	4.4%	46	6.3%	69	5.4%
Chemoimmunotherapy	5	5.6%	3	2.3%	8	2.5%	27	3.7%	43	3.4%
Immunotherapy	2	2.2%	6	4.5%	13	4.0%	23	3.2%	44	3.5%
Targeted Therapy	1	1.1%	3	2.3%	9	2.8%	14	1.9%	27	2.1%
Palliative Radiotherapy	10	11.2%	13	9.8%	34	10.6%	78	10.7%	135	10.6%
Watchful Waiting	-	-	4	3.0%	8	2.5%	11	1.5%	23	1.8%
Best Supportive Care (BSC)	41	46.1%	62	46.6%	150	46.7%	299	41.0%	552	43.4%
Declined all therapies	5	5.6%	2	1.5%	4	1.2%	5	0.7%	16	1.3%
Died before treatment	1	1.1%	3	2.3%	13	4.0%	12	1.6%	29	2.3%
Total	**89**		**133**		**321**		**730**		**1273**	

First Treatment Lung Cancer 2021
SCAN Region (n=1273)



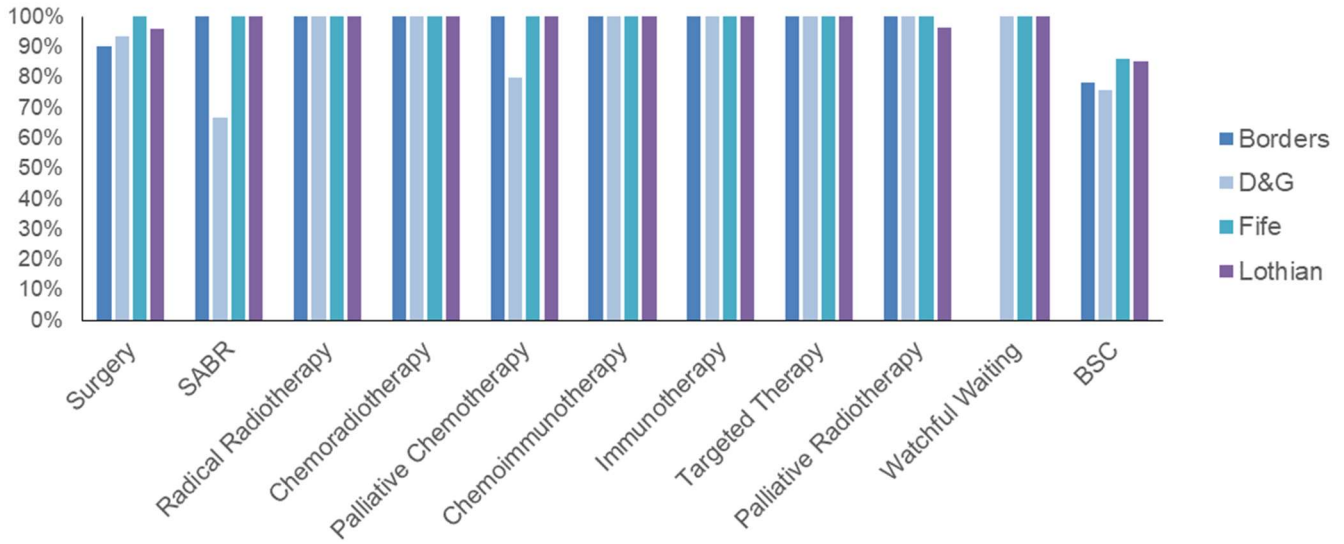
First Treatment by Type Lung Cancer 2021
SCAN Region (n=1273)



* Radical RT includes SABR or conventional radical radiotherapy

Lung Clinical Nurse Specialists 2021	Borders		D&G		Fife		Lothian		SCAN	
Contact with LCNS	78	87.6%	114	85.7%	289	90.0%	678	92.9%	1159	91.0%

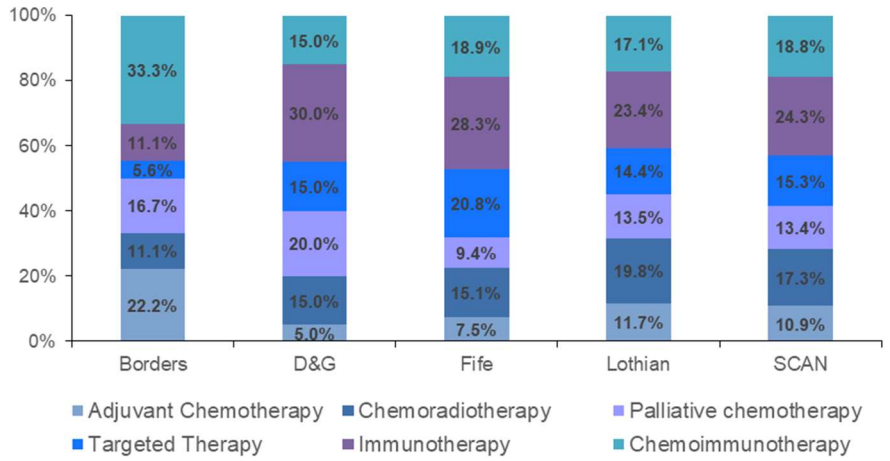
% Patients seen by CNS by First Treatment by Health Board in SCAN Region 2021



Surgical Resection 2021	Borders		D&G		Fife		Lothian		SCAN	
Pneumonectomy	-	-	-	-	1	3.4%	3	3.1%	4	2.7%
Lobectomy	9	90.0%	14	93.3%	27	93.1%	82	85.4%	132	88.0%
Wedge	-	-	1	6.7%	-	-	8	8.3%	9	6.0%
Segmental	1	10.0%	-	-	1	3.4%	3	3.1%	5	3.3%
Other surgery	-	-	-	-	-	-	-	-	-	-
Total	**10**		**15**		**29**		**96**		**150**	
Declined Surgery	-	-	2	1.5%	1	0.3%	7	1.0%	10	0.8%
Died before Surgery	-	-	-	-	-	-	1	0.1%	1	0.1%
% Lung Cancer Patients having Surgery		**11.2%**		**11.3%**		**9.3%**		**13.2%**		**11.9%**

SACT: NSCLC 2021	Borders		D&G		Fife		Lothian		SCAN	
Adjuvant* chemotherapy	4	22.2%	1	5.0%	4	7.5%	13	11.7%	22	10.9%
Chemoradiotherapy	2	11.1%	3	15.0%	8	15.1%	22	19.8%	35	17.3%
Palliative chemotherapy	3	16.7%	4	20.0%	5	9.4%	15	13.5%	27	13.4%
Targeted Therapy (TKIs)	1	5.6%	3	15.0%	11	20.8%	16	14.4%	31	15.3%
Immunotherapy	2	11.1%	6	30.0%	15	28.3%	26	23.4%	49	24.3%
Chemoimmunotherapy	6	33.3%	3	15.0%	10	18.9%	19	17.1%	38	18.8%
TOTAL	**18**		**20**		**53**		**111**		**202**	
Declined SACT	-	-	8	11.1%	8	4.8%	22	6.3%	38	6.1%
Patient died before SACT	-	-	-	-	6	3.6%	6	1.7%	12	1.9%
Total NSCLC & % receiving SACT	**35**	**51.4%**	**72**	**27.8%**	**168**	**31.5%**	**349**	**31.8%**	**624**	**32.4%**

Patients diagnosed with NSCLC in 2021: SACT by Health Board/SCAN Region

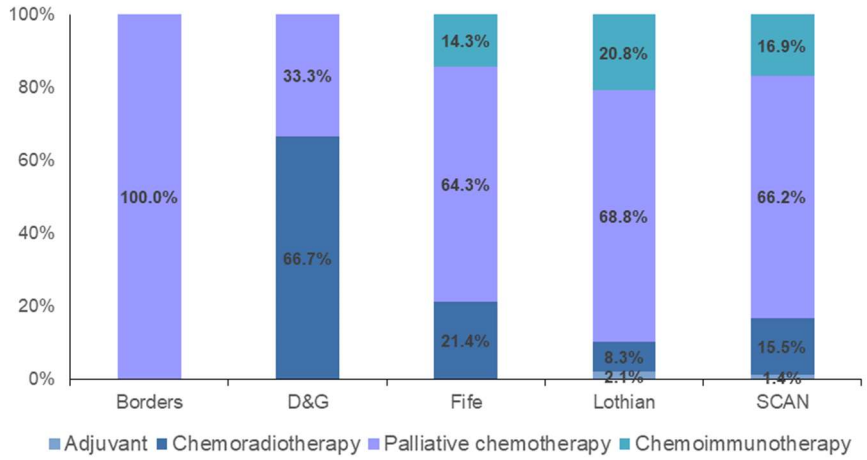


*ADJUVANT treatment in the above table refers to adjuvant **chemotherapy following surgery.** Other possible adjuvant SACT treatments post-surgery are chemoradiotherapy, TKIs, & immunotherapy and, following chemoradiotherapy there is an option of adjuvant immunotherapy. Adjuvant SACT numbers in total are shown below:

	Borders	D&G	Fife	Lothian	SCAN
Post-Surgery					
Adjuvant chemotherapy	4	1	4	13	22
Adjuvant chemoradiotherapy	-	-	1	1	2
Adjuvant TKIs	-	-	-	2	2
Post-Chemoradiotherapy					
Adjuvant immunotherapy	2	-	3	8	13

SACT: SCLC 2021	Borders		D&G		Fife		Lothian		SCAN	
Adjuvant* chemotherapy	-	-	-	0.0%	-	0.0%	1	2.1%	1	1.4%
Chemoradiotherapy	-	-	4	66.7%	3	21.4%	4	8.3%	11	15.5%
Palliative chemotherapy	3	100.0%	2	33.3%	9	64.3%	33	68.8%	47	66.2%
Chemoimmunotherapy	-	-	-	-	2	14.3%	10	20.8%	12	16.9%
TOTAL	**3**		**6**		**14**		**48**		**71**	
Declined SACT	-	-	1	11.1%	1	4.8%	7	9.5%	9	8.4%
Patient died before SACT	-	-	-	-	1	4.8%	-	0.0%	1	0.9%
Total SCLC & % receiving SACT	**3**	**100.0%**	**9**	**66.7%**	**21**	**66.7%**	**74**	**64.9%**	**107**	**66.4%**

Patients diagnosed with SCLC in 2021: SACT by Health Board/SCAN Region

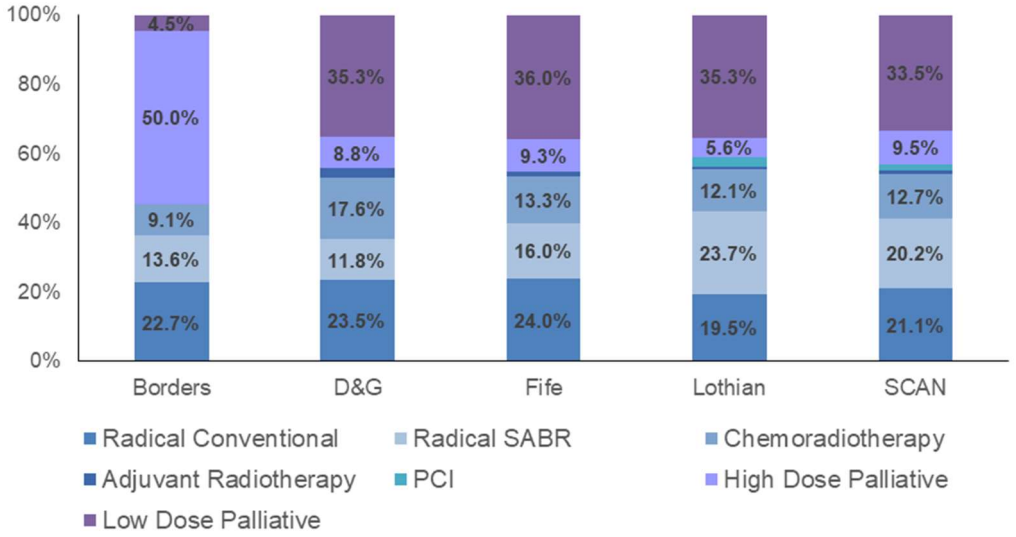


*ADJUVANT treatment in the above table refers only to adjuvant **chemotherapy following surgery.** A further possible adjuvant SACT treatment for patients diagnosed with SCLC and following on from surgery is chemoradiotherapy. Adjuvant SACT numbers in total are shown below:

	Borders	D&G	Fife	Lothian	SCAN
Post-Surgery					
Adjuvant chemotherapy	-	-	-	1	1
Adjuvant chemoradiotherapy	-	1	-	-	1

Radiotherapy 2021	Borders		D&G		Fife		Lothian		SCAN	
Radical radiotherapy: conventional	5	22.7%	8	23.5%	18	24.0%	42	19.5%	73	21.1%
Radical radiotherapy: SABR	3	13.6%	4	11.8%	12	16.0%	51	23.7%	70	20.2%
Chemoradiotherapy	2	9.1%	6	17.6%	10	13.3%	26	12.1%	44	12.7%
Adjuvant radiotherapy	-	-	1	2.9%	1	1.3%	2	0.9%	4	1.2%
Prophylactic Cranial Irradiation (PCI)	-	-	-	-	-	-	6	2.8%	6	1.7%
High dose palliative radiotherapy	11	50.0%	3	8.8%	7	9.3%	12	5.6%	33	9.5%
Low dose palliative radiotherapy	1	4.5%	12	35.3%	27	36.0%	76	35.3%	116	33.5%
TOTAL	**22**		**34**		**75**		**215**		**346**	
Declined radiotherapy	3	3.4%	3	2.3%	3	0.9%	9	1.2%	18	1.4%
Patient died before radiotherapy	-	-	2	1.5%	5	1.6%	4	0.5%	11	0.9%
Distribution of Radiotherapy Given										
Radical	10	45.5%	19	55.9%	41	54.7%	121	56.3%	191	55.2%
Palliative	12	54.5%	15	44.1%	34	45.3%	94	43.7%	155	44.8%
TOTAL	**22**		**34**		**75**		**215**		**346**	
Total lung cancer & % receiving RT	**89**	**24.7%**	**133**	**25.6%**	**321**	**23.4%**	**733**	**29.3%**	**1276**	**27.1%**

Patients diagnosed with Lung Cancer 2021: Radiotherapy by Health Board/SCAN Region



Appendix 2: Historical QPI Attainment Summary – 2020

Lung Cancer QPI Attainment Summary 2020			Target %	Borders		D&G		Fife		Lothian		SCAN	
QPI 1 MDT discussion prior to definitive treatment			95	N 85 D 85	100%	N 131 D 136	96.3%	N 299 D 299	100%	N 686 D 719	95.4%	N 1201 D 1239	96.9%
QPI 2 Pathological Diagnosis	All patients with lung cancer		80	N 51 D 64	79.7%	N 64 D 105	61.0%	N 130 D 168	77.4%	N 374 D 479	78.1%	N 619 D 818	75.7%
	NSCLC with sub-type identified		90	N 40 D 44	90.9%	N 53 D 54	98.1%	N 120 D 130	92.3%	N 343 D 372	92.2%	N 556 D 600	92.7%
	NSCLC IIIB-IV: PDL1 testing		80	N 28 D 35	80.0%	N 40 D 41	97.6%	N 83 D 94	88.3%	N 207 D 241	85.9%	N 358 D 411	87.1%
*QPI 6 Surgical resection in NSCLC patients		All NSCLC	20	N 9 D 44	20.5%	N 14 D 54	25.9%	N 34 D 123	27.6%	N 89 D 372	23.9%	N 146 D 593	24.6%
		NSCLC stage I-II	60	N 9 D 9	100%	N 9 D 10	90.0%	N 22 D 28	78.6%	N 82 D 106	77.4%	N 122 D 153	79.7%
*QPI 7 Lymph node assessment for NSCLC patients having pneumonectomy or lobectomy			80	Analysis is by Hospital of Surgery: RIE								N 111 D 135	82.2%
QPI 8 Radiotherapy (including SABR) for inoperable lung cancer			35	N 5 D 13	38.5%	N 6 D 16	37.5%	N 23 D 61	37.7%	N 95 D 173	54.9%	N 129 D 263	49.0%
QPI 9 Chemoradiotherapy for locally advanced NSCLC			50	N 0 D 1	0.0%	N 0 D 1	0.0%	N 4 D 6	66.7%	N 11 D 15	73.3%	N 15 D 23	65.2%
QPI 10 Chemoradiotherapy for limited stage SCLC			70	N 0 D 0	n/a	N 0 D 0	n/a	N 2 D 2	100%	N 0 D 1	0.0%	N 2 D 3	66.7%
QPI 12 SACT for patients with SCLC	All types of chemotherapy for SCLC		70	N 10 D 12	83.3%	N 9 D 10	90.0%	N 13 D 20	65.0%	N 22 D 48	45.8%	N 54 D 90	60.0%
	Palliative chemotherapy for SCLC patients having treatment with non-curative intent		50	N 9 D 11	81.8%	N 5 D 6	83.3%	N 8 D 15	53.3%	N 19 D 43	44.2%	N 41 D 75	54.7%
*QPI 13.1 30 Day Mortality After Treatment		*Surgery	<5	Analysis is by Hospital of Surgery: RIE								N 1 D 172	0.6%
		Radical Radiotherapy	<5	N 0 D 5	0.0%	N 0 D 9	0.0%	N 0 D 25	0.0%	N 0 D 82	0.0%	N 0 D 121	0.0%
		Adjuvant Chemotherapy	<5	N 0 D 1	0.0%	N 0 D 0	n/a	N 0 D 6	0.0%	N 0 D 11	0.0%	N 0 D 18	0.0%
		Chemoradiotherapy	<5	N 0 D 4	0.0%	N 1 D 8	12.5%	N 0 D 9	0.0%	N 1 D 26	3.8%	N 2 D 47	4.3%

Lung Cancer QPI Attainment Summary 2020		Target %	Borders	D&G	Fife	Lothian	SCAN
QPI 13.1 30 Day (cont.)	Palliative Chemotherapy (NSCLC)	<10	Centralised reports will be available from ChemoCare in due course.				
	Palliative Chemotherapy (SCLC)	<15					
	Biological Therapy (NSCLC)	<10					
*QPI 13.2 90 Day Mortality After Treatment	*Surgery	<5	Analysis is by Hospital of Surgery: RIE				N 2 D 172 1.2%
	Radical Radiotherapy	<5	N 0 D 5 0.0%	N 0 D 8 0.0%	N 0 D 25 0.0%	N 1 D 82 1.2%	N 1 D 121 0.8%
	Chemoradiotherapy	<5	N 0 D 4 0.0%	N 1 D 8 12.5%	N 0 D 9 0.0%	N 2 D 26 7.7%	N 3 D 47 6.4%
QPI 14 SABR for Inoperable Lung Cancer with Stage I Disease		35	N 3 D 7 42.9%	N 4 D 9 44.4%	N 8 D 22 36.4%	N 39 D 96 40.6%	N 54 D 134 40.3%
QPI 15 Cytological/Histological Diagnosis Prior to Definitive Treatment	Surgery	75	N 10 D 10 100%	N 9 D 15 60.0%	N 21 D 34 61.8%	N 66 D 96 68.8%	N 106 D 155 68.4%
	Radical Radiotherapy	75	N 3 D 5 60.0%	N 6 D 9 66.7%	N 10 D 25 40.0%	N 32 D 82 39%	N 51 D 121 42.1%
QPI 16 Contrast CT/MRI for N2 Pts Prior to Definitive Treatment		95	N 1 D 1 100%	N 5 D 5 100%	N 8 D 9 88.9%	N 21 D 26 80.8%	N 35 D 41 85.4%
Clinical Trials N=patients consented to trials/research and held on SCRN database. D= 5year average from Cancer Registry		15	N 2 D 105 1.9%	N 0 D 154 0.0%	N 2 D 361 0.6%	N 100 D 755 13.2%	N 104 D 1375 7.6%

Target Met	Target Not Met	Not applicable

* D&G patients have surgery at Golden Jubilee Hospital, Clydebank and are therefore included in WOSCAN's (West of Scotland Cancer Network) report for QPIs 7, 13(i) and 13(ii) – all reported by HOSPITAL OF SURGERY.
All patients in NHS Borders, Fife and Lothian have thoracic surgery at the Royal Infirmary of Edinburgh (RIE).
Some patients from outwith the SCAN area have surgery at RIE, e.g. patients referred from Tayside. These are identified throughout the report as required.
SCAN totals are therefore not appropriate for QPIs 7 & 13(i) & 13(ii) and are marked as *not applicable*.

Note: Allowance should be made where small numbers and variation may be due to chance and manifest as disproportionate percentages, which can distort results both positively and negatively. These should be viewed with a degree of caution.

Appendix 3: Pre-Treatment Pathological Confirmation of Cancer Diagnosis prior to Surgical Resection and Radical Radiotherapy Audit

QPI 15 Audit: Lung Cancer Pre-Treatment Pathological Confirmation: prior to Surgery and Radical Radiotherapy 2021
Dr Adam Marshall, Consultant Respiratory Medicine, NHS Lothian.

It is desirable to have confirmation of a cancer diagnosis before proceeding to definitive radical treatment; QPI 15 sets an expected target of achieving this of 75% in both radical surgical and radiotherapy interventions. It has been recognised that this target is commonly missed in SCAN and in other cancer networks.

This is because cancer suitable for curative treatment is identified at an earlier stage and therefore more challenging to sample in a minimally invasive manner. Additionally access to diagnostic interventions and clinician expertise is variable across sites leading to potential disparity.

How often do we meet the 75% target- by site in SCAN?

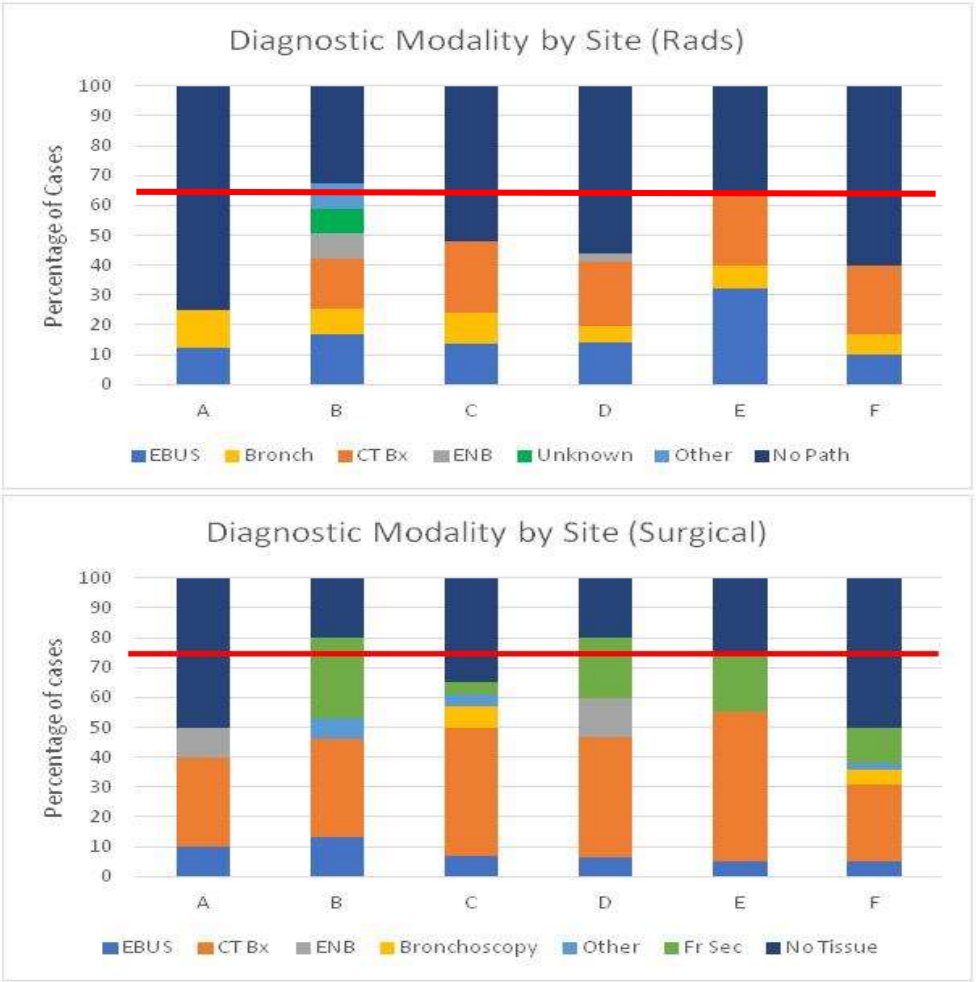


Figure 1. Diagnostic Modality across sites (A, B, C, D, E and F). EBUS- Endobronchial Ultrasound; CT Bx- CT Biopsy; ENB- Electromagnetic Navigation Bronchoscopy, Fr Sec- Frozen Section.

Generally rates of pre-treatment tissue diagnosis were better for patients who received surgery compared with radical radiotherapy. This is likely to reflect a fitter patient population more suitable to undergo diagnostic procedures in the surgical group.

In the radiotherapy cohort, bronchoscopic methods of tissue diagnosis (Bronchoscopy, EBUS and ENB) were more commonly used to reach a tissue diagnosis compared with the surgical group reflecting a higher proportion of N1 and N2 disease / central airway disease in this patient cohort.

How does lesion size influence diagnostic modality?

Further analysis of diagnostics by lesion size across SCAN sites revealed a predictable pattern of increasing diagnostic proportion in step with index lesion size.

Percentage (n) with Tissue Diagnosis prior to Radical Radiotherapy by Site

	A	B	C	D	E	F	**ALL**
1-10mm	NA	0% (1)	0% (3)	0% (1)	NA	0% (2)	**0% (7)**
11-20mm	0% (2)	0% (1)	0% (4)	13% (15)	33% (6)	11% (9)	**20% (37)**
21-30mm	0% (3)	50% (2)	66% (6)	46% (13)	25% (4)	43% (7)	**43% (35)**
31-40mm	NA	NA	40% (10)	100% (3)	75% (8)	40% (5)	**58% (26)**
>40mm	66% (3)	100% (6)	100% (6)	100% (5)	100% (7)	86% (7)	**94% (34)**
Total	25% (8)	70% (10)	48% (29)	43% (37)	64% (25)	40% (30)	**139**

Percentage (n) with Tissue Diagnosis prior to Surgical Intervention by Site

	A	B	C	D	E	F	**ALL**
1-10mm	NA	0% (1)	50% (2)	0% (1)	0% (1)	0% (1)	**17% (6)**
11-20mm	0% (2)	0% (3)	40% (10)	38% (15)	20% (5)	31% (16)	**31% (51)**
21-30mm	66% (3)	100% (4)	80% (5)	85% (7)	33% (3)	33% (15)	**59% (37)**
31-40mm	50% (2)	67% (3)	50% (4)	100% (3)	67% (6)	33% (3)	**64% (21)**
>40mm	100% (3)	50% (4)	86% (7)	100% (3)	100% (5)	63% (8)	**76% (30)**
Total	60% (10)	53% (15)	61% (28)	62% (29)	55% (20)	37% (43)	**145**

As the primary lesion reduces in size, it becomes more challenging to gain a histological or cytological diagnosis. Lesions below 3cm (T1) in size seemed to be challenging with the majority not having tissue diagnosis. Site F is an outlier in pre-operative diagnoses but does have a higher proportion of T1 sized lesions.

How does lesion size affect choice of diagnostic modality across SCAN?

For the purposes of this analysis patients with cancer diagnosed by frozen section were considered to ***not*** have a pre- treatment diagnosis as they went for surgical intervention without diagnostic clarity[40].

Diagnostic Modality by Lesion Size – Radical Radiotherapy

	EBUS	Bronch	ENB	CTBx	Other	No Tissue
1-10mm	0%	0%	0%	0%	0%	100%
11-20mm	0%	0%	0%	19%	0%	80%
21-30mm	14%	6%	3%	17%	0%	57%
31-40mm	19%	12%	0%	27%	0%	42%
>40mm	35%	18%	3%	35%	3%	6%

Diagnostic Modality by Lesion Size – Surgery

	EBUS	Bronch	ENB	CTBx	Other	No Tissue
1-10mm	0%	0%	0%	0%	17%	83%
11-20mm	2%	0%	2%	25%	0%	68%
21-30mm	5%	5%	5%	38%	5%	41%
31-40mm	18%	5%	5%	36%	0%	36%
>40mm	12%	6%	0%	53%	0%	24%

No Tissue- Lothian only

[40] At QPI Formal Review Cycle 2, it was agreed that frozen section should be included within the definition of pre-operative histology. This was implemented in 2020 in the QPI process although as indicated above are not included in this Audit.

In Lothian (3 hospital sites) there were 81 patients who had no tissue prior to radical treatment- 48 who went on to have radical radiotherapy and 33 who had surgical resection.
We retrospectively assessed their radiology to see if there was evidence of bronchus leading to the lesion (bronchus sign positive) and graded these as:

0- no bronchus sign
1- bronchus running along lesion, and
2- bronchus entering lesion

The latter is associated with a significant increase in diagnostic yield at electromagnetic navigation bronchoscopy (ENB).

Reason for no CT Bx – Radical Radiotherapy

Reason for No CT Bx/ Number	Bronchus Sign			% Potentially suitable Navigation Bronchoscopy
	0	1	2	
PTX Risk	8	0	4	33%
GGO	1	0	0	100%
Location	13	3	3	32%
Non-diagnostic CT Biopsy	2	0	1	33%
Size	7	2	2	36%
Unknown	0	0	2	100%

Reason for no CT Bx – Surgery

Reason for No CT Bx/ Number	Bronchus Sign			% Potentially suitable Navigation Bronchoscopy
	0	1	2	
Susp Carcinoid	0	1	1	100%
Non-diagnostic CT Biopsy	0	1	1	100%
GGO	0	1	2	100%
Location	2	3	5	80%
PTX risk	1	1	1	66%
Size	7	1	2	30%
Unknown	0	2	1	100%

Lesion size and CT Biopsy across SCAN

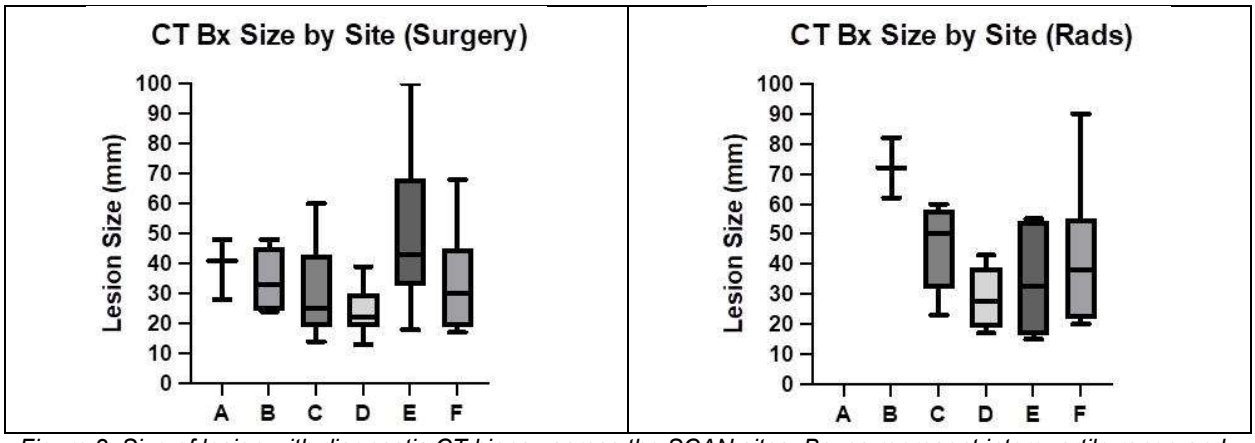


Figure 2. Size of lesion with diagnostic CT biopsy across the SCAN sites. Boxes represent interquartile range and whiskers represent range.

Much smaller numbers of patients had a CT biopsy at sites A & B although total numbers at these sites are also small, lesion sizes at those sites also tended to be bigger. It may be that sites that perform more frequent percutaneous biopsy on smaller lesions could be asked to review challenging cases to see if they are suitable for percutaneous approach.

In total, 100 patients had an attempted CT biopsy. Four patients had the procedure abandoned on the table, with a diagnostic yield within this cancer group of 87.5%. In this group, 42% of CT guided biopsies were performed for lesions <3cm.
A total of 9 patients had a ENB procedure with a diagnostic yield in this cohort of 66%. This population are a selected group of those deemed unsuitable for CT biopsy. In this group 66% of ENB were performed in lesions <3cm.

Summary

- As we pursue radical treatment for smaller lesions this presents a diagnostic challenge. If in the future lung cancer screening leads to a stage shift it could be anticipated that our pre-treatment tissue diagnostic rates will decline given current practice.

- Current guidance advocates a straight to surgery approach for lesions with a high probability of malignancy but as numbers of patients treated increase, radical treatment of benign disease is inevitable with the potential for significant patient harm.

- The lesions which provide the most significant diagnostic difficulty are T1 tumours. CT biopsy is our most frequently used diagnostic tool but utilisation across SCAN sites is variable likely reflecting variation in local expertise.

- If we wish to improve pre- treatment diagnostics then therefore, we should consider
    - Increasing accessibility of CT biopsy across sites
    - Considering referral to RIE for ENB in cases where CT biopsy is not possible. ENB results in smaller tissue yield and is associated with a lower diagnostic yield than CT Biopsy, but has a lower incidence of complication, associated with lower incidence of hospital admission and would have been possible to attempt in a significant proportion of our patients who currently have no diagnosis prior to radical treatment.

- We should pre-empt an increase in lesions <3cm in size and plan strategies to diagnose these early to facilitate curative treatments.

- To provide context to this data it would be important to have a better understanding of current excision rates for benign disease and whether there is a relationship between pre surgical diagnostic rates or not.

Adam Marshall
Consultant Respiratory Physician
Royal Infirmary of Edinburgh
November 2022

Appendix 4: Performance Status

WHO/ECOG PERFORMANCE STATUS (PS) CATEGORIES

0 Fully active. Able to carry on all pre-disease performance without restriction.

1 Restricted in physically strenuous activities but ambulatory and able to carry out work of a light and sedentary nature.

2 Ambulatory and capable of all self-care but unable to carry out many work activities; up and about more than 50% waking hours.

3 Capable of only limited self-care; confined to bed or a chair for more than 50% of waking hours.

4 Completely disabled; unable to carry out any self-care; totally confined to bed or a chair.

Appendix 5: TNM Stage Groups
(TNM Classification of Malignant Tumours, 8th Edition, IASLC, 2016)

Stage Group	Tumour	Nodal	Metastases
Occult carcinoma	Tx	N0	M0
Stage 0	Tis	N0	M0
Stage IA1	T1(mi)	N0	M0
	T1a	N0	M0
StageIA2	T1b	N0	M0
Stage IA3	T1c	N0	M0
Stage IB	T2a	N0	M0
Stage IIA	T2b	N0	M0
Stage IIB	T1a-c	N1	M0
	T2a-b	N1	M0
	T3	N0	M0
Stage IIIA	T1a-c	N2	M0
	T2a-b	N2	M0
	T3	N1	M0
	T4	N0-N1	M0
Stage IIIB	T1a-c	N3	M0
	T2a-b	N3	M0
	T3	N2	M0
	T4	N2	M0
Stage IIIC	T3-T4	N3	M0
Stage IVA	Any T	Any N	M1a-b
Stage IVB	Any T	Any N	M1c

Appendix 6: TNM Classification

TNM Classification of Malignant Tumours, 8th Edition, International Association for the Study of Lung Cancer (IASLC), 2017

T – Primary Tumour		
Tx	Primary tumour cannot be assessed, or tumour proven by the presence of malignant cells in sputum or bronchial washings but not visualized by imaging or bronchoscopy.	
T0	No evidence of primary tumour.	
Tis	Carcinoma in situ	
T1	Tumour 3cm or less in greatest dimension, surrounded by lung or visceral pleura, without bronchoscopic evidence of invasion more proximal than the lobar bronchus (i.e. not in main bronchus).	
	T1(mi)	Minimally invasive adenocarcinoma.
	T1a	Tumour 1cm or less in greatest dimension.
	T1b	Tumour more than 1cm but not more than 2cm in greatest dimension.
	T1c	Tumour more than 2cm but not more than 3cm in greatest dimension.
T2	Tumour more than 3cm but not more than 5cm; or tumour with any of the following features: ○ Involves main bronchus regardless of distance from the carina, but without involvement of the carina. ○ Invades visceral pleura. ○ Associated with atelectasis or obstructive pneumonitis that extends to the hilar region, involving part or all of the lung.	
	T2a	Tumour more than 3cm but not more than 4cm in greatest dimension.
	T2b	Tumour more than 4cm but not more than 5cm in greatest dimension.
T3	Tumour more than 5cm but not more than 7cm in greatest dimension or directly invades any of the following structures: ○ chest wall (including parietal pleura and superior sulcus tumours) ○ phrenic nerve ○ parietal pericardium ○ or associated with separate tumour nodule(s) in the same lobe as the primary.	
T4	Tumour more than 7cm in greatest dimension or invades any of the following structures: ○ diaphragm, mediastinum, heart, great vessels, trachea, recurrent laryngeal nerve, oesophagus, vertebral body, carina, or ○ associated with separate tumour nodule(s) in different ipsilateral lobe to that of the primary tumour.	
N – Regional Lymph Nodes		
Nx	Regional Lymph nodes cannot be assessed.	
N0	No regional lymph node metastasis.	
N1	Metastasis in ipsilateral peribronchial and/or ipsilateral hilar and intrapulmonary lymph nodes, including by direct extension.	
N2	Metastasis in ipsilateral mediastinal and/or subcarinal lymph node(s).	
N3	Metastasis in contralateral mediastinal, contralateral hilar, ipsilateral, or contralateral scalene, or supraclavicular lymph node(s).	
M – Distant Metastasis		
M0	No distant metastasis.	
M1	Distant metastasis present.	
	M1a	Separate tumour nodule(s) in a contralateral lobe; tumour with pleural or pericardial nodule(s) or malignant pleural or pericardial effusion.
	M1b	Single extra-thoracic metastasis.
	M1c	Multiple extra-thoracic metastases in one or several organs.

Appendix 7: Acknowledgements

Clinical and Audit Staff who contributed to the Lung Cancer Comparative Report 2021.

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