CraNE___European_Network_of_Comprehensive_Cancer_Centres

iPAAC INNOVATIVE PARTNERSHIP FOR ACTION AGAINST CANCER

Methodology for defining quality indicators (QI) in order to monitor and improve oncological care within Comprehensive Cancer Care Networks (CCCN)

The tool for development of QI-Sets in Oncology (QISO)

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Abbreviations and Acronyms

CCCN	Comprehensive Cancer Care Network
CanCon	European Guide on Quality Improvement in Comprehensive Cancer Control
CraNE	Network of Comprehensive Cancer Centres: Preparatory activities on creation of National Comprehensive Cancer Centres and EU Networking
EC	European Commission
EU	European Union
iPACC	Innovative Partnership for Action Against Cancer
iET-QI	iPAAC evaluation tool for QI
JA	Joint Action
QI	Quality Indictaor
QISO	QI-Sets in Oncology Tool
QIWG	QI working group
SoS	Set of Standard
WP	Work Package

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Executive summary

This document is based on the work of the Joint Action iPAAC Work Package 10 (WP10) as well as incorporates updates and further development which are the results of the QI working group (QIWG) of the Joint Action CraNE Work Package 6 (WP6) task 3.

The document provides the methodology for defining quality indicators (QIs) in order to monitor and improve structures, processes and results in the field of Oncology.

The document describes how the methodology should be applied in oncology and how QIs should be used to monitor and improve oncological care onsite.

Chapter 1 gives the background on how the methodology was developed, agreed upon, and piloted within the Joint Action iPAAC. Chapter 2 describes the further development of the methodology within Joint Action CraNE WP6 towards a generic methodology to define tumour-specific QI-sets. Chapter 3 outlines the re-evaluation and updating of QISO QI-sets and chapter 4 describes the application of the QISO tool for the development of QI-set for Lung Cancer.

Following this methodology, QI-sets were developed and implemented for colorectal, pancreatic and lung cancer.

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1. Background

The tool for development of QI-Sets in Oncology (QISO) is based on the "iPAAC evaluation tool for QI" (iET-QI) which was a result of the Joint Action iPAAC WP 10.

The iET-QI tool offered for the first time the possibility to create QI sets with a defined methodology in a standardized modified DELPHI Process, that has been agreed upon in an European Joint Action (see "2 – Methodology).

The QI sets for colorectal and pancreatic cancer that were derived in iPAAC were implemented and piloted in two Comprehensive Cancer Care Networks (CCCNs) in two Member States (Lower Silesian Oncology, Pulmonology and Hematology Center, Wroclaw, Poland and Comprehensive Cancer Centre Charité, Berlin, Germany).

The process was evaluated externally and confirmed the applicability of the iET-QI tool and the two QI-sets in different Member States.

Based on the results of the evaluation it was agreed in the scope of the new Joint Actin CraNE to further develop the iET-QI methodology including defining a QI-set for lung cancer and adding an updating process for already existing European QI-sets.

The Development of QI-Sets in Oncology Tool (QISO) and the corresponding derived QI-sets for colorectal, pancreatic and lung cancer should be used at national, regional and CCCN level. The tool provides the flexibility to create tumour-specific QI sets that are applicable in the respective health system of a MS.

The QI sets have clear numerator and denominator definitions and thus allow a comparison of the quality provided.

The defined QIs can be adapted to the characteristics of specific health care systems and can thus be used for the evaluation and governance of oncology care.

At the regional and local level, the QIs are suitable for evaluating and, if necessary, improving the cooperation between the partners in the CCCNs as well as to monitor the adherence to the medical guidelines.

From the patient's point of view, the use of QIs lead to an improvement of care, as QI sets address areas for which there is potential for improvement from a scientific point of view. With this oncological treatment can be standardised and it will be realised that all patients receive the same, quality-based oncological care.

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2. Methodology of the QISO

The QISO tool builds on the iPAAC Evaluation Tool for pancreatic and colorectal QI-sets (iET-QIs) which were developed under the Joint Action iPAAC. The goal is to further develop the iPAAC-QI instrument into a generic methodology how to define sets of tumour-specific QIs that can be used for the monitoring of the quality of care in oncology, for instance in CCCNs.

The QISO methodology follows the G-I-N reporting standards as far as applicable. In table 1 the G-I-N criteria are outlined and the respective methodological steps for the QISO tool described.

Table 1. Criteria according to defined reporting standards [1] and assessment of the proposed methodologic steps

GIN reporting standards	Methodological steps of QISO	Comments
1 + 2 Guideline selection and selection of guideline recommendations *[Not applicable for this process, since the QI candidates are not primarily generated from guideline recommendations]*	Search for QI International Literature search for implemented QI with published results of the QI application. Additional search on websites of national and international QA organizations following a standardized protocol (*see document literature search link*) The search can be generic or tumour-specific. The methodology used to define the implemented QI must be described.	Results of the searches for the target tumour entity
3 Selection process of performance measures	First step of selection (“First screening”) [2] A1) duplication Explanation: There are two or more QI candidates exactly addressing the same topic. Formally, one candidate is kept the others are excluded by criterion A1. A2) lack of understandability Explanation: The wording of the QI candidate is ambiguous. For example, it may not be concluded which population (mentioned in the nominator or denominator) is defined or the intervention is unclear. A3) not feasible for the European CCCN setting. Explanation: This addresses QI candidates which comprise elements, which are	The first selection should be performed by the designated QI working group (QIWG) of resp. task within the EU-project

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	unavailable in a European CCCN setting, such as drugs or non-drug interventions which are unavailable in European countries as well as health care structures (for example specific for setting in the U.S.) which cannot be provided. A4) defining of numerator and denominator not possible. Explanation: The QI is not univocally defined by a ratio of numerator and denominator elements (for example number of individuals receiving treatment out of the total of the diagnosed patients)	
4 Core attributes of performance measures (appraisal)	Second step of selection ("Second Screening") [3-7]: Assessment of: 1. Relevance (potential for improvement /clinical relevance) Question: The quality indicator includes the potential for improving relevant patient outcomes. 2. Feasibility (measurability) Question: The data is routinely documented by the service provider or an additional survey requiring a reasonable level of effort. 3. Usability (clarity of definition) Question: The indicator is clearly and unambiguously defined and is related to a supply aspect that can be influenced by the service provider.	Assessment sheet for second screening (see Annex 1) Answer categories: "no" and "yes" A QI is accepted if the agreement is greater than or equal to 75% for criteria 1-3. Voting by medical experts
5 Specification of performance measures	See first screening, A4: Possibility to create a numerator and denominator is a base for a QI candidate to proceed to the assessment process.	
6 Intended use of performance measures	The use should be defined within the CCCN setting	
7	A praxis test should be performed within selected CCCNs	

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Praxis test of performance measures		
8 Review and re-evaluation of performance measures	After QI implementation, generating and analysing QI results a process should be defined in order to assess whether a QI should be kept, retired or modified.	
9 Composition of the panel deciding on Quality Indicators	Panels are composed by multidisciplinary experts, stakeholders in the field, experts in quality measurements and patient representatives.	In this project two different groups had been involved: The QIWG for the first screening, a multidisciplinary group of external experts for the second screening

3. Updating process for QISO QI-Sets

QIs always refer to the current evidence. Therefore, when e.g. an underlying guideline had been updated, the QI WG needs to be reactivated to evaluate the results of the measured QIs and to determine whether the previous QIs need to be updated.

The general recommendation is, that the QI-WG convenes once every three years. Beside changes in evidence and subsequently in QI the information of already implemented and analyzed QI needs to be reported to the QI-WG at an annual base in order keep QI harmonized with underlying evidence.

Changes and additions compared to the first quality indicator development process are as follows:

3.1. Existing and implemented QI

The aim is to close the quality circle, which means that the results of implemented guideline-based quality indicators are presented to the QI-WG at the beginning of the QI Update round. Thereby, it is possible to assess the existing QI and any results and feedback available and make decisions on how to proceed with the QI developed in the previous round:

- Keeping QI without changes
- Modify QI
- Retire or drop the QI

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3.2. New additional QI

Further, the QI-WG will follow the steps of the first QI development round. Additional QI candidates derived from an update search for internationally reported QI will be screened and assessed in different rounds.

That means that final updated set of QI will consist of the assessed existing QI plus additional new QI.

Every following update round will proceed the same way.

4. Application of the tool for development of QI-Sets in Oncology (QISO)

The methodology for defining a set of QIs in order to monitor and improve care of oncological patients has been successfully applied in several CCCNs.

In the following chapters the application of the QISO is explained in detail on the example of Lung Cancer QI.

4.1 Search and compilation of potential QI to be assessed

As described above, searches had been performed in literature databases and on defined homepages of QA institutions.

The systematic review included 16 studies reporting on 183 QIs. The detailed results are described in the document "Research on international Quality Indicators for Lung Cancer" (see Annex 1). Only these QIs of the 183 QI were used for the list of potential QIs, for which the methodology of their definition was described in the corresponding publication.

The additional search on websites of European Quality Assurance institutions for lung cancer identified 71 potential QIs. Only these QIs were used for the list of potential QIs, for which the methodology of their definition was described on the website. The results of the QIs search are reported in the document "Research on international Quality Indicators for Lung Cancer" (see Annex 1).

4.2 Specification and description of the indented use of QI

For the first screening an excel document was prepared. The numerators and denominators of the potential QIs were taken from the publications or, if necessary, redefined. In addition, the area of application of the QIs (screening, diagnostics, therapy, etc.) was defined.

The prepared Excel document consisted of a total of 254 QIs for lung cancer.

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4.3 Pre-selection of potential QI ("first screening)

The first screening of potential QIs was carried out by the QI working group based on the criteria described in table 1.

After the steering group assessment, which was conducted within 21 days, 39 out of 254 QIs candidates for lung cancer were selected.

4.4 QI appraisal ("Second Screening")

The second phase of selection according to the above-described criteria was delegated to an expert panel group.

Members of this committee were identified among experts active in the specific tumour entity. The selection of the expert members was performed by the QI working group after evaluation of their CVs. Approval or denial of each member's participation proposal was expressed by the members of the QI working group. Approval to the application of the expert to the panel was given when the majority of the QI working group voted in favor of the candidate.

Expert panel members were required to assess each QI in correspondence with the above-mentioned criteria (relevance, feasibility and usability) per each QI by answering yes or no (see Annex 2) Based on the written assessment of all members of the expert panel who are entitled to vote a QI is accepted if the agreement is greater than or equal to 75% for each criterion.

4.5 Final set of QI

The list of potential QI is evaluated and discussed by the expert panel group. The result of the assessment is the final set of QI.

The list of potential QIs was evaluated by 5 lung cancer experts of the 9 selected lung experts of the expert panel group. The expert panel assessment lasted 30 days and for the final set of 20 QIs for lung cancer were accepted.

4.6 Piloting

A practice of consented QIs will be implemented in a pilot CCCN.

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Annex 1: Research on international Quality Indicators for Lung Cancer

Executive summary

This document is part of Task 3, Work Package 6 (WP6) within the CraNE Joint Action. It presents the methodology and the result of the international literature search for already implemented quality indicators (QIs) for Lung Cancer to be used to monitor and improve structures, processes and results of Comprehensive Cancer Care Networks (CCCNs) for Lung Cancer.

The document describes the methodology of the international literature search and the results from two different time periods. The first international literature search was conducted from 14.12.2021 - 07.01.2022 and the second one from 15.02.2023 - 21.02.2023.

This international literature search is part of the iET-QI tools (iPAAC Evaluation Tool for QIs in oncology). The quality indicators identified in the international literature search will be the foundation to conduct the next methodological steps in the iET-QI tool.

1. Search Assignment

The research was conducted in two steps. The first literature search was carried out by Steffi Derenz and Jessica Lobitz between 14.12.2021 - 07.01.2022 and the second also by Nele Grapentin between 15.02.2023 - 21.02.2023 all employees of the German Cancer Society e.V.

The following terms were used as research terminology.

Population:

Adult patients with Lung Cancer in all care settings (outpatient/inpatient).

Lung Neoplasms OR lung* OR pulmon* OR bronch* OR respirat*

AND (cancer* OR carcinom* OR tumor* OR tumour* OR neoplas* OR malign* OR carcinoid* OR sarcom* OR adenocarcinom*)

Intervention:

Quality indicator; Quality indicators

Quality Indicators, Health Care

"quality indicator" OR "quality indicators" OR "performance indicator" OR "performance indicators" OR "quality measure" OR "quality measures" OR "indicator of quality" OR "indicators of quality" OR "performance measure" OR "performance measures"

Update research: last search 20.02.2023
A limitation of the search period was made during the first research from 01.06.2016 -

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14.12.2021. This second search period is an update of the existing international literature from 08.01.2022-08.02.2023.

Language restrictions: English, German

No further limitations were made regarding specific subgroups within the target population.

The search was carried out in the following sources:

Bibliographic Databases

- PubMed: https://pubmed.ncbi.nlm.nih.gov/advanced
- Cochrane: https://www.cochranelibrary.com/advanced-search

Websites of international quality indicator programmes in the field of medical quality assurance/quality measurement/quality indicators

- Internet research via www.google.de

The search strategy and terminology depend on the options of the respective search sources. They were modified accordingly and are presented under point 2: Search strategies.

2. Search Strategy

2.1. Bibliographic Databases

2.1.1 PubMed

Research was carried out on: 14.12.2021 and 20.02.2023

Research	Search Terms	Results 14.12.2021	Results 20.02.2023
#1	**"lung neoplasms"[MeSH Terms]**	251.962	269,561
#2	**(lung*[tiab] OR pulmon*[tiab] OR bronch*[tiab] OR respirat*[tiab]) AND (cancer*[tiab] OR carcinom*[tiab] OR carcinoid*[tiab] OR tumor*[tiab] OR tumour*[tiab] OR neoplas*[tiab] OR malign*[tiab] OR sarcom*[tiab] OR adenocarcinom*[tiab])**	407.461	441,330
#3	**#1 OR #2**	461.678	497,360
#4	**"quality indicators, health care"[MeSH Terms]**	23.686	24,663
#5	**"quality indicator"[tiab] OR "quality indicators"[tiab] OR "performance indicator"[tiab] OR "performance indicators"[tiab] OR "quality measure"[tiab] OR "quality measures"[tiab] OR "indicator of quality"[tiab] OR "indicators of quality"[tiab] OR "performance measure"[tiab] OR "performance measures"[tiab]**	29.467	32,501
#6	**#4 OR #5**	47.524	51,172
#7	**#3 AND #6**	483	537

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Research	Search Terms	Results 14.12.2021	Results 20.02.2023
#8	#7 Filters: **English, German, from 2022/1/8 – 2023/2/8**	247	43
#9	**#8 NOT "The Cochrane database of systematic reviews"[Journal]**	**246**	**43**

2.1.1 Cochrane

Research was carried out on: 14.12.2021 and 20.02.2023

Research	Search Terms	Results 14.12.2021	Results 20.02.2023
#1	**MeSH** descriptor: **[lung neoplasms]** explode all trees	8282	10,232
#2	**(lung* OR pulmon* OR bronch* OR respirat*):ti,ab,kw AND (cancer* OR carcinom* OR carcinoid* OR tumor* OR tumour* OR neoplas* OR malign* OR adenocarcinom*):ti,ab,kw**	35913	38,992
#3	**#1 OR #2**	35937	39,037
#4	**MeSH descriptor: [Quality Indicators, Health Care] explode all trees**	614	808
#5	**("quality indicator" OR "quality indicators" OR "performance indicator" OR "performance indicators" OR "quality measure" OR "quality measures" OR "indicator of quality" OR "indicators of quality" OR "performance measure" OR "performance measures"):ti,ab,kw**	4180	3,240
#6	**#4 OR #5**	4557	3,756
#7	**#3 AND #6**	61	55
#8	#7 with Cochrane Library publication date from Yesn 2022 to Feb 2023, in Cochrane Reviews, Cochrane Protocols, Trials, Clinical Answers and Special collections **NOT Editorial, special Collections**	47	4
	Cochrane Reviews: 0 / Trials: 4 Trials (4) ———[Embase (2), PubMed (2), ICTRP (2)] In total: 4 Trials Cochrane Reviews: 1 / Trials: 46 Trials (46) NOT Studienregister (6 ICTRP/9 CZ.gov) [Embase (23), PubMed (20) - 13 in beiden] In total: 1 Reviews + 31 Trials	**32**	**3**

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14.02.2021

Number of results in Cochrane after duplicate check with PubMed: **19**

Total number of results (PubMed and Cochrane): **265**

20.02.2023

Number of results in Cochrane after duplicate check with PubMed: **1**

Total number of results (PubMed and Cochrane): **46**

2.2 International Quality Indicator programmes

Search was carried out on: 14.12.2021 and 20.02.2023

Institution	Source	Results 20.12.2021	Results 20.02.2023
CMS (Centers for Medicare & Medicaid Services)	https://cmit.cms.gov/CMIT_public/ListMeasures	0	0
ECC Programme (European Cancer Centre Certification)	http://ecc-cert.org/wp-content/uploads/2022/10/Icc_annualreport-2022-A1_220601.pdf	/	37
ASCO (American Society of Clinical Oncology) Quality Oncology Practice Initiative	QOPI (Quality Oncology Practice Initiative) http://qopi.asco.org/index.html https://practice.asco.org/quality-improvement/quality-programs/quality-oncology-practice-initiative/qopi-related-measures https://practice.asco.org/quality-improvement/quality-programs/qopi-reporting-registry	0	0
ISD (Scotland Health Indicators)	http://www.isdscotland.org/Health-Topics/Cancer http://www.healthcareimprovementscotland.org/our_work/cancer_care_improvement/cancer_qpis/quality_performance_indicators.aspx https://www.isdscotland.org/Health-Topics/Quality-Indicators/Cancer-QPI	17	0
IQTiG (Institute for quality assurance and transparence in healthcare)	https://iqtig.org https://iqtig.org/qs-instrumente/qualitaetsindikatoren	0	0

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Institution	Source	Results 20.12.2021	Results 20.02.2023
NHS (National Health Services)	Indicators for Quality Improvement https://digital.nhs.uk/ https://digital.nhs.uk/data-and-information https://www.nice.org.uk/standards-and-indicators/index/All/Cancer	2	0
NQF (National Quality Forum)	Performance Measures http://www.qualityforum.org/QPS http://www.qualityforum.org/Home.aspx	2	0
KCE (Belgian Health Care Knowledge Centre)	https://kce.fgov.be https://kce.fgov.be/en/all-reports	0	0

2.3 Search Engine

Search Engine: www.google.de (the first 50 matches)

Search term German: qualitätsindikator AND (lungenkrebs OR lungenkarzinom)
Update: 01.06.2016 – 20.12.2021
0 **Results**

Search term German: qualitätsindikator AND (lungenkrebs OR lungenkarzinom)
Update: 01.06.2016 – 20.12.2021
0 **Results**

Research was carried out on: 20.12.2021

Number of results after screening: 0

Search Engine: www.google.de (the first 50 matches)

Search term German: qualitätsindikator AND (lungenkrebs OR lungenkarzinom)
Update: 08.01.2022 – 08.02.2023
0 **Results**

Search term English: "quality indicator" AND ((lung AND (cancer OR neoplasm OR tumor OR tumour)) Update: 08.01.2022 – 08.02.2023
0 **Results**

Research was carried out on: 20.02.2023

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Number of results after screening: 0

3. Research Results

Reasons for exclusion

A1: **No or no topic-specific QI (no QI or QI of other entity or non-specific QI).**
A2: **Publication type (e.g.: letter, editorial, abstract only)**
A3: **Duplicate publication**
A4: **Full text not available**
A5: **No results available**

3.1 Bibliographic Databases

Results search 14.12.2021:

Number of results after title and abstract screening: **23**

Results after full text screening 13 publications with a total of 134 quality indicators [1-13]

Andreano et al., 2021

Indicator	Results available?
O1 First contact to first therapy ≤60 days **Numerator:** With an interval between first contact and first therapy ≤60 days **Denominator:** All patients with any recorded treatment and a contact ≤ 180 days	Yes
O2 From PET to surgery ≤45 days **Numerator:** With an interval between PET and surgery ≤45 days **Denominator:** All patients receiving lung surgery and having a PET within 3 months before	Yes
O3 Multidisciplinary evaluation **Numerator:** With multidisciplinary evaluation within 30 days before first treatment **Denominator:** All patients with any recorded treatment	Yes
O4 From thorax CT to surgery ≤45 days **Numerator:** With an interval between thorax CT and surgery ≤45 days **Denominator:** All patients receiving lung surgery and having a thorax CT within 3 months before	Yes
D1 Thorax CT at diagnosis	Yes

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Indicator	Results available?
Numerator: Thorax CT within 2 months from diagnosis **Denominator:** All patients	
D2 Thorax CT before biopsy **Numerator:** With a thorax CT in the 30 days preceding broncoscopy or other biopsy procedure **Denominator:** All patients receiving a biopsy within 3 months before and one month after diagnosis	Yes
D3 Treatment with curative intent preceded by PET **Numerator:** With a PET record in the 3 months preceding surgery or chemoradiation **Denominator:** NSCLC patients in stage I-III receiving either surgery or concomitant/ sequential chemo-radiation	Yes
D4 Cyto-histologic confirmation **Numerator:** With cyto-histologic confirmation in the cancer register **Denominator:** All patients	Yes
D5 NSCLC Stage III patients assessed for metastasis before curative intent treatment **Numerator:** With a head CT/MR and PET/bone scan in the month preceding first therapy **Denominator:** NSCLC in stage III and receiving concomitant/sequential chemo-radiation	Yes
D6 SCLC patients fully staged **Numerator:** With a thorax CT and abdominal CT/ sonography and head CT/MR and PET /bone scan in the 3 months before diagnosis **Denominator:** All SCLC patients	Yes
S1 Survival after first surgery **Numerator:** Not deaceased within 30 days from first surgery **Denominator:** All patients receiving lung surgery	Yes
S2 Patients with a thorax CT ≤30 days before surgery **Numerator:** thorax CT in the 30 days before first surgery **Denominator:** All patients receiving lung surgery	Yes
S3 Functional evaluation before surgery **Numerator:** Lung functionality evaluation in the month before first surgery	Yes

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Indicator	Results available?
Denominator: All patients receiving lung surgery in stage I-IIIa	
S4 Stage I-IIIA NSCLC patients undergoing curative intent surgery **Numerator:** Receiving surgery with presumed curative intent **Denominator:** NSCLC patients in stage I-IIIa	Yes
S5 Stage I-IIA NSCLC patients undergoing lobectomy **Numerator:** Receiving lobectomy as first surgery **Denominator:** NSCLC patients in stage I-IIa and receiving lung surgery	Yes
S6 No second surgery within 30 days **Numerator:** Not undergoing a second lung intervention within 30 days **Denominator:** All patients receiving lung surgery	Yes
S7 Hospital stay ≤14 days for first surgery **Numerator:** With an hospital stay ≤14 days and with no hospital access in the 30 days after discharge **Denominator:** All patients undergoing segmentectomy, lobectomy or pneumonectomy as their first lung surgery	Yes
M1 Stage II-III NSCLC patients receiving chemo-radiation **Numerator:** Receiving concomitant or sequential chemo-radiation **Denominator:** NSCLC patients in stage II-III that did not receive surgery	Yes
M2 SCLC patients undergoing medical oncologic therapy or radiotherapy **Numerator:** Receiving medical oncologic treatment and/or radiotherapy **Denominator:** SCLC patients not in stage IV	Yes
M3 Palliative care before death **Numerator:** Home-care, hospice or hospital admission for palliative care in the 3 months before death **Denominator:** All patients deceased at 31/12/2016	Yes
M4 Pain management before death **Numerator:** With an opioids prescription in the 3 months before death **Denominator:** All patients deceased at 31/12/2016	Yes

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Indicator	Results available?
F1 Follow-up in year 2, 3, and 4 for surviving patients **Numerator:** With at least one follow-up visit or hospital admission in the year (excluding urgent admission and admission for medical oncologic treatment, radiotherapy or lung surgery) **Denominator:** Patients alive after 2, 3, and 4 years	Yes

Beck et al.,

Indicator	Results available?
Volume of new patients registered per location	Yes
Volume of patients undergoing radical radiation treatment for NSCLC per location	Yes
Volume of anatomical parenchymal resections for malignant or benign pathology per hospital location*	Yes
Percentage of patients discussed in a MDT meeting prior to the start of treatment	Yes
Percentage of patients clinical stage III NSCLC and intentional curative treatment in whom cerebral imaging was performed	Yes
Percentage of patients with stage IV adenocarcinoma, not eligible for curative treatment, with molecular diagnostics	Yes
Percentage of patients—with radiation treatment with radical intent—discussed in a MDT meeting prior to the start of treatment	Yes
Percentage of patients—with SBRT with radical intent—with a waiting time (between day of referral and first day of radiation) of ≤21 days	Yes
Percentage of stage III NSCLC patients—with radiation treatment with radical intent—undergoing concurrent chemo-radiotherapy	Yes
Percentage of patients having surgery for a NSCLC discussed in a postoperative MDT meeting	Yes
Percentage of patients having surgery for a NSCLC in which the clinical TNM stage is known during the preoperative MDT meeting	Yes
Percentage of patients having surgery for a NSCLC in which the pathological TNM stage is known during the preoperative MDT meeting	Yes

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Indicator	Results available?
Percentage of patients having surgery for a NSCLC with a waiting time (between the last MDT meeting and day of surgery) of ≤21 days	Yes
Percentage of patients undergoing a combined chemoradiotherapy treatment that died within 90 days from the last radiation	Yes
Percentage of patients with a grade IV or V toxicity within 90 days from the last radiation treatment with curative intent	Yes
Percentage of patients died within 30 days after resection for primary lung carcinoma or during primary admission	Yes
Percentage of patients with a complicated course after resection for primary lung carcinoma	Yes
Percentage of patients with an irradical resection (R1 or R2) after resection for primary NSCLC	Yes

Cramer-van der Welle et al., 2021

Indicator	Results available?
Overall survival after diagnosis	Yes
Overall mortality 1 and 2 years after diagnosis	Yes
Treatment result after resection: resection margins	Yes
Treatment result after resection: rethoracotomy	Yes
Complications after resection	Yes
Side effects after radiotherapy or chemotherapy	Yes
QoL/PROMs (t=0, 3, 6 and 12 months)	Yes

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Guirado et al, 2021

Indicator	Results available?
Efficiency of the LC-MDT **Numerator:** Number of patients with LC included in more than one session of the LC-MDT **Denominator:** Number of patients with LC included in the LC-MDT × 100	Yes
Multidisciplinary evaluation of patients with a new diagnosis **Numerator:** Number of patients with a new diagnosis of LC evaluated in the LCMDT **Denominator:** Number of patients with a new diagnosis of LC × 100	Yes
Multidisciplinary evaluation of patients with recurrence **Numerator:** Number of patients with recurrence evaluated in the LC-MDT **Denominator:** Number of patients with recurrence × 100	Yes
Multidisciplinary evaluation of patients after radical surgery **Numerator:** Number of patients after radical surgery evaluated in a tumor committee **Denominator:** Number of patients after radical surgery × 100	Yes
PET staging in patients subsidiary for potentially curative treatment **Numerator:** Number of patients presented with curative intent in the LC-MDT with PET **Denominator:** Number of patients presented with curative intent in the LCMDT × 100	Yes

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Ismail et al., 2020

Indicator	Results available?
3. Hospitals treating more than 50 lung cancer patients per year	Yes
4. Stage III NSCLC patients undergoing brain imaging before the start of systemic therapy with curative intention	Yes
5. Stage IV adenocarcinoma lung cancer patients undergoing molecular diagnostics before the start of systemic therapy with curative intention	Yes
6. Patients discussed in multidisciplinary consultation before treatment; % *a.Stage I-III curative treatment* *b.Palliative treatment*	Yes
7. Duration of diagnostic *a. < 21 days without invasive mediastinal diagnostics* *b. < 21 with EUS/EBUS, but without mediastinoscopy* *c. < 35 days with mediastinoscopy*	Yes
8. Diagnostics of stage III NSCLC patients with EUS/ EBUS	Yes
9. Stage III NSCLC patients treated with adjuvant chemotherapy	Yes
10. First-line systemic treatment of stage IV NSCLC patients without curative intention; % *a. Chemotherapy* *b. Immunotherapy* *c. Targeted therapy*	Yes
11. First-line systemic treatment of stage IV SCLC patients without curative intention; % *a. Chemotherapy* *b. Immunotherapy*	Yes
12. Use of immunotherapy in elderly patients with stage IV NSCLC disease with no curative intention; % *a. < 70 years* *b. > 70 years*	Yes
13. Use of chemoimmunotherapy in elderly patients with stage IV NSCLC disease with no curative intention; % *a. < 70 years* *b. > 70 years*	Yes
14. Toxicity after treatment with systemic therapy in stage IV NSCLC young (<70 years) patients; % *a. Chemotherapy* *b. Immunotherapy*	Yes

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Indicator	Results available?
c. Targeted therapy *d. Chemo radiotherapy*	
15. Toxicity after treatment with systemic therapy in stage IV NSCLC elderly (>70 years) patients; % *a. Chemotherapy* *b.Immunotherapy* *c.Targeted therapy* *d. Chemo radiotherapy*	Yes

Jakobsen et al., 2016

Indicator	Results available?
wait time (days): GP referral→lung cancer specialist	Yes
wait time (days): Referral→diagnosis	Yes
wait time (days): Diagnosis→treatment	Yes

Kasymjanova et al., 2017

Indicator	Results available?
wait time (days): GP referral→treatment	Yes
wait time (days): Diagnosis→surgery consult	Yes
wait time (days): Surgery consult→surgery	Yes
wait time (days): Surgery→adjuvant chemotherapy	Yes
wait time (days): Diagnosis→chemotherapy	Yes
wait time (days): Diagnosis→radiotherapy	Yes

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Kim et al., 2019

Indicator	Results available?
1. Timeliness of care: time from tissue diagnosis to treatment for lung cancer	Yes
2. Surgical resection in early (stage I and II) NSCLC	Yes
3. Radiotherapy in inoperable stage I-III NSCLC	Yes
4. Systemic therapy in advanced (stage III-IV) NSCLC	Yes
5. Palliative care in advanced (stage III-IV) NSCLC with poor performance status	Yes
6. 30-d mortality following the completion of treatment for lung cancer	Yes

Khorfan et al., 2020

Indicator	Results available?
If a patient has known/suspected non-small cell lung cancer, clinical AJCC stage should be documented prior to initiation of treatment. (Stage I/II NSCLC)	Yes
If a patient undergoes lobectomy or larger resection, pre- or intra-operative tissue diagnosis should be confirmed or reasons for not achieving documented. (Stage I/II NSCLC)	Yes
If a resection is performed, there should be an attempt at lymph node sampling. (Stage I/II NSCLC)	Yes
If a patient undergoes resection for stage T1b[a] or greater tumor, an anatomic pulmonary resection should be performed. (Stage I/II NSCLC) [a] T1b =2-3cm (7th ed.)	Yes
If surgical resection is performed, an R0 resection should be achieved. (Stage I/II NSCLC)	Yes
If a patient has pathologic stage II or higher, chemotherapy should be recommended or reason for no recommendation documented. (Stage I/II NSCLC)	Yes
If a patient receives radiation therapy to the lung (excluding adjuvant radiation), then pathologic diagnosis should be confirmed or attempted prior to treatment. (Stage I/II NSCLC)	Yes

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Matheson et al., 2021

Indicator	Results available?
1—This measure is used to assess the time from diagnosis to care for lung cancer patients. Patients should be receiving treatment within 4 weeks of diagnosis as a surrogate measure for time from general practitioner to treatment. **Numerator:** Treatment < 4 weeks **Denominator:** Lung cancer and any treatment	Yes
2—Proportion of patients with clinical stage I and II NSCLC who undergo surgical resection **Numerator:** Surgical resection **Denominator:** Stage I and II NSCLC	Yes
3—Proportion of patients with clinical stage I–III NSCLC who do not undergo surgery but receive radiotherapy with radical/curative-intent+/− chemotherapy **Numerator:** Radiotherapy with curative intent **Denominator:** Stage I, II and III NSCLC and no surgery	Yes
4—Proportion of patients with advanced NSCLC who receive systemic therapy **Numerator:** Systemic therapy **Denominator:** Stage III and IV NSCLC and ECOG of 0, 1 or 2	Yes
5—Proportion of patients with advanced NSCLC and poor performance status who receive palliative care input **Numerator:** Palliative care input **Denominator:** Stage III and IV NSCLC and ECOG of 2, 3 or 4	Yes
6—Proportion of patients who survived 30 days after treatment for NSCLC **Numerator:** Survived 30 days after treatment **Denominator:** Lung cancer and any treatment	Yes

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Odell et al., 2019

Indicator	Results available?
Measure 1: Surgical Lymph Node Staging >=10 Lymph nodes sampled at resection. Criteria: Stage Ia-IIB NSCLC, Surgical resection, Nodal data available	Yes
Measure 2a: Timing of Surgery After Neoadjuvant Chemotherapy, within 4 months. Criteria: pathol. proven NSCLC, pN1 or pN2 disease, Chemotherapy given before resection	Yes
Measure 2b: Referral for Adjuvant Treatment After Resection, within 6 months. Criteria: pathol. proven NSCLC, pN1 or pN2 disease found at resection, adjuvant referral made	Yes
Measure 3: Nonsurgical primary Treatment of cN2 Disease. Criteria: documented cN2 at presentation, surgical treatment intended, treatment data available	Yes

Vrijens et al., 2018

Indicator	Results available?
QI-1 Median time from incidence date to first active treatment	Yes
QI-2 Proportion of patients discussed in MDT within 6 weeks after incidence date	Yes
QI-3 Proportion of cIII NSCLC patients with surgery discussed in MDT before start of treatment	Yes
QI-4 Proportion of patients with histopathologically confirmed diagnosis	Yes
QI-5 Proportion of patients with histopathologically confirmed diagnosis for whom the tumour type is identified	Yes
QI-6 Proportion of NSCLC patients for whom the subtype has been identified	Yes
QI-7 Proportion of stage IV non-squamous NSCLC patients for whom EGFR-mutation analysis was performed	Yes
QI-8 Proportion of NSLCL patients tested for EGFR mutation before receiving anti- EGFR treatment	Yes
QI-9 Proportion of cI–III NSCLC patients who had a PET-CT prior to treatment with curative intent	Yes

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Indicator	Results available?
QI-10 Proportion of cIII patients who had brain imaging (CT or MRI) before treatment with curative intent	Yes
QI-11 Proportion of cI-III NSCLC patients who had a bone scintigraphy performed after a PET-CT	Yes
QI-12 Proportion of cII-III NSCLC patients who had minimally invasive mediastinal staging (EBUS or EUS or mediastinoscopy) before treatment with curative intent	Yes
QI-13 Proportion of cII-III NSCLC patients who had mediastinoscopy before treatment with curative intent, for whom mediastinoscopy was preceded by EBUS or EUS	Yes
QI-14 Proportion of NSCLC patients who had FEV1 and DLCO performed before surgery	Yes
QI-15 Proportion of NSCLC patients who died within 60 days after primary surgery	Yes
QI-16 Proportion of stage I-II-III patients who died within 60 days after end of primary (chemo)radiotherapy with curative intent	Yes
QI-17 Proportion of patients who received chemotherapy or targeted therapy within 2 weeks of death	Yes
QI-18 Proportion of patients with clinical TNM stage reported to the Belgian Cancer Registry	Yes
QI-19 Proportion of patients with surgery, with pathological TNM stage reported to the Belgian Cancer Registry	Yes
QI-20 Proportion of NSCLC patients whose WHO performance status was reported to the Belgian Cancer Registry	Yes

Wang et al., 2017

Indicator	Results available?
Availability of multidisciplinary lung cancer team	Yes
Proportion of clinical stage III NSCLC patients for which a skeletal scintigraphy and a CT or MRI of the brain is done before the initiation of combination therapy	Yes
Proportion of NSCLC patients in advanced stages who receive performance status assessment	Yes
Proportion of NSCLC patients who receive EGFR test before combination therapy	Yes

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Indicator	Results available?
Proportion of pathology report available in the chart for NSCLC patients who have surgical resection	Yes
Proportion of NSCLC patients who obtain FEV1 and DLCO within 2 weeks before lung resection	Yes
Proportion of NSCLC patients who receive ECG within 2 weeks before lung resection	Yes
Proportion of NSCLC patients staging I or II without contraindications who undergo curative resection	Yes
Proportion of NSCLC patients staging IA without contraindications who receive lobectomy	Yes
Proportion of NSCLC patients staging IB to II who receive lobectomy with adjuvant chemotherapy or lobectomy only	Yes
Proportion of NSCLC patients with stage IIA, IIB or IIIA who receive adjuvant chemotherapy after curative resection	Yes
Proportion of NSCLC patients with stage IIA, IIB or IIIA who receive cisplatin-based adjuvant chemotherapy within 3 to 4 weeks after undergoing curative resection	Yes
Proportion of NSCLC patients staging IIIB with malignant effusion or IV who receive first-line chemotherapy	Yes
Proportion of NSCLC patients staging IIIB or IV who receive imaging study to assess response of chemotherapy at least once before the completion of four cycles	Yes
Proportion of NSCLC patients staging I or II pathologically who receive postoperative radiation therapy after incomplete surgical resection	Yes
Proportion of locally advanced NSCLC patients who receive neo-adjuvant chemotherapy	Yes
Proportion of locally advanced NSCLC patients with performance status 0 or 1 who receive combination therapy	Yes

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Results search 20.02.2023:

Number of results after title and abstract screening: **3**

Results after full text screening: 3 Publications with a total of 49 quality indicators [14-16]

Harrison et al., 2022 (14)

Indicator	Results available?
Time from referral to first respiratory specialist appointment **Recommendations standards** 14 days (SSPLCPNZ *7)–target ≥95% of patients, 7 days–target ≥95% of patients (BTS#11). The NZ standard was used in this study.	Yes
Time from referral to surgery **Recommendations standards** 62 days–target 90% of patients (NZMHFCT ^9), 62 days–target ≥95% of patients (BTS11).	Yes
Time from first respiratory specialist appointment to surgery **Recommendations standards** 56 days–target ≥95% of patients (BTS11). There is no New Zealand guideline for this treatment interval.	Yes
Time from discussion at lung cancer MDT to surgery **Recommendations standards** 31 days- target ≥95% of patients (NZMHFCT 9)–please note this is a generic decision-to-treat to treatment timeframe, with the lung cancer MDT used as the timepoint for decision-totreat. 30 days–target ≥95% of patients (BTS11).	Yes
Timing of CT guided biopsy or EBUS **Recommendations standards** 7 days from referral–target ≥95% of patients (SSPLCPNZ 7).	Yes
Inclusion of PET staging **Recommendations standards** All patients (target 100%) who have curative small cell lung cancer or non-small cell lung cancer (SSPLCPNZ 7).	Yes

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Smith et al., 2022 (15)

Indicator	Results available?
Proportion where time from referral for assessment to diagnosis is ≤28 days	Yes
Proportion with documented screening for supportive care	Yes
Proportion with documented ECOG status	Yes
Proportion with confirmed tissue diagnosis (malignant cytology or histology)	Yes
Proportion with clearly documented cTNM staging	Yes
Proportion undergoing resection with clearly documented PET scan	Yes
Proportion with documented presentation at a lung MDM	Yes
Proportion where time from diagnosis date to first treatment date (any intent) is ≤14 days	Yes
Proportion with NSCLC where time from diagnosis date to surgical resection date is ≤14 days	Yes
Proportion where time from referral date to first treatment (any intent) is ≤42 days	Yes
Proportion with NSCLC (clinical stage I, II) who have had surgical resection	Yes
Proportion with NSCLC (clinical stage I or II) and resection with ≥5 lymph nodes dissected	Yes
Proportion with NSCLC (clinical stage I or II) undergoing resection with VATS approach	Yes
Proportion receiving anticancer treatment (surgery, radiotherapy, chemotherapy or systemic therapy)	Yes
Proportion with NSCLC (stage IIIB or IV) who have ECOG (0–1) and have commenced chemotherapy	Yes
Proportion of NSCLC (pathological stage II) receiving platinum- based chemotherapy after resectio	Yes
Proportion of NSCLC undergoing surgical resection with clearly documented pTN	Yes
Proportion of NSCLC patients undergoing surgical resection where cTN agrees with pTN	Yes
Proportion of patients with NSCLC who have had a surgical resection and died within 30 days of surgery	Yes

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Indicator	Results available?
Proportion of patients with NSCLC who have had a surgical resection and died within 90 days of surgery	Yes
Proportion of patients with NSCLC (stage IV) referred to any palliative care services within 8 weeks of diagnosis	Yes
Proportion of patients with lung cancer where time from chemotherapy start date to death date is ≤30 days	Yes

Trembecki et al., 2022 (16)

Indicator	Results available?
Multidisciplinary tumour conferences assess the completeness of the diagnosticsa	Yes
The percentage of deaths within one year from the diagnosis of a malignant neoplasm, correlated to tumour stage	Yes
The percentage of deaths within 30 days from the date of surgery, correlated to tumour stage	Yes
Percentage of deaths within 30 days from the end of chemotherapy, correlated to tumour stage	Yes
Percentage of deaths within 30 days from the end of palliative radiotherapy, correlated to tumour stage	Yes
Percentage of patients requiring hospitalisation due to complications after surgical treatment	Yes
Percentage of patients requiring hospitalisation due to complications after radiotherapy	Yes
Percentage of patients requiring hospitalisation due to complications after systemic treatment (after 30, 60, 90 days)	Yes
Percentage of patients who received chemotherapy during inpatient hospitalisation (according to the WHO ECOG)	Yes
Percentage of stage III and IV cancer patients	Yes
Assessment of the completeness of a pathological exam	Yes
Percentage of patients with genetic and molecular testing for predictive factors (lung cancer)e	Yes
The percentage of surgical procedures performed with minimally invasive surgery (lung cancer)	Yes

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Indicator	Results available?
Median time elapsed from the date of registration of the patient for a diagnostic (imaging or pathomorphological) exam to the date of obtaining the result of this exama	Yes
Percentage of repeated diagnostic tests over a 6-week period (computed tomography, endoscopy, biopsy, pathomorphological assessment, molecular assessment), shown for each participating centre by tumour type and test type	Yes
Percentage of repeated surgical treatments for diagnoses other than breast cancer	Yes
Percentage of patients with suspected lung cancer consulted by a pulmonologist within 14 working days from the date of registering the referral with the service provider	Yes
The proportion of patients with mediastinal lymphadenopathy greaterthan 10 mm who underwent EBUS-TBNA	Yes
The proportion of patients with suspected lung cancer and pleural effusion diagnosed with fluid aetiology	Yes
The proportion of patients with stage III non-small cell lung cancer who received concurrent chemoradiotherapy	Yes
Percentage of diagnostic tests requiring redescription or reverification of the material over a 6-week period (computed tomography, pathomorphological assessment, molecular assessment), shown for each participating centre by tumour type and test type	Yes

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3.2 International Quality Indicators

Research was carried out on 20.12.2021

Results: 17 (Total of 24 sub indicators)

3.2.1 ISD – Scotland Health Indicators

Public Health Scotland, Information Services Division (ISD) [17]

Indicator	Results available
QPI 1 - Multi-Disciplinary Team (MDT) Meeting **Numerator**: Number of patients with lung cancer discussed at the MDT before definitive treatment. **Denominator**: All patients diagnosed with lung cancer. Excluding patients who died before first treatment.	Yes.
QPI 2 - Pathological Diagnosis 1. **Numerator**: Number of patients with lung cancer who have a pathological diagnosis (including following surgical resection). **Denominator**: All patients with lung cancer. Excluding patients who refuse investigations or surgical resection. 2. **Numerator**: Number of patients with a pathological diagnosis of NSCLC who have a tumour subtype identified. **Denominator**: All patients with a pathological diagnosis of NSCLC. No exclusions. 3. **Numerator**: Number of patients with a pathological diagnosis of stage IIIB or IV non-squamous NSCLC who have molecular profiling undertaken. **Denominator**: All patients with a pathological diagnosis of stage IIIB or IV non-squamous NSCLC. Excluding Patients with performance status 4.	Yes.
QPI 4 - PET CT in patients being treated with curative intent **Numerator**: Number of patients with NSCLC who are treated with curative intent (radical radiotherapy, radical chemoradiotherapy or surgical resection) who undergo PET CT prior to start of treatment.	Yes.

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Indicator	Results available
Denominator: All patients with NSCLC who are treated with curative intent (radical radiotherapy, radical chemoradiotherapy or surgical resection). No exclusions.	
QPI 6 - Surgical resection in non small cell lung cancer 1. **Numerator**: Number of patients with non small cell lung cancer (NSCLC) who undergo surgical resection. **Denominator**: All patients with non small cell lung cancer (NSCLC). Excludes patients who refuse surgery, patients who die before surgery and patients who undergo stereotactic ablative radiotherapy (SABR). 2. **Numerator**: Number of patients with stage I-II (T1aN0- T2bN1, or T3N0) NSCLC, who undergo surgical resection. **Denominator**: All patients with stage I-II (T1aN0-T2bN1, or T3N0) NSCLC. Excludes patients who refuse surgery, patients who die before surgery and patients who undergo stereotactic ablative radiotherapy (SABR).	Yes.
QPI 7 - Lymph node assessment **Numerator**: Number of patients with NSCLC undergoing surgical resection by lobectomy or pneumonectomy that have at least 1 node from at least 3 N2 stations sampled at time of resection or at previous mediastinoscopy. **Denominator**: All patients with NSCLC undergoing surgical resection by lobectomy or pneumonectomy. No exclusions.	Yes.
QPI 8 - Radiotherapy in inoperable lung cancer **Numerator**: Number of patients with lung cancer not undergoing surgery who receive radical radiotherapy (≥ 54Gy) ± chemotherapy or SABR **Denominator**: All patients with lung cancer not undergoing surgery. Excluding Patients with Small Cell Lung Cancer (SCLC), Patients who refuse radiotherapy, Patients who die prior to treatment and Patients with stage IV (M1a or M1b) disease. 35%	Yes.

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Indicator	Results available
QPI 9 - Chemoradiotherapy in locally advanced non small cell lung cancer **Numerator**: Number of patients with stage IIIA NSCLC with performance status 0-1, not undergoing surgery who receive chemoradiotherapy (radiotherapy ≥ 54Gy and concurrent or sequential chemotherapy) **Denominator**: All patients with stage IIIA NSCLC, with performance status 0-1, not undergoing surgery who receive radical radiotherapy ≥ 54Gy. Excludes Patients who refuse treatment, Patients who die before treatment, Patients receiving Continuous Hyperfractionated Radiotherapy.	Yes.
QPI 10 - Chemoradiotherapy in limited stage small cell lung cancer **Numerator**: Number of patients with T1-4, N0-3, M0 (stage I to IIIB)* SCLC, performance status 0 or 1 who receive chemoradiotherapy (radiotherapy > 40Gy and concurrent or sequential platinum-based chemotherapy). **Denominator**: All patients with T1-4, N0-3, M0 (stage I to IIIB) SCLC, performance status 0 or 1. Excludes Patients who refuse treatment, Patients who die before treatment, and Patients who undergo surgical resection.	Yes.
QPI 11 - Systemic anti cancer therapy in non small cell lung cancer 1. **Numerator**: Number of patients with NSCLC not undergoing surgery who receive systemic anti cancer therapy. **Denominator**: All patients with NSCLC not undergoing surgery. Excludes Patients who refuse chemotherapy, Patients who die before treatment. 2. **Numerator**: Number of patients with stage IIIB, IIIC or IV NSCLC, with performance status 0-2 not undergoing surgery that are EGFR / ALK positive who receive biological therapy. **Denominator**: All patients with stage IIIB, IIIC or IV NSCLC, with performance status 0-2 not undergoing surgery that are EGFR or ALK positive Excludes Patients who refuse SACT treatment, Patients who die before treatment, and Patients who are participating in clinical trials	Yes.
QPI 12 - Chemotherapy in small cell lung cancer	Yes.

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Indicator	Results available
1. **Numerator**: Number of patients with SCLC who receive first line chemotherapy ± radiotherapy. **Denominator**: All patients with SCLC. Excludes Patients who refuse chemotherapy, Patients who die before treatment, Patients who are participating in clinical trials. 2. **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. Excludes: Patients who refuse chemotherapy; Patients who die prior to treatment; Patients who are participating in clinical trials.	
QPI 13(i) - 30 day mortality *Adjuvant Chemotherapy* **Numerator**: Number of patients with lung cancer who receive active treatment who die within 30 days of treatment. **Denominator**: All patients with lung cancer who receive active treatment. *Biological Therapy NSCLC* **Numerator**: Number of patients with NSCLC who receive active treatment who die within 30 days of treatment. **Denominator**: All patients with NSCLC who receive active treatment. *Biological Therapy SCLC* **Numerator**: Number of patients with SCLC who receive active treatment who die within 30 days of treatment. **Denominator**: All patients with SCLC who receive active treatment. *Chemoradiotherapy* **Numerator**: Number of patients with lung cancer who receive active treatment who die within 30 days of treatment. **Denominator**: All patients with lung cancer who receive active treatment. *Palliative Chemotherapy NSCLC* **Numerator**: Number of patients with lung cancer who receive active treatment who die within 30 days of treatment.	Yes.

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Indicator	Results available
Denominator: All patients with lung cancer who receive active treatment. *Palliative Chemotherapy SCLC* **Numerator**: Number of patients with lung cancer who receive active treatment who die within 30 days of treatment. **Denominator**: All patients with lung cancer who receive active treatment. *Radical Radiotherapy* **Numerator**: Number of patients with lung cancer who receive active treatment who die within 30 days of treatment. **Denominator**: All patients with lung cancer who receive active treatment. *Surgery* **Numerator**: Number of patients with lung cancer who receive active treatment who die within 30 days of treatment. **Denominator**: All patients with lung cancer who receive active treatment.	
QPI 13(ii) - 90 day mortality *Adjuvant Chemotherapy* **Numerator**: Number of patients with lung cancer who receive treatment with curative intent (surgery, radical radiotherapy or chemoradiotherapy) who die within 90 days of treatment. **Denominator**: All patients with lung cancer who receive treatment with curative intent (surgery, radical radiotherapy or chemoradiotherapy) *Chemoradiotherapy* **Numerator**: Number of patients with lung cancer who receive treatment with curative intent (surgery, radical radiotherapy or chemoradiotherapy) who die within 90 days of treatment. **Denominator**: All patients with lung cancer who receive treatment with curative intent (surgery, radical radiotherapy or chemoradiotherapy) *Radical Radiotherapy* **Numerator**: Number of patients with lung cancer who receive treatment with curative intent (surgery, radical radiotherapy or chemoradiotherapy) who die within 90 days of treatment. **Denominator**: All patients with lung cancer who receive treatment with curative intent (surgery, radical radiotherapy or chemoradiotherapy).	Yes.

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Indicator	Results available
Surgery **Numerator**: Number of patients with lung cancer who receive treatment with curative intent (surgery, radical radiotherapy or chemoradiotherapy) who die within 90 days of treatment. **Denominator**: All patients with lung cancer who receive treatment with curative intent (surgery, radical radiotherapy or chemoradiotherapy)	
QPI 14 - Stereotactic Ablative Radiotherapy (SABR) in inoperable stage I lung cancer **Numerator**: Number of patients with stage I lung cancer not undergoing surgery who receive SABR **Denominator**: All patients with stage I lung cancer not undergoing surgery Excluding Patients with small cell lung cancer (SCLC), Patients who refuse SABR, and Patients who die prior to treatment.	Yes.
QPI 15 - Pre-treatment diagnosis 1. Surgery **Numerator**: Number of patients who receive curative treatment (radical radiotherapy, radical chemoradiotherapy or surgical resection) that have a cytological / histological diagnosis prior to treatment. **Denominator**: All patients with lung cancer who receive curative treatment (radical radiotherapy, radical chemoradiotherapy or surgical resection). Excluding patients who refuse investigations. 2. Radical Radiotherapy **Numerator**: Number of patients who receive curative treatment (radical radiotherapy, radical chemoradiotherapy or surgical resection) that have a cytological / histological diagnosis prior to treatment. **Denominator**: All patients with lung cancer who receive curative treatment (radical radiotherapy, radical chemoradiotherapy or surgical resection). Excluding patients who refuse investigations. 3. Chemoradiotherapy **Numerator**: Number of patients who receive curative treatment (radical radiotherapy, radical chemoradiotherapy or surgical resection) that have a cytological / histological diagnosis prior to treatment.	Yes.

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Indicator	Results available
Denominator: All patients with lung cancer who receive curative treatment (radical radiotherapy, radical chemoradiotherapy or surgical resection). Excluding patients who refuse investigations.	
QPI 16 - Brain Imaging **Numerator**: Number of patients with N2 disease who receive curative treatment (radical radiotherapy, radical chemoradiotherapy or surgical resection) that undergo contrast enhanced CT or contrast enhanced MRI prior to the start of treatment. **Denominator**: All patients with N2 disease who receive curative treatment (radical radiotherapy, radical chemoradiotherapy or surgical resection). Excluding patients who decline brain imaging	Yes.
QPI 17 - Clinical Trials and Research Study Access **Numerator**: Number of patients with Lung cancer enrolled in an interventional clinical trial or translational research. **Denominator**: All patients with Lung cancer. No exclusions	Yes.

3.2.2 NICE – National Institute for Health and Care Excellence

National Institute for Health and Care Excellence (NICE) [18]

Indicator	Results available
Record of lung cancer stage at decision to treat **Numerator**: Of the denominator, the number of patient records where the stage field at the time of decision to treat is completed according to staging rules. **Denominator**: The number of patients first seen in the respective Lung Cancer Audit year.	Yes.

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Research was carried out on: 20.02.2023

- Results: 37 (see point 2.2)

3.2.3 ECC – European Cancer Centre Certification Programme

European Cancer Centre Certification Programme [19]

Indicator	Results available
Primary cases. Target value: ≥ 200	Yes
Patients with new recurrence and/or distant metastases. No target value	Yes
Pretherapeutic tumour board. Target value ≥ 90% **Numerator**: Primary cases of the denominator presented in the pretherapeutic tumour board. **Denominator**: All LC patients with first diagnosis of lung cancer	Yes
Presentation of new recurrences and/or distant metastases after prior curative treatment in the tumour board. Target value ≥ 90% **Numerator**: Patients of the denominator who were presented in the tumour board **Denominator**: Patients with new recurrence and/or distant metastases after prior curative treatment	Yes
Tumour board after surgical treatment of primary cases stages IB-IIIB. Target value ≥ 90% **Numerator**: Primary cases of the denominator that were presented in the tumour board **Denominator**: Surgical primary cases stages IB-IIIB with anatomical lung resection	Yes
Duration of final tumour board decision until start of therapy. No target value **Numerator**: Primary cases of the denominator with time span ≤ 14d between tumour board decision and start of therapy. **Denominator**: Primary cases NSCLC stage I-III with final, pretherapeutic tumour board recommendation for therapy.	Yes
Psycho-oncological Distress Screening. Target value: ≥ 65% **Numerator**: Pat. of the denominator who were screened psycho-oncologically **Denominator**: Primary cases + patients with new recurrence and/or distant metastases	Yes

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Indicator	Results available
Counselling social services. Plausibility corridor < 50%. No target value **Numerator**: Patients of the denominator who received counselling from social services in an inpatient or outpatient setting **Denominator**: Primary cases + patients with recent recurrence and/or distant metastases	Yes
Patients enrolled in a study. Target value ≥ 5% **Numerator**: Patients who were included in a study **Denominator**: Primary cases	Yes
Flexible bronchoscopy. Target value ≥ 500	Yes
Interventional bronchoscopy (thermal procedures and stenting). Target value ≥ 10	Yes
FDG-PET/CT for staging. No target value **Numerator**: Denominator patients with whole-body FDG-PET/CT for staging. **Denominator**: Primary cases with NSCLC clinical stage IB-IIIB	Yes
Lung resections. No target value	Yes
Lung resections. Target value ≥ 75	Yes
Ratio of broncho-/angioplasty surgeries to pneumonectomies. Plausibility corridor < 50%. No target value **Numerator**: Primary cases of denominator with broncho-/angioplasty surgeries **Denominator**: Primary cases with pneumonectomies and primary cases with broncho-/angioplasty surgeries.	Yes
Videothoracoscopic (VATS) and robotic-assisted (RATS) anatomic resections. No target value **Numerator**: Operations of the denominator performed videothoracoscopically (VATS) and robot-assisted (RATS). **Denominator**: Surgical primary cases	Yes
30d lethality after resections. Plausibility corridor < 0,01%. Target value ≤ 5% **Numerator**: Primary cases of the denominator who died post-operative within 30d **Denominator**: Surgical primary cases with anatomical lung resection	Yes

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Indicator	Results available
Post-operative bronchial stump/anastomotic insufficiency. Plausibility corridor < 0,01%. Target value ≤ 5% **Numerator**: Primary cases of the denominator with post-operative bronchial stump/anastomotic insufficiency **Denominator**: Surgical primary cases for each department	Yes
Local R0 resections in stages IA/B and IIA/B. Target value ≥ 95% **Numerator:** Primary cases of the denominator with local R0 resections after completion of surgical treatment **Denominator**: Surgical primary cases of anatomical lung resection in stages IA/B and IIA/B	Yes
Local R0 resections in stages IIIA/B. Target value ≥ 85% **Numerator:** Primary cases of the denominator with local R0 resections after completion of surgical treatment **Denominator**: Surgical primary cases in stages IIIA/B with anatomic lung resection	Yes
Thoracic radiotherapy. Target value ≥ 50	Yes
Stereotactic radiotherapy for inoperability. No target value **Numerator:** Primary cases of the denominator with stereotactic radiotherapy. **Denominator**: Primary cases NSCLC stage IA, IB, IIA with tumor board recommendation against resection.	Yes
Pathology reports. Target value ≥ 200 malignant lung cases (for each specialist 100 L.)	Yes
Adjuvant cisplatin-based chemotherapy stages II-IIIA1/2. Plausibility corridor < 15%. No target value **Numerator:** Primary cases of the denominator with cisplatin-based chemotherapy **Denominator**: R0 and lymph node-resected NSCLC primary cases with anatomical lung resection stages II-IIIA1/2 with ECOG 0/1	Yes
Combined radio-chemotherapy in stages IIIA4/IIIB/IIIC. Target value ≥ 25% **Numerator:** Primary cases of the denominator with combined radio-chemotherapy	Yes

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Indicator	Results available
Denominator: NSCLC primary cases stages IIIA4/IIIB/IIIC with ECOG 0/1	
Maintenance therapy after definitive radiochemotherapy. No target value **Numerator:** Primary cases of the denominator with durvalumab therapy started. **Denominator**: Primary cases after definitive radiochemotherapy without progression and with PD-L1 expression of ≥ 1% on tumour cells	Yes
Molecular-pathological examination of patients NSCLC stage IV. Target value ≥ 75% **Numerator:** Primary cases of the denominator with investigation of at least EGFR mutations in exons 18-21 and BRAF V600 mutations and ALK fusions and ROS1 fusions and RET fusions and NTRK 1-3 fusions. **Denominator**: Primary cases with NSCLC stage IV	Yes
Molecular pathological examination after curative tumor resection. No target value **Numerator**: Primary cases of the denominator with testing for EGFR mutations in exons 19 and 21. **Denominator**: Primary cases with NSCLC stage IB-IIIA and curative tumor resection (anatomic resection, R0).	Yes
First-line therapy with EGFR-TKI in pat. stage IV NSCLC with common activating EGFR mutation (del 19, L858R) and ECOG 0-2. Plausibility corridor < 30%. No target value **Numerator**: Primary cases of the denominator with commencement of first-line therapy with EGFR-TKI **Denominator**: Primary cases with stage IV NSCLC, typical activating EGFR mutation (del 19, L858R) and ECOG 0-2.	Yes
First-line therapy with CNS-active ALK-specific TKI therapy for patients with ALK positive NSCLC in stage IV. Plausibility corridor < 30%. No target value **Numerator**: Primary cases of the denominator with commencement of CNS-active ALK-specific TKI therapy **Denominator**: Primary cases with NSCLC stage IV, ALK pos.	Yes
Combined radiochemotherapy for SCLC stages IIB – IIIC. Plausibility corridor < 30%. No target value	Yes

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Indicator	Results available
Numerator: Primary cases of the denominator with radiochemotherapy **Denominator**: Primary cases with SCLC stages IIB[T3] – IIIC [TNM: cT1/2 N2-3 M0, cT3/4 N0-3 M0] and ECOG 0/1	
Prophylactic cranial irradiation for SCLC (limited disease). No target value **Numerator**: Primary cases of denominator with prophylactic cranial irradiation after end of chemoradiation therapy. **Denominator**: Primary cases with SCLC in tumor stages T3-4 N0-1 M0 and T1-4 N2-3 M0 (limited disease) and remission after chemo-radiotherapy	Yes
Chemo-immunotherapy in SCLC. No target value **Numerator**: Primary cases of denominator with combination with PD-L1 antibody therapy (atezolizumab or durvalumab) **Denominator**: Primary cases with SCLC stad. IV and chemotherapy (platinum/etoposide)	Yes
CTCAE stage V during systemic therapy. No target value **Numerator**: Primary cases of the denominator with CTCAE grade V on systemic therapy **Denominator**: Primary cases stages III or IV on systemic therapy	Yes
Recording of symptoms using MIDOS/ IPOS. Plausibility corridor < 60%. No target value **Numerator**: Primary cases of the denominator with symptom recording by MIDOS or IPOS **Denominator**: Primary cases stage IV and patients with new recurrence and/or distant metastases.	Yes
PD-L1 testing for NSCLC in stage III with radiochemotherapy. Target value ≥ 75% **Numerator**: Primary cases of the denominator with PD-L1 testing before starting radio-chemotherapy **Denominator**: Primary cases with NSCLC stage III with radio-chemotherapy	Yes
PD-L1 testing for NSCLC in stage IV. Target value ≥ 75% **Numerator**: Primary cases of the denominator with PD-L1 testing **Denominator**: Primary cases with NSCLC stage IV	Yes

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Annex 2: Expert panel assessment sheet for Second Screening

Assessment tool for Quality indicators in the course of JA CraNE (WP 6, task 2)

Based on the written assessment of all group members, a QI is accepted if the agreement is greater than or equal to 75% for each criterion.

QI-Nr.			Evidence		
1.	Nominator				
	Denominator				
				No	**Yes**
1.	Relevance (potential for improvement / clinical relevance) Question: Does the quality indicator include the potential for improving relevant patient outcomes?				
2.	Feasibility (measurability) Question: Is the data routinely documented by the service provider or does an additional survey require a reasonable level of effort?				
3.	Usability (clarity of definition, influenceability) Question: Is the indicator clearly and unambiguously defined and is it related to an aspect of care that can be influenced by the service provider?				

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