REVIEW

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Lung cancer symptom appraisal, help-seeking and diagnosis – rapid systematic review of differences between patients with and without a smoking history

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Abstract

Background: Lung cancer is the leading cause of cancer death in the world. A significant minority of lung cancer patients have never smoked (14% in the UK, and ranging from 10% to 25% worldwide). Current evidence suggests that never-smokers encounter delays during the diagnostic pathway, yet it is unclear how their experiences and reasons for delayed diagnoses differ from those of current and former smokers. This rapid review assessed literature about patient experiences in relation to symptom awareness and appraisal, help-seeking, and the lung cancer diagnostic pathway, comparing patients with and without a smoking history.

Methods: MEDLINE, PsychINFO and Google Scholar were searched for studies (2010-2020) that investigated experiences of the pathway to diagnosis for patients with and without a smoking history. Findings are presented using a narrative synthesis.

Results: Analysis of seven quantitative and three qualitative studies revealed that some delays during symptom appraisal and diagnosis are unique to never-smokers. Due to the strong link between smoking and lung cancer, and low awareness of non-smoking related lung cancer risk factors and symptoms, never-smokers do not perceive themselves to be at risk. Never-smokers are also likely to evaluate their experiences in comparison with other non-smoking related cancers, where prognosis is likely better, potentially leading to lower satisfaction with healthcare.

Conclusion: Never-smokers appear to have different experiences in relation to symptom appraisal and diagnosis. However, evidence in relation to help-seeking, and what is driving diagnostic delays for never-smoker patients specifically is lacking.

KEYWORDS
cancer, detection bias, diagnosis, diagnostic delay, help-seeking, lung cancer, never smoker, oncology, psycho-oncology, symptom appraisal

Aron Syversen is the joint first author.

1 | INTRODUCTION

Lung cancer is the leading cause of cancer death in the world.[1] Patients who have never smoked represent approximately 14% of UK lung cancer cases,[2] while worldwide this varies from 10% to 25%.[3] To put this into perspective, when measured as a separate cancer, lung cancer in never-smokers is the seventh most prevalent cancer in the world[4]; and the eighth most prevalent cause of cancer-related death in the UK; higher than cervical cancer, ovarian cancer, leukaemia, and lymphoma.[2,5]

Low net-survival of lung cancer is often attributed to late-stage detection; treatment can offer encouraging prognosis when lung cancer is detected at an earlier stage.[6,7] However, the majority of patients are still diagnosed when their lung cancer has advanced to stage III/IV[6] where one-year net-survival is poorest.[8,9]

There are a number of potential differences between lung cancer patients who have never smoked (hereafter referred to as 'never-smokers') and those who are currently or have previously smoked ('ever-smokers'). First, there are biologically distinct pathways towards lung cancer caused by tobacco smoking compared with other exposures or genes. Tobacco smoke damages the DNA in lung epithelial cells, leading to tumour development and progression.[10,11] In contrast, never-smokers' cancers are more likely to be caused by environmental substances (e.g. pollution), occupational substances (e.g. carcinogenic chemicals) or genetic predisposition.[12] These differences in aetiology contribute to different forms of cancer. Ever-smokers have higher levels of squamous cell lung cancers that grow in the centre of the lungs (bronchi) compared to never smokers who are more likely to have adenocarcinomas that grow in the outer part of the lung.[13,14] This can mean that never-smokers are less likely to experience noticeable symptoms at an early stage of disease, which is likely to contribute to delays in diagnosis.

Second, never-smokers may assume that they are not at-risk of lung cancer and have an amplified tendency to attribute symptoms to other acute conditions.[15] For example, they are less likely to recognise breathlessness as a potential symptom of lung cancer compared to those with a smoking history.[16] This may be due to international public health efforts to reduce the burden of lung cancer, primarily targeted via anti-smoking educational campaigns.[17,18] This has resulted in widespread public awareness of the link between lung cancer and tobacco exposure, as well as stereotypical views of who is likely to get lung cancer, but potentially obscured the fact that never smokers can get lung cancer too.

Third, healthcare professionals in the diagnostic pathway may display a detection bias against pursuing a diagnosis of lung cancer in never-smokers until other diagnoses have been excluded.[19] Although never-smokers make up a significant proportion of lung cancer cases, not much is known about this population.

Responding to an urgent need for information about the experience of lung cancer patients who have never smoked, we designed the PEARL study (Patient Experience of symptoms, help-seeking And Risk factors in Lung cancer in never smokers). The first part of the study is this rapid review, synthesizing evidence relating to experiences of the pathway to diagnosis for patients with- and without a smoking history. This will inform a qualitative study that will aim to generate targeted recommendations to reduce delays in diagnosis of lung cancer in patients who have never smoked.

The Model of Pathways to Treatment (MPT) is a framework that can be used to understand intervals and structure research findings across the cancer patient pathway: including Symptom Appraisal, Help-seeking, Diagnosis and Pre-treatment (see Figure 2).[20] This framework promotes greater consistency (e.g. in terms of defining intervals) across early diagnosis research, allowing comparisons to be made with existing literature, as well as ensuring consideration of range of patient (e.g. comorbidities), healthcare system (e.g. access) and disease factors (e.g. tumour type).

The MPT[20] was used in this study to categorise the experiences of patients into chronological order using the intervals, with a particular focus on findings that may explain or contribute towards delays in the pathway to diagnosis for never-smokers.

1.1 | Research aims

To our knowledge, there has been no review of literature investigating the pre-diagnostic experiences of lung cancer patients who have never smoked. The current review aims to provide a narrative synthesis comparing the experiences of never-smokers and ever-smokers. Additionally, the review will examine how any experiences unique to never-smokers may impact on, or introduce, delays in the pathway to diagnosis of lung cancer.

The research questions guiding this review were:

- What are the symptom appraisal and help-seeking experiences of patients diagnosed with lung cancer, who have never smoked?
- How does this experience compare with the experience of patients with lung cancer who have smoked?
- How do the social and life histories of people prior to the development of lung cancer, particularly for never smokers, impact on their presentation and diagnosis?

2 | METHODS

2.1 | Rapid review

A rapid review methodology was chosen, as this is a systematic approach to synthesise current literature, which can provide a timely and conclusive answer in relation to the direction and strength of current evidence.[21] This will provide a foundation for the urgent subsequent planned work that will investigate experiences of the pathway to lung cancer diagnosis of patients who have never smoked.

The review followed the Preferred Reporting Items for Systematic Reviews guidelines (PRISMA)[22] and practical recommendations by Tricco et al. 2017[23] on how to a conduct rapid a review. To ensure

transparency, the review protocol was registered with PROSPERO (CRD42020191563). The review was made rapid by streamlining the search process through:

– limiting inclusion criteria by date (2010–2020) and language (English)
– limiting searches to three electronic databases

2.2 | Search strategy

Three electronic databases (MEDLINE, PsychINFO and Google Scholar) were searched on 28th June 2020, including results from 1st January 2010 onwards. The following electronic search strategy was employed using Boolean operators:

– (("lung cancer" or "lung neoplasms" or "lung carcinoma")
– AND ("smok* status" or "never smok*" or "cigarette smoking" or "tobacco smoking")
– AND ("symptom appraisal" or "symptom assessment" or "help-seeking" or "delayed diagnosis" or "missed diagnosis" or "early diagnosis" or "diagnos* pathway" or experience or symptom or presentation))
– Search results were limited by language (English) and date (2010–2020).

2.3 | Eligibility criteria

Both qualitative and quantitative studies that met each of the inclusion criteria displayed in Table 1 were included in this review.

The review includes studies from any country/healthcare system, and studies that looked at actual as well as hypothetical symptom appraisal and help seeking. In terms of smoking history, we only selected studies that had samples that included both never-smokers and those with a smoking history, with a particular focus on differentiating the experiences of lung cancer patients by smoking status, or directly comparing experiences of never-smokers and ever-smokers.

Studies were screened by abstract and full text for eligibility (see Table 1) by two reviewers (AS and SvO) independently; disagreements regarding final study selections were resolved by discussion.

2.4 | Quality appraisal

Two reviewers (AS and SvO) then assessed the methodological quality of the included studies independently using the Mixed Methods Appraisal Tool (MMAT),[24] which can concomitantly assess qualitative, quantitative and mixed-methods studies. Criteria assessed studies' methodological quality, analysis and interpretation of results using a simple 'Yes', 'No' or 'Can't tell' rating system. Differences were resolved by consensus with separate criteria for qualitative and quantitative studies. All evidence from studies that were included in the final analysis was treated equally.

2.5 | Data charting and analysis

The MPT[20] was used to categorise the experiences of patients into chronological order using the intervals. Data were extracted from articles that identified experiences unique to never-smokers or provided a direct comparison of experiences between smoking statuses, across any of the MPT intervals. This included: patient appraisal of lung cancer symptoms, interactions with healthcare professionals at any stage of the pathway, experiences of primary and secondary care, and experiences of stigmatisation. Data extraction prioritised any findings that may explain or contribute towards delays in the pathway to diagnosis for never-smokers.

TABLE 1 Eligibility criteria

Inclusion	Exclusion
Qualitative/quantitative data	Systematic/Scoping/Rapid review, editorials, books, dissertations and commentaries
Published & peer-reviewed	Full-text unavailable
Sample of patients diagnosed with lung cancer	Community sample
Assessed lung cancer specific experiences of the pathways to treatment (appraisal, help-seeking, diagnosis, pre-treatment).	Explicit focus on experiences post-treatment
Sample includes both ever and never-smokers.	Sample of ever-smokers only
Published in English	Published in languages other than English
Any country/healthcare system	–
Published in 2010–2020	Published before 2010

Due to the wide range of research designs included in the final analyses, and the rapid design of this review, a meta-analysis was not appropriate for data synthesis. Instead we carried out a narrative synthesis, a common alternative for the reporting of findings used in systematic reviews.[25] To limit the influence of reviewer bias, guidance outlined by the UK Economic and Social Research Council[26] was used throughout to direct data synthesis.

3 | RESULTS

Figure 1 outlines the process followed to identify relevant articles for the review. Searches completed in MEDLINE, PsychINFO and Google Scholar identified 262 records. Articles were exported into EndNote and after removing duplications 246 articles remained. Initial screening of titles and abstracts excluded 213 irrelevant studies (e.g. smoking cessation research), leaving 33 potentially relevant articles. Back-chaining of retrieved articles identified another 12 articles. After a full-text review of these 45 articles, 35 articles were excluded

leaving seven quantitative studies and three qualitative studies. Seven[27–33] were conducted in the USA, one in Australia,[34] one in North India,[35] and one across three European countries (Denmark, Sweden, UK).[36] Full study details, including participant characteristics, data collection and findings, can be found in Tables 2 and 3.

3.1 | Study quality

All 10 studies passed the MMAT screening questions, and were taken through the full MMAT quality assessment (see Supporting Information for full MMAT results).

3.1.1 | Quantitative studies ($n = 7$)

Six quantitative studies[27–32] had samples with a mean age above 60, predominantly white ethnicity (78-95%) and a gender split ranging from 35%–64% female. Singh et al. (2012)[35] recruited a sample that
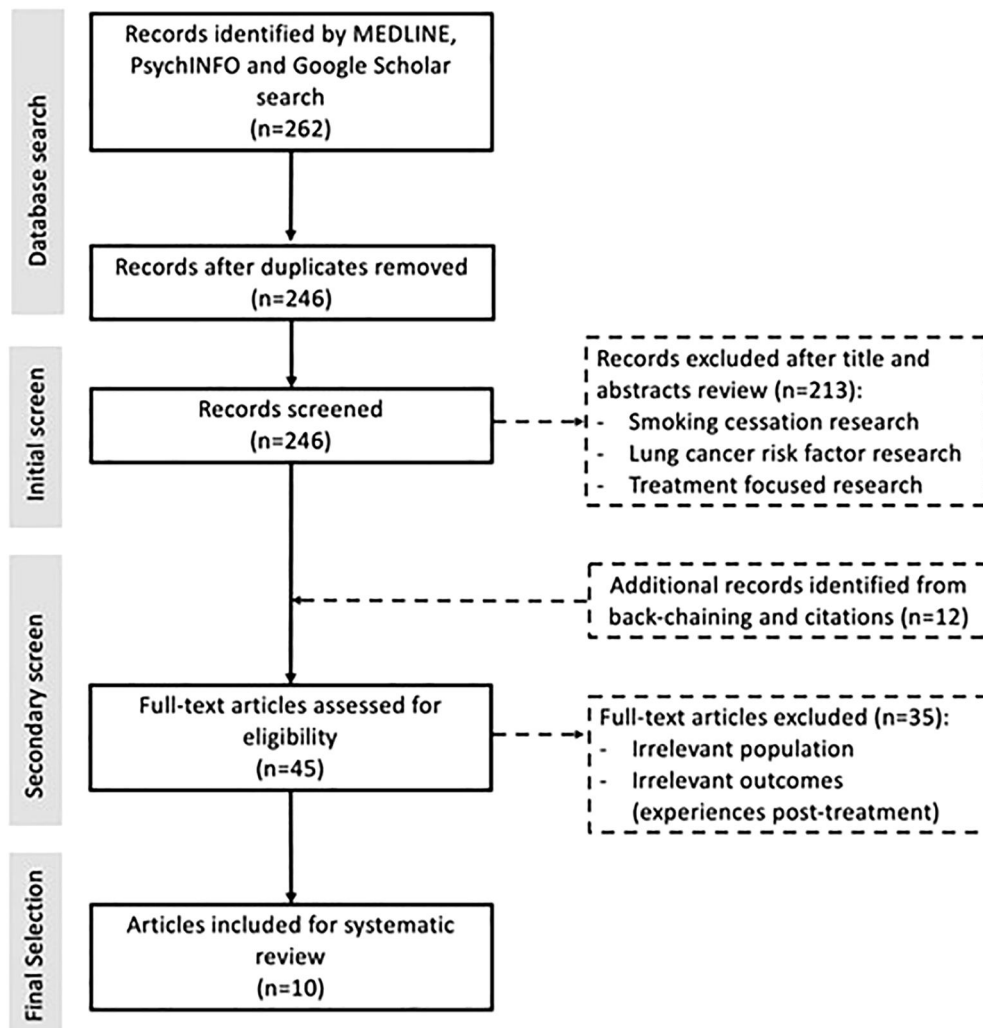

FIGURE 1 Preferred reporting items for systematic reviews guidelines flow diagram of study selection
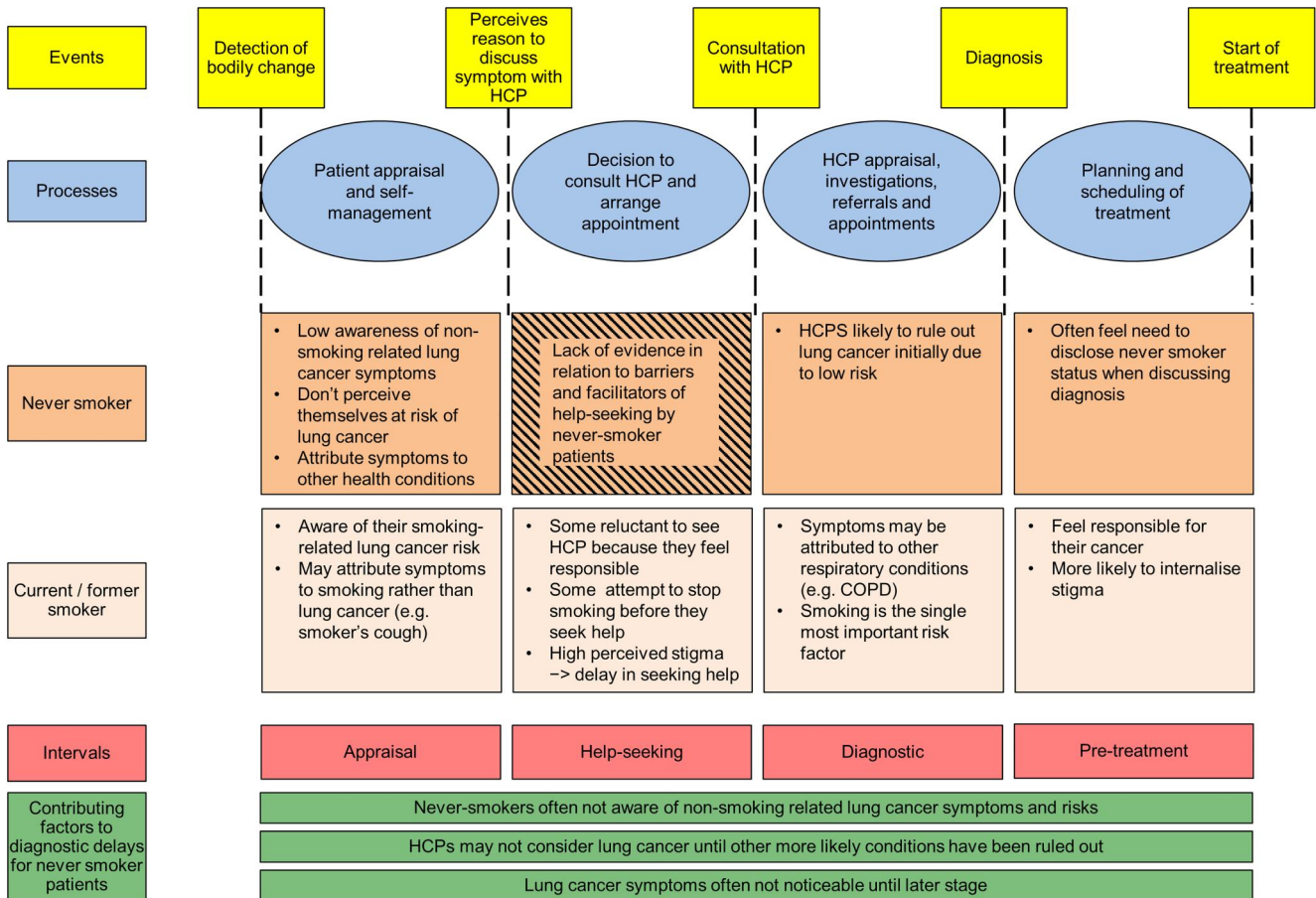
FIGURE 2 Summary of review findings in relation to model of pathways to treatment

was younger (mean age: 58) and mostly male (83%), and Choi et al. (2019)[31] included only a small proportion of never-smokers (5.7% of total sample). We were unable to examine non-response bias for three studies[29,31,32] as they did not report characteristics of non-responders.

3.1.2 | Qualitative studies (*n* = 3)

Only Hajdarevic, et al. (2018)[36] reported participants' age, however this study did not report the proportion of never-smokers in their sample. All studies sufficiently substantiated their findings using data and there was coherence between sources, data collection and analysis. However, Scot et al. (2015)[34] did not provide details of how themes were developed. Interviewer-bias and sample size justification were only addressed by Hamann, et al. (2014).[33]

3.2 | Narrative synthesis

Once extracted, findings were categorised into the MPT intervals (Figure 2) and themes were constructed. These themes are presented in this results section organised by MPT interval.

3.2.1 | MPT appraisal interval

Theme 1: Never-smokers are less likely to perceive themselves at risk of lung cancer.

Of the seven quantitative articles, none reported on symptom awareness of never-smoker patients. However, a lack of lung cancer symptom awareness amongst never-smokers was a frequent theme in the qualitative studies reviewed.[34,36] These studies did not distinguish between different lung cancer types (e.g. squamous cell lung cancers, adenocarcinomas or mesotheliomas). The findings of the qualitative studies suggested that, due to the strong link between smoking and lung cancer, never-smokers were less likely to perceive themselves at risk of lung cancer, did not tend to expect a lung cancer diagnosis, and tended to attribute symptoms to a different condition[34,36]:

> I thought of course it was pneumonia or something... I have never smoked, I have never worked in smoky surroundings. I could never imagine that it could be something like that. Never-smoker Swedish participant[36];

Two studies[28,34] suggested that education may help improve awareness and appraisal of non-smoking related lung cancer risk

TABLE 2 Summary of quantitative studies

Study	Recruitment	Sample/ smoking status (%) Age (SD) Country	Primary outcomes	Results	Conclusion	Study limitations
Carter-harris (2015)[28]	Patients diagnosed with non-small cell lung cancer (primary) were recruited from an academic thoracic-oncology clinic and a community hospital-based outpatient radiation centre.	N = 93 Current: 30 (32.3%) Former: 33 (35.5%) Never: 30 (32.2%) Age: 62 (8.7) USA	Lung cancer stigma scale Timing of medical help-seeking	No significant difference ($p < 0.05$) in total perceived stigma scores between smoking groups. Patients with higher levels of perceived stigma sought medical help later ($r = 0.27$, $p = 0.01$)	Perceived lung cancer stigma can act as a critical obstacle to medical help-seeking. However, there was no difference in stigma scores between those with a smoking history and those without.	Recall bias may have influenced patient data in relation to symptom awareness and medical help-seeking, although key-event mapping was used to reduce the risk of recall bias. Small sample size (n = 93) resulting in limited statistical power and ability to generalise results.
Carter-harris (2014)[27]	Relates to same data set as Carter-Harris (2015) reported above.	N = 93 Current: 30 (32.3%) Former: 33 (35.5%) Never: 30 (32.2%) Age: 62 (8.7) USA	CLCSS Help-seeking: Previous Health care system distrust Social desirability	No significant difference in mean time to medical help-seeking between those with and without a smoking history ($p = 0.222$). Lung cancer stigma only significant predictor of variance in time from symptom onset to medical help-seeking ($p < 0.01$)	Results revealed that lung cancer stigma does not correlate with medical help-seeking. An unexpected finding was that smoking did not correlate with time from symptom onset to medical help-seeking.	Small sample size (n = 93) resulting in limited statistical power and ability to generalise results.
Choi (2019)[31]	Patients being investigated for actual or suspected lung cancer were opportunistically recruited from a midwestern university comprehensive cancer center.	N = 52 Current = 12 (23.1%)	State & trait anxiety Worry	Ever-smokers reported greater anxiety/worry, lower cognitive functioning and more negative perceptions of their health-environment.	No significant differences between smoking groups in anxiety/worry, cognitive function and perceptions of the health environment at the time of	Small sample size, particularly never-smokers (n = 3), with low statistical power, low re-producibility of results and a reduced chance to detect a true

TABLE 2 (Continued)

Study	Recruitment	Sample/ smoking status (%) Age (SD) Country	Primary outcomes	Results	Conclusion	Study limitations
		Former = 37 (71.2%)	Cancer-related worry		diagnosis. Only cancer-related worry was significantly higher amongst smokers.	effect.
		Never = 3 (5.77%)	Attentional function			
		Age: 64 (11.6)	Health environment perceptions			
		USA				
Weiss (2017)[32]	Participants diagnosed with any stage lung cancer were recruited through J. Edwin Brown and US data corporation targeted lists provided by Thomson Reuters.	N = 174	Themes surrounding lung cancer: (1) Support	Never-smokers reported significantly lower self-blame compared to former/current-smokers (mean 0.86 vs. 2.2, $p < 0.001$).	Most participants did not feel personally stigmatised, although self-blame and personalized were significantly greater amongst smokers. Those without a smoking history reported the lowest satisfaction with care.	The questionnaire was not designed for academic research at inception and lacked psychometric testing.
		Current: 33 (19%)	(2) Amount of research	Never smokers reported lower satisfaction with care compared to ever smokers (2.6 vs. 3.2; $p = 0.01$) controlling for stigma and blame did not modify this		
		Former: 119 (68.4%)	(3) The cause			
		Never: 22 (12.6%)	(4) Treatment by society & healthcare providers			
		Modal age: 60–69	(5) Attitudes & experiences			
		USA				
Criswell (2016)[30]	Participants diagnosed with lung cancer within the last 6 months were recruited from Loma Linda University medical center (LLUMC) and city of hope medical center (COH) through	N = 213	Psychological adjustment,	Never-smokers reported lower personal responsibility and lower regret than former/current-smokers; medical stigma was not different between smoking groups.	Never-smokers differed to those with a smoking history in several of their associations between CRRS factors and adjustment variables. Specifically, never-smokers had stronger	Sub-sample sizes for current and never-smokers were small compared to former-smokers.

(Continues)

TABLE 2 (Continued)

Study	Recruitment	Sample/ smoking status (%) Age (SD) Country	Primary outcomes	Results	Conclusion	Study limitations
	questionnaire packs received in mail.	Current: 38 (17.8%) Age: 64.4 (9.8) Former: 141 (66.2%) Age = 68.2 (10.2 Never: 34 (16%) Age = 63.9 (12.2) USA	Depressive symptoms, distress, Physical health-related adjustment, Symptom bother, Satisfaction with healthcare, Supportive care needs coping strategies (CRRS): - Personal responsibility - Regret - Medical stigma	For never-smokers, PR, regret and medical stigma all had moderate positive associations with depressive symptoms, healthcare dissatisfaction, avoidance coping strategies and psychological needs.	associations between all CRRS factors and depressive symptoms.	CRRS did not include a measure of perceived (non-medical) social stigma.
Singh (2012)[35]	Newly diagnosed lung cancer patients were recruited from a tertiary level referral health care facility in North India.	N = 974 Current/ Former: 503 (76.9%) Never:151 (23.1%)	Smoking index Staging of lung cancer (TNM classification)	Stage-IV disease at presentation was higher in never-smokers compared to heavy smokers (67.4% vs. 39.1%).	Clinician 'detection bias' was suggested to be a key reason for later diagnosis in patients who had never smoked.	Bidis (hand-rolled tobacco) were considered equivalent to one cigarette. The heavy smoking group was overwhelmingly male (97.9% vs. 57.7% in the never-smoker group). It is likely that late diagnosis of never-smokers was (partially) due to the gender inequality in access to healthcare in India.

TABLE 2 (Continued)

Study	Recruitment	Sample/ smoking status (%) Age (SD) Country	Primary outcomes	Results	Conclusion	Study limitations
		Age = 58.1 (10.8) North India				
Williamson (2020)[29]	Patients diagnosed with lung cancer in the last 12 months were recruited in thoracic oncology clinics within two National cancer Institutes (NCI) in the southern and Northeastern regions of the USA.	N = 266 Current: 49 (18.4%) Former: 154 (57.9%) Never: 60 (22.6%) Age: 63.3 (10.8) USA	Lung cancer stigma Depressive symptoms	Clinically meaningful lung cancer stigma was experienced by current (93.9%), former (85.4%), and never-smokers (60.0%). Constrained disclosure was similar across all groups. Current/former-smokers reported higher total, internalised and clinically meaningful lung cancer stigma than never-smokers.	Lung cancer stigma is experienced by patients in all smoking status groups, although it is more commonly reported by those with a smoking history. However, patients reported similar levels of discomfort in disclosing their diagnosis, irrespective of smoking status.	Data were cross-sectional so cannot infer causality.

TABLE 3 Summary of qualitative studies

Study	Recruitment	Sample/Smoking split (%)	Methods/Aim of interview	Results	Conclusion	Study limitations
Hajdarevic (2018)[36]	Patients diagnosed with lung cancer in the last 6 months were recruited through purposive sampling, snowball sampling and social media.	N = 72 Denmark: 22 England: 20 Sweden: 30 No detail on smoking status of the full sample, detail of smoking status of participants who are quoted in the paper is included in the results. Age range (England): 51–70	Semi-structured interviews aimed to assess how (and if) smoking was discussed by patients. The topic of smoking was never introduced by the interviewer.	Feeling responsible for cancer was most common in England. And amongst English participants, feeling responsible for the cancer was more prominent in smokers. 90% of English participants discussed smoking during their interview (Denmark 73%, Sweden 60%). Never-smokers used not-smoking as an explanation for not anticipating their diagnosis.	English participants almost always discussed their lung cancer with reference to smoking. Smoking plays a dominant role in the lung cancer narrative in England, more so than in the other countries.	Does not identify smoking status split within sample, limiting the ability to draw conclusions in relation to differences between never-smokers and those with a smoking history.
Scott (2015)[34]	Patients with a lung cancer diagnosis and GPs were recruited from lung cancer support networks across NSW, Australia.	Patients N = 20 Former: 13 (65%) Never: 7 (35%) GP's N = 10 Age unknown Australia	Open-ended interviews examined symptom recall and medical help-seeking behaviour. Interviews with GPs assessed perceptions of lung cancer symptoms.	Never-smokers often feel the need to clarify their non-smoking status (including to clinicians). Patients felt anti-smoking messaging encourages stigma and could increase hesitation to seek help. Delays in diagnosis may occur when GP's (and patients) do not consider non-smokers at risk of lung cancer.	This study has highlighted the stigma that is felt by lung cancer patients, regardless of smoking status. The study also highlights that GP's often rule out lung cancer in patients who do not smoke.	Interviews were only completed with one group, meaning other themes may have been missed.

TABLE 3 (Continued)

Study	Recruitment	Sample/Smoking split (%)	Methods/Aim of interview	Results	Conclusion	Study limitations
Hamann (2013)[33]	Patients with a confirmed lung cancer diagnosis were identified by treating oncologists from the UT Southwestern's Harold C. Simmons cancer center	Interviews	An interview framework guide was developed to: (i) Describe experiences of stigma; (ii) explore smoking history's role in stigma (iii) investigate stigma's impact on treatment-related behaviour.	95% of interviewees discussed perceived stigma.	Perceived stigma is experienced by patients with and without a smoking history. However, internalised stigma was more prevalent amongst those with a smoking history.	Researchers believed sample lacked hispanic participants due to language barriers.
		N = 42	Focus groups intended to provide feedback on the conceptual model from interviews.	~50% of participants reported negative responses from HCP's. Never-smokers perceived judgmental smoking-related assumptions from HCP's.	Never-smokers reduce the negative impact of stigma by disclosing their never-smoker status.	
		Current: 10 (24%)		Some never-smokers described how they 'pre-empt' stigmatising reactions by disclosing their non-smoking status.		
		Recent: 11 (26%)		Internalised stigma was discussed more by current-smokers than never-smokers.		
		Former: 10 (24%)				
		Never: 5 (12%)				
		Focus groups				
		N = 23				
		Age unknown				
		USA				

factors and symptoms, which in turn may encourage earlier help-seeking amongst never-smokers.

3.2.2 | MPT help-seeking interval

Theme 2: Lack of evidence in relation to help-seeking amongst never-smokers/no clear evidence for differences.

Only one study reported on the help-seeking experiences of never-smokers.[27] No significant differences were found in the time from symptom onset to medical help-seeking behaviour between those with and without a smoking history.[27] No qualitative studies focused on help-seeking experiences of never smokers specifically.

3.2.3 | MPT diagnosis interval

Theme 3: Delayed diagnosis amongst never-smoker patients/What is driving diagnostic delays amongst never-smoker patients?

One quantitative paper assessed the differences in disease stage at diagnosis between never smokers and those with a smoking history.[35] Never-smokers were more likely to be diagnosed at a later stage, however, from the data collected it is impossible to identify whether this can be attributed to delays at the appraisal, help-seeking or diagnostic intervals.[35]

Theme 4: HCP detection bias may contribute to late diagnosis of never-smokers.

The strong association between smoking and lung cancer was suggested to be a cause of clinical bias,[33,34] making it less likely for HCPs to consider lung cancer until other diagnoses have been excluded, or treatments have been tried. This could contribute to delays in lung cancer diagnoses.[34,35]

> For never smokers, the link between smoking and lung cancer means that they (and their GPs) are less likely to perceive themselves as being at risk. While acknowledging the link to smoking status, it may be important to focus attention on symptoms themselves as a way of prompting earlier detection of lung cancer authors comment Scott et al. (2015)[34]

3.2.4 | MPT pre-treatment interval

Theme 5: Never-smokers report lower satisfaction with the care they receive.

The current literature does not report any statistically significant differences in anxiety, worry and health environment perceptions between ever and never-smokers.[31] However, Weiss et al. measured satisfaction with care and found that never-smokers rated their satisfaction lower than ever smokers.[32] There is also evidence that the association between feelings of personal responsibility and depressive symptoms, satisfaction with healthcare and psychological needs were significantly higher for never smokers than ever smokers.[30] The authors suggest that this may be due to never smokers attributing their cancer to personal traits (e.g. character flaws) or external factors (e.g. a partner who smokes), which makes them more likely to experience poor psychological outcomes.

The strong link between smoking and lung cancer, and the resulting bias, may influence patient encounters with HCPs potentially contributing to lower satisfaction with care. For instance, patients who have never smoked reported being questioned about their smoking status:

> The first negative reaction I got was in the hospital, from the respiratory therapist. [Family member] heard her. She said this under her breath while I was having respiratory therapy post-op, "That's what you get for smoking." Never-smoker participant, USA.[33]

4 | DISCUSSION

The findings of this review highlight that evidence about differences between lung cancer patients who have never smoked and patients with a smoking history is concentrated in the appraisal and diagnostic intervals, and that evidence in relation to help-seeking and GP referral is lacking (see Figure 2).

The unequivocal causal link between tobacco use and lung cancer risk, and resulting tobacco-centric/exclusive models of risk and referral have had a number of unintended consequences for patient, HCP and system behaviour resulting in delayed diagnosis. These include underestimated perceived lung cancer risk and misattribution of symptoms among never-smokers, and HCPs being less likely to consider lung cancer in never-smokers due to detection bias. Indeed, while longitudinal data suggest current smokers adopt risk-minimising beliefs as a strategy to resolve cognitive dissonance,[37] there is evidence of a general tendency to underestimate one's relative risk of lung cancer (when compared with others) among former and never smokers too.[38] Furthermore, we found a small amount of evidence that suggests that never smokers experience lower satisfactions with healthcare, which is related to feelings of personal responsibility and may also relate to comparisons with other non-smoking-related cancers, where prognosis is better.

4.1 | Strengths and limitations

An effective rapid review must strike a balance between 'accelerating' its methods whilst maintaining rigour. As database searches for this review were limited to MEDLINE, PsychINFO and Google Scholar, some key research may have been missed. Back-chaining of selected articles and key literature was performed to mitigate this.

All the studies included in this review passed the MMAT quality assessment, however individual study design did affect the results of this review. There was some lack of sampling diversity in the included studies, particularly in relation to never-smoker lung cancer patients who were underrepresented. Most of the studies were undertaken in the USA, where access to healthcare has unique barriers (e.g. cost of health insurance[39]) that may not be relevant for patient in other countries. The quantitative studies had small sample sizes that resulted in low statistical power to detect differences between never-smokers and smokers, and did not include validated measures in their questionnaires. We would also like to highlight that there may be some cultural factors at play, that are important to consider while interpreting the papers included in this review. For instance, Singh et al. (2012)[35] found that never-smokers sought medical help later than heavy smokers. However, their heavy smoker participants were almost exclusively male, which would have significantly influenced the findings due to the extensive gender discrimination in access to healthcare that exists in the study setting (India).[40] These limitations highlight that further research in relation to patient experiences of the pathway to diagnosis is urgently needed, particularly outside of the US and in relation to never-smokers who have received very little attention thus far.

Nevertheless, this is the first review to compare experiences of the journey to lung cancer diagnosis of patients who have never smoked to those with a smoking history. Rapid reviews are an effective method to identify high priority issues for the policy agenda, and have the capacity to scope the existing research field to isolate gaps in the literature that require urgent research.[23] This was applied in the current review to identify when and how never-smokers are most at risk of delayed diagnosis. Although rapid, this review utilised PRISMA guidelines to ensure a systematic process was followed.[22] Furthermore, the utilisation of a theoretical framework (MPT) provided structure to allow clear comparison of outcomes of the different studies included in this review.[20]

4.2 | Implications

The findings of this study provide a number of implications for theory, research, and practice:

4.2.1 | Research

This review highlights a paucity of evidence in relation to the experiences of never-smokers during the appraisal, help-seeking and diagnosis intervals, and evidence differentiating the patient experiences of those with different types of lung cancers. This is particularly the case for those cancers more likely to occur in never-smokers (adenocarcinomas or mesotheliomas) and that may lead to different symptom experiences/profile of symptoms. Future research should focus its efforts in three areas:

(1) Explore drivers of symptom awareness, symptom appraisal and propensity to act in HCPs and never-smokers in response to (potential) lung cancer symptoms.
(2) Development and testing of interventions based on findings of the above.

4.2.2 | Practice

We suggest that patients with known lung cancer risk factors such as exposure to industrial and environmental hazards (e.g. second-hand smoke) should have this information collected by, and flagged on, electronic health records, in order to prompt HCPs to consider lung cancer risk in consultations. Decision aids (e.g. in the UK; NICE guideline for referral of suspected cancer[41] and QCancer risk calculator[42]) include little or no information about non-smoking risks (although NICE guidance includes asbestos exposure). These tools could be refined to consider the common risks for never-smokers. In addition, an increased awareness amongst HCPs that, albeit rarely, lung cancer can occur in people who do not have any of the known risk factors (e.g. due to genetic mutations) will help ensure that these patients are referred for further tests once more common potential explanations for their symptoms have been ruled out.

4.2.3 | Public health

This review suggests that from a public health perspective, public awareness of lesser-known lung cancer risk factors (e.g. radon exposure) needs to be improved, as well as awareness that people without these risk factors can still get lung cancer. For instance, in a population-based survey Simon et al.[43] identified that the majority of the UK population could only identify one risk factor for lung cancer, the most commonly reported factor by a large margin being smoking.

Tobacco smoking remains a significant risk factor for lung cancer and public health priority. However, as highlighted by Chambers, et al. 2012[44]; public health campaigns should be carefully designed and disseminated to ensure that this risk is communicated effectively while limiting the unintended consequences for both smokers (messages should be non-judgemental and acknowledge the difficulties of overcoming tobacco addiction) and never smokers (ensuring that industrial and environmental risk factors are included). Future public health initiatives should also consider including additional activities that focus specifically on lung cancer risk factors and symptoms that are not related to smoking.

4.2.4 | Conclusion

Lung cancer in never smokers is a different disease to that in patients with a smoking history, and this is reflected in different experiences of the lung cancer diagnostic pathway. It is vitally important to continue to study what causes these differences, and how these

affect patient outcomes. These findings highlight that clinical tools and public health campaigns need to strike a balance between explaining the dangers of smoking, and raising awareness of lung cancer in never-smokers, in order to promote appropriate help-seeking and referral of never-smokers. Improved understanding of the clinical utility of non-smoking risk factors of lung cancer, as well exploration of symptom awareness, appraisal and help-seeking of people who have never smoked, are important next steps in improving lung cancer outcomes for never-smokers.

CONFLICT OF INTEREST
None declared.

AUTHOR CONTRIBUTION
Georgia Black and Sandra van Os designed the study. Aron Syversen and Sandra van Os designed and performed the literature search and data extraction. Georgia Black, Aron Syversen and Sandra van Os performed the analysis and wrote the first draft. All authors contributed to the final text of the manuscript.

PATIENT CONSENT FOR PUBLICATION AND ETHICAL APPROVAL
Not required.

DATA AVAILABILITY STATEMENT
Data sharing is not applicable to this article as no new data were created or analysed in this study.

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