

Clinical tool accurately classifies benign and malignant spots on lung scans of smokers

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A Terry Fox Research Institute(TFRI)-led study has developed a new clinical risk calculator software that accurately classifies, nine out of ten times, which spots or lesions (nodules) are benign and malignant on an initial lung computed tomography (CT) scan among individuals at high risk for lung cancer.

The findings are expected to have immediate clinical impact worldwide among health professionals who currently diagnose and treat individuals at risk for or who are diagnosed with [lung cancer](#), and provide new evidence for developing and improving lung-cancer screening programs. A total of 12,029 lung cancer nodules observed on CTs of 2,961 current and former smokers were examined in the population-based study.

The results, to be published in the Sept. 5th issue of the *New England Journal of Medicine* (NEJM), will have an immediate impact on clinical practice, says co-principal investigator Dr. Stephen Lam, chair of BC's Provincial Lung Tumour Group at the BC Cancer Agency and a professor of medicine at the University of British Columbia.

"We already know that CT screening saves lives. Now, we have evidence that our model and risk calculator can accurately predict which abnormalities that show up on a first CT require further follow up, such as a repeat CT scan, a biopsy, or surgery, and which ones do not. This is extremely good news for everyone – from the people who are high risk for developing lung cancer to the radiologists, respirologists and thoracic surgeons who detect and treat it. Currently, there are no Canadian

guidelines for us to use in clinical practice."

In countries where guidelines do exist, they largely relate to nodule size. The pan-Canadian team's [prediction model](#), developed by Brock University epidemiologist Dr. Martin Tammemägi, includes a [risk calculator](#) that considers several factors in addition to size: older age, female sex, family history of lung cancer, emphysema, location of the nodule in the upper lobe, part-solid nodule type, lower nodule count and spiculation (presence of sharp or needle-like points). "Reducing the number of needless tests and increasing rapid, intensive diagnostic workups in individuals with high-risk nodules are major goals of the model," says Dr. Tammemägi.

The TFRI team used two sets of data to determine their findings, studying a total of 12,029 nodules from 2,961 persons – current and former smokers, aged 50-75, who had undergone low-dose CT screening. One set involved participants in the TFRI Pan-Canadian Early Detection of Lung Cancer Study from 2008 to 2010, where 1,871 persons with a total of 7,008 nodules (102 of which were malignant) were screened and followed. The other set involved 1,090 persons with 5,021 nodules (of which 42 were malignant) who took part in several lung cancer prevention trials conducted by the BC Cancer Agency during 2000-2010 and were funded through the U.S. National Cancer Institute (NCI). In the former study, participants were followed for an average of three years; in the latter, for an average of eight-and-a-half years.

Dr. Lam says the prediction model holds up even in cases where clinicians are faced with the toughest challenges; for example, deciding what to do when nodules are one centimeter (the approximate width of an adult thumbnail) or smaller. While nodule size is one predictor of lung cancer, the largest nodule appearing on the CT was not necessarily cancerous. The pan-Canadian study team found that nodules located in the upper lobes of the lung carry an increased probability of cancer. In

both data sets studied, researchers found that where cancer was present, fewer nodules were found. This model will simplify the work involved, especially for radiologists, in evaluating and assessing nodules on scans, as well as respirologists and [thoracic surgeons](#) who must make decisions about tests and treatment for their patients.

"An accurate and practical model that can predict the probability that a lung nodule is malignant and that can be used to guide clinical decision making will reduce costs and the risk of morbidity and mortality in screening programs," wrote Dr. Lam and study colleagues in the article, titled: *Probability of Cancer in Pulmonary Nodules Detected on First Screening Computed Tomography*."

"The findings in this study bolster the potential for the successful implementation of a lung cancer screening program using low-dose computed tomography (CT) within a high-risk population. This tool, combined with CT-screening, will increase our success in earlier detection, diagnosis and treatment of the disease. Further, this model combined with new guidelines for best clinical practice, will provide our health care system with both effective and affordable tools to implement such a program," says Nova Scotia thoracic surgeon Dr. Michael Johnston, a member of the study team. Dr. Johnston serves on the executive of the Terry Fox Research Institute and is chair of the medical advisory committee of Lung Cancer Canada.

"Many jurisdictions throughout the world are now considering whether or how to best implement lung cancer screening. Studies like this one are key to answering important questions so decisions are most likely to result in good practice and planning, and ultimately benefit patients," says Dr. Heather Bryant, vice-president, cancer control at the Canadian Partnership Against Cancer.

The significant findings come on the heels of the U.S. National Lung

Screening Trial (2011) that found a 20% reduction in lung cancer mortality with the use of low-dose thoracic computed tomography.

Dr. Christine Berg, co-principal investigator of the National Lung Screening Trial and former chief, Early Detection Research Group, division of cancer prevention, for the National Cancer Institute in the United States, says: "This important work of Dr. Lam and colleagues is a major advance for clinicians performing [lung cancer screening](#). They provide a tool to grapple with the problem of the high rate of positive low-dose computed tomography scans. Fewer follow-up scans with their attendant cost and fewer biopsies with their complications will need to be performed while continuing to diagnosis lung cancer at an early stage to lower mortality. Coupled with continued public health efforts to lower cigarette smoking, this work will have international impact on the leading cause of cancer death worldwide."

Provided by Terry Fox Research Institute

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