LUNG CANCER POLICY NETWORK

# Care pathways for lung cancer: building a foundation for optimal care

November 2023

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# Contents

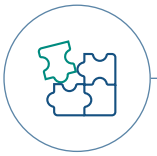
# Executive summary

**Care pathways play an essential role in delivering high-quality lung cancer care.** Care pathways offer an effective tool to support the multidisciplinary decision-making and organisation of care required from when lung cancer is suspected to its diagnosis, treatment and end-of-life care.[1] This holistic approach, based on nationally agreed guidelines, standards and protocols,[2] helps ensure a coordinated health system response to lung cancer.[3] Careful capacity and treatment planning will become increasingly needed to address an anticipated growing volume of people identified at earlier stages of disease through early detection and screening. Care pathways can also enable the rapid and appropriate integration of new technologies and treatment approaches as they emerge.

**Care pathways for lung cancer offer an opportunity to address key challenges at every stage of care, but their potential is yet to be fully realised.** Lung cancer is the leading cause of cancer deaths worldwide[4] and there is global acknowledgement that improvements in lung cancer care and outcomes need to be a policy priority,[5 6] but the value of care pathways in this process has not been universally recognised. Based on the benefits in survival associated with the implementation of care pathways for cancer,[7-9] a small number of countries and regions have established formal care pathways for lung cancer in recent years.[10-17] We can build on this progress and draw on real-world evidence of the value of care pathways to inform future care pathway development.

**Implementation of high-quality care pathways can help transform outcomes and offer equitable access to best-practice care for everyone with lung cancer.** The development of optimal care pathways not only offers the chance to adapt health systems to the shifting landscape of lung cancer care, it may also help address the underlying inequities in access to diagnosis and care that are so prominent in lung cancer.

**To support health system leaders and decision-makers in delivering high-quality care and optimise effective, consensus-driven care pathways for lung cancer, we recommend the following actions:**



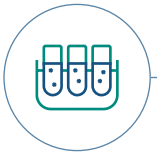
Ensure **multidisciplinary care** throughout the care pathway

Perform continuous **monitoring and evaluation** of care pathways using evidence-based performance assessment

Determine clear, time-defined **targets** for different stages of lung cancer care, taking into account the structure and characteristics of the health system

Implement evidence-based **digital technologies** that can assist systematic information management and sharing to maximise pathway efficiency

Integrate **low-dose computed tomography (LDCT) screening** programmes, alongside **smoking cessation** support and **pulmonary nodule evaluation protocols**, into the care pathway



Ensure care pathways for lung cancer are ready to incorporate new **biomarkers**

Introduce high-quality **prehabilitation** programmes into the care pathway that are appropriate for all lung cancers

Integrate **appropriate treatments** and **clinical trial opportunities** into care pathways for lung cancer

Compile evidence to inform the delivery of comprehensive **rehabilitation**

Ensure high-quality **end-of-life care** is an integral part of care pathways for lung cancer

# Why care pathways are important for high-quality lung cancer care

## What is a care pathway?

**Care pathways offer a structured approach to care, providing an effective tool to help manage lung cancer.** Care pathways embody a holistic approach to healthcare through treatment of the whole person (physical and psychological);[18] they incorporate all aspects from preventive to end-of-life care.[3] They codify the care to be expected for a given group of patients, supporting mutual decision-making among the variety of healthcare professionals involved.[3] Without a clearly defined care pathway, uncertainty among healthcare professionals about where and when to refer patients is likely, increasing the risk of people not receiving timely and appropriate care. Ultimately, care pathways aim to:[3]

- enhance the quality of care by increasing its consistency across different settings
- streamline health system processes
- optimise resource distribution and efficiency
- promote safety and increase satisfaction among people receiving care
- improve outcomes.

**Key stakeholders involved in lung cancer care are beginning to recognise the value of care pathways, but there is often confusion over pathway scope.** Care pathways themselves are a relatively new concept in healthcare, but their value is now being recognised.[3] For example, the European Commission acknowledged the importance of a holistic approach to cancer care in Europe's Beating Cancer Plan.[19] However, the novelty of care pathways can cause confusion over their definition and scope, which may lead to difficulties in implementation.[20] It is also important to distinguish between care pathways and clinical pathways, with the latter generally tailored to one or more stages of the entire care pathway for a given healthcare setting.

In this report we have adopted the following definition of care pathways for lung cancer: Tools to support the mutual decision-making and organisation of care processes for people with lung cancer.* They cover all stages of care, starting from when cancer is suspected to follow-up and end-of-life care, and are based on nationally agreed guidelines, standards and protocols.

## Why are care pathways for lung cancer important?

**Implementation of care pathways for lung cancer can lead to improved experiences, outcomes and survival for people with the disease.** Building effective care pathways can help relieve the burden of disease and treatment on daily life, quality of life and employment status for people with lung cancer.[21,22] In general, cancer care pathways can improve outcomes, reduce waiting times for diagnosis and treatment, and improve survival.[7-9] This is also the case for lung cancer. For example, in Denmark, introduction of care pathways for lung cancer has resulted in an increase in three-year relative survival for people with the disease from 11% to 20%.[23]

* This report mainly focuses on non-small-cell lung cancer (NSCLC); for definitions of terms used, please see the glossary on the Lung Cancer Policy Network website: https://www.lungcancerpolicynetwork.com/glossary-category/a/

**Investment in evidence-based care pathways for lung cancer can help reduce the costs of care at a national level.** In 2017 it was predicted that from 2020 to 2050, tracheal, bronchus and lung cancer could cost health systems worldwide USD $3.9 trillion, which accounts for the greatest proportion (15.4%) of the total estimated cost of cancer care.[24] Crucially, however, monetary investment in lung cancer care now could mitigate some of this future financial burden. In 2022, the International Cancer Benchmarking Partnership established consensus on the areas for investment in high-income countries to optimise lung cancer services across the care pathway.[6] These included implementation of lung cancer screening initiatives, ensuring diagnosis within 30 days of referral and comprehensive auditing of lung cancer care.[6]

## Care pathways for lung cancer are already emerging

**Government commitments to developing care pathways for lung cancer are increasing worldwide.** A rising number of countries and territories have developed a national or regional care pathway for lung cancer. These include, but are not limited to, Australia,[10] Denmark,[7] England,[11] Norway,[12] Nova Scotia,[13] Ontario,[14 15] Scotland[16] and Wales.[17]

**The wide-scale development of care pathways for lung cancer would benefit from clear, evidence-based guidelines.** There is wide variation in coverage, content, scope and methodological quality of guidelines for lung cancer care.[25] This in part may explain why the development of evidence-based care pathways remains limited, with very few examples of optimal care pathways for people with lung cancer.[26] Once care pathways for lung cancer have been developed, systematic and context-specific implementation is needed to promote the delivery of evidence-based care.

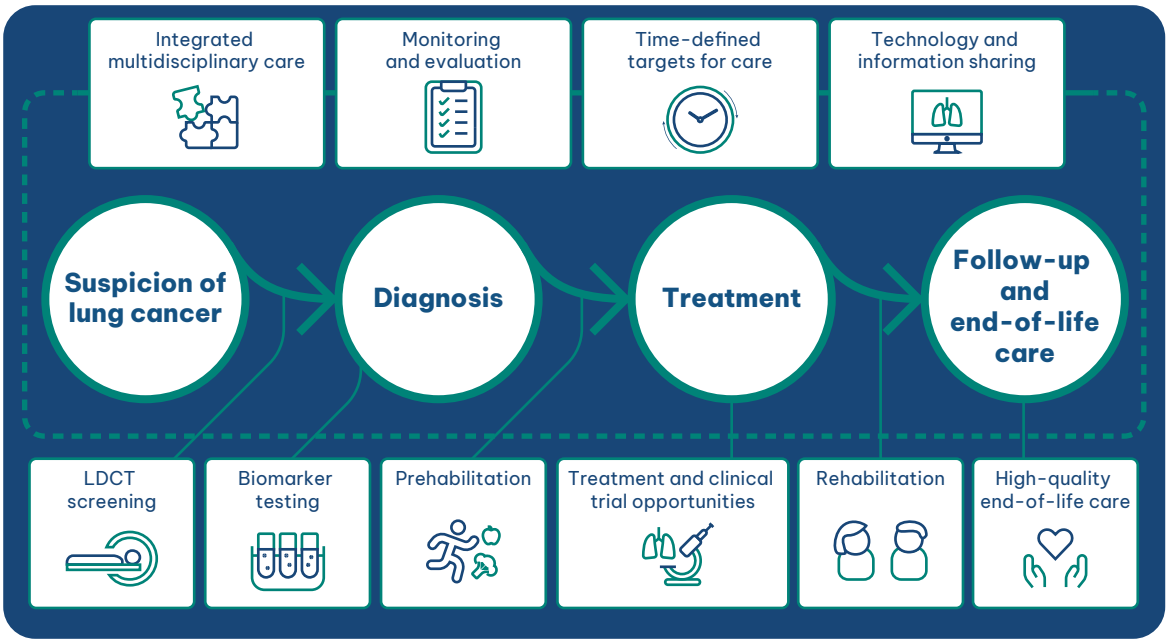
**‘Only a few countries have optimal care pathways, but I don’t think they have been implemented really well because it is up to the local health services and the hospitals to implement them.’**

Dr Zulfiquer Otty, Townsville Cancer Centre, Australia

**High-quality care pathways for lung cancer must be informed by the changing approaches to lung cancer care.** The emergence of precision medicine (also known as personalised medicine) allows for more detailed diagnosis and treatment tailored to the individual, guided by diagnostic tools that can identify specific genomic drivers of disease.[27-29] Integration of precision medicine,[30 31] increasing early detection[5 32] and addressing barriers to equitable care[5] are gradually being recognised as key to improving outcomes and survival in lung cancer. All of these factors must be taken into account as care pathways for lung cancer are developed and optimised.

# Steps to establish high-quality care pathways for lung cancer

**Opportunities across and at specific stages of care pathways for lung cancer to promote high-quality care**




**Developing optimal care pathways for lung cancer requires solid foundations that support high-quality care throughout the pathway, such as comprehensive multidisciplinary care and use of evidence-based technologies.** Care pathways can transform outcomes, but this takes concerted support from all stakeholders. Policymakers need to support the implementation of evidence-based care pathways at the national level, underpinned by standardised guidance and flexibility for local application.

**'The care pathway has to capture everything, the whole journey.'**

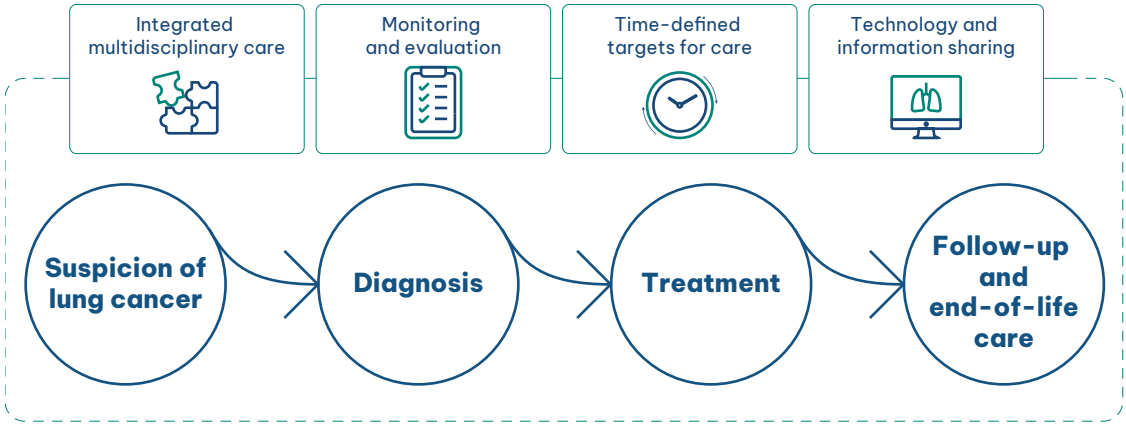
Dr Mohamad Saab, University College Cork, Ireland

**'The way we create optimal care pathways is crucial; all people involved in the care of the person with lung cancer must feel a sense of investment in the pathway to deliver the highest quality care.'**

Professor Robert Thomas, University of Melbourne, Australia

# Foundations for developing optimal care pathways for lung cancer

**Opportunities to promote high-quality care across care pathways for lung cancer**




## Ensure multidisciplinary care throughout the care pathway

**A multidisciplinary approach to lung cancer care is essential to embed at every stage of the care pathway.** Care by a multidisciplinary team (MDT) is recognised as best practice around the world.[5 33] MDT care has been shown to reduce wait times and increase access to timely and appropriate diagnosis and treatment, as well as improve satisfaction of people with lung cancer.[34-38] There is a clear association between multidisciplinary care and healthcare professionals adhering to guidelines, broader use of different treatment types and improved survival.[39] As the therapeutic landscape becomes more complex and the role of precision medicine in lung cancer care gathers pace, the importance of MDTs is likely to grow to ensure people have access to the breadth of specialist expertise needed to optimise their care (*Case study 1*).[40]

**CASE STUDY 1**

### Recognising the importance of multidisciplinary care and patient navigation as a marker of excellence

The GO2 Foundation in the US has established the Centers of Excellence Program with rigorous criteria for person-focused, coordinated and multidisciplinary care across the lung cancer care pathway.[41] The programme recommends involving patient navigators in the MDT and at every stage of a person's care.[41] Patient navigators are healthcare professionals that can enhance effective implementation of care pathways for lung cancer by providing additional support to individuals and facilitating MDT coordination.[42] Their role can involve tracking appointments or chasing test results to reduce waiting times, and assist engaging diverse communities in lung cancer care (e.g. screening) to address inequalities.[42,43] To date, over 60 centres participate in the programme.[41]

**Providing multidisciplinary care promotes person-centred care which is crucial across all stages of a lung cancer care pathway.** Person-centred care aims to understand and address people's concerns, needs and expectations, all of which can change as individuals experience different stages of the care pathway.[44] This approach demands effective multidisciplinary care to help reduce variation in care and improve people's quality of life throughout the care pathway.[44] In support of this, shared decision-making tools have been developed to assist individuals in making decisions, based on clinical evidence as well as their personal preferences, through a collaborative approach with the MDT.[5,45]

**Integration of the different care services that an individual requires during care for lung cancer can help improve quality of life and outcomes.** People with lung cancer report lower quality of life than those diagnosed with other cancers.[46] This is likely due to the high symptom burden, frequent late-stage diagnosis, psychological distress and stigma associated with lung cancer.[47] Treatment and care for lung cancer will likely be delivered by a range of healthcare professionals across different settings, should include physical and mental healthcare, and aim to improve outcomes and quality of life for

people with the disease.[39 48] As such, discussions about how a person's physical and mental health can be best supported throughout care pathways for lung cancer should be an integral part of their care.[49] *Case study 2* highlights the value of nutritional support pathways as part of an integrated care approach.

**CASE STUDY 2**

### The value of integrating nutritional support pathways in lung cancer care

Symptoms of lung cancer as well as side effects from treatments such as (chemo)radiotherapy can include malnutrition and clinically significant weight loss.[50 51] For this reason, several countries have introduced dedicated nutritional support pathways for people with lung cancer:

- risk-stratified lung cancer nutritional care pathway from the British Association for Parenteral and Enteral Nutrition[52]
- nutritional intervention protocol at a referral centre in Brazil[53]
- CanEAT pathway in Australia.[54]

Nutritional support pathways can aid early intervention in people at high risk of malnutrition by identifying factors associated with weight loss and providing prompt nutritional support such as dietary counselling to improve quality of life.[50 55]

**An under-recognised but important aspect of MDT support for people with lung cancer is to ensure availability of high-quality palliative care across the entire care pathway.** For people with lung cancer, timely integration of palliative care* improves survival and quality of life.[56-58] Many countries have recognised the value of palliative care as part of care pathways for lung cancer,[59] but no standardised approach currently exists and care is often fragmented.[60 61] To realise the known benefits, its integration in the care pathway is crucial, as recommended by the latest European Respiratory Society guidelines.[33 56-58 62]

* Practical, physical and emotional support for people with a serious illness, from diagnosis to end-of-life care.[63 64]

## Perform continuous monitoring and evaluation of care pathways using evidence-based performance assessment

**Care pathways should be continually assessed to maintain standards.** Determining the efficacy of the care pathway, and its impact on the experiences and outcomes of people with lung cancer, enables adjustments to refine the pathway based on the latest evidence and guidance. It can help improve the person's satisfaction with their care and ensure timely progression through each stage of care. A variety of measures can enable this, including:

- **quality indicators** of guideline-concordant lung cancer care – help monitor care over time and inform the adaptation of national guidelines (and, in turn, the care pathway); specific quality indicators have been developed in Canada (Ontario),[65 66] Italy (Lombardy),[67] the Netherlands[68] and the US[69]
- **process and outcome indicators** – assess the effect of the clinical pathway on a specific process or outcome (e.g. indicators for NSCLC surgery in China[70])
- quantifiable **key performance indicators (KPIs)** and evidence-based **audit tools** – support the audit of people's experience of care; KPIs and audit tools could be easily adapted to a variety of clinical situations and conditions, including lung cancer (*Case study 3*).[71 72]

CASE STUDY 3

## Utilising performance metrics and audit tools to assess the quality of care provision across a care pathway

**KPIs** provide objective evidence of progress that can be used to inform decision-making and system improvements throughout the care pathway.[73] For example, the World Health Organization Global Breast Cancer Initiative Implementation Framework uses KPIs to identify the extent of any health system gaps across the entire care pathway for breast cancer.[74] This evidence will inform recommendations focused on improving early detection, diagnosis, treatment and supportive services for breast cancer, ultimately aiming to reduce global breast-cancer mortality, particularly in low- and middle-income coutries.[74] These KPIs, and examples from other cancer types, could be used to inform the development of KPIs to assess the quality of lung cancer care.

**Audit tools** rigorously evaluate the quality of care and identify areas for improvement. For example, in 2020 the Netherlands established a nationwide lung cancer audit, with 15 quality indicators, to assess the key standards of lung cancer care at every stage of the pathway.[72] Through the participation of every Dutch hospital, the audit provides insight into the real-world treatment landscape of people with lung cancer and the variation in care between facilities, enabling evidence-informed improvement plans and resource allocation.[72]

## Determine clear, time-defined targets for different stages of lung cancer care, taking into account the structure and characteristics of the health system

**Clear, time-defined targets along the care pathway can help streamline care processes to reduce delays in diagnosis and treatment.** Undue waiting times for diagnosis and access to the lung cancer treatment pathway have been observed globally.[21 22 27 35 36 75 76] These delays adversely affect prognosis and survival, but they can be addressed through effective care pathway implementation (*Figure 1*).[77-80] Adding specific time intervals to care pathways for lung cancer may help reduce unnecessary delays and improve outcomes. Some countries have recognised the importance of benchmarking care through the addition of interval target times to national care pathways for lung cancer, with examples including Australia,[81] Canada (Nova Scotia,[13] Ontario[14 15]) and England.[11] However, these time intervals may vary by country to accommodate the various structures and characteristics of health systems and other factors, such as tumour aggressiveness.[82 83]

**'When you look at the spectrum of aggressiveness of tumours, lung cancer is on the more aggressive side so you've got less time to successfully treat these individuals compared with some other cancers. These differences in urgency of care need to be acknowledged in care pathways because they are causing disparities in outcomes as a result of the delays.'**

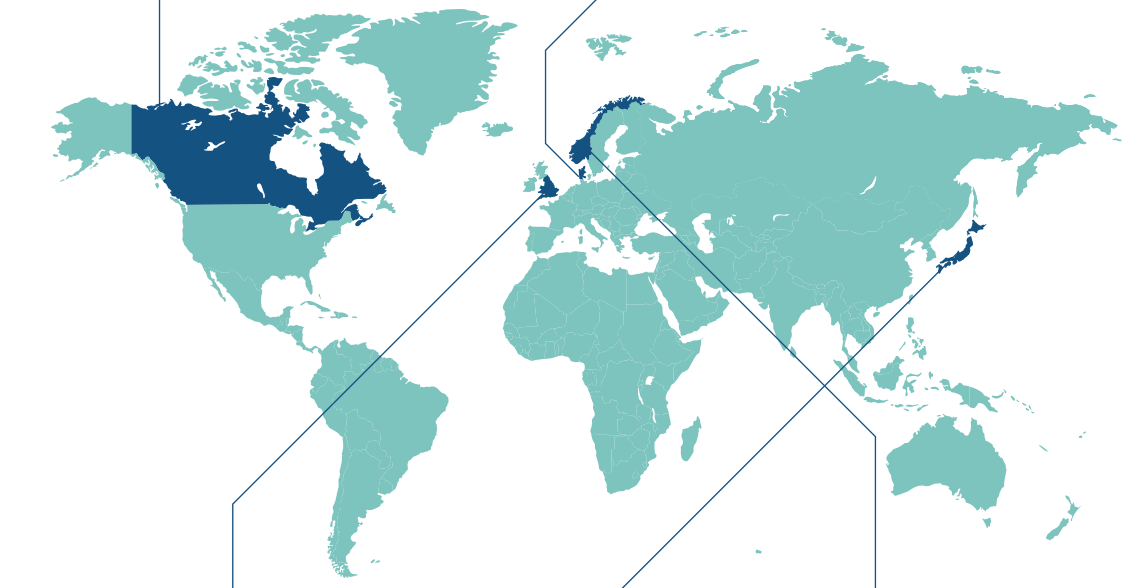
Professor David Baldwin, University of Nottingham, UK

## FIGURE 1. Examples of care pathways for lung cancer reducing waiting times to diagnosis and treatment

**CANADA:** A standardised triage process for suspected lung cancer significantly improved timeliness of diagnosis and staging in Ontario:

- from **38.5** to **15.7** days for a positron emission tomography (PET) scan
- from **33.4** to **13.1** days for brain imaging
- from **38.0** to **22.7** days for a diagnosis.[84]

**DENMARK:** Introduction of a lung cancer care pathway resulted in a decreased median waiting time for lung cancer diagnosis from **49** days to **32** days.[85]



**ENGLAND:** Recommended as part of the NHS England National Optimal Lung Cancer Care Pathway,[11] an immediate and direct referral pathway from chest X-ray to a computed tomography (CT) scan reduced average waiting times, e.g. from **17.8** to **2.4** days in the East and North Hertfordshire NHS Trust.[86-88]

**JAPAN:** Implementation of a clinical pathway reduced the length of total hospital stay associated with video-assisted thoracoscopic pulmonary resection (a type of minimally invasive surgery[89]) from **29.4** days to **18.6** days.[90]

**NORWAY:** A systematic process to analyse the current status of a system and suggest improvements applied to the care pathway for lung cancer resulted in a decrease:

- from **64** to **16** days for time to diagnosis
- from **26.5** to **15** days for time from diagnosis to surgery.[91]

## Implement evidence-based digital technologies that can assist systematic information management and sharing to maximise pathway efficiency

**Investment in effective digital technologies is a key factor in decreasing the disparities in care access and standards.** Embedding evidence-based technological advancements into care pathways for lung cancer can automate referrals, provide individuals with increased digital access to information, and offer greater access to care for traditionally underserved communities (*Figure 2*). To support this, systematic data collection, coordination and centralisation can enable monitoring of the quality of care across the care pathway and guide the refinement of standards of care. These approaches are already being implemented in other types of cancer: electronic medical records have been used to measure and streamline cancer care pathways,[92 93] and national and regional cancer databases are increasingly being used to benchmark outcomes at different stages of the care pathway.[5]

## FIGURE 2. Examples of technological interventions across care pathways for lung cancer

### CANADA

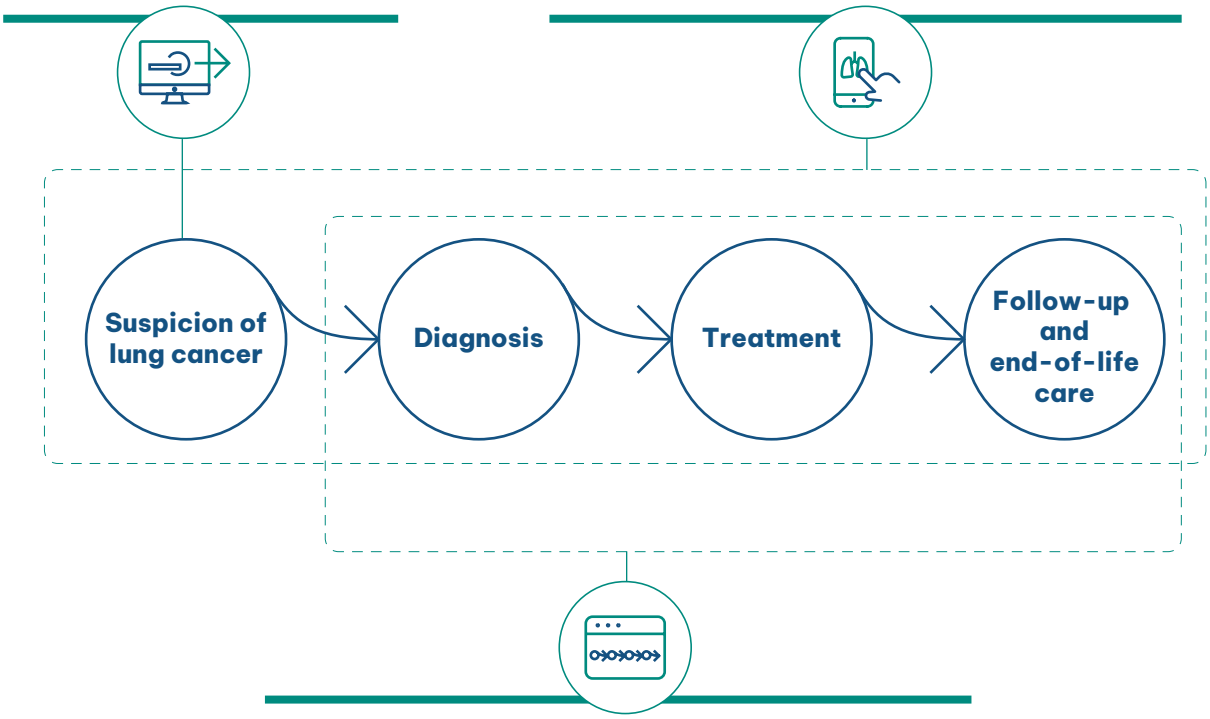
An automatic referral process for people with CT scans suggestive of lung cancer resulted in a shorter average time to referral to a tertiary thoracic surgical centre (from **23.6** to **4.7** days).[94]

Automatic referrals were also associated with a shorter wait time for referral, irrespective of the type of referring physician and the location of the person receiving care.[94]

### AUSTRALIA

Information about optimal care pathways for many forms of cancer (including lung cancer) has been made freely available through a web-based application.[95] The resource aims to provide easy access to the care pathways for people receiving care and healthcare professionals, and support multidisciplinary care across all settings.[96]

It includes simple navigation through the care pathways, from prevention to end-of-life care, as well as the principles of care the pathways are aligned with, a quick reference guide and supporting videos/podcasts.[95]

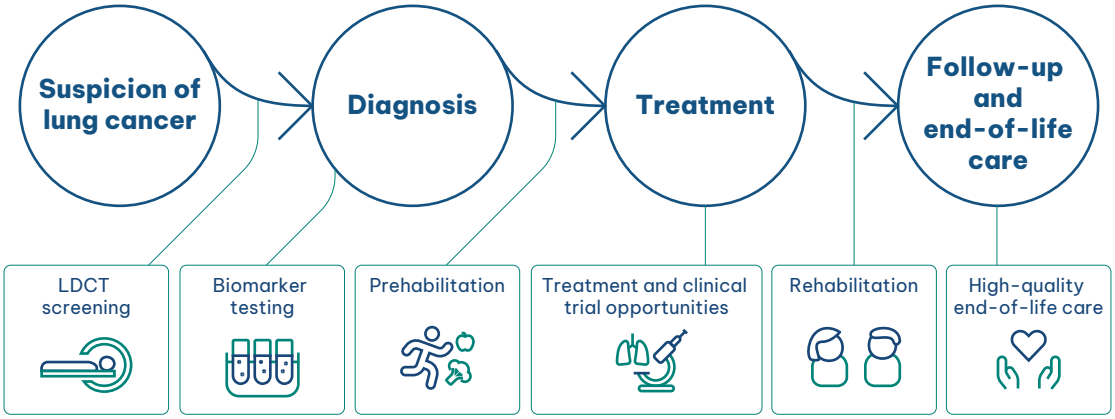



### AUSTRALIA

A specialist palliative rural telehealth service (SpaRTa) in Queensland allows people with lung cancer to book consultations and call healthcare professionals; it covers medical, nursing, social work, occupational therapy and pharmacy services.[97,98]

# Optimising specific stages of care pathways for lung cancer

**Opportunities to promote high-quality care at specific stages of care pathways for lung cancer**

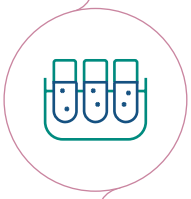



## Integrate LDCT screening programmes, alongside smoking cessation support and pulmonary nodule evaluation protocols, into the care pathway

**Screening for lung cancer should be an integral part of the care pathway, where feasible, and the downstream implications of this should be thoughtfully considered.** Cumulative international evidence shows that LDCT screening increases the likelihood of lung cancer detection at an early stage, when long-term survival is greater.[99-104] In recognition of this, there has been a notable expansion of national LDCT screening programmes in recent years.[105 106] Screening will decrease the number of people entering the pathway through other means (e.g. a primary healthcare professional or emergency presentation), and initially increase the overall number of people entering the care pathway.[27] The latter will result in heightened pressures on a health system workforce and technical capacity (for example, a rise in demand for CT scans). To understand how best to adapt their health systems to such changes, several countries have assessed how implementing LDCT screening may affect their surgical workforce.[107-1110] In the long-term, screening should ultimately ease the overall economic burden on the health system, as the cost of

treating a person with late-stage lung cancer is higher than for earlier-stage disease.[111 112] Effective lung cancer screening implementation is anticipated to change the current profile of people entering the care pathway, and ongoing review and refinement of the care pathway will be crucial to adapt to this.

**The care pathway can be further streamlined by implementing smoking cessation support and pulmonary nodule evaluation alongside LDCT screening.** Smoking cessation interventions have demonstrated the potential to greatly enhance the impact of lung cancer screening programmes, including a reduction in mortality.[113] However, smoking-related discussions with healthcare professionals can often leave people feeling distressed.[114] One approach to addressing this is an empathic communication skills training module for healthcare professionals, introduced in the US to help facilitate non-judgemental and supportive smoking-related discussions.[115] Additionally, the introduction of protocols to evaluate pulmonary nodules, which inform cancer management based on nodule characteristics, can reduce variation in screening adherence,[116-118] decrease false-positive results from the screening process and avoid over-investigation.[106] Both are examples of how consistent implementation of evidence-informed protocols could ease demands on health system resources and improve the overall care experience of people with lung cancer.[119 120]



## Ensure care pathways for lung cancer are ready to incorporate new biomarkers

**Biomarkers can enhance the detection, diagnosis and treatment of lung cancer, and their use should be recognised in care pathways.** Biomarker testing has huge potential to improve early detection of lung cancer. It enables greater understanding of risk and stratification of positive LDCT scans as well as supporting the classification of pulmonary nodules.[121] Once a diagnosis has been established, biomarkers and other tests can assist selection of the most appropriate treatments for an individual, as some targeted therapies may only work for people whose cancers have certain biomarkers.[122]

To help identify those biomarkers, next generation sequencing (NGS) has emerged as a valuable diagnostic tool and liquid biopsy as a complementary approach to tissue sampling in the past decade in several countries (*Case study 4*).[27 123-126] NGS involves large-scale DNA-sequencing technology to isolate the entire genome of an organism.[127] A liquid biopsy examines a blood sample to identify cancer cells or pieces of DNA from tumour cells,[128] often in cases where the quantity and quality of available tissue for testing is insufficient.[124 125] Both interventions help guide treatment and better characterise an individual's prognosis.[27 128] Challenges to the implementation of biomarker testing during the diagnosis stage of care pathways (such as inconsistent availability of NGS in health facilities) should be addressed to optimise treatment at later stages.[27] Multidisciplinary communication and coordination are essential, as is optimising tissue biopsies to ensure sample adequacy.[30 124 125 129 130]

**CASE STUDY 4**

### Biomarker use in care pathways in Spain

In 2022, a group of experts (selected by the Spanish Society of Pathology and the Spanish Society of Medical Oncology) in NSCLC diagnosis and treatment proposed a series of evidence-informed recommendations to optimise the detection and use of biomarkers in clinical practice.[131] These recommendations recognise the potential role of both NGS and liquid biopsy in NSCLC diagnosis and onward care through the pathway.[131] They are supported by the latest real-world evidence from the Lung Cancer Biomarker Registry, which suggests systematic incorporation of sequencing methods such as NGS to optimise national lung cancer biomarker diagnostics.[132]

**Clear biomarker testing pathways can help support the effective integration of biomarkers into routine lung cancer care.** Differences in the route to diagnosis for people with lung cancer are well documented, and countries are beginning to recognise the value of biomarkers in the diagnostic process.[133-137] To help support the integration of new biomarkers, the Welsh Thoracic Oncology Group has developed a biomarker testing pathway for lung cancer.[17] Another approach has been adopted in the US, where researchers have proposed a timeline for diagnosing advanced NSCLC based on the latest guidance for comprehensive biomarker testing.[130]

## Introduce high-quality prehabilitation programmes into the care pathway that are appropriate for all lung cancers

**Quality prehabilitative care is essential to maximise the potential for positive outcomes at downstream stages of the care pathway for people with all types of lung cancer.** Prehabilitation enables people with cancer to prepare for treatment and improve their chance of good clinical outcomes, through prescribed exercise, nutrition and psychological interventions.[138 139] It can maximise people's ability to cope physically and mentally with the demands of treatment (therapeutic resilience) and improve their long-term health.[139] There is increasing evidence to support prehabilitation for all people with cancer, but such programmes for lung cancer are currently only well established for early stage, operable cancer.[140 141] Introducing prehabilitation for later-stage, more advanced lung cancer could improve individuals' preparedness for treatment, as well as their health outcomes and quality of life.[140] Implementation of later-stage prehabilitation programmes may also have the potential to improve health system efficiency and care provision through greater awareness among healthcare professionals of the latest evidence to streamline clinical practice.[142] Health system decision-makers should be encouraged to support integration of prehabilitation interventions, and continue to refine what best practice looks like based on future evidence.[143]

## Integrate appropriate treatments and clinical trial opportunities into care pathways for lung cancer

**New or developing therapeutic interventions for lung cancer, including opportunities for participation in clinical trials, should be integrated into the care pathway where possible.** Modern treatment pathways for lung cancer depend on multiple factors, including histology, biomarker testing and clinical trial availability, with increasing importance placed on clear planning of post-diagnostic care.[144] Health systems should be prepared to accommodate these increasingly diverse treatment routes into the care pathway.

### Integrating precision medicine innovations

**The emergence and evolution of precision treatments should be reflected in care pathways for lung cancer.** For lung cancer, the development of precision medicine has been shaped by recent advances in genomic profiling (of both individuals and tumour cells) and the association of numerous genetic mutations with an increased risk of lung cancer.[27] There is growing recognition that precision cancer care can improve the outcomes and survival of people with lung cancer.[30 31] Precision medicine should therefore be integrated into care pathways for lung cancer where effective delivery is feasible (*Table 1*).

**TABLE 1. Precision medicine innovations which could be integrated into care pathways for lung cancer**

| | Targeted Therapies | Immunotherapy |
|---|---|---|
| **What is the intervention?** | Targeted therapies target proteins on the surface of cancer cells that control how these cells grow, divide and spread.[145] The presence of these proteins is caused by genetic alterations that can be found through biomarker testing.[146] | Immunotherapy helps the immune system recognise and destroy cancer cells, preventing growth and spread of the cancer.[147] |
| **Why should the intervention be integrated into care pathways for lung cancer?** | Targeted therapies often cause fewer side effects than traditional treatment, because they do not affect normal, healthy cells.[145,146] As researchers learn more about the specific genetic alterations that result in the expression of different proteins on the surface of lung cancer cells, treatments that target these proteins can be better designed.[145] | For people with NSCLC who do not have identifiable genetic alterations, immunotherapy is likely to become the backbone of therapy as more biomarkers are identified and characterised.[27] |
| **What progress has been made so far?** | Several targeted therapies have been approved to treat people with NSCLC with different genetic alterations.[146,148] A significant number of targeted therapies are also currently under investigation in clinical trials.[149] | Current lung cancer research is investigating the use of immunotherapy on its own, and in combination with other treatments.[150] Some immunotherapies have been approved and others are under investigation in clinical trials.[150] |

### Integrating clinical trial opportunities

**Clinical trials offer viable treatment options for many people with lung cancer and should be effectively integrated into the care pathway in a way that would promote equitable access.** Clinical trials can determine if new therapies for lung cancer are safe, work better than current treatments, have any side effects and improve quality of life.[151] Participation in clinical trials for advanced-stage lung cancer can increase average survival time tenfold.[152] Yet, awareness of suitable trials among people with lung cancer and the MDT is often low,[21] access opportunities are varied, and there is an under-enrolment of certain populations based on their socioeconomic status, ethnicity, gender and other factors.[153] To address these challenges, some countries have acknowledged the importance of embedding clinical trials in their national care pathway for lung cancer. Examples are the NHS England National Optimal Lung Cancer Pathway[11] and the Australian optimal care pathway for lung cancer.[10]

## Compile evidence to inform the delivery of comprehensive rehabilitation

**Tailored rehabilitation can improve physical and emotional health and should be effectively integrated into the care pathway, but people with lung cancer face significant barriers to these services.** Rehabilitation for people with lung cancer can include dietary advice, psychological support and pulmonary rehabilitation (e.g. exercise, smoking cessation).[143] It can also involve online support, such as pulmonary rehabilitation tools and platforms; when integrated into the cancer pathway, these may improve physical health, emotional health and quality of life, as well as decrease symptom burden.[154] However, long waiting times and limited awareness of available services are some of the many factors that may prevent people with lung cancer from being offered rehabilitation.[155] As the number of people with lung cancer is expected to rise, demand for these services will also grow.[156] Identifying and addressing barriers to access and supporting effective integration of rehabilitation services into the care pathway should be an important consideration for care pathway optimisation.[143 155]

## Ensure high-quality end-of-life care is an integral part of care pathways for lung cancer

**End-of-life care is a vital part of the care pathway, particularly given the high proportion of people with lung cancer currently diagnosed at a late stage.** The latter stages of care pathways for lung cancer must not be overlooked, and currently most people present with advanced-stage disease and enter end-of-life care directly.[106] No standardised approach to end-of-life care for lung cancer currently exists, despite many countries recognising end-of-life care as a crucial component of the care pathway.[60 61 157] Consistent integration of end-of-life care into care pathways will transform our approach to lung cancer care and improve people's quality of life.[64]

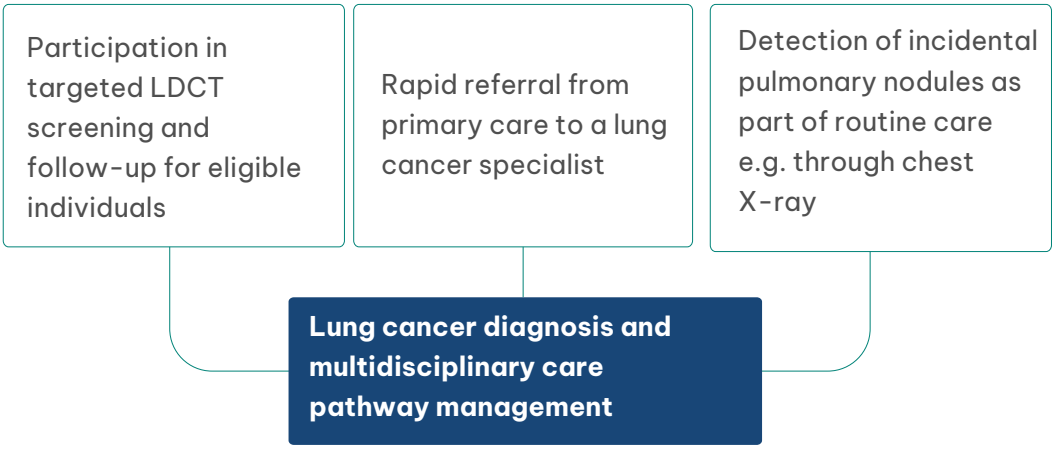
# Care pathways are situated in the context of changing approaches to lung cancer care

**For the development and continued optimisation of care pathways for lung cancer to be effective, they need to be situated in, and adapt to, the changing policy landscape.** To deliver lasting change in the experiences and outcomes for people with lung cancer, health system decision-makers should adapt to evolving evidence, innovation and best practice at every stage of the care pathway.

## There is a growing focus on early detection

**A comprehensive approach to the early detection of lung cancer will help to improve outcomes.** The World Health Organization states that 'by developing effective strategies to identify cancer early, lives can be saved and the personal, societal and economic costs of cancer care are reduced'.[158] There is a pressing need for early detection strategies for lung cancer, as the majority of people currently present to health services with advanced-stage disease, when treatment options are limited.[106] Experts recommend that all countries should add the early detection of lung cancer to their national cancer control plans to complement the primary prevention and risk reduction efforts.[5] Methods to detect lung cancer early are varied and their impact should be considered across all stages of the care pathway (*Figure 3*).[159]

**FIGURE 3. Approaches to encourage early detection of lung cancer**




Adapted from The Health Policy Partnership (2021).[159]

## Targeted approaches to diagnosis and treatment are emerging

**The potential to integrate precision medicine to lung cancer care across the entire care pathway could transform patient outcomes and should be duly considered.** There is growing recognition that wider integration of precision lung cancer care can support the delivery of appropriate treatment, enhance early detection, and minimise the risks of treatment side effects and cancer recurrence – ultimately resulting in better outcomes.[160] A broader uptake of precision medicine should be explored across the entire care pathway. This will require flexibility and collaboration, and should utilise resources such as the Global Precision Medicine Map and Network developed by the From Testing to Targeted Treatments Program.[161]

## Barriers to equitable care are beginning to be addressed

**There is evidence of significant inequalities in lung cancer, with some individuals and communities being at an increased risk of not receiving best-practice care.** Differences in incidence, mortality and outcomes in lung cancer are observed for a variety of factors, including sex, age, race, ethnicity and socioecnomic status.[162] In Europe, lung cancer was the largest contributor to inequalities in

total cancer mortality from 1990 to 2015 among adults aged 40–79 years, and a substantial proportion of these deaths were associated with a lower socioeconomic status.[163] For example, in Germany, between 2007 and 2018, the largest inequalities in cancer incidence were observed for lung cancer, with a higher number of cases in the most deprived regions.[164] Across the globe, a number of countries have recognised such barriers to equitable care and are making active efforts to address them, with examples from the Americas highlighted in *Figure 4*.[163 165]

**FIGURE 4. Addressing barriers to equitable care across care pathways for lung cancer in Brazil, Canada and the US**

**BRAZIL**

The national health system in Brazil covers approximately 73% of healthcare facilities, with inequalities in access to diagnostic testing and treatment for lung cancer between public and private institutions.[166 167] Private healthcare provision is well resourced, but public healthcare faces disproportionate regional differences.[166] This compounds health inequalities, with many people with lung cancer experiencing financial, social and geographic barriers to care.[168] Programmes to encourage smoking cessation, shorten the time to diagnosis, increase public awareness of lung cancer and improve access to healthcare facilities have been identified as the most pertinent to promote equitable care and improve outcomes along the care pathway in Brazil.[166]

**CANADA**

In Canada, lung cancer is more often diagnosed in people with lower levels of education, lower income and in a lower occupational class.[169 170] These populations are also least likely to participate in preventive healthcare practices such as LDCT screening.[170 171] To address these health inequalities, Canadian researchers have developed the Strategy for Patient-Oriented Research protocol.[170] The protocol supports a network of stakeholders in engaging with people with lung cancer to design and deliver healthcare services that are acceptable to them and that promote equitable access to lung cancer screening.[170]

**US**

Racial disparities are one of the strongest predictors of poor lung cancer outcomes in the US.[172] Black Americans, Latino Americans, Asian Americans/Pacific Islanders and Indigenous Peoples all have over a 10% lower likelihood of receiving an early diagnosis and a greater risk of not receiving any treatment when compared with White Americans.[172] To address this, a system-based, pragmatic approach to treatment disparities was introduced in five cancer centres.[173] The intervention involved a nurse navigator, race-specific feedback to clinical teams on treatment completion rates, and a real-time patient management system.[173] The approach has seen some success in reducing racial inequalities in lung cancer treatment and outcomes.[173]

# Stigma towards lung cancer is being recognised

**The stigma surrounding lung cancer may contribute to inequities in care and outcomes.** Stigma towards people with lung cancer – for example, perceiving the condition as self-inflicted[174] – poses a significant barrier to early diagnosis,[75] detrimentally affecting the care delivered at every stage of the pathway and resulting in long-term disparities in outcomes.[175 176]

**Stigmatised perceptions of lung cancer do not reflect the evidence of which populations are in fact at risk.** The stigma associated with tobacco smoking as a significant risk factor for lung cancer is well documented and numerous tobacco control initatives have resulted in declining smoking rates.[114 177-179] However, lung cancer has multiple risk factors, including biological and environmental,[180] and its rates are rising among people who have never smoked.[180 181] It is therefore essential to characterise the risk factors that influence lung cancer development and ensure care pathways are agile, so they can adapt to such emerging evidence.[180]

**Innovative approaches to pathway implementation may help address stigma and some of the barriers to best-practice care experienced by people with lung cancer.** Flexibility in the composition and implementation of care pathways for lung cancer is important to increase equitable access to care. In the UK, alternative care pathways in the form of community pharmacy referral services and community-based interventions have been implemented to improve early lung cancer detection and diagnosis in underserved populations and high-risk groups.[182 183] For example, in Manchester a community screening pilot targeting populations in deprived areas has been held in local shopping centres to reduce travel and increase accessibility, which in turn has promoted screening participation and detection of early stage lung cancer.[184 185]

# Moving towards more effective care pathways for lung cancer

**Health system decision-makers should acknowledge the potential that evidence-based care pathways have for addressing the challenge of delivering high-quality lung cancer care.** The development and expansion of LDCT screening programmes,[106] persisting inequalities in lung cancer outcomes,[163 165] and accumulating technological and scientific advancements[27] demonstrate the variety of challenges and opportunities for the lung cancer community. Effective care pathways can drive improvements in outcomes, facilitate equitable care and optimise the use of infrastructure and resources. In turn, this will lessen the social and economic burden on the health system.

**'Care pathways have the potential to revolutionise healthcare. Every care pathway must be thoughtfully developed and organised, and informed by the latest evidence and guidelines. This way, when implemented, it will have maximal impact.'**

Professor Robert Thomas, University of Melbourne, Australia

**Immediate action is needed from policymakers to develop and optimise care pathways for lung cancer and would significantly improve outcomes.** The substantial global burden and poor outcomes of lung cancer, and the current inequalities in access to high-quality lung cancer care, have the potential to be transformed through increasing earlier detection and utilising diagnostic and treatment advances. To effectively realise this opportunity, it is essential to develop high-quality care pathways for lung cancer.

**Policymakers must assess and identify how to improve current practice, develop care pathways where they currently do not exist, and optimise these pathways through consideration of the following steps:**

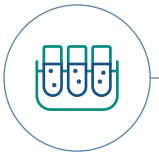
Ensure **multidisciplinary care** throughout the care pathway

Perform continuous **monitoring and evaluation** of care pathways using evidence-based performance assessment

Determine clear, time-defined **targets** for different stages of lung cancer care, taking into account the structure and characteristics of the health system

Implement evidence-based **digital technologies** that can assist systematic information management and sharing to maximise pathway efficiency

Integrate **LDCT screening** programmes, alongside **smoking cessation** support and **pulmonary nodule evaluation protocols**, into the care pathway



Ensure care pathways for lung cancer are ready to incorporate new **biomarkers**

Introduce high-quality **prehabilitation** programmes into the care pathway that are appropriate for all lung cancers

Integrate **appropriate treatments** and **clinical trial opportunities** into care pathways for lung cancer

Compile evidence to inform the delivery of comprehensive **rehabilitation**

Ensure high-quality **end-of-life care** is an integral part of care pathways for lung cancer

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