National Cancer Recovery Group
National Cancer Quality Steering Group

Mesothelioma
Clinical Quality Performance Indicators

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Contents Record

March 2023 (v3.0)
This document was updated following formal review (1st Cycle) of the Mesothelioma Quality Performance Indicators (QPIs) which took place following analysis of year 3 of the Mesothelioma QPI data.

The following QPIs have been updated:

- QPI 1: Diagnostic Imaging
- QPI 3: Multidisciplinary Team
- QPI 4: Systemic Anti-Cancer Treatment
- QPI 5: Radiotherapy for Management of Pain
- QPI 6: Pleural Fluid Management

The following QPI have been archived:

- QPI 7: Clinical Trials and Research Study Access*

***** This indicator will continue to be monitored via other national reporting systems rather than through the QPI process.

As a result of the changes above, the contents page and page numbering differ from earlier versions of this document. Sections 1 – 11 and the appendices have also been updated.

Please note that this version of the Mesothelioma QPI Document applies to cases diagnosed from 1st January 2022 onwards. Where amended or new QPIs require new data items for measurement, this will apply for patients diagnosed from 1st January 2023.

Previous Update:

December 2021 (v2.0)
This document was updated following baseline review of the Mesothelioma QPIs which took place after analysis of the mesothelioma QPI data. This has been undertaken following Year 2 analysis in order to include a larger cohort of patients for review. As a result, the following QPIs have been updated:

- QPI 4: Systemic Anti-Cancer Treatment

In addition, text within the sections 1 – 11 has also been updated. Please note that this version of the Mesothelioma QPI document applies to cases diagnosed from 1st January 2021.

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1. National Cancer Quality Programme

Better Cancer: Ambition and Action (2016)[1] details a commitment to delivering the national cancer quality programme across NHSScotland, with a recognised need for national cancer QPIs to support a culture of continuous quality improvement. Addressing variation in the quality of cancer services is pivotal to delivering improvements in quality of care. This is best achieved if there is consensus and clear indicators for what good cancer care looks like.

Small sets of cancer specific outcome focussed, evidence based indicators are in place for 19 different tumour types. These QPIs ensure that activity is focused on those areas that are most important in terms of improving survival and individual care experience whilst reducing variation and supporting the most effective and efficient delivery of care for people with cancer. QPIs are kept under regular review and are responsive to changes in clinical practice and emerging evidence.

A programme to review and update the QPIs in line with evolving evidence is in place as well as a robust mechanism by which additional QPIs will be developed over the coming years.

1.1 Quality Assurance and Continuous Quality Improvement

The ultimate aim of the programme is to develop a framework, and foster a culture of, continuous quality improvement, whereby real time data is reviewed regularly at an individual Multi Disciplinary Team (MDT)/Unit level and findings actioned to deliver continual improvements in the quality of cancer care. This is underpinned and supported by a programme of regional and national comparative reporting and review.

NHS Boards are required to report against QPIs as part of a mandatory, publicly reported, programme at a national level. A rolling programme of reporting is in place, with approximately three national tumour specific summary reports published annually. These reports highlight the publication of the QPIs in the Cancer QPI Dashboard which includes comparative reporting of performance against QPIs at MDT/Unit level across NHSScotland, trend analysis and survival. This approach helps to overcome existing issues relating to the reporting of small volumes in any one year.

In the intervening years tumour specific QPIs are monitored on an annual basis through established Regional Cancer Networks and local governance processes, with analysed data submitted to Public Health Scotland (PHS) (previously ISD Scotland) for inclusion in the Cancer QPI Dashboard and subsequent national summary reports. This approach ensures that timely action is taken in response to any issues that may be identified through comparative reporting and systematic review.

2. Quality Performance Indicator Development Process

The QPI development process was designed to ensure that indicators are developed in an open, transparent and timely way.

The Mesothelioma QPI Development Group was convened in May 2018, chaired by Dr Hilary Dobson (Deputy Director, Innovative Healthcare Delivery Programme). Membership of this group included clinical representatives drawn from the three regional cancer networks, Healthcare Improvement Scotland, ISD and patient/carer representatives. Membership of the development group can be found in appendix 1.

3. QPI Formal Review Process

As part of the National Cancer Quality Programme a systematic national review process has been developed, whereby all tumour specific QPIs published are subject to formal review following 3 years analysis of comparative QPI data.

The formal review process is clinically driven with proposals for change sought from specialty specific representatives in each of the Regional Cancer Networks. It is designed to be flexible in terms of the extent of review required with tumour specific Regional Clinical Leads undertaking a key role in this decision making. Formal review meetings to further discuss proposals are arranged where deemed necessary. The review builds on existing evidence using expert clinical opinion to identify where new evidence is available, and a full public engagement exercise will take place where significant revisions have been made or new QPIs developed.

During formal review QPIs may be archived and replaced with new QPIs. Triggers for doing so include significant change to clinical practice, targets being consistently met by all Boards and publication of new evidence. Where QPIs have been archived, for those indicators which remain clinically relevant, data will continue to be collected to allow local / regional analysis of performance as required.

Any new QPIs have been developed in line with the following criteria:

- **Overall importance** – does the indicator address an area of clinical importance that would significantly impact on the quality and outcome of care delivered?

- **Evidence based** – is the indicator based on high quality clinical evidence?

- **Measurability** – is the indicator measurable i.e. are there explicit requirements for data measurement and are the required data items accessible and available for collection?

4. Format of the Quality Performance Indicators

QPIs are designed to be clear and measurable, based on sound clinical evidence whilst also taking into account other recognised standards and guidelines.

- Each QPI has a **short title** which will be utilised in reports as well as a fuller **description** which explains exactly what the indicator is measuring.

- This is followed by a brief overview of the **evidence base and rationale** which explains why the development of this indicator was important.

- The measurability **specifications** are then detailed; these highlight how the indicator will actually be measured in practice to allow for comparison across NHSScotland.

- Finally a **target** is indicated, which dictates the level each unit should be aiming to achieve against each indicator.

In order to ensure that the chosen target levels are the most appropriate and drive continuous quality improvement as intended they are kept under review and revised as necessary, if further evidence or data becomes available.

Rather than utilising multiple exclusions, a tolerance level has been built into the QPIs. It is very difficult to accurately measure patient choice, co-morbidities and patient fitness

therefore target levels have been set to account for these factors. Further detail is noted within QPIs where there are other factors which influenced the target level.

Where 'less than' (<) target levels have been set the rationale has been detailed within the relevant QPI. All other target levels should be interpreted as 'greater than' (>) levels.

5. Supporting Documentation

A national minimum core dataset and a measurability specification document have been developed in parallel with the indicators to support the monitoring and reporting of Mesothelioma QPIs. These will be implemented for patients diagnosed with Mesothelioma on, or after, 1st January 2023.

6. Mesothelioma QPI Inclusion Criteria

Pleural mesothelioma is the most common form of mesothelioma and accounts for approximately 80 - 85% of cases[3.] Various other types exist including peritoneum and pericardial mesothelioma. The treatment of these cancers is different from pleural mesothelioma therefore the QPI development group has agreed that the QPIs will apply to pleural mesothelioma only.

7. Quality Performance Indicators for Mesothelioma

QPI 1 – Diagnostic: Imaging

QPI Title:	Thoracic computed tomography (CT) scan optimised for pleural assessment should be undertaken as standard for diagnosis and staging in patients with mesothelioma.	
Description:	Proportion of patients with mesothelioma in whom CT scan optimised for pleural assessment (between 60 and 90 seconds) is carried out, and TNM stage is recorded. **Please note:** The specifications of this QPI are separated to ensure clear measurement of: (i) Patients in whom CT scan optimised for pleural assessment (between 60 and 90 seconds) is carried out; and (ii) Patients in whom CT scan optimised for pleural assessment (between 60 and 90 seconds) is carried out for first discussion at the national MDT, and TNM stage is recorded.	
Rationale/Evidence:	Overall reported diagnostic accuracy of CT scan in the detection of pleural malignancy in 60%-97%, with specificity of 79%-89%. BTS Guidelines for Investigation and Management of Malignant Pleural Mesothelioma: Section 5[3,4,5,6,7]. The QPI development group acknowledge that there may be additional tests required for staging purposes, however agreed to focus on optimal CT imaging for the measurement of this QPI.	
Specification (i):	**Numerator:**	Number of patients with mesothelioma in whom CT scan optimised for pleural assessment was carried out.
	Denominator:	All patients with mesothelioma.
	Exclusions:	• Patients who decline investigations.
Target:	90% The tolerance within this target is designed to account for patients with significant renal impairment (e.g. eGFR <30) or allergies to iodinated contrast. In addition, it accounts for those patients in whom diagnosis was an incidental finding on non-contrast CT, and additional imaging is not clinically required.	

(Continued overleaf)

QPI 1 – Diagnostic: Imaging (continued)

Specification (ii)	**Numerator:**	Number of patients with Mesothelioma in whom CT scan optimised for pleural assessment was carried out for first discussion at the national MDT meeting, and who have TNM stage recorded.
	Denominator:	All patients with Mesothelioma who had CT optimised for pleural assessment carried out for first discussion at national MDT meeting.
	Exclusions:	• None
Target:	95%	

QPI 2 – Diagnostic: Histopathology

QPI Title:	Patients should have a histopathological diagnosis of Mesothelioma.
Description:	Proportion of patients who have a histopathological diagnosis of mesothelioma. **Please note:** This QPI measures 3 distinct elements: i) Patients with mesothelioma who have a histopathological diagnosis. ii) Patients with a histopathological diagnosis of mesothelioma who have a subtype identified. iii) Patients with a histopathological diagnosis of epithelioid mesothelioma who have IHC markers profiling* undertaken.
Rationale/Evidence:	A definitive histological diagnosis of mesothelioma is valuable in helping inform patients and carers about the nature of the disease and the likely prognosis and to facilitate compensation claims. Tissue should be obtained by thoracoscopy or image guided biopsy. Cytology should not be relied upon in isolation for the diagnosis of mesothelioma[8,9]. Histological subtyping on biopsy material is important because non-epithelioid histology is associated with a significantly shorter overall survival[10,11]. Also, the entry into some clinical trials is dependent on presence or absence of subtypes. Mesothelioma may mimic other tumours including adenocarcinoma and sarcoma. Immunohistochemistry is the most important ancillary technique in differentiating these tumours. A panel of antibodies to include at least 2 mesothelioma markers and 2 adenocarcinoma markers increases diagnostic accuracy[12].
Specification (i):	**Numerator:** Number of patients who have a histopathological diagnosis of mesothelioma. **Denominator:** All patients with mesothelioma. **Exclusions:** • Patients who decline investigations.
Target:	85% The tolerance within this target is to account for patients in whom pursuit of tissue is not clinically safe or appropriate.

(Continued overleaf)

QPI 2 – Diagnostic: Histopathology (continued)

Specification (ii):	**Numerator:**	Number of patients with a histopathological diagnosis of mesothelioma who have a subtype identified.
	Denominator:	All patients with a histopathological diagnosis of mesothelioma.
	Exclusions:	• No exclusions.
Target:	95% The tolerance level within this target is designed to account for situations where there is insufficient tissue to perform additional testing.	
Specification (iii):	**Numerator:**	Number of patients with a histopathological diagnosis of epithelioid mesothelioma who have an appropriate immuno-histochemical panel* undertaken on the biopsy.
	Denominator:	All patients with a histopathological diagnosis of epithelioid mesothelioma.
	Exclusions:	• No exclusions.
Target:	95% The tolerance level within this target is designed to account for situations where there is insufficient tissue to perform additional testing.	

* Details of the immuno-histochemical panel undertaken that is currently measured within this QPI is outlined within the associated dataset document.

(Continued overleaf)

QPI 3 – Multidisciplinary Team

QPI Title:	Patients should be discussed by a multidisciplinary team (MDT).
Description:	Proportion of patients with mesothelioma who are discussed at the national mesothelioma MDT meeting.
Rationale and Evidence:	Evidence suggests that patients with cancer managed by a multi-disciplinary team have a better outcome. There is also evidence that the multidisciplinary management of patients increases their overall satisfaction with their care[13]. Discussion within the national MDT will formulate standardised management plans and treatment decisions, providing reassurance that patients are being managed appropriately.
Specifications:	**Numerator:** Number of patients with mesothelioma discussed at the national mesothelioma MDT meeting. **Denominator:** All patients with mesothelioma. **Exclusions:** • None
Target:	95% The tolerance level within this target is designed to account for uncommon situations where frail patients present with rapidly deteriorating disease and a local plan is made for symptom directed care only.

QPI 4 – Systemic Anti-Cancer Treatment

QPI Title:	Patients with good performance status should receive first line treatment with Systemic Anti-Cancer Treatment (SACT).
Description:	Proportion of patients with mesothelioma and performance status (PS) 0 -1 who receive first line treatment with SACT.
Rationale/Evidence:	For patients with mesothelioma and good PS, first-line SACT leads to longer survival. This includes chemotherapy using a combination of cisplatin (or carboplatin) and pemetrexed, which is associated with longer survival than treatment with cisplatin alone[14]. Carboplatin can be offered instead of cisplatin if cisplatin is contraindicated or would increase risk. This is based on equivalent efficacy in previous studies[15]. Combination immune checkpoint blockade, using Ipilimumab and Nivolumab, is associated with longer survival than treatment with cisplatin (or carboplatin) plus pemetrexed[16]. The superiority of Ipilimumab and Nivolumab was greatest in patients with non-epithelioid histological subtype.
Specifications:	**Numerator:** Number of patients with a diagnosis of mesothelioma and PS 0-1 who receive first line treatment with SACT. **Denominator:** All patients with a diagnosis of mesothelioma and PS 0 -1. **Exclusions:** • Patients who decline or defer SACT treatment. • Patients receiving chemotherapy treatment as part of a clinical trial.
Target:	60% The tolerance within this target accounts for situations where patients with PS 0 -1 may not be suitable for treatment with SACT due to co-morbidities.

Please Note:
This QPI will be reported one year in arrears. This will enable reporting of all patients who receive first line SACT within 12 months following diagnosis. This has been deemed a more appropriate time frame to capture this particular aspect of treatment.

QPI 5 – Radiotherapy for Management of Pain

QPI Title:	Radiotherapy should be given for management of uncontrolled pain in patients with mesothelioma where appropriate.
Description:	Proportion of patients with mesothelioma who are referred to the national MDT with uncontrolled pain who receive radiotherapy.
Rationale/Evidence:	Radiotherapy should not be offered as a prophylactic, preoperative or post-operative treatment modality. Use should be restricted to control of mesothelioma pain. Localised radiotherapy can improve pain control in mesothelioma, although the effect is variable and is short lived[17,18,19,20,21, 22]. Radiation dose fractionation utilised in studies of localised radiotherapy for pain control in mesothelioma are variable. The optimal dose is not known (SYSTEMS2 trial).
Specifications:	**Numerator:** Number of patients with mesothelioma referred to the national MDT with uncontrolled pain who receive radiotherapy. **Denominator:** All patients with mesothelioma referred to the national MDT with uncontrolled pain. **Exclusions:** • Patients who decline radiotherapy treatment. • Patients receiving radiotherapy treatment as part of a clinical trial. • Patients who undergo a cordotomy. • Patients with uncontrolled pain which becomes controlled after optimisation of analgesia.
Target:	75% The tolerance within this target accounts for the fact that due to co-morbidities and fitness not all patients will be suitable for radiotherapy. It also accounts for factors of patient choice.

Please Note:
This QPI will be reported one year in arrears. This will enable reporting of all patients referred to the national MDT for pain management who receive radiotherapy within 18 months following diagnosis. This has been deemed a more appropriate time frame to capture this particular aspect of treatment.

QPI 6 – Pleural Fluid Management

QPI Title:	Patients with mesothelioma, who have symptomatic pleural effusion should be offered talc pleurodesis or indwelling pleural catheter (IPC) to manage fluid.
Description:	Proportion of patients with mesothelioma with symptomatic pleural effusion who undergo either talc pleurodesis (via slurry or poudrage) or indwelling pleural catheter (IPC) insertion to manage fluid.
Rationale/Evidence:	No single fluid control technique has been shown to be superior in terms of patients' symptoms or pleurodesis success in mesothelioma. However, it is important that patients are able to be offered both techniques and given the choice on fluid management. As patient choice is difficult to measure the type of fluid management procedure undertaken is utilised within this QPI as a proxy measure. This will provide an indication of any variation in practice across NHS Boards. VATS-PP has been shown to be more expensive, associated with greater complications and longer hospital stay than talc slurry pleurodesis[23]. IPC and talc slurry pleurodesis have similar patient-related outcomes in malignant pleural effusion and mesothelioma[24].
Specifications:	**Numerator:** Number of patients with mesothelioma who have symptomatic pleural effusion who undergo either talc pleurodesis (via slurry or poudrage) or indwelling pleural catheter (IPC) insertion to manage fluid. **Denominator:** All patients with mesothelioma who have symptomatic pleural effusion. **Exclusions:** • Patients who decline fluid management procedures. • Patients in whom pleural management is not required e.g. no symptomatic re-accumulation of pleural effusion after initial fluid aspiration or fluid removal during thoracoscopy.
Target:	90% The tolerance level within this target is designed to account for the fact that due to co-morbidities and fitness not all patients may be suitable for a procedure. Furthermore, some patients may positively choose a non-definitive procedure, e.g. pleural fluid aspiration, for reasons of perceived convenience or reluctance to commit to definitive management.

Please note:
Information on the type of procedure used to manage pleural fluid (talc pleurodesis or IPC) will be reported across NHS Boards alongside this QPI. This information should be reviewed to ensure there is sufficient choice between these options for patients

QPI 8 – Post-Mortem Examination

QPI Title:	Patients with a diagnosis of mesothelioma should only undergo post-mortem examination in the absence of pathological evidence of diagnosis.
Description:	Proportion of patients who have died with a pathological diagnosis of mesothelioma who undergo post-mortem examination.
Rationale/Evidence:	Since 2014, the Procurator Fiscal and Chief Medical Officer have agreed procedures to reduce distress to the family. Reduction in the number of inappropriate post-mortem examinations carried out will prevent the families of patients being exposed to additional stress following a patients' death[25]. Post mortem examination is used to determine diagnosis of mesothelioma for the legal reasons and civil compensation claims. Where a patient has pathological evidence of Mesothelioma this provides a conclusive diagnosis, removing the requirement for post- mortem examination.
Specifications:	**Numerator:** Number of patients who have died with a pathological diagnosis of mesothelioma who undergo post- mortem examination. **Denominator:** All patients who have died with a pathological diagnosis of mesothelioma. **Exclusions:** • None
Target:	<10% This QPI is measuring the proportion of patients who do have a pathological diagnosis and undergo a post mortem examination therefore a 'less than' target level has been set. The tolerance within this target accounts for those patients who undergo post mortem examination for reasons unrelated to mesothelioma.

8. Survival

Improving survival forms an integral part of the national cancer quality improvement programme. Mesothelioma survival analysis will be reported on a 3-yearly basis by Public Health Scotland (PHS). The specific issues which will be addressed, for example 1 year or 5 year survival rates, will be identified by an expert group ahead of any analysis being undertaken, as per the agreed national cancer quality governance and improvement framework.

To ensure consistent application of survival analysis, it has been agreed that a single analyst on behalf of all three regional cancer networks undertakes this work. Survival analysis will be scheduled as per the national survival analysis and reporting timetable, agreed with the National Cancer Quality Steering Group and National Cancer Recovery Group. This reflects the requirement for record linkage and the more technical requirements of survival analyses which would make it difficult for individual Boards to undertake routinely and in a nationally consistent manner.

9. Areas for Future Consideration

The Mesothelioma QPI Groups have not been able to identify sufficient evidence, or determine appropriate measurability specifications, to address all areas felt to be of key importance in the treatment of Mesothelioma and therefore in improving the quality of care for patients affected by this type of cancer.

The following area for future consideration has been raised across the lifetime of the Mesothelioma QPIs.

- Palliative Management of Mesothelioma Patients.

10. Governance and Scrutiny

A national and regional governance framework to assure the quality of cancer services in NHSScotland has been developed; key roles and responsibilities within this are set out below. Appendices 4 and 5 provide an overview of these governance arrangements diagrammatically. The importance of ensuring robust local governance processes are in place is recognised and it is essential that NHS Boards ensure that cancer clinical audit is fully embedded within established processes.

10.1 National

- National Cancer Recovery Group
    - Accountable for overall national cancer quality programme and overseeing the quality of cancer care across NHSScotland.

- Healthcare Improvement Scotland
    - Proportionate scrutiny of performance.
    - Support performance improvement.
    - Quality assurance: ensure robust action plans are in place and being progressed via regions/Boards to address any issues identified.

- Public Health Scotland (previously Information Services Division (ISD))

- Publish national comparative report on tumour specific QPIs and survival for three tumour types per annum and specified generic QPIs as part of the rolling programme of reporting.

10.2 Regional – Regional Cancer Networks

- Annual regional comparative analysis and reporting against tumour specific QPIs.
- Support national comparative reporting of specified generic QPIs.
- Identification of regional and local actions required and development of an action plan to address regional issues identified.
- Performance review and monitoring of progress against agreed actions.
- Provide assurance to NHS Board Chief Executive Officers that any issues identified have been adequately and timeously progressed.

10.3 Local – NHS Boards

- Collect and submit data for regional comparative analysis and reporting in line with agreed measurability and reporting schedule (generic and tumour specific QPIs).
- Utilise local governance structures to review performance, develop local action plans and monitor delivery.
- Demonstrate continual improvements in quality of care through on-going review, analysis and feedback of clinical audit data at an individual multidisciplinary team (MDT) or unit level.

11. References

1. Scottish Government (2016). Beating Cancer: Ambition and Action (accessed December 2016). Available online from: http://www.gov.scot/Resource/0049/00496709.pdf.
2. Robert Shavelle, Kate Vavra-Musser, Jessica Lee, Jordan Brooks. Life Expectancy in Pleural and Peritoneal Mesothelioma Lung Cancer Int. 2017; 2017: 2782590. Published online 2017. (accessed April 2019). Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5292397/
3. Salonen O, Kivisaari L, Standertskjöld-Nordenstam CG, et al. Computed tomography of pleural lesions with special reference to the mediastinal pleura. Acta Radiol Diagn 1986;27:527–31. (accessed November 2018).
4. Seely JM, Nguyen ET, Churg AM, et al. Malignant pleural mesothelioma: computed tomography and correlation with histology. Eur J Radiol 2009;70:485–91.(accessed November 2018).
5. Okten F, Köksal D, Onal M, et al. Computed tomography findings in 66 patients with malignant pleural mesothelioma due to environmental exposure to asbestos. Clin Imaging 2006;30:177–80. (accessed November 2018).
6. Knuuttila A, Kivisaari L, Kivisaari A, et al. Evaluation of pleural disease using MR and CT. With special reference to malignant pleural mesothelioma. Acta Radiol 2001;42:502–7. (accessed November 2018).
7. Metintas M, Ucgun I, Elbek O, et al. Computed tomography features in malignant pleural mesothelioma and other commonly seen pleural diseases. Eur J Radiol 2002;41:1–9. (accessed November 2018).
8. Walters J, Maskell NA. Biopsy techniques for the diagnosis of mesothelioma. Recent Results Cancer Res 2011;189:45–55. (accessed November 2018).
9. Segal A, Sterrett GF, Frost FA, et al. A diagnosis of malignant pleural Mesothelioma can be made by effusion cytology: results of a 20 year audit. Pathology 2013;45:44–8. (accessed November 2018).
10. 54 Wu D, Hiroshima K, Matsumoto S, et al. Diagnostic usefulness of p16/CDKN2A FISH in distinguishing between sarcomatoid mesothelioma and fibrous pleuritis. Am J Clin Pathol 2013;139:39–46. (accessed November 2018).
11. 5555 Hida T, Matsumoto S, Hamasaki M, et al. Deletion status of p16 in effusion smear preparation correlates with that of underlying malignant pleural mesothelioma tissue. Cancer Sci 2015;106:1635–41. (accessed November 2018).
12. Woolhouse I, et al. Thorax 2018;**73**:i1–i30. doi:10.1136/thoraxjnl-2017-211321. (accessed November 2018).
13. NHS Quality Improvement Scotland (2008) Management of Core Cancer Services Standards. (accessed November 2018).
14. Vogelzang NJ, Rusthoven JJ, Symanowski J, et al. Phase III study of pemetrexed in combination with cisplatin versus cisplatin alone in patients with malignant pleural mesothelioma. J Clin Oncol 2003;21:2636–44. (accessed November 2018).
15. Van Meerbeeck JP, Gaafar R, Manegold C, et al. Randomized phase III study of cisplatin with or without raltitrexed in patients with malignant pleural mesothelioma: an intergroup study of the European Organisation for Research and Treatment of Cancer Lung Cancer Group and the National Cancer Institute of Canada. J Clin Oncol 2005;23:6881–9. (accessed November 2018).
16. Baas et al. First line Nivolumab plus ipilimumab in unresectable malignant pleural mesothelioma (CheckMate 743): a multi-centre, randomised, open label phase 3 trial. Lancet (2021); 397:10272:375-386. Available from: https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)32714-8/fulltext

(accessed December 2022).

17. MacLeod N, Chalmers A, O'Rourke N, et al. Is Radiotherapy Useful for Treating Pain in Mesothelioma?: A Phase II Trial. J Thorac Oncol 2015;10:944–50. (accessed November 2018).
18. Davis SR, Tan L, Ball DL. Radiotherapy in the treatment of malignant mesothelioma of the pleura, with special reference to its use in palliation. Australas Radiol 1994;38:212–4. (accessed November 2018).
19. De Graaf-Strukowska L, van der Zee J, van Putten W, et al. Factors influencing the outcome of radiotherapy in malignant mesothelioma of the pleura—a single-institution experience with 189 patients. Int J Radiat Oncol Biol Phys 1999;43:511–6. (accessed November 2018).
20. Jenkins P, Milliner R, Salmon C. Re-evaluating the role of palliative radiotherapy in malignant pleural mesothelioma. Eur J Cancer 2011;47:2143–9. (accessed November 2018).
21. Chapman E, Berenstein EG, Dieguez M, et al. Radiotherapy for malignant pleural mesothelioma. Cochrane Database Syst Rev 2006;3:CD003880. (accessed November 2018).
22. Macleod N, Price A, O'Rourke N, et al. Radiotherapy for the treatment of pain in malignant pleural mesothelioma: a systematic review. Lung Cancer 2014;83:133–8. (accessed November 2018).
23. Rintoul RC, Ritchie AJ, Edwards JG, et al. Efficacy and cost of video-assisted thoracoscopic partial pleurectomy versus talc pleurodesis in patients with malignant pleural mesothelioma (MesoVATS): an open-label, randomised, controlled trial. Lancet 2014;384:1118–27. (accessed November 2018).
24. Davies HE, Mishra EK, Kahan BC, et al. Effect of an indwelling pleural catheter vs chest tube and talc pleurodesis for relieving dyspnea in patients with malignant pleural effusion: the TIME2 randomized controlled trial. JAMA 2012;307:2383–9. (accessed November 2018).
25. Chief Medical Officer – Procurator Fiscal Service. Mesothelioma Proforma (2014). (accessed November 2018).
26. British Thoracic Society. Guideline for the Investigation and Management of Malignant Pleural Mesothelioma (2018). (accessed November 2018). Available from: https://www.brit-thoracic.org.uk/standards-of-care/guidelines/bts-guideline-for-the-investigation-and-management-of-pleural-mesothelioma/

12. Appendices

Appendix 1: QPI Development Process

Preparatory Work and Scoping

In March 2018 The British Thoracic Society published the 'Guideline for the Investigation and Management of MPM'[26]. This along with an abstract summary published in the British Medical Journal informed the basis of the evidence on which the QPIs were developed.

Indicator Development

The indicator development phase of the project allowed the development group to create evidence based measurable indicators with a clear focus on what could actually make a real difference to quality of care.

Draft QPIs were then assessed by the Mesothelioma QPI Development Group against three criteria:

- **Overall importance** – does the indicator address an area of clinical importance that would significantly impact on the quality and outcome of care delivered?
- **Evidence based** – is the indicator based on high quality clinical evidence?
- **Measurability** – is the indicator measurable i.e. are there explicit requirements for data measurement and are the required data items accessible and available for collection?

Engagement Process

The Mesothelioma QPIs were included as part of the Mesothelioma Clinical Quality Performance Indicator Engagement Document which was made available on the Scottish Government website over January and February 2019, as part of a wide clinical and public engagement exercise.

During the engagement period clinical and management colleagues from across NHSScotland, patients affected by Mesothelioma and the wider public were given the opportunity to influence the development of Mesothelioma QPIs. Several different methods of engagement were utilised:

Professional groups, health service staff, voluntary organisations and individuals:

- Wide circulation of the draft documentation for comment and feedback.

Following the engagement period all comments and responses received were reviewed by the Mesothelioma QPI Development Group and used to produce and refine the final indicators.

Appendix 2: Mesothelioma QPI Development Group Membership (2018)

Name	Designation	Cancer Network/Base
Hilary Dobson	Chair, National Cancer Quality Steering Group	
Andrew Baird	Consultant Radiologist	SCAN / NHS Lothian
Rocco Bilancia	Consultant Thoracic Surgeon	WoSCAN / Golden Jubilee National Hospital
Kevin Blyth	Respiratory Physician	WoSCAN / NHS Greater Glasgow and Clyde
Diana Borthwick	Lung Clinical Nurse Specialist	SCAN / NHS Lothian
Jo Bowden	Consultant in Palliative Medicine	SCAN / NHS Fife
Fiona Carnochan	Associate Specialist in Thoracic Surgery	SCAN / NHS Lothian
Mahendran Chetty	Consultant Respiratory Physician	NCA / NHS Grampian
Tracy Cole	MCN Manager	WoSCAN
Gordon Cowell	Consultant Radiologist	WoSCAN / NHS Greater Glasgow and Clyde
Craig Dick	Consultant Pathologist	WoSCAN / NHS Greater Glasgow and Clyde
Kirsty Docherty	Clinical Nurse Specialist	WoSCAN / NHS Greater Glasgow and Clyde
Jen Doherty	Project Co-ordinator	National Cancer Quality Programme
Emma Dymond	Consultant in Palliative Medicine	WoSCAN / NHS Greater Glasgow and Clyde
Angela Elliott	Lay Representative	
Carrie Featherstone	Consultant Clinical Oncologist	WoSCAN / Beatson West of Scotland Cancer Centre
Lucy Heycock	Lung MacMillan Advanced Nurse	NCA / NHS Highland
Alan Kirk	Consultant Thoracic Surgeon	WoSCAN / Golden Jubilee National Hospital
Andrew Leitch	Consultant Respiratory Physician	Scan / NHS Lothian
Carol MacGregor	Consultant Clinical Oncologist	NCA / NHS Highland
Melanie Mackean	Consultant Medical Oncologist	SCAN / NHS Lothian
Julie Mencnarowski	Lung Clinical Nurse Specialist	SCAN / NHS Lothian
Laura McNaughton	Clinical Nurse Specialist	WoSCAN / NHS Greater Glasgow and Clyde

Name	Designation	Cancer Network/Base
Noelle O'Rourke	Consultant Clinical Oncologist	WoSCAN / NHS Greater Glasgow and Clyde
Ailsa Patrizio	Audit Facilitator	SCAN
Tracy Petrie	Lung Clinical Nurse Specialist	NCA / NHS Grampian
Phil Reid	Consultant Respiratory Physician	SCAN / NHS Lothian
Fiona Roberts	Consultant Pathologist	WoSCAN / NHS Greater Glasgow and Clyde
Julie Roberts	Lay Representative	
Phil Short	Consultant Respiratory Physician	NCA / NHS Tayside
Alan Simms	Consultant Radiologist	SCAN / NHS Lothian
Donald Slater	Consultant Pathologist	SCAN / NHS Lothian
Lorraine Stirling	Project Officer	National Cancer Quality Programme
Selina Tsim	Consultant Respiratory Physician	WoSCAN / NHS Greater Glasgow and Clyde
Vipin Zamvar	Consultant Cardiothoracic Surgeon	SCAN / NHS Lothian

NOSCAN – North of Scotland Cancer Network
SCAN – South East Scotland Cancer Network
WoSCAN – West of Scotland Cancer Network

Appendix 3: Mesothelioma QPI Formal Review Group Membership (2022)

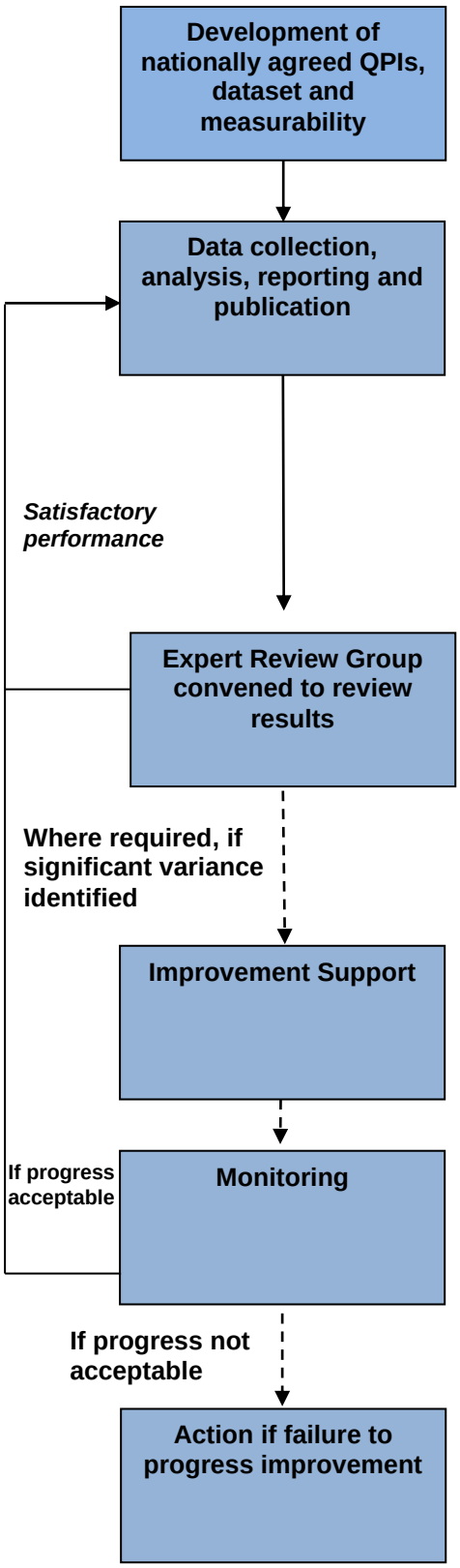
Name	Designation	Cancer Network
Kevin Blyth	Respiratory Physician / Clinical Lead	WoSCAN
Mahendran Chetty	Consultant Respiratory Physician	NCA
Ali Clinton	Consultant Oncologist	WoSCAN
Jen Doherty	Project Co-ordinator	National Cancer Quality Programme
Carol MacGregor	Consultant Clinical Oncologist	NCA
Julie McMahon	Information Analyst	WoSCAN
Anna Morton	Programme Manager	Scottish Cancer Network
Colin Noble	Consultant Thoracic Radiologist	WoSCAN
Ailsa Patrizio	Audit Facilitator	SCAN
Phil Reid	Consultant Respiratory Physician	SCAN / NHS Lothian
Fiona Roberts	Consultant Pathologist	WoSCAN
Philip Short	Consultant Respiratory Physician	NCA / NHS Tayside
Elaine Smith	Scottish Mesothelioma MDT Co-ordinator/Audit Facilitator	WoSCAN
Lorraine Stirling	Project Officer	National Cancer Quality Programme
Selina Tsim	Consultant Respiratory Physician	WoSCAN

Formal review of the Mesothelioma QPIs has been undertaken in consultation with various other clinical specialties e.g. oncology and pathology.

NCA – North of Scotland Cancer Network
SCAN – South East Scotland Cancer Network
WoSCAN – West of Scotland Cancer Network

Appendix 4: 3 Yearly National Governance Process & Improvement Framework for Cancer Care

This process is underpinned by the annual regional reporting and governance framework (see appendix 5).



1. National QPI Development Stage

- QPIs developed by QPI development groups, which include representation from Regional Cancer Networks, Healthcare Improvement Scotland, PHS, patient representatives and the Cancer Coalition.

2. Data Analysis Stage:

- NHS Boards and Regional Cancer Advisory Groups (RCAGs)* collect data and analyse on yearly basis using nationally agreed measurability criteria and produce action plans to address areas of variance, see appendix 5.
- Submit yearly reports to PHS for collation and publication every 3 years.
- National comparative report approved by NHS Boards and RCAGs.
- PHS produce comparative, publicly available, national report consisting of trend analysis of 3 years data and survival analysis.

3. Expert Review Group Stage (for 3 tumour types per year):

- Expert group, hosted by Healthcare Improvement Scotland, review comparative national results.
- Write to RCAGs highlighting areas of good practice and variances.
- Where required NHS Boards requested to submit improvement plans for any outstanding unresolved issues with timescales for improvement to expert group.
- Improvement plans ratified by expert group and National Cancer Recovery Group.

4. Improvement Support Stage:

- Where required Healthcare Improvement Scotland provide expertise on improvement methodologies and support.

5. Monitoring Stage:

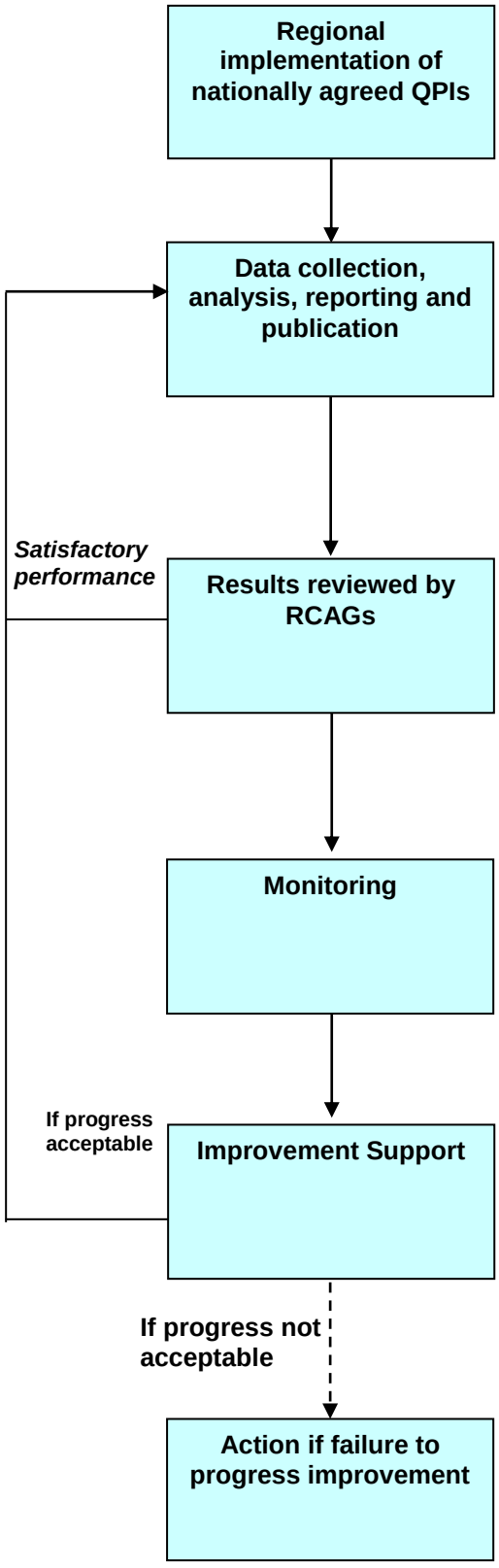
- RCAGs work with Boards to progress outstanding actions, monitor improvement plans and submit progress report to Healthcare Improvement Scotland.
- Healthcare Improvement Scotland report to National Cancer Recovery Group as to whether progress is acceptable**.**

6. Escalation Stage:

- If progress not acceptable, Healthcare Improvement Scotland will visit the service concerned and work with the RCAG and Board to address issues.
- Report submitted to National Cancer Recovery Group and escalation with a proposal to take forward to Scottish Government Health Department.

*The Regional Cancer Planning Group (South and East of Scotland) and the North Cancer Clinical Leadership Group (North Cancer Alliance) are equivalent to the Regional Cancer Advisory Group (RCAG) in the West of Scotland.

Appendix 5: Regional Annual Governance Process and Improvement Framework for Cancer Care



1. Regional QPI Implementation Stage:

- National cancer QPIs and associated national minimum core dataset and measurability specifications, developed by QPI development groups.
- Regional implementation of nationally agreed dataset to enable reporting of QPIs.

2. Data Analysis Stage:

- NHS Boards collect data and data is analysed on a yearly basis using nationally agreed measurability criteria at local/ regional level.
- Data/results validated by Boards and annual regional comparative report produced by Regional Networks.
- Areas of best practice and variance across the region highlighted.
- Yearly regional reports submitted to PHS for collation and presentation in national report every 3 years.

3. Regional Performance Review Stage:

- RCAGs* review regional comparative report.
- Regional or local NHS Board action plans to address areas of variance developed.
- Appropriate leads identified to progress each action.
- Action plans ratified by RCAGs.

4. Monitoring Stage:

- Where required, NHS Boards monitor progress with action plans and submit progress reports to RCAGs.
- RCAGs review and monitor regional improvement.

5. Improvement Support Stage:

- Where required Healthcare Improvement Scotland maybe requested to provide expertise to NHS Boards/RCAGs on improvement methodologies and support.

6. Escalation Stage:

- If progress not acceptable, RCAGs will escalate any issues to relevant Board Chief Executives. If progress remains unacceptable RCAGs will escalate any relevant issues to Healthcare Improvement Scotland.

*The Regional Cancer Planning Group (South and East of Scotland) and the North Cancer Clinical Leadership Group (North Cancer Alliance) are equivalent to the Regional Cancer Advisory Group (RCAG) in the West of Scotland.

Appendix 6: Glossary of Terms

Adenocarcinoma	Cancer that begins in cells that line certain internal organs and that have gland-like (secretary) properties.
Biopsy	Removal of a sample of tissue from the body to assist in diagnosis of a disease.
Cancer	The name given to a group of diseases that can occur in any organ of the body, and in blood, and which involve abnormal or uncontrolled growth of cells.
Chemotherapy	The use of drugs that kill cancer cells, or prevent or slow their growth.
Clinical trials	A type of research study that tests how well new medical approaches or medicines work. These studies test new methods of screening, prevention, diagnosis, or treatment of a disease.
Co-morbidities	The presence of one or more additional disorders or diseases.
Computed Tomography (CT)	An x-ray imaging technique, which allows detailed investigation of the internal organ of the body.
Contraindication/ Contraindicated	A symptom or medical condition that makes a particular treatment or procedure inadvisable because a person is likely to have a bad reaction.
Cytology	The study of the structure and function of cells under the microscope.
Diagnosis/Diagnosed	The process of identifying a disease, such as cancer, from its signs and symptoms.
First-line/Primary treatment	Initial treatment used to reduce or treat a cancer.
Glomerular Filtration Rate (GFR)/eGFR	Glomerular filtration rate (GFR) is a measure of the function of the kidneys. This test measures the level of creatinine in the blood and uses the result in a formula to calculate a number that reflects how well the kidneys are functioning, called the estimated GFR or eGFR.
Histological/ Histopathogical/Histology	The study of the structure, composition and function of tissues under the microscope, and their abnormalities.
Immunohistochemistry (IHC)	A process used to diagnose some types of cancer including mesothelioma. It is a lab test that uses antibodies to test for certain antigens (markers) in a sample of tissue.
IHC Panel	The specification of which markers should be undertaken or examined.
Indwelling Pleural Catheter (IPC)	An indwelling pleural catheter is a soft, flexible tube that runs under your skin to the area next to your lungs. One end of the tube stays outside your body.
Malignant	Cancerous. Malignant cells can invade and destroy nearby tissue and spread to other parts of the body.
Mesothelioma	A type of cancer that develops from the thin layer of tissue that covers many of the internal organs (known as the mesothelium). The most common area affected is the lining of the lungs and chest wall.
Multi-disciplinary team meeting (MDT)	A meeting which is held on a regular basis, which is made up of participants from various disciplines

	appropriate to the disease area, where diagnosis, management, and appropriate treatment of patients is discussed and decided.
Palliative	Anything which serves to alleviate symptoms due to the underlying cancer but is not expected to cure it.
Pathological	The study of disease processes with the aim of understanding their nature and causes. This is achieved by observing samples of fluid and tissues obtained from the living patient by various methods, or at post mortem.
Pathologist	A doctor who identifies diseases by studying cells and tissues under a microscope.
Performance Status	Performance status is a measure of a cancer patients' general well-being and activities of daily life. This measure is used to determine whether they can receive treatment or whether changes to treatments are necessary.
Platinum-based chemotherapy	Chemotherapy drugs that contain derivatives of the metal platinum.
Pleural Effusion	Pleural effusion, is the build-up of excess fluid between the layers of the pleura outside the lungs.
Pleurodesis	Pleurodesis is a procedure that is carried out to treat recurrent collapsed lungs or fluid build-up between the lung and chest wall lining.
Post- Mortem Examination	A post-mortem examination, also known as an autopsy, is the examination of a body after death. The aim of a post-mortem is to determine the cause of death. Post-mortems are carried out by pathologists.
Radiotherapy	Radiotherapy is a treatment where radiation is used to kill cancer cells. There are many different ways you can have radiotherapy, but they all work in a similar way. They damage cancer cells and stop them from growing or spreading in the body. Radiotherapy can also be used as a treatment to relieve bone pain caused by cancer that has spread into the bone.
Second-line treatment	Treatment that is given when initial treatment (first-line or primary treatment) doesn't work, or stops working.
Staging	Process of describing to what degree cancer has spread from its original site to another part of the body. Staging involves clinical, surgical and pathology assessments.
Surgery/Surgical resection	Surgical removal of the tumour/lesion.
Survival	The percentage of people in a study or treatment group who are alive for a certain period of time after they were diagnosed with or treated for a disease, such as cancer.
Systemic Anti-Cancer Therapy (SACT)	Treatment of cancer using drugs which prevent the replication or growth of cancer cells. This encompasses biological therapies and cytotoxic chemotherapy.
Talc Pleurodesis	Talc pleurodesis is a specific form of chemical pleurodesis. As compared to indwelling pleural catheter placement, talc pleurodesis has been shown to be equally effective in relieving shortness of breath.

Video Assisted Thorascopic Surgery - Partial Pleurectomy (VATS-PP)	Video-assisted thoracoscopic surgery is a type of thoracic surgery performed using a small video camera that is introduced into the patient's chest via small incisions. The surgeon is able to view the instruments that are being used along with the anatomy on which the surgeon is operating. Partial pleurectomy is a surgical procedure that is done to remove part of the pleura, the linings that surround the lungs.