

Peer Review File

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Reviewer A

The authors sought to understand potential barriers and facilitators to the uptake of a national LCS program in Australia from key stakeholders across health professional disciplines. I commend the authors on a comprehensive, structured, and well-written qualitative analysis of the focus groups.

RESPONSE: Thank you for your positive comments.

Below are my comments:

Major Comments

Methods, line 166: Can you talk more about how the interview guide was designed. Were any particular frameworks (e.g., CFIR) or conceptual models of LCS applied to the interview guide development?

RESPONSE: Yes, the CFIR was applied to the development of the interview guide. We have now stated this on page 8.

Changes in text: Page 8 - A semi-structured moderator guide was developed to explore the potential of LCS in Australia, including the constructs of the CFIR in the design of the guide.

2. Methods, line 172: Focus groups included a mix of professional disciplines which raises the question about the potential for hierarchy to influence the focus group discussion (e.g. nurses may not speak up if in the same virtual room as a supervising physician). How was this addressed either in selecting the participants for the focus groups or in the interviews themselves.

RESPONSE: All participants were given the space and opportunity to contribute in the focus groups and did so. None of the participants within the focus groups were in the same focus group as another participant who they supervised or as their supervisor. The focus groups were held during COVID lockdown periods and participants enrolled at a time that suited them. Their participation was not tied to any organisational affiliation.

Minor Comments:

1. Introduction, line 130: Consider using references specific for lung cancer screening. Also consider avoiding the term minority or minorities as can be considered diminutive and in some countries they are no longer the minority. Can see JAMA published guidance: Inclusive Language for Reporting Demographic and Clinical Characteristics

a. Rustagi AS, Byers AL, Keyhani S. Likelihood of Lung Cancer Screening by Poor Health Status and Race and Ethnicity in US Adults, 2017 to 2020. *JAMA Netw Open*. 2022;5(3):e225318. doi:10.1001/jamanetworkopen.2022.5318

b. Tailor TD, Tong BC, Gao J, Henderson LM, Choudhury KR, Rubin GD. Utilization of Lung Cancer Screening in the Medicare Fee-for-Service Population. *CHEST*. 2020;158(5):2200-2210. doi:10.1016/j.chest.2020.05.592

RESPONSE: We have removed reference to ‘ethnic minority groups and deprived populations’ and replaced with ‘underserved populations’. We have also replaced the references with those you provided as well as one from the Manchester Lung Health Check pilot, thank you.

Changes in text: Page 6 - Previous research has shown reduced uptake of cancer screening consistently in underserved populations [27-29]

2. Introduction, line 133: This sentence is confusing and please try to simplify. It also references the the UKLS pilot trial but also consider observational studies of real-world data which have shown that people who are older and currently smoking are actually more likely to get screened.

a. Silvestri GA, Goldman L, Burleson J, Gould M, Kazerooni EA, Mazzone PJ, Rivera MP, Doria-Rose VP, Rosenthal LS, Simanowith M, Smith RA, Tanner NT, Fedewa S. Characteristics of Persons Screened for Lung Cancer in the United States : A Cohort Study. *Ann Intern Med*. 2022 Nov;175(11):1501-1505. doi: 10.7326/M22-1325. Epub 2022 Oct 11. PMID: 36215712.

RESPONSE: We have reworded this sentence and also included the reference you provide.

Changes in text: Page 6 - Individual factors shown to be associated with participation in LCS include age, gender, smoking status and socioeconomic group, but the direction of these associations has been found to vary. In a UK trial setting, being older, female, currently smoking and being in an underserved population, were associated with low participation [22]. A cohort study in the US however, found those who were older, female and were currently smoking, were more likely to be screened for lung cancer [23]. Practical (travel, comorbidities, convenience) and emotional (fear, avoidance of lung cancer information) barriers to participation in LCS are also evident in those at high risk [22, 24].

3. Methods, line 241: Is the term CALD a well-known abbreviation? If not I would avoid if possible, as I had to look it up later.

RESPONSE: This abbreviation has been removed.

4. Results, line 194: Can you provide information on the range of participants per focus group (e.g. 2 to 10)

RESPONSE: We have now included this in the manuscript.

Changes in text: Page 9 - We conducted 24 focus groups (range 2-5 participants). As noted earlier, the focus groups were conducted during COVID lock down in Australia, and we found

that having fewer participants to manage over Zoom in each group was more advantageous than larger groups.

5. Results line 257: Are you able to provide some context for this quote, if there was a question prompt or what the interviewee is referencing “I think approach it ...” What are they referring to when they say it and what is going to have to be tailored to each patient.

RESPONSE: We have now removed the first sentence of the quote as it was quite ambiguous in talking about stigma. This quote is placed following the discussion about stigma, and related to talking about stigma with participants.

Changes in text: Page 11 - First sentence removed, the quote now reads – *‘I think you have to be realistic and truthful to the patient that’s going to be have to be tailored to each patient, how they feel in terms of that stigma and why they feel that stigma, as well, because I’m sure each patient may feel it because ‘[they] all told me to quit and I feel bad about not doing it’.* (FG2)

6. Discussion, line 507-509: Mobile vans have also been used in the US and support your statement about providing access to hard to reach populations

a. Raghavan D, Wheeler M, Doege D, et al. Initial Results from Mobile Low-Dose Computerized Tomographic Lung Cancer Screening Unit: Improved Outcomes for Underserved Populations. *Oncologist*. 2020;25(5):e777-e781. doi:10.1634/theoncologist.2019-0802

RESPONSE: Thank you for providing that reference, we have now included it in the manuscript at reference 36 (Page 20).

7. Discussion, line 526: I would be interested in learning more about healthcare professionals reflections on whether SDM should be required for LCS since it is a controversial topic in the US. If SDM is a requirement, then it may act as an additional barrier to accessing screening and requiring a clinician to do it can limit who can perform LCS. Conversely, SDM may improve engagement and relevant to many healthcare decisions.

RESPONSE: The topic of shared decision-making wasn’t discussed in depth in the focus groups and therefore we cannot add further on the views specific to our study. However, recent feasibility projects undertaken in Australia (Cancer Australia report, ref 12 in the manuscript) indicate that this is an emerging issue for consideration. It is unlikely to be mandated in the Australian setting but there is a keen interest in adapting existing tools and resources for the Australian program. We have added this to the manuscript.

Changes in text: Page 21 - Recent feasibility projects undertaken in Australia [12] indicate that this is an emerging issue for consideration. It is unlikely to be mandated in the Australian setting but there is a keen interest in adapting existing tools and resources for the Australian program.

Reviewer B

This is a powerful study where the authors conducted 24 focus groups with 84 health professionals, researchers, policy makers and program managers of current screening programs. The authors found that stakeholders reported that LCS in Australia was acceptable and feasible. The paper is well written and is an outstanding piece of work on a timely issue.

RESPONSE: Thank you very much for your positive comments.

Reviewer C

Abstract:

- Methods: add the range of the number of participants per focus group.

RESPONSE: We have now added this to the manuscript.

Changes in text: Page 3 - We conducted 24 focus groups (range 2-5 participants)

Highlights:

- First bullet under "What is known and what is new" sounds like a causal relationship which you did not assess. Reward to match the design of the study.

RESPONSE: Thank you for this suggestion. We have modified the two points under this heading.

Changes in text: Page 4

There are significant barriers to the provision of lung cancer screening identified in US and UK programs.

This study explores barriers in the setting of Australia, where screening is yet to be introduced.

INTRODUCION

- Line 100: change to - and improving early detection prompted...

RESPONSE: This has been changed.

- Line: 102: have taken change to took

RESPONSE: We believe 'have taken' is grammatically correct and therefore have decided not to make this change.

- line 103: remove to

RESPONSE: This has been removed.

- Line 105: remove have

RESPONSE: This has been removed.

- Line 106: change to - Europe, demonstrating clinical effectiveness of LDCT in 2020, implementation was acknowledged

RESPONSE: This has been changed.

- Line 114: need a sentence of why you are using the definition "high risk". Is it to target the objectives of promoting health equity or the target population?

RESPONSE: The term 'high risk' is used in this context to define the target population for LCS. We have now clarified this.

Changes in text: Page 5 - In defining the priority population for LCS, the term 'high-risk' is applied to individuals, usually within the context of screening eligibility criteria that includes age (e.g. 50-70 years), smoking pack-year history (e.g. 30 years) and smoking status (e.g. current or former, having quit in <10 years) [16].

- in the paragraph starting with line 114 it would be beneficial to add more information about how a screening is determined to be acceptable by health professionals and consumers. It may help justify your use of CFIR.

RESPONSE: Thank you, we have added an additional sentence here to clarify.

Changes in text: Page 5/6 - The acceptability of LCS has been measured in communities where screening has been introduced through surveys with participants [18] and with health professionals [19] but few studies have used focus groups methods to measure acceptability [20].

- line 124 - 127: rework into one sentence to model the sentence on the US. Also make all the statistics consistent either all p-values or percentages, not a mix. Above you use "hard-to-reach" and "underserved" I highly recommend using this language over deprived.

RESPONSE: We have amended the final sentence to reflect research from the US and included references which reflect this research. The language has also been amended. We note that in the UK, the terminology of 'deprived' is frequently used, however, we agree with you and have changed this to underserved.

Changes in text: Previous research has shown reduced uptake of cancer screening consistently in underserved populations [27-29] and so demonstrates the need for newly implemented cancer screening programs to address the barriers to uptake in these populations from the early stages of planning a program.

- Line 120-141: these two paragraphs need to be reorganized to display a more coherent story of known existing barriers to lung cancer screening. One paragraph should focus on individual factors that potentially contribute to barriers to screening and the second to focus on system uptake of screening and experiences barriers. Recommend to reference <https://pubmed.ncbi.nlm.nih.gov/37713024/> for additional support in these paragraphs.

RESPONSE: We have adapted the introduction to reflect your comment.

- Overall, I would recommend reviewing the CFIR model and seeing if you can reorganize the introduction to model components such as inner setting, outer setting, individual domains, and implementation process considerations to help organize the introduction and later support your use of the model later.

RESPONSE: Thank you for this suggestion. We have now integrated the mapping of the results onto the CFIR into the results section where we believe it is more appropriate, rather than adapting the introduction to fit where other investigators haven't used the CFIR previously.

METHODS

- line 153: Recruited participants purposefully represented the spectrum of health care professional responsible for the implementation of a national LCS program.

RESPONSE: We have amended this sentence as advised.

Changes in text: Page 7 - Recruited participants purposefully represented the spectrum of health professionals responsible for the implementation of a national LCS program.

- line 154: define GP

RESPONSE: This has now been defined as general practitioners.

- line 167: remove during the focus groups

RESPONSE: This has been removed.

- Line 169-170: last sentence is confusing. Are you saying that this is one of three articles? at which level are you referencing participation factors (individual, inner setting, outer setting)?

RESPONSE: Yes, that is correct. There have been three manuscripts, one published, this manuscript and then another in preparation (smoking cessation).

- Data collection: provide more detail about the range of number of participants in each group.

RESPONSE: We have now added this to the manuscript.

Changes in text: Page 9 - We conducted 24 focus groups (range 2-5 participants)

Also, were the focus groups conducted by site/hospital or did you have multiple providers across different sites within each focus group?

RESPONSE: We have now added this to the manuscript.

Changes in text: Page 8 - Focus groups were conducted between February and July 2021 and included a mix of professional disciplines from a range of clinical sites within each group.

How much time was spent on the presentation vs. the semi-structured interview?

RESPONSE: The presentation was split into brief sections, with extensive time for discussion throughout. It consisted of 14 slides, 8 of which posed questions from the interview guide for discussion. It is hard to quantify given the discussion time within each focus group was different. We have now added this to the manuscript.

Changes in text: Page 8 - The research team developed a structured presentation to provide an introduction about LCS. Key components included findings from international LCS randomised controlled trials, an overview of findings from the National Lung Cancer Screening Enquiry (October 2020), the proposed risk assessment tool (PLCOm2012), and international LCS trials. A semi-structured moderator guide was developed to explore the potential of LCS in Australia, including the constructs of the CFIR in the design of the guide. The presentation and guide were used in all focus groups. On multiple occasions participants were asked to express their attitudes freely, across all aspects of implementation and to express any concerns. The presentation consisted of 14 PowerPoint slides in total, 8 of which posed questions to facilitate discussion.

- Line 174: indicate number of groups conducted via zoom and reasons why.

RESPONSE: We have now added this to the manuscript.

Changes in text: Page 8 – All focus groups with the exception of one, were carried out via Zoom due to COVID-19 restrictions and participants locations across Australian states, and lasted no longer than one hour.

- Line 179: who transcribed the audio recordings? A study team member or a third party service?

RESPONSE: We have now added this to the manuscript.

Changes in text: Page 9 - The focus groups were audio recorded, transcribed using AI powered software Trint and anonymised, and initially checked by one author.

- Line 186: add abbreviation for CFIR

RESPONSE: We have now added this to the manuscript (Page 7).

Changes in text: Page 7 - Therefore, the aim of this study was to gain an understanding of the potential barriers or facilitators to the uptake of a national LCS program for screening participants from the perspectives of healthcare providers, using qualitative methods and the Consolidated Framework for Implementation Research (CFIR) [32].

RESULTS

- Line 194: add the range of number participants in each group

RESPONSE: We have now added this to the manuscript.

Changes in text: Page 9 - We conducted 24 focus groups (range 2-5 participants)

- Throughout the paper be consistent in using priority or target populations.

RESPONSE: Thank you for this comment. We have changed all instances to priority population in the manuscript.

- Line 278-280: clarify this sentence. It can be shortened.

RESPONSE: We have clarified this sentence.

Changes in text: Page 11 - Participants perceived that if cancer is not included in the name of the program, those worried about cancer won't be motivated to attend as they will not recognise it as cancer screening.

- Line 331: add the word and

RESPONSE: This sentence has been amended.

Changes in text: Page 14 - This included different communications and different forms of messaging and advertising campaigns through mail, social media and television, that feature role models who had been for screening.

- Line 336: BreastScreen is spelled and capitalized differently here than above.

RESPONSE: This has been amended.

- Line 362: change is to was

RESPONSE: This has been changed.

- Line 385-387: delete sentence.

RESPONSE: We are unsure the reason for being requested to delete this sentence. This sentence represents how the success of the program could be undermined if those ineligible are sent to have lung cancer screening.

- Line 392-400: are you saying that people are more concerned with false-positives or false-negatives. There is more concise language for what is described.

RESPONSE: We are unsure of which section the reviewer is referring to here, as this section is about managing ineligibility rather than concern about false positives.

- Line 420: consider using patient instead of participants.

RESPONSE: This sentence has been amended.

Changes in text: Page 16 - Participants perceived that those eligible for screening would find LCS very acceptable and that patients will be happy to have further investigations.

- Line 463-463: change to the right services at the right time.

RESPONSE: This isn't what this sentence is describing, and therefore we would prefer to keep this as it is.

- Line 465: delete to

RESPONSE: This has been changed.

- Line 471: delete that and that

RESPONSE: We have amended this sentence.

Changes in text: Page 19 - A centralised referral and management system was suggested by some participants, as it was viewed that there should be capacity to follow up patients within the program, and this would facilitate communication between primary and hospital care.

DISCUSSION

- no comments

Reviewer D

OVERALL

The manuscript describes a qualitative study examining the acceptability and feasibility of implementing a national screening program in Australia. The study conducted a series of focus groups (n=24) with health care professionals and others (n=84). The manuscript addresses an important issue and reports on activities, barriers, and facilitators to establishing a national lung cancer screening program.

RESPONSE: Thank you for your positive comments.

MAJOR

The Consolidated Framework for Implementation Research (CFIR) is mentioned in abstract methods and in the methods section in the text. It is not mentioned in the results, and there was little to no integration of the themes with CFIR.

RESPONSE: Thank you for this comment. We have now mapped the themes throughout the results to the CFIR framework.

There was a large diversity in the types of health care providers who may or may not serve different populations. More detail is needed regarding the grouping of the focus groups. If the different provider groups were not grouped separately, what was the rationale?

RESPONSE: Due to busy schedules of the health professionals included in this study, it was not possible to find one common time to run focus groups that were grouped by single profession. In addition, by having different professions within the focus group, this provided different perspectives and experiences, and facilitated the discussions throughout.

MINOR

In the introduction, the 2012 recommendations from the USPSTF were mentioned. However, data collection coincided with the release of the updated recommendations, March 2021. Either in the introduction or in the discussion, it would be great if the updated recommendations are referenced and how it would impact plans for Australia's national roll out of LCS.

RESPONSE: Thank you for this suggestion. The Australian national roll out has not been heavily influenced by the updated USPSTF recommendations. We have added this reference and text to reflect this.

Changes in text: The United States Preventive Services Task Force has since updated their recommendations for LCS in 2021 [11] but this has not influenced the implementation plans for Australia [12].

In the discussion, it would also be great if the authors were comment on whether Australia would consider following CMS guidance regarding the requirement for the counseling and SDM visit with a decision aid prior to ordering LCS.

RESPONSE: As per a previous comment by reviewer A, we have added further to this in the manuscript.

Changes in text: Page 21 - Recent feasibility projects undertaken in Australia [12] indicate that this is an emerging issue for consideration. It is unlikely to be mandated in the Australian setting but there is a keen interest in adapting existing tools and resources for the Australian program.

Reviewer E

The authors assessed participation factors in the acceptability and feasibility of lung cancer screening in Australia by conducting 24 focus groups with 84 key stakeholders of current lung

cancer screening programs. Five themes were identified and thoroughly discussed. Barriers and facilitators were summarized at each stage of the screening and assessment pathway.

Minor comments

Line 101: The USPSTF implemented the lung cancer screening recommendations in December 2013, not December 2012. Reference: <https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/lung-cancer-screening-december-2013>

RESPONSE: This has been corrected.

2. Line 121-122: The 2016 data (citation 16) is outdated. I suggest replacing citation 16 with <https://www.lung.org/media/press-releases/state-of-lung-cancer-2022> The most recent report from the American Lung Association on lung cancer screening rate among eligible individuals in the US is 5.8% across all states in 2021.

RESPONSE: Thank you for providing this, we have updated reference 16 to that provided.

Changes in text: Page 6 - For example, a recent report from the US shows screening rates as low as 1% in some states (average of those eligible 5.8%) [25], with screening rates as high as 58% in the Veterans Health Administration demonstration projects performed across 8 sites [26].

Reviewer F

Strength:

- How to improve the participation rate of LDCT lung cancer screening among high-risk individuals is an important topic. The rationale and motivation are well presented in the manuscript.

RESPONSE: Thank you for your positive comments.

- The study presented a detailed investigation of participant factors in promoting lung cancer screening in real practice. This is a complicated problem, and the presented study sheds light on a possible approach by conducting surveys among health professionals who have directly involved in the implementation of lung cancer screening programs, at a national level.

RESPONSE: Thank you for your positive comments.

Weakness

- The study is presented qualitatively, which should be considered as the primary limitation. The paper reads more like a collection of case studies. Presenting the findings in a quantitative manner when it is possible could largely improve the quality of the paper.

- For instance, regarding if including the “cancer” in the program name, how many of your participants agree or disagree.
- The same can be applied to other items, such as how many people agree that using PLCOm2012 for risk assessments is impractical in real practice.

RESPONSE: Thank you for your comment. We would not consider the qualitative design of the study to be a limitation. We agree with the reviewer that providing a quantitative summary of results would help explain what is observed, however as little is known about how clinicians view these issues we wanted to explore these questions and elicit a range of opinions. A qualitative approach is the best method to facilitate this as it allows more in-depth exploration of participant responses. This is an important first step before more quantitative approaches are employed. In addition, the sample was chosen to reflect a range of views and does not attempt to be representative, therefore percentages would not be meaningful or generalizable. Furthermore, the data collection method will not allow us to accurately turn the results into numerical estimates.

Quotes were chosen to more effectively illustrate the themes that emerged during the interviews and while there were other quotes that matched the argument, the ones offered in the paper give the reader an overall view.

- The study could also be benefitted by discussing emerging technologies that can potentially promote lung cancer screening, such as artificial intelligence.

RESPONSE: Thank you for this suggestion. We have checked coding tree for all comments and while AI and its use is an interesting topic, none of the participants spoke about this in sufficient detail for it to be included as a finding from the focus groups.