

Pan-Canadian Lung Cancer Screening Initiative

Lung Cancer Screening Framework for Canada: Summary and Key Considerations

March 2016

Authors:

Aamir Bharmal, Medical Resident, Canadian Partnership Against Cancer

Heather Bryant, Vice President, Cancer Control, Canadian Partnership Against Cancer

Anna Crosskill, Specialist, Screening and Early Detection, Canadian Partnership Against Cancer

Contact:

Canadian Partnership Against Cancer

1 University Ave. Suite 300

Toronto, ON M5J 2P1

416-915-9222

screening@partnershipagainstcancer.ca

Lung Cancer Screening in Canada

In March 2016, the Canadian Task Force on Preventive Health Care (Task Force) issued new guideline recommendations in favour of lung cancer screening with low-dose computed tomography (LDCT) in adults aged 55-74 years who are current or former smokers with a smoking history of at least 30 pack-years, defined as the average number of packs smoked daily multiplied by the number of years of smoking. While lung cancer screening has been shown to reduce lung cancer mortality in a high-risk population (1), screening should be monitored and controlled in order to limit the risk of false-positive results and ensure appropriate patient follow-up. This paper summarizes some of the key issues for lung cancer screening program implementation outlined in the 2014 Lung Cancer Screening Framework for Canada. (2) The Framework consists of 34 consensus statements developed through an extensive consultation process with pan-Canadian working groups comprised of Pan-Canadian Lung Cancer Screening Network (PLCSN) members and other expert clinicians, pathologists, radiologists, smoking cessation experts and thoracic surgeons. The Framework can support Canadian jurisdictions in decision-making around lung cancer screening by outlining key elements for consideration.

Clinical Issues

Development of radiological guidelines

The National Lung Screening Trial (NLST) demonstrated the benefit of LDCT screening for lung cancer in a controlled setting. (1) The Framework outlines radiological requirements for screening program implementation in order to replicate benefits of the NLST while minimizing harms. A major concern with lung cancer screening is the high abnormal screening rate and subsequent diagnostic follow-up. (3) Based on the breast cancer screening mammography experience, the frequency of false-positive results is impacted by practice setting. (4) Parallels can be drawn to lung cancer screening with LDCT and the importance of programmatic screening in high quality, monitored settings in order to maximize benefits and minimize harms. (3) Centres performing the screening test should collect data on their results in order to monitor quality and help to address outstanding questions about lung cancer screening.

Some of the specific radiologic requirements outlined in the Framework include the development of a standard definition for an abnormal lung screen and screening algorithms for management of abnormal findings. The Framework also recommends the development of technical parameters and dosage levels for LDCT and guidelines for measurement techniques and standardized reporting. Standardized classification and reporting systems, like the Lung-Reporting and Data System (LU-RADS) (5) can serve as quality assurance tools in concert with scoring systems, like the PanCan lung nodule malignancy probability calculator, which has been recommended by the British Thoracic Society Guideline (6) and the American College of Radiology (ACR) Lung-RADS. (7) The development of an accreditation program for lung cancer screening centres such as the ACR Lung Cancer Screening Center designation (8) and continuing medical education on the radiological components of lung cancer screening will further support quality control.

Clinical work-up of indeterminate nodules

Screening programs will need to develop clear parameters for the definition of a positive scan and requisite follow-up investigations. (3) The Framework outlines some of the key considerations pertaining to the development of guidelines for the clinical work-up of indeterminate nodules. These include the development of algorithms for additional imaging, biopsy, and surgical resection once the patient

transitions from screening to a clinical pathway for diagnostic work-up or potential treatment. The indications for and requisite elements of multidisciplinary clinical review should be defined. Furthermore, recommended methods for performing non-surgical and surgical biopsies should be outlined. Ultimately, effective clinical management of indeterminate nodules will be an important contributor to the overall program, risks of harms, and cost effectiveness of lung cancer screening.

Guidelines for pathology reporting of nodules

Effective lung cancer treatment is dependent on accurate and timely diagnosis as a result of high-quality pathology reporting. Given that lung cancer screening with LDCT will increase the number of CT-guided lung biopsies to evaluate lung nodules, the use of standard diagnostic terminology, the adoption of synoptic reporting, and the development and application of recommendations for the submission, handling, adequacy and preparation of cytology specimens or tissue will be important for the success of lung cancer screening programs. (3,9)

To that effect, the Partnership's Pathology Working Group for the Framework and Cancer Care Nova Scotia's Lung Cancer Screening Pathology Working Group and Clinically Detected Lung Cancer Working Group have initiated discussions around the development of synoptic reporting for lung biopsy and cytology specimens as well as standards for specimen quality and handling.

Recommendations of surgical and therapeutic interventions for suspicious nodules

The Task Force guideline recommendations stipulate that lung cancer screening should only be carried out in health care settings with access to expertise in early diagnosis and treatment of lung cancer. As with mammographic screening, one of the potential harms of lung cancer screening includes the high false-positive rate, which can result in invasive follow-up. (1) The vast majority of abnormal screening results are addressed through one or more follow-up LDCT scans. However, when they occur, inappropriate lung cancer screening surgical interventions carry greater risks than for other cancer screening programs due to the types of surgical interventions required. (3)

The Framework outlines some of the key considerations to ensure interventions for suspicious nodules minimize harms while maximizing the potential benefits. These include linkage of screening programs to treatment pathways, which can support early diagnosis and cure. Rapid diagnosis initiatives that minimize wait times are already underway in some provinces. (10, 11) Further considerations include confirmation of diagnosis and cancer stage prior to treatment, development of criteria for patient assessment to determine resectability and operability, development of minimum standards for treatment services and monitoring of interventions.

Population Issues

Identification of high-risk individuals

Unlike population-based screening for breast, cervical, and colorectal cancers, lung cancer screening is delivered to a high-risk population. Lung cancer screening trials have shown benefit for individuals at high-risk of lung cancer based on smoking history. (1) However, no central databases exist with information on smoking history and, as such, effective mechanisms will need to be put in place for the recruitment of eligible participants and the collection of self-reported participant data. It is important that lung cancer screening be offered to those for whom the risks and benefits have been established

and not to a wider segment of the population for whom the risk-benefit ratio is unknown. A further consideration is that a disproportionate burden of lung cancer cases occurs among populations who are disadvantaged and often harder to reach with public health interventions. (3)

Given the high abnormal screening rates with LDCT, increasingly specific mechanisms are being developed to effectively target the population at highest risk of cancer and limit false-positive results. The use of risk prediction models such as Pan-Canadian Early Detection of Lung Cancer model (PLCOM2012) (12) offers an evidence-based approach to defining eligibility based on calculated level of risk derived from a number of predictors rather than age and smoking history alone. The use of risk prediction models may also allay patient concerns by basing eligibility on a more comprehensive level of risk.

Integration of smoking cessation practices

Lung cancer screening should complement, not compete with smoking cessation activities. Specifically, there is potential for the initiation of lung cancer screening to be a ‘teachable moment’ or a window of opportunity for eligible screening participants who are current smokers or who recently quit (an often hard-to-reach group) to become aware of the impacts of tobacco and change their current smoking or sustain their recent quit behaviours. (13) For those diagnosed with lung cancer, the effect of smoking cessation can be equal to, or even exceed, the positive therapeutic effects of chemotherapeutic agents. (14) In addition, lung cancer screening combined with smoking cessation interventions is more cost-effective than screening delivered alone. (15,16)

Some of the most effective counselling interventions for smoking cessation include motivational interviewing and the 5 A’s model. (17) Evidence suggests that smoking cessation interventions integrated along the cancer care continuum need to be sustainable, tailored to individual participants, involve regular follow-up, and reduce perceived barriers to cessation (e.g., distance from treatment locations or barriers to accessing nicotine replacement therapy). (17) They should also provide adequate information on side effects and incorporate patient preferences. (18) It is also important that clinicians, nurses, and relevant staff receive adequate training to support smoking cessation and can refer patients to evidence-based ethno-culturally appropriate smoking cessation programs. (19)

Conclusion

The CTFPHC guideline recommends high-risk lung cancer screening in Canada when offered in healthcare settings with access to expertise in early diagnosis and treatment of lung cancer. The Framework provides additional context on implementation-related considerations for lung cancer screening. While Task Force recommendations highlight areas for further research, the field of lung cancer screening is continuing to evolve and new data is being published in areas relating to risk assessment, patient selection, false negatives, and cost-effectiveness. The collection of data by organized lung screening initiatives in the Canadian context will support lung cancer screening quality and help to address remaining evidence gaps in order to maximize the benefits and minimize the harms of screening.

References

1. National Lung Screening Trial Research Team, Aberle DR, Adams AM, Berg CD, Black WC, Clapp JD, Fagerstrom RM, Gareen IF, Gatsonis C, Marcus PM, Sicks JD. Reduced lung-cancer mortality with low-dose computed tomographic screening. *N Engl J Med*. 2011 Aug 4;365(5):395-409.
2. Canadian Partnership Against Cancer. Pan-Canadian Lung Cancer Screening Initiative: Lung Cancer Screening Framework for Canada [Internet]. Toronto: Canadian Partnership Against Cancer; 2014. Available from: http://www.cancerview.ca/idc/groups/public/documents/webcontent/lung_framework_en.pdf
3. Field JK, Smith RA, Aberle DR, Oudkerk M, Baldwin DR, Yankelevitz D, Pedersen JH, Swanson SJ, Travis WD, Wisbuba II, Noguchi M. International association for the study of lung cancer computed tomography screening workshop 2011 report. *Journal of Thoracic Oncology*. 2012 Jan 31;7(1):10-9.
4. Bryant H. Of babies and bathwater: Reconsidering the public health approach to breast cancer screening. In *Cancer Forum* 2014 Dec (Vol. 38, No. 3, p. 202). The Cancer Council Australia.
5. Manos D, Seely JM, Taylor J, Borgaonkar J, Roberts HC, Mayo JR. The Lung Reporting and Data System (LU-RADS): a proposal for computed tomography screening. *Canadian Association of Radiologists Journal*. 2014 May 31;65(2):121-34.
6. Callister ME, Baldwin DR, Akram AR, Barnard S, Cane P, Draffan J, Franks K, Gleeson F, Graham R, Malhotra P, Prokop M. British Thoracic Society guidelines for the investigation and management of pulmonary nodules. *Thorax*. 2015 Aug 1;70(Suppl 2):ii1-54.
7. American College of Radiology. Lung-RADS Version 1.0 Assessment Categories [Internet]. American College of Radiology; 2014 Apr 28 [cited 2016 Mar 2]. Available from: <http://www.acr.org/~media/ACR/Documents/PDF/QualitySafety/Resources/LungRADS/AssessmentCategories.pdf>
8. American College of Radiology. Accreditation [Internet]. American College of Radiology; date unknown [cited 2016 Mar 2]. Available from: <http://www.acr.org/Quality-Safety/Accreditation>
9. Cancer Care Ontario. Synoptic Pathology Reporting [Internet]. Toronto: Cancer Care Ontario; date unknown [updated 2009 Apr 24; cited 2016 Feb 12]. Available from: <https://www.cancercare.on.ca/cms/One.aspx?portalId=40955&pageId=41216>
10. Cancer Care Ontario. Diagnostic Assessment Programs [Internet]. Toronto: Cancer Care Ontario; date unknown [updated 2014 Sept 18; cited 2016 Feb 12]. Available from: <https://www.cancercare.on.ca/pcs/diagnosis/diagprograms/>
11. Cancer Care Manitoba. IN SIXTY for Health Care Professionals [Internet]. Winnipeg: Cancer Care Manitoba; date unknown [date unknown; cited 2016 Feb 12]. Available from: http://www.cancercare.mb.ca/home/health_care_professionals/cancer_patient_journey/
12. Tammemägi MC, Katki HA, Hocking WG, Church TR, Caporaso N, Kvale PA, Chaturvedi AK, Silvestri GA, Riley TL, Commins J, Berg CD. Selection criteria for lung-cancer screening. *New England Journal of Medicine*. 2013 Feb 21;368(8):728-36.
13. Clark MM, Cox LS, Jett JR, Patten CA, Schroeder DR, Nirelli LM, Vickers K, Hurt RD, Swensen SJ. Effectiveness of Smoking Cessation Self-Help Materials in a Lung Cancer Screening Population. *Lung Cancer*, 2004; 44: 13-21
14. Toll BA, Brandon TH, Gritz ER, Warren GW, Herbst RS. Assessing tobacco use by cancer patients and facilitating cessation: an American Association for Cancer Research policy statement. *Clinical Cancer Research*. 2013 Apr 15;19(8):1941-8.
15. Villanti AC, Jiang Y, Abrams DB, Pyenson BS. A cost-utility analysis of lung cancer screening and the additional benefits of incorporating smoking cessation interventions. *PLoS One*. 2013 Aug 7;8(8):e71379.

16. McMahon PM, Kong CY, Bouzan C, Weinstein MC, Cipriano LE, Tramontano AC, Johnson BE, Weeks JC, Gazelle GS. Cost-effectiveness of computed tomography screening for lung cancer in the United States. *Journal of Thoracic Oncology*. 2011 Nov 30;6(11):1841-8.
17. Canadian Partnership Against Cancer. Interventions Aimed at Tobacco Use Cessation along the Cancer Care Continuum: Final Report [Internet]. Toronto: Canadian Partnership Against Cancer; 2015. Available from:
http://www.cancerview.ca/idc/groups/public/documents/webcontent/interventions_for_tobacco_use.pdf
18. Croghan GA, Croghan IT, Frost MH, Sloan JA, Novotny PJ, Nelson MA, Gauvin TR, Taswell JB, Allen MS, Hurt RD. Smoking Cessation Interventions and Post-Operation Outcomes in Esophageal and Lung Cancer Patients. Not Yet Published.
19. Schnoll RA, Engstrom PF, Subramanian S, Demidov L, Wielt DB. Smoking Cessation Counseling by Russian Oncologists: Opportunities for Intervention in the Russian Federation. *International Journal of Behavioral Medicine*. 2006; 13(1):8-15.