HOPE

AMIDST LUNG CANCER

2024 EDITION

BC LUNG FOUNDATION

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Forewords

Dr. Cathy Clelland
Medical Director, BC Cancer Primary Care Program

Dr. Vincent Wong
President, BC College of Family Physicians

Continuing professional development (CPD) is an important ongoing activity to all healthcare providers. Many licensing bodies in healthcare require continuing education for all members who hold licenses to continue practicing in their specific profession. These requirements are intended to encourage providers to expand their foundations of knowledge and stay up-to-date on new developments to achieve and maintain high standards of competency and professionalism along their healthcare career journey. For example, both the College of Family Physicians of Canada and the Royal College of Physician and Surgeons of Canada include accredited and unaccredited learning activities that can be applied for maintenance of competency requirements.

Non-certified activities have not been formally reviewed by either college but comply with their definition of CPD, are non-promotional in nature,

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Christopher Lam
President and CEO, BC Lung Foundation

Dr. Diana Ionescu
Consultant Pathologist, BC Cancer Agency

Lung cancer is a complex and multifaceted disease that requires a comprehensive approach for prevention, diagnosis, and treatment. A multidisciplinary approach is essential to tackling this devastating disease, which claims millions of lives worldwide every year. While the burden is greatest amongst older patients, we do see lung cancer in younger patients as well, and lung cancer is the third most common cause of cancer death in the 30- to 49-year-old age group.

By working together, healthcare professionals, policymakers, community leaders and patient advocates can reduce the incidence of lung cancer and improve public health.

The journey begins with prevention, where education and awareness play a crucial role. Smoking cessation programs, environmental pollution control, and healthy lifestyle promotion are all vital components of a comprehensive prevention strategy,

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Hope Comes Early With More Screening: Lung Cancer Screening In Canada

by Dr. Stephen Lam

Lung cancer is a global health issue. In 2020, more than 2.2 million people were diagnosed with lung cancer. Twenty percent of all cancer deaths are due to lung cancer.

Lung cancer has a higher economic burden than any other cancer in terms of lives lost, impaired quality of life and productivity losses due to early death. The primary reason for the substantial individual, health system and economic burden of lung cancer is due to a high proportion of lung cancer cases being diagnosed at a late stage, where prognosis is poor. Two in five people with lung cancer are diagnosed at stage IV, when the five-year survival rate is less than 10%. However, when lung cancer is diagnosed at the earliest stage, the five-year survival can be as high as 92%. Low-dose CT screening for lung cancer has been shown to reduce mortality from lung cancer by up to one quarter in randomized clinical trials and meta-analyses. This is achieved by shifting the diagnosis of lung cancer to an earlier stage. Instead of 20% of lung cancers being found in Stage I, ≥50% of the screen detected lung cancers are Stage I. There is a great opportunity to change the outcome of lung cancer patients with screening.

Globally, nine countries - United States, Canada, South Korea, Poland, China, Croatia, Czech Republic, Taiwan and United Arab Emirates have organised screening programs. A further 6 countries – United Kingdom, Australia, Italy, Slovakia, Romania and Kazakhstan, have formal commitment to implement LDCT screening with a number of other countries in the planning process. In Canada, British Columbia and Ontario have province-wide organized screening programs; four provinces have plans to roll out provincial programs and three provinces have pilot studies. All Canadian provinces use the PLCOm2012 lung cancer risk prediction tool to determine screening eligibility in people between the age of 50/55 to 74 years who have ever smoked in the past or currently still smoking. The PLCOm2012 risk prediction model has been shown to address race/ethnicity and sex disparity better than age and pack-years criteria recommended by the US Preventive Services Task Force.

Implementation of a lung cancer screening program requires a health system approach. It is important to have a governing structure to establish the policies, guidelines, standards, promotion strategies, quality assurance and quality improvement; adequate CT scanning capacity and a trained workforce to operate the scanning facilities and interpret the screening CTs, sustainable financing, a plan how the population eligible for lung cancer screening will be assessed to ensure screening is targeted appropriately, an established process for recruitment that mitigate health inequities, an evidence based screening protocol with clearly defined diagnostic and treatment pathway and follow-up to maximize the benefits of screening while minimizing potential harms such as unnecessary imaging studies, biopsy or surgery for benign disease.

Primary healthcare providers play a central role in provision of pharmacotherapy to participants who are still smoking and management of additional findings on the screening LDCT. Pharmacotherapy with varenicline, cytisine or dual nicotine replacement therapy, has been shown to significantly improve the quit rate in addition to education and counseling and double the benefits of screening for participants who are still smoking. Management of

> “LDCT screening for lung cancer significantly reduces mortality from lung cancer.”

additional findings such as severe coronary artery calcifications, moderate or severe emphysema, pulmonary fibrosis, bronchiectasis, can add benefits by reducing the risk of cardiovascular death and optimizing lung health treatment.

LDCT screening for lung cancer significantly reduces mortality from lung cancer. To maximize the benefits of LDCT screening, further research is needed to identify high risk individuals who are not currently eligible but would benefit from LDCT screening. The role of blood or breath biomarkers should be evaluated for potential application to identify high risk individuals for LDCT screening in randomized controlled studies. Artificial intelligence methods integrating clinical, demographic and imaging information are promising approaches to personalize the screening interval and duration. Future studies are needed to determine the most effective approaches to deliver smoking cessation services to older individuals who have been smoking for several decades and are still smoking. LDCT screening goes beyond detecting and treating lung cancer early; it provides the framework for improving lung cancer care in the general population through prevention, risk assessment, early detection, rapid diagnosis and timely treatment.

continued from page 1, Foreword: Dr. Cathy Clelland and Dr. Vincent Wong

and provide valuable professional learning opportunities. They may include reading journals and other educational healthcare communications with relevant, non-industry developed clinical information, such as the articles included in this BC Lung Association Newsletter. Many of the authors include important clinical information and/or links to relevant tools or other educational opportunities. We encourage you to consider the information included and the potential for changes in patient management in the context of your own practices. Time spent reading is applicable to non-certified CPD credits, and any resulting quality improvement activities you may undertake as a result could also be eligible for additional credits.

continued from page 1, Foreword: Christopher Lam and Dr. Diana Ionescu

as highlighted in several of the articles in this newsletter, with examples and statistics from our province. When prevention fails, early diagnosis is key. Family physicians often serve as the first point of contact for patients. Their familiarity with individual medical histories allows them to identify risk factors and symptoms early on and to have lung cancer on their differential diagnosis for symptomatic patients often showing elusive symptoms mimicking other conditions. When family physicians spot these symptoms, they initiate further investigations, ensuring timely evaluation. They are gatekeepers, identifying symptoms, assessing risk, and facilitating early diagnosis. Their vigilance and patient-centered approach significantly impact survival rates. As we continue the fight against lung cancer, let us recognize and appreciate the tireless efforts of these frontline healthcare providers.

A multidisciplinary team can facilitate timely and accurate diagnosis through collaborative efforts. Interventional radiologists, pneumonologists, thoracic surgeons and pathologists work together to procure biopsy samples, for the biopsy-proven diagnosis of cancer and its stage. Treatment itself is a complex and highly individualized process, requiring input from multiple specialists. Surgery, chemotherapy, radiation therapy, and targeted therapy are just a few of the options available, and a multidisciplinary team must weigh the benefits and risks of each approach to develop an effective treatment strategy, which is often done at tumour group meetings, where difficult cases are discussed. Biomarker testing by pathologists and molecular geneticists has its crucial role in this personalized approach to therapy and is evolving through development of our basic understanding of cancer biology and advances in the technologies we use for testing.

In British Columbia we acknowledged long ago that lung cancer is a formidable foe that requires a united front to combat and we have been fostering collaboration and cooperation among healthcare professionals, patients, and communities on each of the areas listed above, which are also detailed in this newsletter by experts from BC.

Advances In Thoracic Surgery: Bringing Hope To Lung Cancer Patients In BC

by Dr. Anna McGuire

We are exceptionally fortunate to be experiencing in real-time an era in lung cancer treatment history that will be looked back upon as a historical landmark period in BC and Canada. This is because we are learning that we can cure (yes, cure) not only early stage lung cancer, but also locally advanced stage lung cancer patients (where the tumour has spread out of the lung to surrounding lymph nodes) with treatment combinations that involve thoracic surgery and novel targeted genetic and immune therapies. A crucial combination is to offer lung cancer patients minimally invasive lung-sparing thoracic surgery, plus novel targeted and immune therapy agents, to secure truly robust quality of life and long-term survival.

Minimally Invasive Procedures:

One of the most significant advancements in thoracic surgery is the rise of minimally invasive procedures. Traditional open surgeries often came with substantial post-operative pain and extended recovery periods. However, thanks to techniques like video-assisted thoracoscopic surgery (VATS) lung cancer patients can now undergo procedures with smaller incisions, reduced pain, and quicker recovery times. These minimally invasive approaches not only enhance patient comfort but also contribute to improved surgical outcomes.

Lung-Sparing Techniques:

For patients with early-stage lung cancer, lung-sparing techniques are emerging as game-changers. These approaches focus on removing only the cancerous portion of the lung, preserving as much healthy lung tissue as possible. This not only contributes to improved lung function post-surgery but also reduces the overall impact on quality of life. By

Below: Dr. Anna McGuire (L) and former thoracic surgery fellow, Dr. Diab, who is now a thoracic surgeon in England




Above photos by Dr. Diana Ionescu

offering an alternative to traditional lung removal (lobectomy), these techniques provide hope to patients who may have otherwise faced more invasive procedures.

Precision Medicine and Personalized Treatment in Thoracic Surgery:

The advent of precision medicine has revolutionized the treatment landscape for lung cancer patients. Genetic testing and molecular profiling allow doctors to tailor therapies to a patient's specific genetic makeup and the characteristics of their tumor. This approach has led to the development of targeted therapies and immunotherapies, which have shown remarkable success in treating and curing lung cancer. Thoracic Surgeons now understand that in order to truly offer patients every opportunity to achieve cure, lung cancer is a disease that must be approached through a multi disciplinary lens immediately from diagnosis, regardless of stage. This means that some patients will benefit from preoperative chemotherapy and immune therapy followed by surgery, whereas others will be candidates for upfront surgery followed by immune therapy and chemo, or targeted gene therapy and chemo.

> “We are learning that we can cure (yes, cure) not only early stage lung cancer, but also locally advanced stage lung cancer patients with treatment combinations that involve thoracic surgery and novel targeted genetic and immune therapies.”

Collaborative Care and Multidisciplinary Teams:

It is truly an exciting time to be a thoracic surgeon in British Columbia. Minimally invasive procedures, precision medicine, lung-sparing techniques, CT screening for high risk populations, and collaborative care approaches are transforming the way lung cancer is treated in our province. In the realm of thoracic surgery, collaboration is key. Multidisciplinary teams work together to develop comprehensive treatment plans tailored to each patient's unique situation. General Practioners play a crucial role in facilitating this collaborative care approach, ensuring that patients receive the best possible treatments and support at every stage of their journey. As the field continues to progress, there is a renewed sense of optimism that a cure for lung cancer is within reach, bringing brighter long term prospects for patients across the province.

Lung Cancer Today: Hope Replaces Nihilism

by Dr. Barbara Melosky

The treatment of lung cancer has evolved over the last few decades. But it has really changed steeply in the last 5 years. As a medical oncologist, I have witnessed and been part of this unbelievable journey. When I started my practice, I had very few therapeutic tools to offer to patients. The ones I had, had harsh side effects and many patients turned down palliative treatment in this precious time of their lives.

The first change we saw was with the discovery of targeted therapy. The tyrosine kinase inhibitors against the epidermal growth factor receptor (EGFR TKI's) came into the clinic before we even knew how they acted. Some patients had a "Lazarus" effect when given a drug called gefitinb but many did not. We recognized that the nonsmokers with lung cancer seemed to benefit more. It was not for several years we realized that it was beneficial in those patients whose tumors harbored an EGFR mutation. Today, we can find that mutation in a plasma sample and we have multiple oral pills to choose from, most often choosing the third generation drug, osimertinb.

Patients benefit from prolonged survival of years, not months with high quality of life. Multiple other driver mutations have been discovered and with that, targeted therapy directed towards them.

The latest change has been the treatment with immunotherapy. When I talk to my patients of how these work, I explain that this class of drugs is not killing the cancer. They are waking up the patient's own immune system to attack. With the complexity of the immune system, I never thought this would work. But it does. We now have patients with metastatic disease alive and well without progression at 5 years. I never thought I would see this.

> "Patients benefit from prolonged survival of years, not months with high quality of life."

It is not just advances in metastatic disease that has changed the treatment paradigm. We have moved targeted therapy and immunotherapy to the earlier stages. Patients with resected tumors that harbor an EGFR mutation are now given osimertinib in the post-operative adjuvant setting. We may argue among ourselves if this is curative or just prolonging recurrence. At the end of the day, preventing a bone or brain metastases is just as an important endpoint.

We have moved immunotherapy to both the pre-operative setting (neoadjuvant), post-operative (adjuvant) or both perioperative. One in four patients given three cycles of a checkpoint inhibitor nivolumab with chemotherapy will not have any cancer found in the resected specimen. This is outstanding. The surgical world is changing fast.

This is an unbelievable time to be involved in thoracic oncology. Our patients are living longer and better. Every patient deserves an optimistic oncologist. Hope has replaced nihilism.

Below: Marguarita (third from the right), Dr. Melosky's lung cancer patient, with the BC Cancer Lab team in March 2024.

Radon Gas: Why Exposure Matters

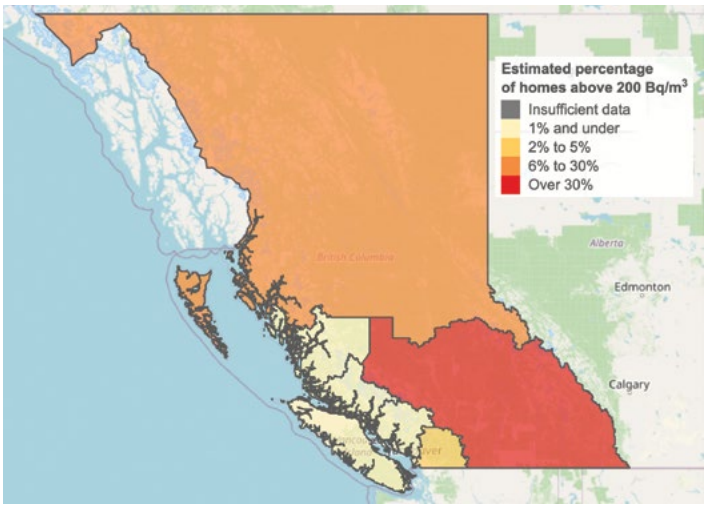
by Anne-Marie Nicol, PhD

Most people are aware of exposures that cause cancer—too much sun, poor dietary habits, smoking, asbestos, chemicals, and pesticides. One big exception is radon gas - an IARC 1 Lung Carcinogen that leads to over 3,000 deaths in Canada each year. Many Canadians have never heard of radon, which means they are not taking steps to reduce their exposure. Statistics Canada's biennial Households and Environments Survey (HES) finds that less than half of Canadians can answer questions about radon correctly. Worse, less than 10% of Canadians have tested their homes. Testing is the only way to know if radon levels are high enough to cause health problems. Unlike other carcinogenic exposure, radon gas can be easily and quickly reduced through a process known as "radon mitigation". Unfortunately, many Canadians still live in homes where radon levels go unknown and unaddressed.

> "For people who have never smoked, radon is considered the leading cause of lung cancer."

There are a few reasons why radon remains in the shadows of public opinion and public policy. Radon is an invisible soil gas, meaning that it enters buildings from cracks in the foundation and sidewalls or in gaps around plumbing and pipes. It is also odorless and colorless, making it impossible to detect without a monitor or a test kit. Additionally, radon exposure tends to be higher inside of homes and on lower floors. Policies that govern air quality tend to focus on outdoor air, providing little guidance for compounds that exist only indoors and inside private dwellings. There are testing and mitigation programs for workplaces, but these spaces generally contribute only a small proportion of a person lifetime radon dose.

Radon is part of the decay chain or "breakdown" of uranium, which exists in varying concentrations in soils and rocks across Canada. Like uranium, radon is radioactive and unstable, giving off alpha particle radiation as it breaks down. Radon gas and its decay products can be inhaled, leading to DNA damage in lung tissues. Exposure can occur outside although dilution with outdoor air reduces the risk significantly. Indoor spaces, particularly those that are under-ventilated and rooms closer to the ground tend to have greater concentrations. The higher the radon levels and the longer the exposure time, the greater the risk of damage and cancer. For people who have never smoked, radon is considered the leading cause of lung cancer. If people smoke and are exposed to radon, the risk of lung cancer goes way up.



Above: Radon Map of BC. Courtesy of BC Centre for Disease Control

The lack of awareness and sheer "invisibility" of the exposure has served to keep radon out of the spotlight, but this may be changing. The BC Lung Foundation along with the Take Action on Radon program and the Donna Schmidt Foundation have been helping people across BC access radon test kits and monitors. The results have been surprising and galvanizing. British Columbia, once thought to have lower radon levels than other provinces, is home to some serious radon "hot spots" or areas where radon gas levels are high in more than half of homes that tested. A clearer picture of radon is now publicly available through the BC Centre for Disease Control's Radon Map of BC. The more homes that are tested, the greater the attention this exposure is getting. Recent building code changes in some parts of BC are also helping to reduce exposure and make radon mitigation more straightforward for homeowners.

The good news is that high radon levels can be easily reduced. Radon mitigation is very effective, even where homes have high levels. There are certified radon professionals working across the country, trained using methods adapted to a range of Canadian climates. Lung cancer remains the leading cause of cancer death in Canada, and it is one of the least survivable cancers (only 22% of people diagnosed with lung cancer are alive 5 years after diagnosis). Testing for radon and reducing levels if elevated are two steps that all Canadians should consider seriously, particularly if people are current or ever tobacco smokers.

Meeting Hope In Hope:
A Story Of Living Happily With Lung Cancer

by Dr Diana Ionescu

An old folklore story says that in each of us, there is a constant battle between two wolves; the Black and the White. The Black Wolf inside us represents our negative emotions: fear, anger, despair, envy, jealousy, guilt, grief, resentment, frustration, shame, and arrogance. The White Wolf symbolizes good emotions: peace, love, hope, joy, optimism, courage, humility, empathy, acceptance, and faith. During each life experience, we feed one wolf more than we do the other, creating an inner tension that is often harder to deal with than reality.

Which wolf would a diagnosis of lung cancer feed?

The morning is still young, with dew bending the bright green grass and the crisp cold air biding of the sunrise. As I drive on Highway 1, the fog embraces the mountaintops and tightly wraps around my car. I love it, as it forces me to slow down, thinking about the wonderful people I am about to see again at the Vancouver Soaring Association Club in Hope. I will spend the day with Heidi and Kalli, who share their lung cancer story; if lucky, I may even ride in the sky.

As I get through the gate, Heidi welcomes me with a golden smile spreading her heart's warmth like a field of wildflowers. The walkie-talkie is buzzing in her hand; as always, she is listening, watching after those who play with the birds on the gliders soaring above us. She and her husband Kalli met at the soaring club thirty years ago and never left each other since.

“It wasn’t a big deal at all," Kalli tells me about his symptoms before the diagnosis, comfortably sitting next to Heidi: “After a trip to Mexico in the spring of 2017, I was treated for shingles. Hearing me cough and learning the cough had been lingering for two months, at the follow-up visit, Dr. Leoni Maritz sent me for a chest X-ray, followed only a day later by a chest CT scan. This was the turning point: it showed a two centimeters nodule in my lung, which they biopsied with some nearby nodes that also showed cancer. This is how I became a cancer patient, and before I knew it, I had surgery in Kelowna, where they removed about twenty centimeters of my left lung. I had stage IIB (pT2a pN1b) lung cancer with pleural invasion, and 13 out of 14 nodes had cancer spread. Foreign language to me if you want to know the truth", the former jewelry designer smiles, squeezing his wife's hand and looking at her for confirmation.

Handsome at seventy-six, father of two, and grandfather of two, Kalli is now seven years cancer-free and counting. "I was discharged from BC Cancer and have been under the care of my family doctor, Dr. Darrell Hamm, since two months after I finished chemotherapy in September 2017. My cancer journey seems short compared to the other lung cancer patients I encountered during my treatment. I like the follow-ups with my family doctor. He has known me for many years, and his care is not cancer specific but addresses other ongoing issues I have, such as my long-standing anemia. I feel safe

Heidi and Kalli kayaking on a lake close to home (Kelowna), days after his first chemotherapy. As Heidi says, the only bad thing worth mentioning is Kalli's funny-at-the-time haircut.

because I am also followed with a chest x-ray every six months by Dr. Anand Jugnauth, the surgeon who operated on me in May 2017, and his team (at the time) Drs: Michael Humer, Andrew Leuong, Shaun Deen. I can contact BC Cancer anytime if I have a specific concern, but I hope that will not be necessary. I do not think about the 50% recurrence rate at five years my oncologist, Dr. Sanjay Rao, told me I had in December 2017, when we last met. I did not think about it then; why would I do it now? These are just statistics; when it is about me, having or not having cancer, it is all or nothing, 0% or 100%".

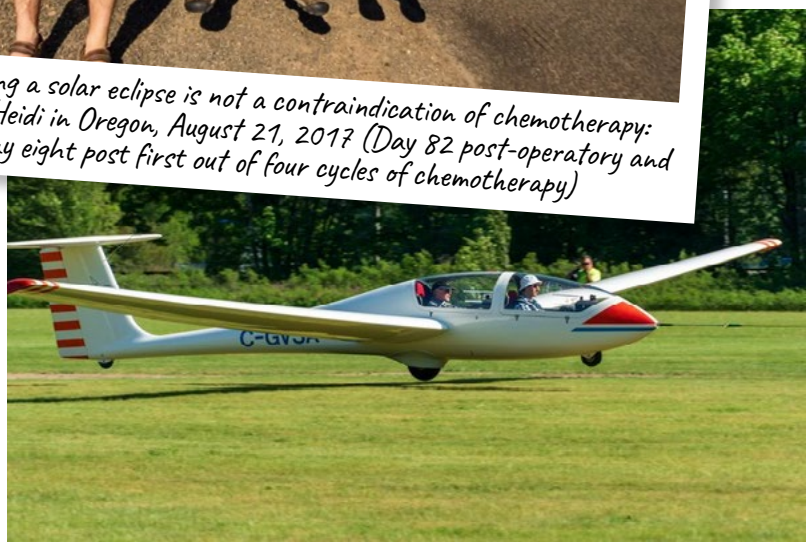
Kalli is one of those patients who made peace with cancer from the very beginning. After dealing with nausea and light-headedness that temporarily stopped him during chemotherapy, he went kayaking. He traveled to Oregon to watch the total solar eclipse between chemo cycles one and two and to Iceland and England between cycles two and three. “The trips were planned, and we didn’t want to change them because I got cancer.” He and Heidi reconnected to the club, finding strength in their passion for gliding along with their lifelong friends, forming a charming community in Hope.

My day ended up being a great one: inspirational conversation, great people, and a ride on a glider, with amazing views and acrobatic loops in the bright blue sky, and another check on my bucket list of things to experience.

> “Maybe we should not look at cancer as an enemy.”

We can decide to feed the White Wolf without ignoring the existence of the Black one, as the negative emotions give us a counterpoint to the positive ones, and it is our choice to allow them both to guide our journey. Moreover, while the White Wolf part of us is caring, compassionate, and hopeful, we need the qualities of the Black Wolf, like tenacity, courage, and fearlessness at times of struggle. As cancer patients, as we acknowledge and feed both wolves, our inner struggles subside, and we gain the wisdom and peace to look at the bright side.

Watching a solar eclipse is not a contraindication of chemotherapy: Kalli and Heidi in Oregon, August 21, 2017 (Day 82 post-operatory and day eight post first out of four cycles of chemotherapy)



Kalli where his heart is: Flying with his nephew, Nick Popp, in Hope

Give A Breath...Of Hope

by Dr. Cheryl Ho

On June 1 2024 over 70 team members in BC participated in Lung Cancer Canada's Give a Breath 5K. Give a Breath began as a local 5K walk/run in Edmonton, founded by Tim Monds and his family in 2019. What started as a heartfelt local event has grown into a powerful nationwide movement, with events in Edmonton, Halifax, Toronto, Vancouver, and virtually, allowing participants from all over Canada to join in support. The annual event was hosted at the Vancouver Pacific Spirit Park for the second year with a committed team of individuals who support the lung cancer community. In our inaugural year 2023, over $23,000 was raised by our BC team!

Funds raised through Give a Breath 5K support Lung Cancer Canada's Airways of Hope program. This program ensures comprehensive care for individuals facing lung cancer, including healthcare navigation, peer and group support, and one-on-one support from a registered social worker.

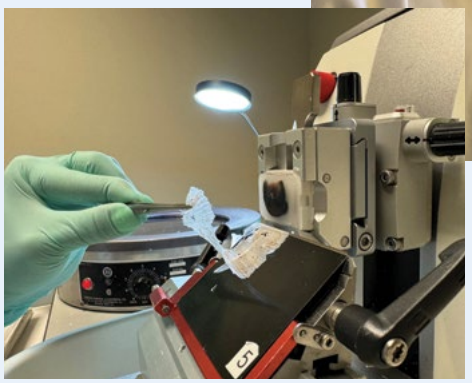
Additionally, funds help expand our research program, including the establishment of a new award aimed at supporting the best and brightest minds in lung cancer research in Canada. A recent awardee, Dr. Renelle Myers, (respirologist Vancouver General Hospital) has been investigating breath biopsies for never smokers who are not eligible for lung cancer screening through the existing BC program. Samples of breath may be able to determine predictive difference for never smokers at higher risk of developing lung cancer. These individuals could be recommended for low dose CT screening resulting in cases being caught early and lives saved.

The patients, families, friends and medical team are dedicated to supporting and advocating for lung cancer awareness and funding. Together, we can make a significant difference.

As Is Our Pathology,
So Is Our Practice *- Sir William Osler*:

Pathology Of Lung Cancer In BC

by Dr Diana Ionescu



Photos by Dr. Diana Ionescu

In the last decade pathology of lung cancer has undergone a revolution, and the pathologist's role has changed and expanded. With this change come new responsibilities for the doctors and the patients. Personalized medicine, targeted therapy, and immunotherapy have, at their core, the choice of the best treatment for every patient based on the clinical phenotype and tumor characteristics.

If, in the past, pathology reports included prognostic data related to cancer type and stage, nowadays, it also predicts response to therapies by identifying tumor biomarkers in tissue or blood samples, using various tests performed mainly through immunohistochemistry or molecular pathology. Until the spring of 2023, these tests were requested by medical oncologists, surgeons, or pulmonologists for patients with advanced-stage, metastatic lung cancer of a particular type, non-small cell carcinoma, adenocarcinoma subtype. Recently, the standard of care has changed, and biomarker testing in lung cancer is reflex, ordered at the time of diagnosis, regardless of stage. This approach provides the treating physician with information needed during treatment initiation and saves valuable time for the patient. The turnaround time of these tests is critical.

In keeping with the current guidelines, the BC Cancer Laboratory reports the panel of molecular biomarkers and those performed by IHC within 7-10 days of receiving the tissue. Centralized testing at BC Cancer allows for the best management of these small tissue samples, assuring their accurate processing, expert interpretation, and reporting in a laboratory with longstanding expertise in molecular testing and extensive programs for quality assurance. For example, after the patient tissue is fixed in formalin and embedded in wax, a Pathologist evaluates it under the microscope to ensure sufficient tumor material for testing. First, the pathology technologists prepare several four microns sections and perform immunohistochemistry for tumor drivers ALK and ROS1, as well as PD-L1, a marker that predicts the likelihood of response to immunotherapy.

The remaining tissue gets forwarded to the BC Cancer Genetics Lab (CGL), where DNA and RNA are extracted and tested for their quality and quantity before they are interrogated for the presence of numerous targets or driver mutations, including EGFR, ALK, ROS1, NTRK, RET, MET, and BRAF, to name the most important ones. These are all part of a panel of 52 markers, commercialized as AmpliSeq Focus Panel for Illumina.

Since 2007, BC Cancer Laboratories has worked closely with the BC Lung Tumor Group to change, adapt and improve the biomarkers tested in lung cancer to help with treatment selection among the drugs available to patients in BC.

Sometimes the clinical situation of a lung cancer patient deteriorates extremely fast, and testing is necessary for the immediate initiation of treatment. CGL offers point-of-care testing at the clinical request and provides results within approximately three hours of receiving tissue blocks from the originating hospitals where the tissue was initially obtained, by biopsy, fine needle aspiration, or surgery. Although limited to the most commonly seen driver, EGFR, test results in these sick, clinically selected patients are life-changing.

More than other areas of medicine, oncology has become a multidisciplinary specialty. The oncologists deciding on a treatment for the patient in front of them rely heavily on pathology and biomarker data; this depends on accurate processing by an army of technologists and laboratory assistants and tissue quality obtained by surgeons, pulmonologists, and interventional radiologists. Every step is essential, and the cancer journey is affected by the valuable and responsible work of many cancer team players.

BC Cancer Primary Care Program:
Family Practice Oncology Network (FPON) And Primary Care Provider Lung Cancer Education Opportunities

by Dr. Cathy Clelland

"For a long time, the role of primary care in cancer was largely seen as peripheral, but as prevention, diagnosis, survivorship, and-end-of-life care assume greater importance in cancer policy, the defining characteristics of primary care become more important." *Lancet Oncology, 2015*

In 2003, the BC Cancer launched the Family Practice Oncology Network (FPON) to provide oncology education, resources and connections to strengthen family physicians' abilities to care for people living with cancer in their communities. In 2016, FPON expanded to become the BC Cancer Primary Care Program with a mandate to: bring the lens of primary care into the strategic work of BC Cancer; facilitate support for primary care providers through education in partnership with UBC Continuing Professional Development; develop primary cancer care guidelines in partnership with the BC Guidelines and Protocols Advisory Committee (GPAC); and, advocate for clear lines of communication between primary care and oncologists to provide adequate resources to care for this complex population.

Our initial goal was to address the education and training needs for the implementation of General Practitioners in Oncology (GPOs) so that every community with a catchment of 15,000 or more would have access to cancer treatment as close to home as possible through collaborative care with oncology specialists at an appropriate regional/provincial centre. This has expanded to a twice-yearly Clinical Practitioner in Oncology (CPO) Education program to support new GPOs as well as NPs in Oncology and residents in Palliative Care. Our annual GPO Case Study Day is offered as part of the BC Cancer Summit in November, providing case-based, collaborative interactive presentations by GPOs and oncology specialists on management topics relevant to GPOs and NPOs in regional cancer centres and community oncology sites throughout BC and the Yukon.

Educational activities for Family Physicians and members of the broader primary care community have expanded over the years to include the offering of monthly Primary Care Webcasts (8:00 am 3rd Thursday each month except July/Aug/Dec) with presentations on a variety of Cancer

topics, an annual Primary Care CME Day now held in April and production twice yearly of the Journal of Family Practice Oncology (Spring and Fall) now available only in a virtual format. The Journal brings follow-up articles to many of our webinar and CME events as well as updates relevant to community primary care and their patients with cancer. We most recently partnered with the Guidelines and Protocols Advisory Committee (GPAC) to develop the Primary Care Lung Cancer Guideline "Suspected Lung Cancer in Primary Care" (*https://www2.gov.bc.ca/gov/content/health/practitioner-professional-resources/bc-guidelines/lung-cancer*)

FPON has also partnered with UBC CPD to develop a library of online self-directed learning modules, including the most recent addition: the BC Cancer Primary Care Learning Sessions: Lung Cancer eLearning course offers valuable resources and knowledge to support health professionals in their work. This online course is designed to provide primary care providers with up-to-date information on the diagnosis, treatment and management of lung cancer in primary care settings.

Explore the BC Cancer Primary Care Learning Sessions: Lung Cancer today using the following link: *https://ubccpd.ca/learn/learning-activities/course?eventtemplate=477-bc-cancer-primary-care-learning-sessions-lung-cancer*

These modules also form the basis for Virtual Small Group Learning Sessions connecting community primary care providers, local specialists and GPOs with the oncology team at their Regional Cancer Centre. These virtual sessions are an opportunity to meet each other, discuss opportunities and challenges that are faced at the local level, and start the networking discussion to develop possible solutions and support a sustainable cancer care system.

While links to all our educational offerings can be found on our website FPON.ca, to improve our ability to communicate with community providers and healthcare partners about the latest Family Practice Oncology Network (FPON) news, educational updates, practice gems and other BC Cancer Primary Care communications including information on the electronic publishing of the twice-yearly Journal, please scan the QR code below to sign up for our communications database.

Questions? Please contact us at fpon@bccancer.bc.ca

Photos Of HOPE

Margarita Huang is a patient with metastatic lung cancer who kept her positive attitude throughout her journey with cancer and who heightens her spirits by continuing her greatest joys: painting and photography.

Everyone adores Margarita's photography, which she joyfully shares even during her hospital visits to BC Cancer Vancouver Cancer. Here are some photographs that Margarita donated during her visits as a patient.

Medical Laboratory Technologists at work at BC Cancer Laboratory, photos by Dr. Diana Ionescu

Below: Photographs by Margarita Huang, cancer survivor

Below: Photograph by James Kissinger, cancer survivor and caregiver, husband and travel companion of Margarita

Hope Is In The Fresh Air: Lung Cancer & Air Pollution

by Dr. Renelle Myers

Lung cancer takes the lives of more Canadians than breast, colorectal, and pancreatic cancers combined.[1] The five-year net survival for lung cancer is among the lowest of all types of cancer at 24%.[2] Smoking tobacco (commercial cigarettes) is the most common cause of lung cancer, but recently lung cancer is increasing in individuals who have never smoked tobacco, and it is increasing at an alarming rate.

Lung cancer in never smokers is currently the 7th leading cause of cancer deaths in both sexes worldwide.[3]

Lung cancer deaths related to tobacco smoking are projected to decrease in the next 25 years but the number and proportion of lung cancers in people who have never smoked will continue to increase. In some East Asian countries, the incidence of lung cancer has been increasing over time, with over 50% of lung cancers in people who have never smoked.[4]

Air pollution is a major cause of lung cancer in people who have never smoked.

Increasing evidence indicates that air pollution is a major cause of lung cancer in people who have never smoked. In 2013, the International Agency for Research on Cancer (IARC) classified outdoor air pollution and particulate matter 2.5 micrograms/meter³ ($PM_{2.5}$) in outdoor air pollution as carcinogenic to humans (Group 1) and a cause of lung cancer.[5,6] Fine particulate matter ($PM_{2.5}$) are the small particles in the air < 2.5 microns, that can travel deeply into the lung and cause irritation and inflammation. They typically consist of a mix of things like smoke, soot, liquid or solid particles in aerosol, and can be made up of hundreds of different chemicals. Most particles form in the atmosphere as a result of complex reactions of chemicals such as sulfur dioxide and nitrogen oxides, which are pollutants emitted from power plants, industries and automobiles.

Indoor sources of $PM_{2.5}$	Outdoor Sources of $PM_{2.5}$
Burning candles and incense	Traffic/vehicle emissions
Re-suspended particles	Industry
Hobbies like woodworking	Wildfire smoke
Tobacco smoke	
Gas stoves and cooking	
Fireplaces and Wood stoves	
Furnaces	

Above table: Indoor and outdoor sources $PM_{2.5}$

The Global Burden of Disease (2019)[7] study showed that the percent of the global lung cancers attributable to each risk factor are: 62.4% for smoking, 5.8% for second-hand smoke, 15.3% for particulate matter $PM_{2.5}$, and 4% for household air pollution from use of solid fuels for cooking. This highlights the importance of fine particulate matter in the development of lung cancer. $PM_{2.5}$ is often used as a general indicator of air pollution level. Around the world, the average annual concentrations of $PM_{2.5}$ currently range from <10 µg/m3 to >100 µg/m³ with an average of 46 µg/m³.[8,9] A meta-analysis of 20 cohort studies showed a 14% increase in risk for lung cancer incidence or mortality for each 10µg/m³ increase in $PM_{2.5}$.[9] Although the average general residential levels of $PM_{2.5}$ in Canada are <10µg/m³, associations between low levels of $PM_{2.5}$ exposure and increased Canadian mortality have been demonstrated.[10] Recent findings have also demonstrated that chronic exposure to even low doses of air pollution measured

> “Air pollution is a major cause of lung cancer in people who have never smoked.”

by $PM_{2.5}$ 5µg/m³ can be harmful to health. [11,12,13] In 2021, the WHO lowered the threshold for safe annual mean exposure from $PM_{2.5}$ from 10 µg/m³ to 5 µg/m³. A very recent report from Canada and the US showed that exposure to $PM_{2.5}$ as low as 2.5 µg/m³ is associated with adverse health effects.[14] With a growing, and urbanizing population and increasingly frequent wildfires due to anthropogenic climate change, many cities in Canada will exceed this threshold. Wildfire smoke impacts respiratory health more than fine particles from other sources and is threatening to erase the progress to improve air quality. Air pollution is a public health problem that is associated with an increased lung cancer burden. Thus, there is an urgent need to increase our understanding of how air pollution exposure causes lung cancer in never smokers, and an even more important need on educating on how to limit air pollution exposure.

In Canada the largest source of air pollution is wildfire smoke in the summer. The Air Quality Index (AQI) can be used, it will indicate when air pollution levels reach harmful levels in your area. This tool can be used to help reduce exposure, especially when planning outdoor events and activities. When the levels are high, spending more time indoors and reducing aerobic activity (walking instead off jogging), can reduce $PM_{2.5}$ inhalation.

Research at BC Cancer is focused specifically on determining at the molecular level, how air pollution causes lung cancer, as well as developing screening program for never smokers who may be at risk for lung cancer secondary to exposure to high levels of air pollution.

Updates On Radiation Oncology Of Early Lung Cancer: Understanding SABR & Its Growth In BC

by Dr. Devin Schelenberg

The above CT image is a cross checking though a patient's chest. The colorwash demonstrates the high dose region of radiation surround a small cancer in the patient's lung. The remaining organs in the chest are unaffected from the radiation.

Lung cancer is the leading cause of cancer death worldwide. In Canada, it is the most commonly diagnosed cancer (excluding non-melanoma skin cancers) and also the leading cause of cancer death for both men and women. Approximately 31,000 Canadians will be diagnosed with lung cancer and 20,600 will pass away due to lung cancer this year. Meaning that one quarter of all Canadian cancer deaths are from lung cancer.

Radiation Therapy is used at all stages of disease (from cancer cure for localized disease to palliative of symptoms when cancer is widespread). However, this article focuses on the technological and treatment advances that have facilitated effective treatment of early (stage 1) lung cancer - when the disease has not spread to lymph nodes or other organs.

Stereotactic Ablative Body Radiation (or SABR) is a non-invasive treatment that uses focused radiation (X-rays) to target and eliminate early growing lung cancers. This type of radiation delivers extremely precise and very high doses of radiation to small cancers, while sparing the normal structures and tissues nearby. The result is that the cancerous tissue in the lung can be killed while the vast majority of normal lung remains unaffected.

The first step in the treatment process is to accurate identify the location of the cancer with CT and PET scanning and after meeting the cancer care specialist (Radiation Oncologist) the patient undergoes a dry-run of sorts where a further CT is carried out for radiation planning and immobilization. From this specialized image the physics of a radiation plan is developed.

An example of a radiation plan is highlighted above. A CT and PET image of the lung cancer is first shown without any radiation dose. The radiation plan is then laid over the CT image with the colors indicating the amount of radiation received.

The tight radiation dose is made possible by a combination of innovations in the treatment delivery (the Linear Accelerator – pictured below) and the advent of higher computer power allowing more intense physics computations.

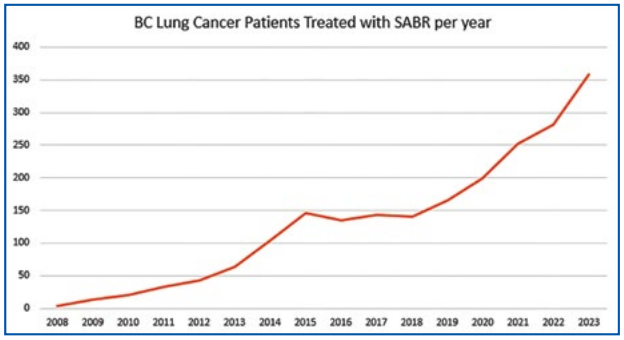
As the Linear Accelerator moves around the patient in an arc or a full circle, a focussed beam of radiation comes out of the machine directed at the tumor. The shape of that radiation beam changes as the machines rotates, so no matter the angle of treatment, the shape of the treatment beam always matches the shape of the tumor. The result is that very little normal tissue gets caught up in the radiation field and very few side effects occur.

That small, focused radiation area allows us to increase the radiation dose to the tumor while still delivering a lower (very tolerable) dose to the surrounding organs. Because the volume of normal tissue affected by radiation is so small, we no longer need to deliver the radiation slowly over time to allow the normal organs to recover. As a result, for small tumors, instead of an "ordinary" course of radiation that might take 6 weeks, a curative early lung cancer treatment can be complete in as little as one session with the patient walking into the cancer centre, receiving treatment and walking out within an hour (though some patients will require 3, 4 or even 8 daily treatments).

SABR treatment has yet to surpass surgery as the gold standard way of treating early lung cancers, but several groups have demonstrated similar survival outcomes when this type of radiation is compared to surgery. Specifically, as SABR is an outpatient procedure without any anesthetic or skin cutting, it has proven beneficial if patients are not able to tolerate an operation because of reduced lung function, heart problems or those that are older or more frail. In BC there is no age cut-off for SABR and certainly 70, 80 and even 90 year old patients have received this curative treatment.

We have also seen SABR used in combination with surgery (if for example there were 2 lung tumors present on both the right and left) and multiple courses of SABR are also common with patients being cured of a lung cancer with SABR only to require a further SABR for a new lung cancer that develops 5 years later.

With improved lung cancer screening, we hope to see more lung cancers being found earlier and for many of those patients we expect either surgery or SABR to be effective means of improving survival. It is likely the use of SABR will continue to grow in BC.



Above: Increasing numbers of BC Cancer Lung patients treated with Stereotactic Ablative Body Radiation (SABR) over the past years.

Above: Linear accelerator

Radon Gas Additional Resources:

McMaster University, together with Health Canada, has designed a free certified program, Radon: Is it in your patients' homes, to provide you and your colleagues with reliable, evidence-based information. This self-study e-learning radon module is eligible for maintenance of proficiency or certification credits: https://machealth.ca/programs/radon/

BC CDC Radon Map of BC: http://www.bccdc.ca/about/news-stories/stories/2021/new-interactive-radon-map

Health Canada Radon: About https://www.canada.ca/en/health-canada/services/health-risks-safety/radiation/radon.html

Statistic's Canada's Household and Environmental Survey: https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3810008601

Take Action Radon's 100 Radon Test Kit Challenge https://takeactiononradon.ca/resources/100-radon-test-kit-challenge/

BC Lung Foundation https://bclung.ca/radon

Lungs Matter financial support for radon mitigation: https://www.lung.ca/lungs-matter-radon-mitigation-support

BC Cancer Statistics access at: http://www.bccancer.bc.ca/health-info/disease-system-statistics/cancer-statistics-online-dashboard

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