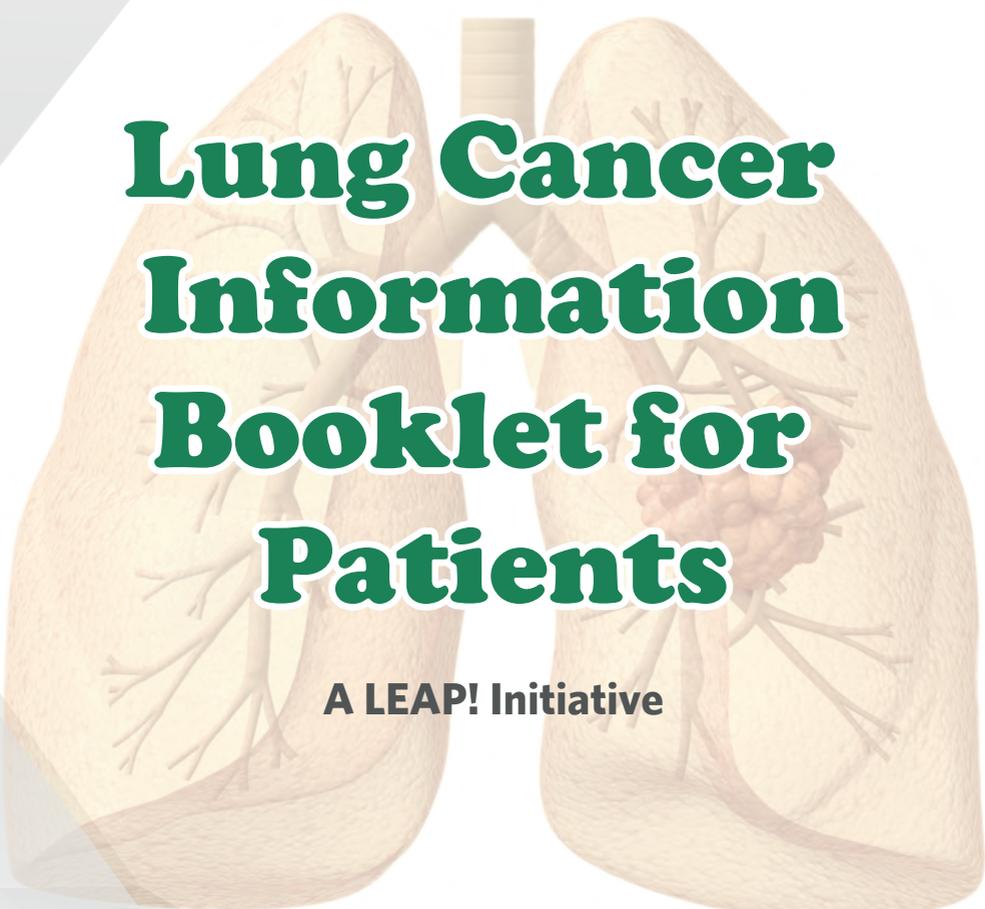




National Cancer  
Centre Singapore  

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SingHealth

An anatomical illustration of human lungs, showing the bronchial tree and blood vessels. A small, dark, irregular mass representing a tumor is visible on the right lung. The illustration is semi-transparent, allowing the text to be overlaid.

# **Lung Cancer Information Booklet for Patients**

**A LEAP! Initiative**

It can be intimidating to be diagnosed with lung cancer, let us help you navigate this journey one breath at a time.

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Document No. CEIS-EDU-PEM-264/0524

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First Edition 2021, Reprint 2024

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# 1. Thoracic Medical Oncology Team at NCCS

## Who are we?

A group of medical oncologists who specialize in the treatment of lung cancers and are responsible for prescribing systemic treatment (chemotherapy, targeted therapy, immunotherapy). The Lung Cancer Consortium Singapore (LCCS) was established in 2001, with the aim to bring together the clinical and research community in order to advance the diagnosis and management of thoracic cancers. Both public and private sector clinicians across all hospitals collaborate with research institutions in Singapore in order to better understand the origins of lung cancer, as well as introduce improved interventions and novel therapies for cancer patients.

As an academic centre, we endeavour to deepen our understanding of lung cancer and thereby deliver quality care to our patients. The National Lung Cancer Research (NLCR) study is part of this effort, which includes in-depth study on our patients as well as cutting-edge scientific research. You may be approached by our research coordinators to participate in this – do your part for lung cancer today!

Lung Cancer Education and Advocacy for Patients (LEAP) was established in 2019, with the aim of enhancing patient education, improving patient support as well as facilitating patient advocacy. Patient advocacy involves empowering patients to participate in shared decision making during their lung cancer journey, through educational resources, peer support and community outreach.

If you are keen to join LEAP, find out more and/or make a donation, please kindly email us at [leap@nccs.com.sg](mailto:leap@nccs.com.sg)

## What services do we provide?

- a. Largest thoracic oncology team in Singapore with broad expertise with latest treatments (targeted, immunotherapy and chemotherapy)
- b. Subspecialty thoracic pathology and radiation oncology service
- c. Inpatient oncology subspecialty care
- d. Cutting edge clinical trials (phase I to III) and precision oncology programme
- e. Rebiopsy programme
- f. Patient education
- g. Lung cancer research
- h. Integrated palliative and supportive care (rehab, Allied Health including pharmacists, dieticians and medical social workers)
- i. Patient advocacy



### What is lung cancer?

- Lung cancer originates from cells of the lung. This is different from cancers from other parts of the body that have spread to the lung, for example colon cancer that has spread to the lungs is still colon cancer.
- Lung cancers are divided into small cell lung cancer (SCLC) and non-small cell lung cancer (NSCLC) based on the biopsy results, the latter is much more common. Treatment of small cell and non-small cell lung cancer is different
- There are different subtypes of NSCLC, of which the most common ones are adenocarcinomas and squamous cell carcinomas. The subtype of NSCLC may affect the type of treatment recommended.

### How does lung cancer develop?

Cancer cells acquire genetic changes which cause them to grow abnormally in the lung. These abnormal cancer cells may invade normal parts of the body and spread to other parts of the body through blood/lymphatic vessels (metastasis).

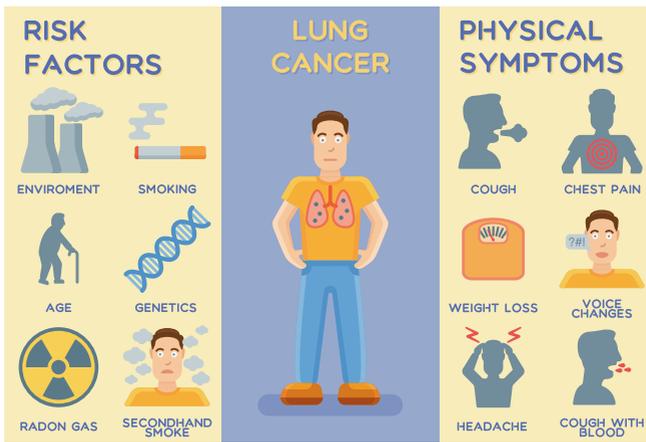
### Risk factors for lung cancer

Tobacco smoking is the most common risk factor for developing lung cancer, both SCLC and NSCLC. Your risk increases the longer you smoke and the more you smoke. If you are keen to stop smoking and would like some help, kindly speak to your doctor about our Smoking Cessation clinic.

Exposure to certain chemicals such as asbestos also increases the risk of lung cancer. Asbestos was used in shipbuilding and the construction industry in the 1960s but has since been banned.

### Symptoms of lung cancer

The most common symptoms of lung cancer are chronic cough and breathlessness. Coughing up blood, fatigue, pain, loss of appetite and loss of weight are also frequently encountered. However, some patients with an early lung cancer might not have any symptoms.



## 3. Diagnosis

### How is lung cancer diagnosed?

Comprises a combination of scans and biopsy of an abnormal growth that was detected on a scan or on clinical examination.

### How is lung cancer staged? Why do we do staging?

After confirming the diagnosis of lung cancer, your doctor may order additional tests to determine if the cancer has spread to other parts of the body. This information is used to decide on the stage of the lung cancer. Different stages of lung cancer require different types of treatment.

### Stages of lung cancer

Small cell lung cancer (SCLC) and non-small cell lung cancer (NSCLC) are staged differently.

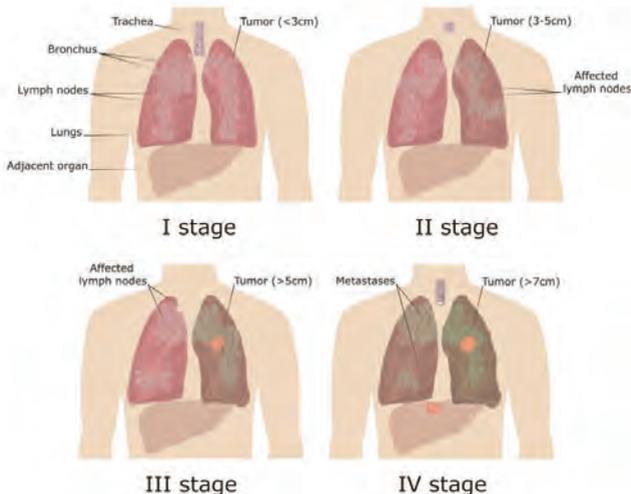
#### SCLC

- Limited-stage: cancer cells are only on one side of the chest and can be treated with a single radiation field
- Extensive-stage: cancer cells have spread throughout the chest, the other side of the chest and/or other body parts far away.

#### NSCLC

- Stage 0: cancer cells are in airways but have not grown into lung tissue or spread outside the lung
- Stage 1 - 3: cancer cells have grown into lung tissue, some have spread to nearby lymph nodes but not spread to body parts far away.
- Stage 4 (metastatic): cancer cells have spread to body parts far away from the primary lung tumour. Common sites of spread include brain, adrenal gland and other parts of the lungs

## Four stages of lung cancer



**A) Scans commonly used for staging:**

- Computed tomography (CT) scan
- FDG positron emission tomography (PET) scan, usually combined with CT (PET CT)
- Magnetic resonance imaging (MRI) Brain

**B) Blood tests:**

- Full blood count (FBC): includes white blood cells, red blood cells and platelet count
- Biochemistry: kidney and liver function tests, as well as certain salt (electrolyte) levels

**C) Lung function tests**

- Only required if planned for surgery and/or radiotherapy

**Molecular/Biomarker testing (for NSCLC)**

- Certain types of lung cancers may be further divided into different subtypes classified by biomarker or molecular testing of the lung biopsy specimen for certain genes or proteins. These results are used to select treatment particularly in stage IV NSCLC.
- Molecular testing is usually done on biopsy samples. However, in some situations when the biopsy specimen is not available or the quantity is not enough for further tests, or where biopsy cannot be performed a blood test can be done to determine the molecular profile of the cancer. This is referred to as "liquid biopsy".
- Biomarkers routinely tested
  - EGFR (Epidermal growth factor receptor)
  - ALK (Anaplastic lymphoma kinase)
  - ROS-1
  - PD-L1
  - BRAF
- Other rare biomarkers may be sent and will be explained by your doctor accordingly

*Please note that not every test is appropriate for every patient and doctors may recommend different tests depending on each individual's cancer condition. Talk with your doctor on which procedures and tests are right for you.*

## 4. Treatment Overview

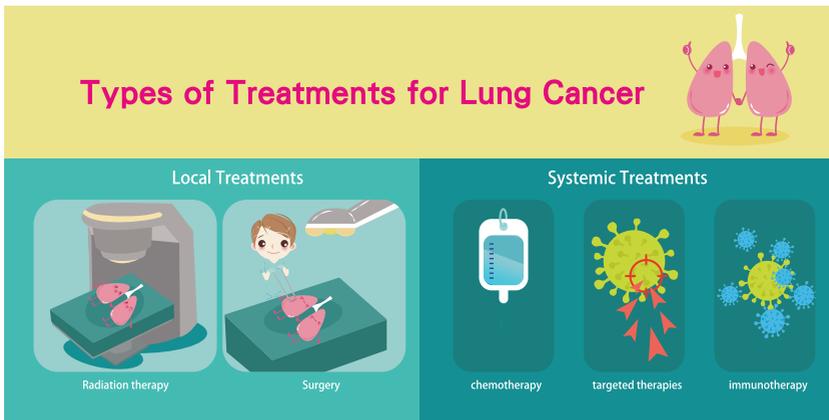
### SCLC

#### Limited-stage

- Most commonly treated with a combination of chemotherapy and radiotherapy, either given concurrently or one after the other
- Some patients may also be treated with surgery first
- Radiation to the brain may also be given to some patients who respond well to reduce the risk of cancer spread to the brain (known as prophylactic cranial irradiation)

#### Extensive-stage

- Most commonly treated with a combination of chemotherapy and immunotherapy
- Some patients may also be treated with radiation depending on their sites of spread and response to treatment



### NSCLC

#### 1. Stage 1 and 2

- Usually comprises surgery to remove the lung tumour
- Radiotherapy may be chosen for some patients instead of surgery
- Depending on stage, some patients may be considered for pre-operative chemo-immunotherapy
- Depending on stage and findings at time of surgery, some patients may be considered for post-operative therapy to reduce recurrence risk (adjuvant treatment). This may include chemotherapy, targeted therapy, immunotherapy or radiotherapy.

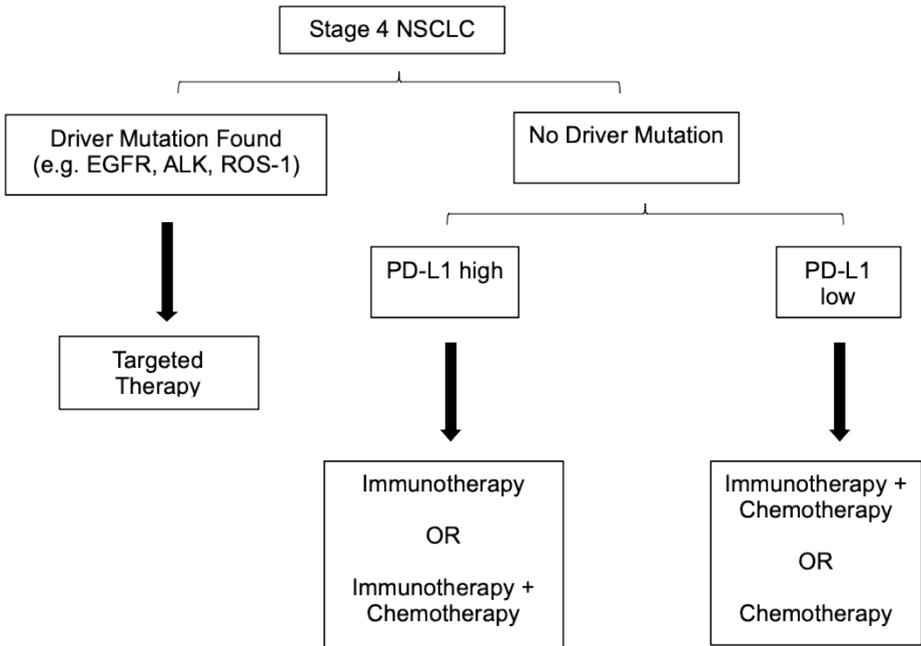
#### 2. Stage 3

- This cancer may not be removable by surgery, due to involvement of lymph nodes located in the middle portion between both lungs ("mediastinum"), or due to the proximity of the tumour to vital organs such as the heart or big blood vessels.
- Treatment usually comprises that of a combination of radiotherapy to the lungs/ lymph nodes together with chemotherapy followed by immunotherapy.

- Requires multidisciplinary care and comprises varying multimodality combinations of surgery, radiation, chemotherapy and immunotherapy

### 3. Stage 4

- Systemic treatment is the mainstay for most patients and will be dictated by molecular profiling of the tumour cell.
- Treatment options consist of
  - Chemotherapy
  - Targeted therapy
  - Immunotherapy
- The diagram below briefly illustrates how treatment is decided.



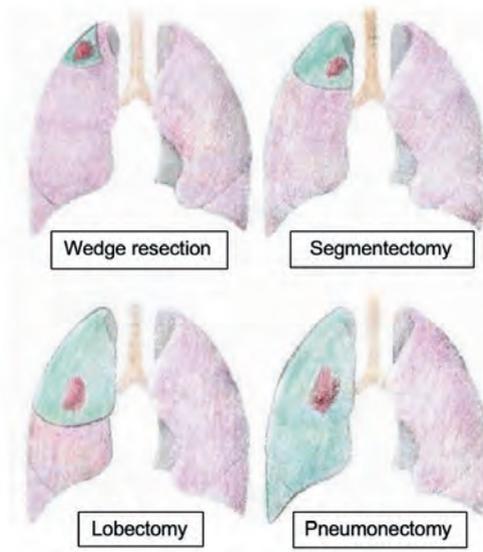
*Please note that this is just a guide and does not apply to all patients as each patient's condition is unique. Please speak with your doctor if you have further questions*

### 4. Clinical trials

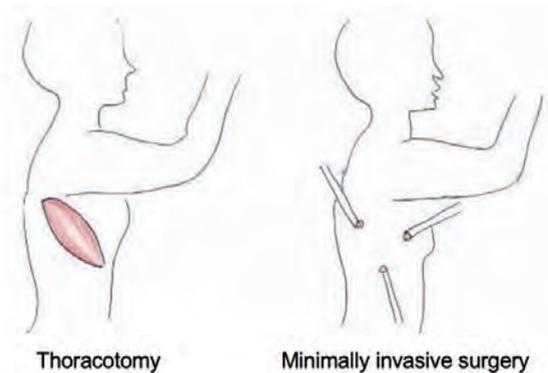
- Can involve patients with different stages of disease, depending on availability and suitability

Surgery for lung cancer can be done for diagnostic or therapeutic purposes

- Diagnostic procedures include removal of part of the lung (wedge resection, segmentectomy or lobectomy), biopsy of lining of the lung (pleural biopsy) or biopsy of lymph nodes
- Therapeutic procedures usually involve removal of part of the lung (wedge resection, segmentectomy or lobectomy) or entire part of the lung (pneumonectomy). The surrounding lymph nodes are also removed during a therapeutic lung resection.



- These operations are usually done through keyhole incisions whenever possible so that patients recover faster. If it is not possible to complete the operation safely with keyhole incisions, an open thoracotomy is used instead.



### **How does radiotherapy work?**

Radiotherapy uses high energy x-rays to destroy cancer cells. As normal cells can also be damaged by radiotherapy, radiation treatment is carefully delivered in a targeted manner to achieve therapeutic outcomes while minimizing side effects. Following radiotherapy, the side effects will gradually resolve as the normal cells repair themselves.

Radiotherapy may be given:

- On its own, to cure early stage lung cancer
- After surgery, to reduce the risk of lung cancer relapse
- At the same time or after chemotherapy, to cure stage 3 lung cancer involving the lung and lymph nodes.
- To control symptoms, if lung cancer has spread to other parts of the body like the brain or bones.

### **What is the radiotherapy process like?**

#### Radiotherapy planning

For radiation treatment to be delivered in a targeted manner, it needs to be carefully planned by your radiotherapy team.

Planning for radiotherapy usually involves having a CT scan of the area of treatment (known as a CT simulation scan). A mould (known as a vac-lok) will also be carefully fitted to help you lie on your back, with both arms raised above your head (supported by arm rests) during the scan. Information from the simulation scan will then be sent to a treatment planning computer, which will work out the radiation doses to be delivered to the target area.

It is important for you to lie still, so that your position can be recorded. If you feel uncomfortable during the simulation scan, please inform your radiotherapy team so that they can make you more comfortable. You will need to be in the exact same position when you receive your radiotherapy treatment. To aid your radiation therapist in positioning your body for treatment, some treatment setup marks or lines may be applied to your skin. These must be kept throughout the course of your treatment. Do NOT erase them or apply soap when washing over the area being treated.

During the simulation scan and treatment, you are required to breathe in a regular and uniform pattern. To maintain the regularity of your breathing and your arms position comfortably during the course of treatment, we recommend deep breathing, arms, shoulders and side bending exercises. Please speak to your radiotherapy team for more information on these exercises.



*Figure 1. A patient undergoing a CT simulation scan for chest radiotherapy. The patient lies on his back, with both arms raised above his head, in the treatment position. The vac-lok keeps the patient in a comfortable and consistent position. A respiratory localization box and an infra-red camera, allows tracking of the patient's breathing. Sometimes patients may be required to hold their breath during treatment, to reduce the field of radiation. This is known as deep inspiration breath-hold (DIBH) treatment. In these instances, patients will have a visual accessory to guide them in holding their breath.*

### Different types of radiotherapy treatments

Radiotherapy is directly aimed at cancer cells from a radiotherapy machine. Depending on the lung cancer stage and area of treatment, radiotherapy can be delivered in different ways.

#### **Stereotactic body radiotherapy (SBRT)**

SBRT delivers extremely precise, very intense, high doses of radiation to small lung cancers while minimizing damage to surrounding healthy tissue. Treatment courses are usually short (approximately 2 weeks). It is only suitable for some patients.

#### **Conventional radiotherapy**

Conventional radiotherapy is delivered in short daily sessions (Monday to Friday) over a period of 4 to 7 weeks. This form of radiotherapy is often used in multimodality treatment with surgery and/or chemotherapy.

#### **Palliative radiotherapy**

Palliative radiotherapy can be delivered to shrink cancers and control symptoms such as pain, coughing up blood or breathlessness. This can either be delivered in one session or over a few days to weeks. The type of palliative radiotherapy used is highly specific to each individual patient. Please speak to your radiation doctor for more information.

## **What are common side effects during the course of chest radiotherapy?**

During the course of radiotherapy, the treatment itself is not painful. However, over time, you may experience some side effects from treatment. Please do not be distressed, as these side effects are usually temporary and specific to the area of radiation. Below are some advice on what you can do to minimize discomfort during your radiation treatment.

### **1. Difficulty swallowing**

If your gullet receives some radiation, you may feel discomfort when eating. This is due to inflammation. To minimize the problem:

- Avoid smoking, drinking alcohol and taking hot, spicy food
- Drink plenty of water and/or other fluids
- Change your diet to soft foods
- Milk supplements may be useful. Your doctor can provide advice if needed.
- Have smaller portions but more frequent meals.
- Your doctor may recommend medications to reduce the discomfort.

### **2. Cough**

You may experience increased coughing and some breathlessness during or sometimes after treatment. Some medication from your doctor can alleviate these problems. If you have fever and/or your phlegm becomes dirty, green or foul smelling, please inform your radiation doctor or therapist.

### **3. Skin**

Your skin, especially at the back region, may become darker (similar to a sun tan effect). This does not require any medication and will disappear gradually after treatment.

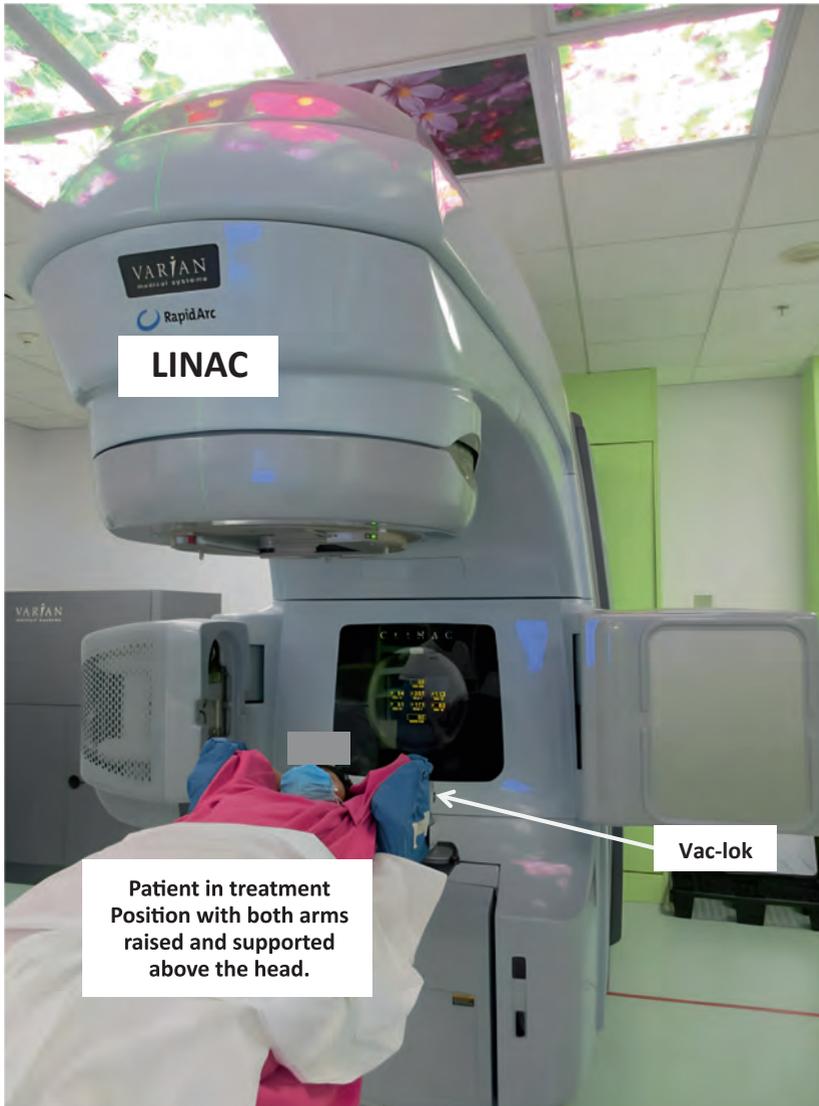
*If you experience any issues during the course of your radiotherapy, please do not hesitate to inform your radiation doctor or radiation therapists.*

## **What are possible late effects following chest radiotherapy?**

Rarely, some patients may develop side effects weeks or months after radiotherapy. These are typically known as late effects. Possible late effects include:

1. Inflammation or scarring of the treated lung, which can result in breathlessness or cough.
2. Narrowing of the gullet which can make it difficult to swallow.
3. Thinning of the bones and ribs, which may result in chest discomfort.

Targeted ways of radiotherapy delivery have reduced the risks of these late effects happening. Therefore, most patients do not experience them. If you are worried about late effects, please talk to your radiation doctor for more advice.



**LINAC**

**Vac-lok**

**Patient in treatment  
Position with both arms  
raised and supported  
above the head.**

*Figure 2. A patient undergoing chest radiotherapy. Radiation is directly aimed at the tumour target from a radiotherapy machine known as a linear accelerator (LINAC).*



### How does chemotherapy work?

Chemotherapy works by interfering with DNA, which results in cell death. Normal healthy cells are also affected this process, which gives rise to side effects such as hair loss and low blood counts as common examples.

### What is the chemotherapy process like?

- If your doctor has recommended you chemotherapy, he/she will make arrangements for treatment in the ambulatory treatment unit (ATU) and explain the treatment schedule to you.



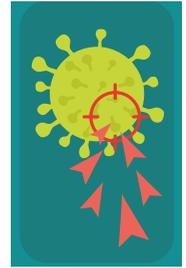
Figure 3. ATU at NCCS where chemotherapy is given.

- Chemotherapy is usually given via a drip and/or injection
- Some chemotherapy may be given over a few days consecutively/ whilst others are given once a week; or once every 3-4 weeks.
- The duration of chemotherapy may depend on several factors such as the stage of your disease, the type of chemotherapy used, as well as the response of your lung cancer to chemotherapy, and the side effects experienced

### What are common side effects related to chemotherapy?

Side effects will differ between the various chemotherapy agents. Common general side effects would include hair loss, fatigue, change in taste, nausea/vomiting and low blood counts as some examples. These side effects are usually temporary and steps can be taken to prevent or reduce them. Your doctor will discuss in detail what other specific side effects to look out for.

If you are on Pemetrexed (Alimta) chemotherapy, you will need regular oral Folic acid and Vitamin B12 injections to prevent side effects such as low blood counts.



### How does targeted therapy work?

Patients' whose tumours have specific abnormalities present within the lung cancer cells may be sensitive to certain drugs which target these specific abnormalities. The most common ones would be EGFR and ALK, for which oral tyrosine kinase inhibitors (TKI) tablets have been shown to have benefit over standard chemotherapy.

### What are some examples of targeted therapy?

EGFR TKI: Gefitinib, Erlotinib, Afatinib, Osimertinib

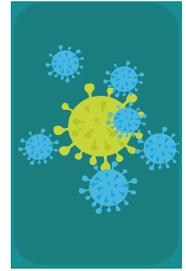
ALK TKI: Crizotinib, Ceritinib, Alectinib, Lorlatinib

### What are common side effects caused by targeted therapy?

Side effects are dependent on the type of drug and the severity may vary from person to person. Common side effects include rashes, diarrhoea, paronychia (nail bed infection), nausea/vomiting and oral ulcers. These are usually mild and manageable with medications and/or medication dosage adjustments. Rare but potentially dangerous side effects would include pneumonitis (inflammation of the lungs) and transaminitis (liver inflammation). Blood tests will be done at clinic visits to monitor your organ function. If you experience persistent fever, worsening breathlessness and/or cough please inform your doctor immediately.



Figure 4. Paronychia - infection of nail bed.



## How does immunotherapy work?

Our body's immune system not only helps us to fight infection, but can also help to prevent or slow cancer growth. However, cancer cells have developed ways to hide from the immune system and continue to survive and grow. Immunotherapy refers to drugs that may help to activate and work with a person's immune system to recognise and attack cancer cells.

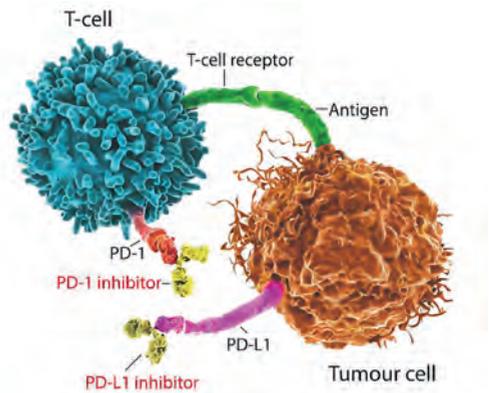
Common types of immunotherapy used in lung cancer are called 'checkpoint inhibitors' which are drugs which target a protein called PD-1 or its partner protein PD-L1. These proteins are immune checkpoint proteins which prevent the immune system from killing cancer cells. Checkpoint inhibitors work by interfering with this process, thereby activating the immune system to destroy cancer cells. These drugs are given in a similar way to chemotherapy by a drip in our treatment unit.

Other types of immunotherapy are being tested in lung and other cancer types such as (i) combinations of checkpoint inhibitors or combinations of checkpoint inhibitors with other drugs and (ii) vaccines. Some of these may be given in the context of a clinical trial.

## Who is suitable for immunotherapy?

Immunotherapy can be used as adjuvant treatment in Stage 3 NSCLC following chemotherapy and radiotherapy. It can also be used with chemotherapy before surgery in some patients.

It is more commonly used to treat Stage 4 lung cancer especially in patients not suitable for targeted therapy, either in combination with other drugs or as a single agent. PD-L1 is a biomarker which is routinely tested on lung biopsy specimens and the PD-L1 score of the cancer helps doctors decide what would be the best treatment strategy.



## What are the common side effects from immunotherapy?

Immunotherapy in general is fairly well tolerated although fatigue may be experienced. The side effects are mainly related to overactivity of the immune system resulting in inflammation of various organs, of which the common ones affected are skin, thyroid, lungs and liver. Rarely, patients may develop life-threatening side effects related to inflammation of vital organs such as the brain and lungs and/or heart. Please inform your doctor if you are feeling unwell and seek medical attention early.

## What are clinical trials?

Clinical trials are medical research studies involving people. Specifically for cancer research, these studies are performed with the intention of improving the ways we treat and prevent cancer.

## Why should I participate?

Clinical trials are needed to establish the efficacy and safety of breakthrough treatments which can become the new standard of care. Participating in a clinical trial may also give you access to cutting-edge treatment options which may have not been readily available otherwise.

Clinical trials not only have potential direct benefit to the participant, but also help others. When you participate in a clinical trial, you are contributing to a body of knowledge which serves to improve our understanding of cancer and also advance treatment and prevention strategies.



## 5. Multidisciplinary Care

### **What is multidisciplinary care and who may be involved in my care?**

Treatment of lung cancer involves multiple specialties, otherwise termed as multidisciplinary care. The specialties involved may include some, if not all, of the following:

- Medical Oncology
- Radiation Oncology
- Respiratory Medicine
- Cardiothoracic Surgery
- Diagnostic Radiology
- Interventional Radiology
- Palliative Medicine
- Allied Health Services

### **Access to Allied Health professionals**

National Cancer Centre Singapore provides a myriad of trained Allied Health professionals to help patients through their cancer journey. These include:

- Oncology- trained nurses
- Oncology-trained pharmacists
- Physiotherapists
- Occupational therapists
- Speech therapists
- Medical Social Workers

*Please ask your doctor if you are interested to know more or access any of these services*



### What is Supportive and Palliative Care?

Supportive and palliative care is an **approach to care**, that focuses on the management of problems related to your cancer and its treatment. It aims to improve the quality of life of cancer patients and their families and is **appropriate at any stage** of your illness. It has been strongly recommended by major clinical cancer societies that supportive and palliative care be given alongside usual oncology care for any patient with advanced cancer.

In NCCS, our supportive and palliative care specialists from the Division of Supportive and Palliative Care (DSPC) work very closely with your lung cancer team. Our DSPC team consists of a multidisciplinary team of doctors and nurses. Your doctor may have already referred you to a supportive and palliative care specialist before or during your treatment; or you may be newly introduced to this team. This does not mean your doctor has abandoned or given up on you, but rather, your doctor has done this, to ensure that you will have an **additional layer of care**, support and attention - to allow you and your caregivers, to cope with the physical, emotional, mental, social, spiritual and practical needs.

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As a patient living with lung cancer, here are some of the symptoms that might occur (the list is not exhaustive, but we have listed the more common symptoms).

We hope to provide you with some quick tips regarding how you can cope better with these symptoms.

### Symptoms that a lung cancer patient might face:

#### A. Breathlessness

##### **Definition**

Shortness of breath, also known as dyspnoea or breathlessness, refers to the feeling of having difficulty in breathing. The severity may vary from person to person, but the feeling of suffocation can cause much anxiety and distress in many people with cancer.

There are many possible causes of breathlessness, which may (or may not) be related to your cancer.

##### **Causes:**

- Cancer blocking the airways
- Fluid surrounding the lungs (Pleural effusion)
- Chest infection (Pneumonia)
- Low red blood cell levels (Anaemia)
- Pressure from a swollen abdomen or liver
- Blood clot in an artery in the lung
- Side effects of anticancer treatment (e.g. scarring for radiation therapy or surgery)
- Stress, anxiety or other psychological problems
- Other chronic problems e.g. asthma, chronic airways disease, heart failure

##### **Treatment**

Your doctor will ask you further questions (e.g. when it started, associated symptoms) and conduct a physical examination, to find out the cause of your shortness of breath.

***New or sudden onset shortness of breath usually requires urgent attention to investigate and treat the cause, whilst more chronic shortness of breath can be managed with medicines to relieve the symptom.***

Your doctor may also order further investigations (e.g. x-rays) if needed. Treatment for dyspnoea depends on its cause.

Some of the methods to manage your breathlessness include:

**Non-pharmacological methods:**

1. General/ environmental e.g. maintaining a calm atmosphere, encouraging air flow to the face (From the window or a hand-held fan)
2. Energy conservation (The 4 'P's')
  - i) **Planning**
    - Plan out the activities in advance to spread the energy consuming ones throughout the day/week
    - Assemble all supplies for a task first to avoid extra trips
    - Organize the home and working environment by placing commonly used items within reach
  - ii) **Prioritize**
    - Carry out most important task first and delegate the less important tasks for later
    - Engage the help of family members for strenuous task such as scrubbing floor
  - iii) **Pacing**
    - Carry out one activity at a time
    - Allow for ample time to complete activities and incorporate frequent rest
    - Perform task at a moderate rate and avoid rushing
  - iv) **Positioning**
    - Perform all tasks in sitting if possible e.g. showering, dressing or cooking
    - Avoid overhead reaching tasks and hold the object close to the body
    - Avoid tasks that require stooping or crouching
    - Support your arm onto surfaces when carrying out tasks using your hands

When sitting on your chair or sofa, sit upright with your back against the chair with feet apart, and lean forward with your arms on your knees



When standing, lean back against the wall with your feet slightly apart. Keep your shoulders relaxed



### 3. Learning relaxation techniques

#### 4. Using pursed lips breathing

##### i) Pursed Lip Breathing Technique:

- Control breathing rhythm using pursed lip technique.

##### ii) To get speed and posture of your body into the rhythm of breathing:

- Breathing in when stretching out your arms and expanding chest (E.g. reaching up for things or straightening up your trunk)
- Breathing out when getting your limbs back towards your body (E.g. Crouching)

##### iii) Coordinate breathing with body movement:

- Coordinate exhalation phase of breathing for exertive movements.
- Breathe in while preparing for exertion, breathe out when delivering a force.



## **Application of Energy Conservation in basic self-care**

### Feeding:

- Take small and frequent meals.
- Maintain good and supported posture.

### Grooming:

- Perform tasks in sitting.
- Use small towel to minimise effort in wringing.
- Use aids when possible, example electric toothbrush and electric razor.

### Dressing:

- Perform task in sitting.
- Wear loose, comfortable clothing.
- Wear shoes without shoelaces.
- Get help if needed.

### Toileting:

- Raise height of toilet seat.
- Maintain good intake of fibre.
- Maintain good ventilation in the toilet.

### Bathing:

- Bathe during the day when you have the most energy.
- Set up environment before bath.
- Sit to bathe.
- Use aids. Example long handed sponge.
- Pace tasks to allow rest in between if necessary.

### Using a handheld fan:

- Using a handheld fan may be helpful to ease your breathlessness.
- Get into comfortable position, hold the fan yourself if possible about 15cm away from your face.
- Allow the cool air to blow around the middle part of your face.

## **Pharmacological methods**

These can include:

1. Oxygen therapy
2. Inhalers or nebulizers
3. Low dose opioids (especially if its caused by cancer)

Your doctor will have a discussion with you regarding your medication and the benefits and side effects of the medication. Opioid medications are not addictive and are safe for consumption, if prescribed for the appropriate condition and in the appropriate dose.

Other methods for managing your breathlessness could involve referring you to another group of professionals e.g. physiotherapists or occupational therapists to help you manage your breathlessness.

## Pleural Drain

Some patients develop fluid collections in their chest which can make it difficult for them to breathe especially when doing some physical activity for example, walking or climbing stairs. It may be necessary to remove this fluid to help the lungs expand again. This is done under sterile conditions by inserting a small needle through the skin into the chest cavity under ultrasound guidance. This is known as “fluid aspiration”.

In many cases, it is necessary to insert a small soft plastic tube to allow the fluid to drain out gradually over a few days. The tube is connected to a specialised plastic box known as an underwater seal. Under sterile conditions, a small needle is inserted through the skin into the chest cavity under ultrasound guidance. Then, a wire inserted through the needle and the needle is removed. Then the soft tube is inserted by sliding it over the wire, and then the wire is removed. The tube is stitched to the skin. This is known as “fluid drainage”.

Both the fluid aspiration and fluid drainage procedures are commonly performed and are considered very safe. Very uncommonly, there may be problems due to bleeding, infection, tube dislodgement, tube blockage or pneumothorax (air in chest cavity).



### Ultrasound guided pleural drainage

This image shows the ultrasound scan of a patient with a large pleural effusion (shown with the red arrow). The lung is collapse (white arrow). A soft tube (green arrow) has been inserted from the skin, through the chest wall into the fluid to allow this fluid to drain out slowly. The tube will be stitched to the skin to prevent it from falling out and will be connected to an underwater seal box.

## B. Pain

### Definition

Pain is an unpleasant sensation and experience caused by damage to any body tissue or nerve. Although it may seem common, not every person with cancer will experience pain. Even if you do, it may help to know that all pains can be treated, and most pains can be controlled.

### Causes of pain

These can be related to:

- The direct effect of cancer damaging or affecting body tissue or nerves
- Cancer treatment e.g. damage to nerve due to previous treatment or previous surgery

### Treatment

As treatment of pain depends on its cause, your doctor will ask you more questions regarding your pain (e.g. when it first started, how it feels like) and perform a physical examination to find out what is causing the pain. Your doctor may also advise for further investigations (e.g. x-rays) if needed.

### Treatment then involves:

1. Treating the underlying cause whenever possible
2. Medications for pain relief e.g. Panadol, opioids like tramadol, morphine, or other medications e.g. non-steroidal anti-inflammatory medications
3. Interventional methods for pain relief e.g. nerve block, vertebroplasty or kyphoplasty
4. Referral to other healthcare professionals to help with pain management e.g. physiotherapists, occupational therapists

*Your doctor will have a discussion with you regarding your treatment and the benefits and side effects of the medication. Opioid medications are not addictive and are safe for consumption, if prescribed for the appropriate condition and in the appropriate dose.*

## C. Cough

### Definition

A cough is a natural reflex and is your body's way of clearing the airways of irritants and protecting your lungs from infection.

A cough can be acute (starts suddenly, lasts less than 3 weeks) or persistent (lasts more than 8 weeks).

A cough that brings up mucus or other secretions is called a productive (or wet cough), one that does not is called a dry cough.

### Causes

These can be related to the

- underlying cancer itself,
- its treatment (e.g. post radiotherapy),
- medications used to treat other conditions e.g. hypertension (e.g. Angiotensin-converting enzyme [ACE] inhibitors e.g. enalapril)
- non-cancer causes e.g. infection or other chronic lung conditions e.g. asthma, chronic obstructive pulmonary disease, Gastroesophageal reflux disease

Danger signs (which you should tell your doctor about) include:

- coughing up blood
- coughing up coloured mucus
- experiencing other serious symptoms with your cough e.g. worsening breathlessness, change in the roughness of your voice, trouble swallowing, chest pain, fever, or a sore throat

### **Treatment**

Your doctor might order up some tests to diagnose the reason for your cough. Your doctor might also start some medicines. These could include:

- mucus loosening expectorants e.g. guaifenesin
- cough suppressants e.g. dextromethorphan, codeine
- antihistamines/decongestants e.g. chlorphenamine / pseudoephedrine

Some patients might also undergo specific treatment that target the tumour causing the cough, e.g. chemotherapy, radiation, surgery. Other methods to help manage the cough include:

- avoiding smoking/ second-hand smoke
- taking a hot shower to loosen mucus
- staying hydrated (to make mucus in the throat thinner)
- sucking on cough drops / lozenges
- try relaxation techniques, e.g. deep breathing

*Useful resources:*

<https://www.cancer.net/coping-with-cancer> (doctor approved information from ASCO)

<https://www.nccs.com.sg/patient-care/Pages/Coping-with-Cancer-and-treatments.aspx>

Living with advanced cancer or being told that treatment is no longer working can cause you to experience a wide range of emotions. You may be anxious about the uncertainties ahead, or you may feel defeated that your cancer has progressed despite everyone's best efforts. You may feel sad or perhaps worry about leaving your loved ones behind. These feelings are normal, and there is no right or wrong to how you should feel. Many people find that talking to their families, close friends or healthcare team about their feelings and concerns help them feel and plan better during this time.

Below are some common topics that you might feel that you want to talk to your loved ones about:

1. Resolving unfinished business and making a legacy
2. Discussing and recording your care preferences e.g. through an Advance Care Plan or a Advanced Medical Directive
3. Putting your financial and legal matters in place
4. Deciding on funeral matters
5. Deciding on tissue, organ and body donations

The following are some useful resources and readings:

1. Advanced Medical Directive:  
<https://www.moh.gov.sg/policies-andlegislation/advance-medical-directive>
2. Advance Care Planning:  
<https://www.livingmatters.sg/advance-careplanning/about-acp/>
3. Lasting Power of Attorney:  
<https://www.msf.gov.sg/policies/Pages/LastingPower-of-Attorney.aspx>
4. Human organ transplant act:  
<https://www.gov.sg/factually/content/what-ishota-all-about>
5. The National Environment Agency: Post-death matters  
<https://www.nea.gov.sg/our-services/after-death/post-deathmatters/arranging-a-funeral>
6. Singapore Hospice Council:  
<https://singaporehospice.org.sg/>

*Should you feel you need more help about these topics, please ask your healthcare team about it. They might consider making a referral to the appropriate healthcare specialist for you to further discuss this.*



### **What about caregivers?**

Below are some common questions that caregivers might ask.

#### **Are caregivers expected to put up a strong front all the time?**

Caregiver stress is real. Take time to pause and reflect. Do acknowledge your feelings regularly. You are allowed to feel sad or inadequate. You are not expected to know everything. You are definitely allowed to rest.

#### **Should I approach end of life topics with my loved one?**

Not all loved ones might be ready to have this conversation with each other. However, along this journey, there are certain trigger points that might be important for one to have a frank and open conversation with each other (such as whilst one is approaching a change in different treatments or whilst one notices that your loved one is getting weaker)

#### **How can I approach end-of-life topics with my loved one?**

You do not have to approach these topics if you are not comfortable. But if you would like to, here are some things you can do while discussing end-of-life topics with your loved one. Listen actively and observe if there are underlying fears, anxiety and worries. Talking about these emotions and issues earlier will allow for one complete unfinished business, encourage reconciliation or forgiveness in relationships.

Overall, should you feel you need more help about these topics, please ask your healthcare team about it. They might consider making a referral to the appropriate healthcare specialist for you to further discuss this.

## 6. Rebiopsy Programme

### Why do I need a repeat biopsy if I already had one at diagnosis?

Cancer cells can acquire mutations over time which change their behavior including response to treatment. A repeat biopsy may be recommended to look for these mutations to see if a change in treatment strategy would be appropriate, and/or assess suitability for clinical trials.

### How is a biopsy done?

Tissue biopsies typically involve needle biopsies, where small needles are inserted through the skin to extract cancer cells from a tumour. This is commonly done under imaging-guidance (Ultrasounds/CT scans etc). Select cases may require other biopsy methods, which your doctor will discuss with you.

### Types of tissue biopsies

- Transthoracic needle aspiration (TTNA):
  - This procedure is performed by an Interventional Radiologist under image guidance (usually using CT). The procedure is done under sterile conditions. Local anaesthesia is given to the skin which will be felt as a momentary stinging sensation. After this there should not be any significant pain. There is no need for general anaesthesia for this procedure.
  - Under image guidance, a small specialised needle is inserted through the skin directly into the lung lesion. The needle is capable of taking tiny samples of tissue which will be examined by the pathologist to detect the nature of the lesion. In some cases, additional tests to check for infection may also need to be performed. Excess tissue may be frozen for later use in case more testing is needed in future.



#### Transthoracic lung biopsy (TTNA)

This shows a CT scan image of a patient undergoing a lung lesion biopsy. The needle is shown by the **green arrows** the lesion (tumour) in the left lung is shown by the **red arrow**. The needle has two parts: the inner part can be inserted several times to take several small samples. The outer part only needs to be inserted once.

- **Transbronchial lung biopsy (TBLB):** a bronchoscope will be guided down your throat into the lungs to reach the tumour. This is usually done with sedation.
- **Core biopsy:** A small needle is inserted through the skin into the tumour, commonly a lymph node

*Surgical biopsy: done under general anaesthesia either through minimally invasive techniques or open surgery Liquid biopsies usually involve blood draws.*

## 7. How will I afford treatment?

Cost of treatment is an understandingly important concern for patients and we are here to help.

Many anti-cancer drugs offered at our centre are standard cancer treatment options which are covered by Medisave/Medishield. Patient assistance programmes and/or subsidies are also available for selected drugs including targeted therapy and immunotherapy which tend to be costlier.

NCC also has dedicated Medical Social Workers (MSWs) who are able to provide financial assistance for needy patients.

If you have financial concerns, please speak to your doctor.

## 8. Glossary/Useful terms to know

### **Adenocarcinoma**

A subtype of cancer which originates from the lining of organs, for example the airways

### **Adrenal gland**

A small organ on top of each kidney which produces hormones

### **ALK (Anaplastic lymphoma kinase)**

A type of protein on the edge of a cell that sends signals for cell growth

### **Biopsy**

A procedure that removes fluid or tissue samples for testing

### **Bronchus**

One of the two main airways that extends into the lungs

### **Carcinoma**

Cancer arising from cells that line the inner or outer surfaces of the body

### **Computed Tomography (CT)**

A scan that uses x-rays from many angles to make a picture of the insides of the body

### **Contrast**

A dye put into the body to make clearer pictures during scans

### **EBUS (Endobronchial ultrasound)**

A procedure that involves putting an ultrasound probe down the windpipe to visualize structures inside the lung. Commonly combined with a biopsy.

### **EGFR (Epidermal growth factor receptor)**

A protein on the edge of a cell that sends signals to the cell to grow

### **FNA (Fine needle aspiration)**

A procedure that removes tissue samples with a very thin needle

### **Gene**

Coded instructions in cells for making new cells and controlling how cells behave

### **Invasion**

Growth of cancer cells from their origin into another tissue

### **Lymph Node**

Small glands that are widely present throughout the body and form part of the immune system

### **Metastasis**

The spread of cancer from the original tumour site to other areas of the body

**MRI (Magnetic Resonance Imaging)**

A scan that uses radio waves and magnets to make pictures of the insides of the body

**Mutation**

Abnormal changes in coded instructions within cells (genes)

**NGS (Next Generation Sequencing)**

A modern technology used to sequence DNA and RNA efficiently

**NSCLC (Non-small cell lung cancer)**

A cancer originating from lung cells

**Pericardiocentesis**

A procedure that removes fluid from around the heart with a needle

**PET (Positron Emission Tomography)**

A scan which uses a radioactive drug (tracer) to show activity within the body on a cellular level

**Pleural effusion**

An excess of fluid between the two layers of tissue lining around the lungs

**Prognosis**

The likely course and outcome of a disease

**PFT (Pulmonary Function Tests)**

A set of breathing tests used to test the strength of the lungs

**ROS-1**

A type of protein on the edge of a cell that sends signals for cell growth

**SCLC**

Small cell lung cancer

**TTNA (Transthoracic needle aspiration)**

A procedure that removes tissue samples with a thin needle guided through the chest wall

## 9. Frequently Asked Questions

- **Can I continue working while on treatment?**

Every patient is unique and tolerates treatment differently, whether your line of work increases your risk of catching infections is also relevant to patients who are on chemotherapy. It would be best to discuss this with your doctor so all these factors can be considered before coming to a decision.

- **Can I take TCM while on treatment?**

In general, we would advise against taking traditional Chinese Medicine (TCM) when undergoing anti-cancer treatment (including chemotherapy, immunotherapy and targeted therapy) to avoid risks of drug interactions which may cause undesirable side effects and/or compromise treatment effectiveness. Please speak to your doctor or pharmacist if you have further queries.

- **What kind of food should I take or avoid while on treatment?**

For patients on chemotherapy, we advise against taking food which has a higher chance of causing bacterial infections such as uncooked or unfresh food.

LEAP held a webinar on this topic in May 2020, the video is available on the NCCS Youtube channel.

## 10. How can I find out more?

We hope you have found this booklet helpful. Please email us at [leap@nccs.com.sg](mailto:leap@nccs.com.sg) if you have further queries.

- These are useful websites to refer to if you would like more information
- LCCS/LEAP website: <https://lccs.com.sg/leap>
- NCCS: <https://www.nccs.com.sg>
- Clinical trials at NCCS:  
<https://www.nccs.com.sg/research-innovation/clinical-trials/current-clinical-trials>
- BC Cancer Agency: <http://www.bccancer.bc.ca>
- NCCN: <https://www.nccn.org>

### **Acknowledgment:**

*We would like to thank Dr Apoorva Gogna (Interventional Radiology), Dr Cynthia Chia (Cardiothoracic Surgery), Dr Kevin Chua (Radiation Oncology) and Dr Shirlyn Neo (Palliative Medicine) for their invaluable help in the production of this pamphlet.*





For more information on Lung Cancer, please scan the QR code below:

