



Recommendations for the development of an integrated lung cancer care process: an expert consensus report

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Abstract

Objective To identify key aspects of the lung cancer care process and generate prioritised recommendations to optimise coordination, quality, and equitable access to diagnosis and treatment.

Methods 24 experts from the National Advisory Committee of the Lung Ambition Alliance in Spain participated in a structured consensus process using an adapted RAND/UCLA method. The process comprised three phases: literature review (Phase I), identification of key issues (Phase II, $n = 21$), and prioritisation of recommendations (Phase III, $n = 24$). Each recommendation was scored for impact and feasibility on a 1–9 Likert scale. Agreement was defined when $\geq 66.6\%$ of experts rated within the same range as the median; disagreement when $\geq 33.3\%$ scored in both the 1–3 and 7–9 ranges; other cases were considered indeterminate.

Results A total of 76 recommendations addressing 34 key aspects were identified (66% related to humanisation and perceived care quality and 34% to coordination and continuity). From which, 62 achieved agreement for impact and 14 were indeterminate; regarding feasibility, 10 reached agreement, 2 met disagreement criteria and 64 were indeterminate. In this regard, 17 high-priority recommendations (high impact and feasibility) were prioritised, covering prevention, access to diagnosis and treatment, standardisation of care processes and communication with patients. In addition, 29 recommendations were classified as high impact, relating to information systems, care coordination, prevention and awareness, equity in access to diagnostic tests and treatment, and patient care and safety.

Conclusions Implementing these recommendations is essential to enhance equity, coordination, and quality of lung cancer care, requiring a nationwide, multi-stakeholder effort to advance towards an integrated and patient-centred model.

Keywords Lung cancer · Integrated care process · Coordination · Quality

Introduction

Lung cancer remains a leading cause of death worldwide and in most European countries, posing a significant public health challenge [1, 2] due to its high incidence, high morbidity and mortality, and considerable socioeconomic impact [3, 4]. In Spain, lung cancer continues to be a major concern, with an estimated 34,500 new cases projected for 2025, making it the third most frequently diagnosed cancer [1]. While incidence is decreasing among men, it is rising in women, particularly those aged 60 and older, largely reflecting historical patterns of tobacco consumption [1]. Tobacco exposure, both active and passive, remains the predominant

risk factor, with only around 12% of cases occurring in individuals who have never smoked [5].

Consistent with global trends, cancer remained the leading cause of death in Spain in 2024, and lung cancer accounted for the highest number of cancer-related deaths, approximately 23,200, with mortality rising over the past five years [1]. Despite advances in diagnosis and treatment, overall survival remains poor, with five-year survival rates around 30%, highlighting the urgent need for improved early detection, prevention, and therapeutic strategies [1].

From an economic perspective, the burden of lung cancer is substantial. Across the European Union, the total economic cost of cancer was estimated at €126 billion in 2009, with lung cancer representing the highest share (approximately 15% of all cancer-related costs) [6]. In Spain, direct

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healthcare costs remain significant throughout the disease continuum. A national study from 2020 found a cost of €63,245 per patient in early stages, rising to approximately €103,365 for metastatic stages [3]. These figures underscore the importance of early and efficient diagnosis and intervention, which can significantly reduce the economic burden [3].

Lung cancer management is complex due to disease heterogeneity, diverse therapeutic alternatives, and the need for coordinated multidisciplinary care. Early diagnosis is crucial for improving survival, yet non-specific symptoms, combined with referral delays between care levels and limited access to diagnostic tests and treatment, often lead to late-stage detection, when survival rates are reduced. In contrast, early-stage detection can yield five-year survival rates of up to 90% [7]. This highlights the critical need for effective screening strategies and efficient, responsive care processes that ensure timely and appropriate intervention while enhancing patients' quality of life.

Integrated Care Processes (ICPs) are crucial tools for enhancing the global quality of healthcare services and patient care. They help organise and structure the different phases of the healthcare process, ensuring both equity and efficiency. In recent years, several local guidelines have been developed to streamline cancer care across the patient's entire journey. These documents serve as a framework for healthcare professionals, supporting diagnostic and therapeutic decision-making while ensuring that interventions are effective and based on the latest scientific evidence [8, 9]. However, for lung cancer, there are no up-to-date, nationally applicable guidelines to standardise criteria, optimise coordination across care levels, and ensure equitable and efficient access to diagnosis and treatment nationwide.

This study seeks to address the gap by identifying the most critical aspects of the lung cancer care process and generating a set of prioritised, expert-driven recommendations. These recommendations aim to enhance the humanisation and perceived quality of care while improving coordination and continuity across all phases of the patient journey.

Methods

This study followed a structured consensus process based on an adapted RAND/UCLA Appropriateness Method [10], suited to the context of lung cancer care in Spain. Conducted between February and November 2024, it involved three phases, led by the National Advisory Committee of the Lung Ambition Alliance in Spain. Phase I involved a narrative literature review and analysis of the current situation of lung cancer care in Spain. In Phase II, a

reduced expert group collaborated to identify patient-centred issues or potential bottlenecks in the oncological process, issuing recommendations to address them. In Phase III, the recommendations were prioritised based on potential impact and feasibility, followed by an open discussion among experts from the National Advisory Committee.

National advisory committee of the lung ambition alliance in Spain

The National Advisory Committee of the Lung Ambition Alliance in Spain is an independent group comprising 24 professionals including patient representatives and healthcare professionals from different specialties (Table S1) and has been consistently focused on improving the quality of lung cancer care and promoting early detection. Participation in the project was voluntary and not confidential, and each expert confirmed their participation by signing a collaboration agreement. Participants received financial compensation for the time they devoted to the project.

Phase 1: Literature review and analysis

A situation analysis was conducted through a narrative review of the literature in PubMed, Scopus and Web of Science, covering publications from 2012 to 2025. The search combined keywords including "lung cancer", "comprehensive care", "care process", "clinical guidelines", "humanisation", "perceived quality" and "lung cancer survivors". Grey medical literature was also reviewed to identify existing national guidelines, care protocols, and other recommendations currently implemented in Spanish hospitals, care protocols and other recommendations currently implemented in national hospitals.

Phase 2: Identification of key issues and proposal of recommendations

To conduct this phase, 21 experts from the National Advisory Committee were divided into two working groups, each focusing on specific aspects of lung cancer management. Group 1 addressed the humanisation of care and patient-perceived quality, while Group 2 focused on coordination and continuity of care.

Each member received an information dossier outlining the project's objectives, methodology, and roles. The dossier also included a summary of the literature review, including a curated bibliography, a synthesis of key patient-centred aspects, preidentified bottlenecks, and examples of ongoing initiatives to improve patient care. This material was discussed in virtual meetings, serving as the basis for identifying key patient-centred issues and

bottlenecks, leading to the development of phase-specific recommendations across the oncological process. The identified key aspects and recommendations were reviewed and validated by all members of the National Advisory Committee during a face-to-face meeting.

Phase 3: Prioritisation and consensus on recommendations

All members of the National Advisory Committee participated in prioritising the recommendations, evaluating each for its potential impact to humanise lung cancer care or improving care coordination and continuity, and its feasibility of implementation within the Spanish National Health System (SNHS). Experts independently scored each recommendation on a 1-to-9 Likert scale for both impact and feasibility [11], with 1–3 indicating low, 4–6 intermediate, and 7–9 high impact or feasibility. Contributions were equally weighted across professional profiles, ensuring a multidisciplinary perspective. The overall scores were calculated as the average of individual scores, with medians and distribution bands also assessed. Consensus was evaluated following the adapted RAND/UCLA Appropriateness Method, based on the distribution of expert responses: agreement was defined as at least 77.77% of experts rating a recommendation within the median range; disagreement occurred when at least one-third (33.33%) rated it 1–3, and another third (33.33%) in the range 7–9. Recommendations not meeting these criteria were classified as undetermined.

In this study, recommendations were categorised based on scoring patterns. High-priority recommendations achieved consensus with average scores ≥ 7 for both impact and feasibility. High-impact recommendations reached an average impact score ≥ 8 , regardless of feasibility, reflecting their potential to substantially improve lung cancer care. These predefined criteria were applied consistently across all recommendations during the prioritisation process to ensure an objective and structured evaluation.

After prioritisation, a final report summarising the key issues, recommendations, and results was produced. These results were shared within the National Advisory Committee during a face-to-face meeting. In this meeting, members reached group consensus on the proposed issues, guided by moderators who facilitated discussions, encouraged perspective sharing, and provided targeted recommendations. Aligned with the Recommendation Generation-Based Consensus Model [12], the National Advisory Committee iteratively refined the recommendations, adjusting their preferences based on expert input and feedback until a shared decision was reached.

Following the consensus meeting, the resulting report was circulated to the experts for review. Several rounds of online

revisions were conducted, incorporating minor editorial changes as well as additional expert comments.

Results

An ideal ICP for lung cancer was defined by identifying the key phases of the oncological process, which structured the work around six domains of care (Fig. 1). For each of these phases, specific recommendations were formulated. In addition, actions which covered general aspects affecting all stages of the process were classified within a cross-cutting domain.

Primary prevention should be focused on strategies to reduce the incidence of the disease through awareness, social education and smoking cessation programmes. Secondary prevention aims to implement lung cancer screening programmes and early detection to identify cases at early stages. The suspicion phase emphasises early identification of signs and symptoms, optimising referrals. The diagnostic phase addresses access to specific tests and lung biomarkers, as well as the emotional support needed when communicating a diagnosis. The treatment phase encompasses the adoption of a multidisciplinary approach to ensure and optimise the flow of timely and personalised interventions. Finally, the follow-up phase covers post-treatment assessment, rehabilitation, and comprehensive care for survivors.

As a result of this process, a total of 34 key aspects and 76 recommendations aimed at improving the quality of care for lung cancer patients were identified (Table 1 and S2). Of the total recommendations, two-thirds were focused on the humanisation of care and quality as perceived by patients, while one-third focused on continuity and coordination of the care process. In terms of consensus, 62 recommendations achieved agreement for impact, whereas 14 were classified as undetermined. For feasibility, 10 recommendations reached agreement, 2 met the criteria for disagreement, and the remaining 64 were considered undetermined.

All recommendations were assessed using a two-step analysis based on their impact and feasibility. Initially, those scoring highly on both dimensions were categorised as prioritised recommendations. Subsequently, the relevance of examining recommendations with high potential impact, even if they had lower feasibility, was also recognised as relevant.

Prioritised recommendations

A total of 17 recommendations were prioritised, each receiving an average score above 7 points for both impact and feasibility. Most of these pertained to the treatment phase (6 recommendations), followed by 2

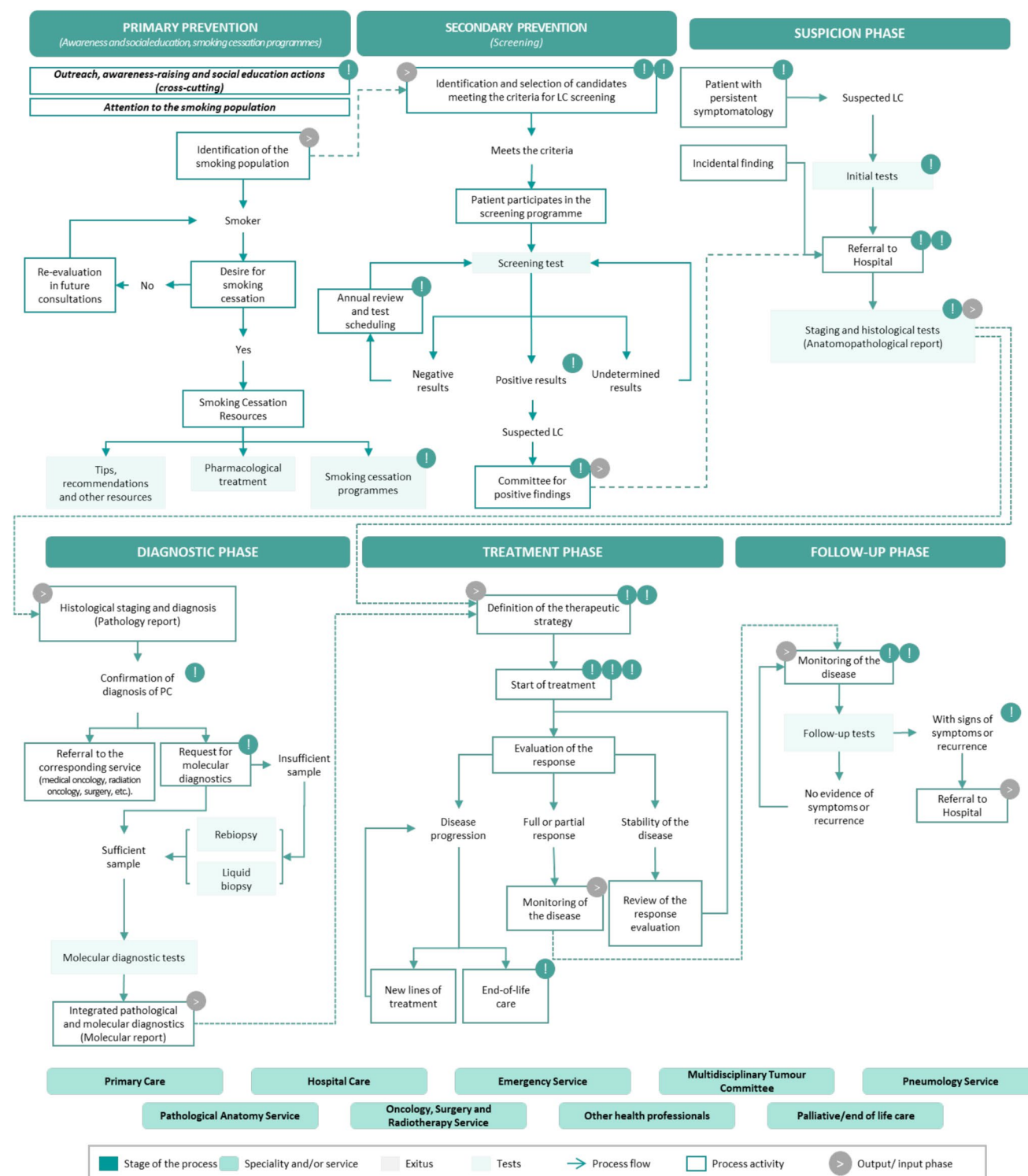


Fig. 1 Illustrative, non-exhaustive scheme, which may vary depending on the centre or hospital where the patient is treated

recommendations each for the cross-cutting domain, primary prevention, secondary prevention, diagnosis and follow-up phases. In addition, 1 recommendation was prioritised with the suspicion phase. All 17

recommendations achieved some level of expert consensus regarding their impact. However, feasibility ratings were less uniform, with 7 recommendations showing an indeterminate degree of consensus (Table 2).

Table 1 Key issues and recommendations identified

Areas	Key factors	Recommendations		
		H	C	Total
Cross-cutting	11	16	11	27
Primary prevention	2	3	0	3
Secondary prevention	6	2	4	6
Suspicion	4	3	2	5
Diagnosis	2	5	4	9
Treatment	6	13	3	16
Follow-up	3	8	2	10
TOTAL	34	50	26	76

H Humanisation of care and quality perceived by patients

C Continuity and coordination of the care process

Bold text indicates summary totals, including the total number of key factors and the total number of recommendations

High-impact recommendations

A total of 29 recommendations were identified, each receiving an impact score above eight on a 1-to-9 scale. The majority (10 recommendations) were related to the treatment phase, followed by seven cross-cutting recommendations and five related to diagnosis. In addition, three recommendations addressed secondary prevention, two focused on primary prevention, and two corresponded to the suspicion phase. Notably, no high-impact recommendations were identified for the follow-up phase. Although all 29 recommendations reached expert consensus on their impact, 23 showed either a lack of consensus or an indeterminate level of agreement regarding feasibility (Table 3).

Several high-impact recommendations emphasised the need to define and monitor standardised waiting-time targets throughout the lung cancer care pathway. In alignment with Spain's National Cancer Strategy (2021) and National Advisory Committee's previous consensus [13, 14], a set of benchmarks was unified defining median timeframes from referral to diagnosis and treatment (Table 4). These indicators serve as quality standards and support equitable access to timely care.

Discussion

The implementation of ICPs is a key strategy for improving healthcare quality and patient outcomes, particularly in complex clinical scenarios such as lung cancer. This structured, standardised approach reduces clinical variability, improves continuity of care, and enhances efficiency while fostering more personalised and humanised care.

The prioritisation exercise conducted in this study offers a dual-layer analysis. Among the 76 recommendations proposed, 17 were prioritised based on their high impact and feasibility for short- or medium-term implementation in the SNHS (Table 2). These actions, feasible under current human and technical capacities, have the potential to substantially improve patient quality of life and foster more equitable care. In addition, 29 high-impact recommendations were identified (Table 3); although some require resources to implement, their potential to significantly improve the quality of life for lung cancer patients highlights the importance of considering them when developing lung cancer-specific ICPs. Undoubtedly, targeted strategies are required to address resource-related barriers and increase the feasibility of their implementation.

All recommendations included in this study can be categorised into three domains, based on similarities in their content and focus: communication and awareness-raising, multidisciplinary assessment and standardisation, and monitoring of access to diagnosis and treatment. This categorisation was conducted in a pragmatic manner, aiming to organise related recommendations together to facilitate interpretation and discussion. Each domain includes recommendations prioritised for their combination of high impact and feasibility, which can be implemented using existing resources, as well as those selected solely for their high impact, which may require further development to overcome systemic barriers. The first domain, communication and awareness-raising, comprises 53% (9 of 17) of the prioritised recommendations (31.1, 28.1, 13.1, 33.2, 29.3, 25.3, 16.1, 33.1, 12.1). In addition, nine recommendations were identified as high-impact overall (19.1, 31.1, 14.1, 8.5, 13.1, 10.1, 28.1, 13.2, 8.6), from which three are also included among the prioritised recommendations. Effective communication is fundamental to delivering high-quality lung cancer care, as it ensures that patients are well-informed about their diagnosis and treatment options [15–18], and available health and social support services [16, 19]. Transparent, face-to-face communication fosters shared decision-making, reduces psychological distress [20], and strengthens trust between patients and healthcare professionals [21]. Nonetheless, certain high-impact actions remain underdeveloped. There is a pressing need for interoperable, automated tools to facilitate communication across different care levels [22]. While Electronic Health Records (EHR) are available in many regions, their lack of interoperability and integration constitutes a substantial barrier to quality. To address this, the SNHS should establish standardised and protocolised data collection practices nationwide, enabling efficient information and knowledge sharing across all healthcare professionals and levels of care. Furthermore, improving communication requires targeted awareness-raising efforts aimed at health professionals and the general population. This includes the

Table 2 Recommendations prioritised according to their average impact and feasibility

Stage of the process	Type— No	Recommendation	Impact		Feasibility		Avg. impact- feasibility
			Avg. score	Consensus	Avg. score	Consensus	
Treatment	H 31.1	Inform patients and their families about palliative care and/or end-of-life care (e.g. advance decision planning)	8.45	95.45%	7.95	100.00%	8.20
Treatment	C 28.4	Implement tools to measure actual waiting times between diagnosis and initiation of treatment	8.41	95.45%	7.64	86.36%	8.03
Treatment	H 28.1	Inform about the different treatment options available, including possible clinical trials for which the patient could be a candidate	8.27	95.45%	7.64	90.91%	7.96
Secondary prevention	C 17.1	Define a specific circuit for the evaluation and assessment of patients with positive screening results, as part of a specialised Multidisciplinary Committee	8.41	100.00%	7.45	86.36%	7.93
Primary prevention	H 13.1	Promote specialised training on smoking cessation for primary care professionals and other professionals involved in lung cancer	8.36	95.24%	7.41	81.82%	7.89
Treatment	H 26.1	Integrate Multidisciplinary Tumour/Thoracic Tumour Committees in the centres to ensure personalised care appropriate to the needs of the patient	8.32	90.91%	7.36	81.82%	7.84
Follow-up	H 33.2	Provide recommendations on exercise, healthy lifestyle habits, recovery of work-life, etc	7.64	86.36%	7.95	86.36%	7.80
Cross-cutting	C 7.2	Develop and implement protocols for rapid action and referral of lung cancer patients throughout the process	8.50	95.45%	7.05	72.73%	7.78
Treatment	C 26.2	Define and multidisciplinary tumour committees/thoracic tumour committees in all hospitals, which comprise professionals from different specialties and professions Promote the creation of Inter-hospital Multidisciplinary Tumour Committees to foster the exchange of knowledge and the resolution of specific cases among more healthcare professionals from different fields	8.32	90.91%	7.18	77.27%	7.75
Suspicion	C 22.1	Define and establish referral circuits and fast-track pathways for patients with suspected lung cancer, including efficient communication channels between the different levels of care and professionals involved	8.32	95.45%	7.05	77.27%	7.69
Treatment	H 29.3	Raise awareness of cancer pain and ensure that it is adequately managed	7.91	90.91%	7.45	86.36%	7.68
Cross-cutting	C 7.1	Implement mechanisms and systems for measuring access times to diagnostic tests and treatment	8.00	95.45%	7.32	68.18%	7.66
Diagnosis	C 24.3	Implement mechanisms and systems to measure the time from suspicion to confirmation of diagnosis, ensuring compliance with a median of 15–28 days, (as detailed in Table 4)	8.27	100.00%	7.00	63.64%	7.64
Diagnosis	H 25.3	Provide contact information for social services and patient associations that can be accessed by the patient for psychosocial support resources and other programmes	7.82	86.36%	7.41	81.82%	7.62

Table 2 (continued)

Stage of the process	Type— No	Recommendation	Impact		Feasibility		Avg. impact- feasibility
			Avg. score	Consensus	Avg. score	Consensus	
Secondary prevention	H 16.1	Define a protocol for communicating results to patients, always reporting results or false positives in person	7.91	95.45%	7.23	77.27%	7.57
Follow-up	H 33.1	Improve information on available social and health care resources and patient associations and facilitate access to them	7.45	81.82%	7.41	86.36%	7.43
Primary prevention	H 12.1	Conduct awareness-raising and anti-stigma campaigns aimed at: Adequately inform the population about the chances of lung cancer survival when detected early Combat the stigma associated with lung cancer and tobacco Raise awareness of the risk of lung cancer in the non-smoking population	7.36	77.27%	7.09	72.73%	7.23

H: Humanisation of care and quality perceived by patients

C: Continuity and coordination of the care process

Bold values correspond to the combined average score of impact and feasibility scores, and determine the descending ranking order of the recommendations

implementation of smoking cessation training programmes, pain management, and lung cancer survivorship [23, 24], as well as public awareness campaigns to reduce the stigma associated with lung cancer, particularly among non-smokers [25]. From an organisational standpoint, many improvements are achievable within healthcare structures, as they primarily involve optimising current resources. Therefore, communication-related interventions offer high-impact, cost-efficient opportunities for system improvement.

The second domain, multidisciplinary assessment and standardisation of care, includes 29% (5 of 17) of the prioritised recommendations (17.1, 26.1, 7.2, 26.2, 22.1). In addition, nine recommendations in this domain were classified as high impact (7.2, 17.1, 5.1, 26.1, 26.2, 22.1, 25.6, 29.5, 7.3), including the five recommendations from the prioritised set. Multidisciplinary Tumour Committees (MTDs) facilitate collaborative decision-making, particularly in complex cases, and are increasingly involved earlier in the oncological process, including diagnosis. Their implementation has been associated with improved outcomes and increased survival [26, 27]. Despite their recognised benefits, MTDs in Spain may lack institutional support. Therefore, health authorities should allocate existing resources to ensure their effective implementation and integration across hospitals. Furthermore, prioritised recommendations also include the need to develop standardised procedures, fast-track protocols, and enhanced inter-professional communication. These measures help reduce delays, limit clinical variability, ensure equitable, coordinated care, and have been shown to positively impact patient outcomes and satisfaction [22]. These

actions can be implemented using the existing SNHS infrastructure, helping to improve efficiency and support national health strategies. Despite their potential impact, some recommendations are challenging to implement. For instance, the introduction of oncology case managers, who help guide patients through the care continuum, faces challenges such as unclear roles, staffing limits, and high workloads, among others. Nevertheless, their incorporation can enhance patient care through improved coordination and continuity, while also contributing to greater system efficiency by reducing redundancies, optimising resource utilisation, and lowering hospital readmission rates [28].

The third domain, monitoring access to diagnostics and treatment, accounts for 18% (3 of 17) of the prioritised recommendations (28.4, 7.1, 24.3). Nine additional recommendations were deemed high impact (24.1, 25.4, 28.2, 28.4, 25.5, 28.3, 24.3, 7.1, 23.1), including two prioritised recommendations. Many lung cancer cases are diagnosed at advanced stages, limiting curative treatment options. Despite medical advances, disparities in diagnostic and treatment access persist due to geographic, administrative, and socioeconomic factors [29]. Therefore, to improve clinical outcomes and care equity, it is necessary to establish clear standards for acceptable waiting times and implement monitoring systems that ensure adherence. In this regard, the National Cancer Strategy emphasises the need to standardise care to improve quality and evaluate outcomes, particularly patient survival [30]. Existing EHRs should be used more effectively to collect and standardise data, delivering timely and equitable care throughout the system, in alignment

Table 3 Recommendations prioritised according to their average impact

Stage of the process	Type— No	Recommendation	Impact		Feasibility	
			Avg score	Consensus	Avg score	Consensus
Diagnosis	H 24.1	Facilitate access to evidence-based diagnostic (and molecular diagnostic) tests throughout the country	8.73	100.00%	5.64	36.36%
Diagnosis	C 25.4	Develop a process or protocol for requesting molecular diagnostics, ensuring that a median of 14 days from suspicion to completion of molecular diagnostic testing is adhered to (as detailed in Table 4)	8.68	100.00%	6.50	45.45%
Cross-cutting	C 7.2	Develop and implement protocols for rapid action and referral of lung cancer patients throughout the process	8.50	95.45%	7.05	72.73%
Treatment	H 28.2	Facilitate access to evidence-based treatments throughout the country	8.50	100.00%	6.05	31.82%
Secondary prevention	C 19.1	Plan and coordinate primary and hospital care levels: Establish rapid channels of contact between Primary Care and Hospital Care in the event of suspected findings Develop and implement interoperable information systems that allow access to and exchange of information between professionals Create population-based registries that include lung cancer patients, as well as all those screened and their results (negative, indeterminate or positive) Develop automated mechanisms and systems for follow-up and annual review of candidates with negative or indeterminate results for the scheduling of the screening test	8.50	100.00%	5.95	36.36%
Treatment	H 31.1	Inform patients and their families about palliative care and/or end-of-life care (e.g. advance decision planning)	8.45	95.45%	7.95	100.00%
Treatment	C 28.4	Implement tools to measure actual waiting times between diagnosis and initiation of treatment	8.41	95.45%	7.64	86.36%
Secondary Prevention	C 17.1	Define a specific circuit for the evaluation and assessment of patients with positive screening results by a specialised Multidisciplinary Committee	8.41	100.00%	7.45	86.36%
Secondary Prevention	H 14.1	Raise public awareness of the importance of early diagnosis and encourage participation in screening programmes	8.41	100.00%	6.09	36.36%
Primary Prevention	H 13.1	Promote specialised training on smoking cessation for primary care professionals and other professionals involved in lung cancer	8.36	95.24%	7.41	81.82%
Diagnosis	C 25.5	Monitor the homogeneous implementation of the biomarkers included in the Common Services Portfolio of the National Health System in all centres in Spain	8.36	100.00%	6.95	68.18%
Treatment	C 28.3	Define referral circuits and protocols for access to treatment, in case the hospital does not have them	8.36	100.00%	6.68	63.64%
Follow-up	C 10.1	Adapt information systems to ensure that patient information is accessible at every stage of the process and by all levels of care	8.36	95.45%	6.09	36.36%
Treatment	H 26.1	Integrate Multidisciplinary Tumour/Thoracic Tumour Committees in the centres to guarantee personalised care appropriate to the needs of the patient	8.32	90.91%	7.36	81.82%
Treatment	C 26.2	Define and establish Multidisciplinary Tumour Committees/ Multidisciplinary Thoracic Tumour Committees in all hospitals, composed of professionals from different specialities and professions • Promote the creation of Inter-hospital Multidisciplinary Tumour Committees to foster the exchange of knowledge and the resolution of specific cases between a greater number of healthcare professionals from different fields	8.32	90.91%	7.18	77.27%

Table 3 (continued)

Stage of the process	Type— No	Recommendation	Impact		Feasibility	
			Avg score	Consensus	Avg score	Consensus
Suspicion	C	22.1 Define and establish referral circuits and fast-track pathways for patients with suspected lung cancer, including efficient communication channels between the different levels of care and professionals involved	8.32	95.45%	7.05	77.27%
Cross-cutting	H	5.1 Define the figure of case management, as a link between the different levels of care, and between these and the patient	8.32	95.45%	6.59	50.00%
Cross-cutting	H	8.5 Guarantee adequate time in medical consultations to explain to patients and relatives the diagnosis, tests, implications, therapeutic strategies, etc., as well as to resolve possible doubts	8.32	90.91%	5.82	22.73%
Treatment	H	28.1 Inform about the different treatment options available, including possible clinical trials for which the patient would be a candidate	8.27	95.45%	7.64	90.91%
Diagnosis	C	24.3 Implement mechanisms and systems to measure the time from suspicion of lung cancer (LC) to confirmation of diagnosis, ensuring compliance with a median of 15–28 days, as detailed in Table 4	8.27	100.00%	7.00	63.64%
Treatment	H	30.1 Implement safe practices and clinical safety monitoring and evaluation mechanisms to ensure safe and quality cancer care	8.23	95.45%	6.95	68.18%
Primary Prevention	H	13.2 Develop and implement primary prevention actions, such as smoking cessation programmes, and encourage the participation of the smoking population in them	8.23	95.24%	6.77	50.00%
Diagnosis	C	25.6 Define standardised processes and protocols for obtaining samples for molecular diagnostics, encouraging access to liquid biopsy for insufficient or unsuitable tissue samples when re-biopsy is not possible	8.14	90.91%	6.50	59.09%
Cross-cutting	H	8.6 Implement automated information collection systems to improve communication between the healthcare professional and the patient	8.14	90.91%	6.45	45.45%
Treatment	H	29.5 Optimise care times and circuits in Day Hospitals	8.09	95.45%	6.86	54.55%
Cross-cutting	C	7.1 Implement mechanisms and systems for measuring access times to diagnostic tests and treatment	8.00	95.45%	7.32	68.18%
Cross-cutting	C	7.3 Define the warning circuit for pathological screening results	8.00	95.45%	6.95	68.18%
Suspicion	C	23.1 Promote equitable access to lung cancer resources and services through the accreditation of referral centres and referral centres, the creation of a network of referral centres, services and units	8.00	90.91%	6.27	45.45%
Treatment	H	29.6 Encourage home-based care, whenever possible	8.00	90.91%	6.14	54.55%

H Humanisation of care and quality perceived by patients

C Continuity and coordination of the care process

Bold values indicate the average impact score, which determines the descending ranking order of the recommendations

with national standards. Key actions include measuring and reducing waiting times and setting up a network of reference centres to ensure that all patients can access personalized diagnoses and treatment in optimized circuits, even when patient referrals occur [31].

Beyond the three main categories, two additional high-impact recommendations (30.1 and 29.6) target overall patient care and safety, including strengthening safety protocols and expanding home care services. Although more resource-intensive and organisationally complex, these

measures are vital for delivering comprehensive, high-quality lung cancer care.

The successful implementation of an ICP for lung cancer within the SNHS requires clearly defined responsibilities across care levels, adequate organizational resources, and system-level enablers that support coordinated and timely care. The prioritized and high-impact recommendations of this consensus provide a practical framework for operationalization. Responsibilities are assigned across disciplines to ensure accountability and continuity of care. Primary care

Table 4 Recommended Time Standards for the Lung Cancer Integrated Care Pathway (Aligned with Spain's National Cancer Strategy and National Advisory Committee previous consensus [13, 14])

Interval	Target median time	References
Primary care referral → First hospital consultation	≤ 7 days	Spanish National Cancer Strategy (2021)
First hospital consultation → Pathological diagnosis (or exclusion)	≤ 15 days	Spanish National Cancer Strategy (2021)
First hospital consultation → Molecular diagnostic testing*	≤ 14 days	Spanish National Cancer Strategy (2021)
First hospital consultation → Complete pathological and molecular diagnosis*	≤ 28 days (4 weeks)	Spanish National Cancer Strategy (2021)
Diagnosis → Surgical treatment	≤ 14 days (2 weeks)	Spanish National Cancer Strategy (2021)
Diagnosis → Systemic treatment (chemotherapy, targeted, or immunotherapy)	≤ 7 days (1 week)	Spanish National Cancer Strategy (2021)
Diagnosis → Radiotherapy treatment	≤ 28 days (4 weeks)	Spanish National Cancer Strategy (2021)

*If molecular testing is required

is responsible for awareness and anti-stigma initiatives, smoking-cessation programs, communication of screening results, and initiation of fast-track referral circuits (recommendations 12.1, 13.1, 16.1, and 22.1). Hospital care focuses on rapid-action referral protocols and systematic monitoring of diagnostic and treatment intervals (recommendations 7.1, 7.2, and 28.4). Radiology plays a key role in timely diagnostic access and confirmation (recommendations 7.1 and 24.3), while Pathology and molecular-diagnostic services ensure rapid diagnostic turnaround, accurate communication of results, and provision of psychosocial support information (recommendations 24.3, 16.1, and 25.3). MTDs are tasked with evaluating positive screening results, guiding personalized treatment decisions, and coordinating inter-hospital case discussions (recommendations 17.1, 26.1, and 26.2). Medical Oncology, Thoracic Surgery, and Radiation Oncology ensure that patients receive comprehensive information on treatment options, pain management, and palliative care (recommendations 28.1, 29.3, and 31.1). Follow-up services share responsibility for recommendations 33.1 and 33.2.

Implementation also requires minimum structural resources, including functional MTDs with protected scheduling and secretariat support; adequate pathology and molecular-testing capacity to meet turnaround standards; interoperable EHR systems that enable referral networks and shared documentation; case-management capacity for coordination; and accredited referral-centre networks. Data capture must rely on standardized Key Performance Indicators (KPIs)—diagnostic intervals, molecular-testing turnaround, treatment initiation times, MTD activity and follow-up indicators—supported by operational dashboards and unified registries. The fast-track pathway shown in Fig. 1 can be operationalized with the following RACI matrix (Table 5), aligned with the roles delineated in the recommendations. Despite a structured approach, implementation challenges persist, particularly due to variability in the perceived feasibility of individual measures. Further research is warranted to explore how professional roles, institutional frameworks, and regional capacities influence the success of lung cancer ICPs. As a next step, it is recommended that hospitals and

Table 5 RACI framework for the fast-track pathway

Pathway phase	Responsible	Accountable	Consulted	Informed
Primary Prevention	Primary Care	Regional Health Service	Other health professionals/Public health programmes	Patient
Secondary Prevention (Screening)	Primary Care (identification target population)/Hospital Care (Radiology and screening tests are under Hospital Care)	Hospital Management	Primary Care/Pneumology Service	Patient/Primary Care
Suspicion Phase	Primary Care/Hospital Care	Hospital Management	Pneumology Service/Hospital Care	Patient
Diagnostic Phase	Pathological Anatomy Service + Hospital Care	Hospital Management	MTD	Patient/Regional Registry
Treatment Phase	Medical Oncology, Thoracic Surgery and Radiation Oncology	Hospital Management	MTD/Palliative Care	Patient
Follow-up Phase	Medical Oncology, Thoracic Surgery and Radiation Oncology + Primary Care	Regional Health Service	Medical Oncology/Primary Care/ Patient Associations	Patient

healthcare centres develop and implement lung cancer ICPs that align with these recommendations and are tailored to their local needs, thereby facilitating ongoing evaluation and continuous improvement of care.

In summary, this analysis highlights three strategic domains for the improvement of lung cancer care: effective communication, MTD coordination, and systematic monitoring of access to services. The prioritised recommendations offer a practical roadmap for immediate implementation, while the high-impact items requiring further development delineate priority areas for future investment and research. Successful implementation will require context-specific adaptations that account for local healthcare services capacities, ensure relevance, feasibility, and sustainability.

The findings should be interpreted considering several limitations. Although indicators were developed through guideline review and expert consensus, the process may be affected by selection and participation bias, as it was non-anonymous, financially compensated, and certain professional profiles may have been over- or under-represented. In addition, generalisability is also limited by substantial regional in diagnostic capacity, molecular-testing availability, MTD committee functioning, and care coordination across Spain. Furthermore, the use of the adapted RAND/UCLA Appropriateness Method also introduces methodological constraints, since recommendations reflect expert judgement rather than empirical performance data. Finally, while several recommendations were rated as high impact, their feasibility remains uncertain due to structural barriers, which may hinder consistent implementation across the SNHS.

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Declarations

Conflict of interest Margarita Majem reports grants from AstraZeneca and F. Hoffmann-La Roche, consulting fees from AstraZeneca, BeiGene, Boehringer Ingelheim, Bristol Myers Squibb, F. Hoffmann-La Roche, Helsinn Therapeutics, Janssen Oncology, Merck Sharp Dohme, Novartis, Pfizer, Pierre Fabre, and Takeda; and personal fees from AstraZeneca, F. Hoffmann-La Roche, Helsinn Therapeutics, Merck Sharp Dohme, and Pfizer; as well as support for attending meetings and travel from AstraZeneca, F. Hoffmann-La Roche, Merck Sharp Dohme Oncology, and Pfizer. Patricia Alonso-Fernández reports consulting fees from AstraZeneca and support for attending meetings and travel from AstraZeneca. Pilar Garrido reports personal fees for payment or honoraria for lectures, presentations, manuscript writing, or educational events from Janssen, MSD, Novartis, Medscape, Takeda, TouchTime, Medscape. Support for attending meetings and travel from AstraZeneca, Roche, and Janssen, and advisory roles (personal fees) with Abbvie, Amgen, AstraZeneca, Bayer, Beigene, Bristol-Myers Squibb, Boehringer-Ingelheim, Daiichi-Sankyo, GlaxoSmithKline, Gilead, IO-Biontech, Johnson & Johnson, Lilly, MSD, Novartis, PharmaMar, Pfizer, Regeneron, Roche, Sanofi, and Takeda. Ángel Gayete reports consulting fees from AstraZeneca, and support for attending meetings and travel from AstraZeneca. Florentino Hernando reports consulting fees from AstraZeneca, and support for attending meetings and travel from AstraZeneca, Bristol Myers Squibb, and Johnson. José Luis López-Guerra reports consulting fees from AstraZeneca, and support for attending meetings and travel from AstraZeneca. María D. Lozano reports consulting fees from AstraZeneca; honoraria from AstraZeneca, Bristol Myers Squibb, Roche, and Pfizer; support for attending meetings and travel from AstraZeneca, Roche, and MSD; and leadership roles as President of SEAP and Chair, Membership Committee of IAC. Bartomeu Massuti reports consulting fees from AstraZeneca, and support for attending meetings and travel from AstraZeneca. Luis Paz-Ares reports grants from MSD, AstraZeneca, Pfizer, and Bristol Myers Squibb; consulting fees and/or personal fees from AstraZeneca, Lilly, MSD, Roche, PharmaMar, Merck, Novartis, Amgen, Pfizer, Sanofi, Bayer, Bristol Myers Squibb, Mirati, GlaxoSmithKline, Janssen,

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Ethical approval Ethical approval was not sought for the present study because no human participants, their data or biological material were involved.

Informed consent This study did not involve patients, patient data, or biological material. Therefore, informed consent was not required.

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