



National University  
Heart Centre  
Singapore



# Thoracic Surgery: Patient Information Brochure

# Contents

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- NUHCS Thoracic Surgery ..... 3**
- What is Thoracic Surgery..... 4**
- Anatomy of the Lung..... 4**
- Surgery Planned..... 6**
- How is the Surgery Performed ..... 8**
- What are the Risks of Surgery ..... 9**
- Lead Up to Surgery ..... 10**
- Surgery Day ..... 11**
- Post-Operative Care ..... 12**
- When Will I Know My Results ..... 16**
- Staging for Lung Cancers ..... 17**
- FAQ ..... 18**

# NUHCS Thoracic Surgery

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Established in 2007, the NUHCS Lung Surgery Team today carries out more than 400 lung surgeries each year. In 2009, NUHCS is the first centre in Singapore to carry out the Uniportal Video-Assisted Thoracic Surgery (UVATS) - where lung surgery is performed with only a single cut of about 3cm at the side of the chest - and is the only centre in Singapore with a full team of experienced UVATS thoracic surgeons supported by a team of specialty care nurses and case managers. In addition to the wide range of lung conditions, the centre also manages rarer conditions such as Hyperhidrosis (excessive sweating), Pectus Chests (pigeon or funnel chests), and Rib Fractures.



NUHCS Thoracic Surgery Team

# What is Thoracic Surgery?

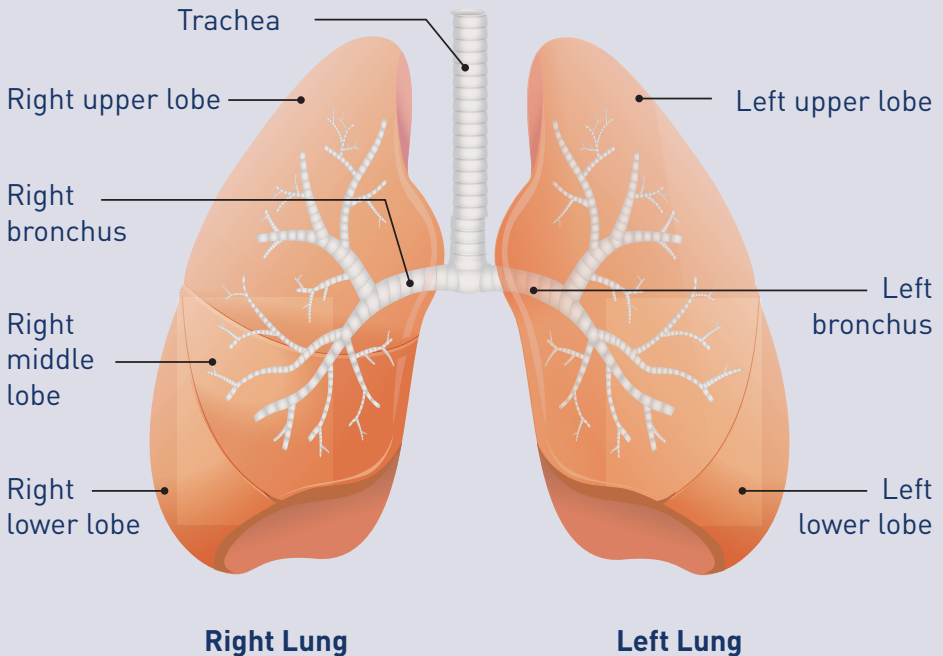
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Thoracic Surgery is surgery performed to treat various parts of your chest including the lungs, diaphragm, chest wall and mediastinum. Our surgeons are trained to do both minimally invasive and open surgeries depending on your needs.



## Anatomy of the Lung

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Everyone has two lungs, a right and left lung. These lungs are divided into lobes, three on the right and two on the left. The lobes on the right are called the upper, middle and lower lobes. The lobes on the left are called the upper and lower lobes. Within each lobe they are also further divided into segments. Each segment has its own blood and air supply.

The lungs exist in your chest and are wrapped by two thin layers called pleura. The pleura overlying your lung is called the visceral pleura, the pleura attached to the chest wall is called the parietal pleura. Between these two pleura there is pleural fluid, a lubricant that helps your lung move within your chest.

Both lungs are connected to your nose and mouth via your windpipe. Your windpipe starts off as the trachea in your neck and as it goes down towards your lungs, divides into bronchus. These carry air from outside your body into your lungs for oxygen to be absorbed and carbon dioxide to be released.

Like all organs in your body, there are lymph nodes within and around the lung. These are mainly distributed along the bronchus.

Your lungs lie in close relation to your heart and the space between the lungs are called the mediastinum. It is for this reason thoracic surgery has its specific risks as our surgeons operate close to your vital organs.

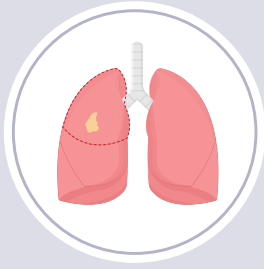


# Surgery Planned

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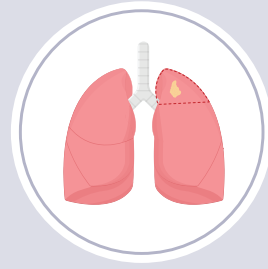
Depending on the location of your lung lesion, the surgeon would recommend an appropriate surgery to cleanly remove the lesion and ensure no cancer cells get left behind. To do this, they must not only take the lesion but a sufficient part of the lung either along the divisions (lobes and segments) or with a wedge resection. In general, the different types of surgeries can be found on page 8.





### **Lobectomy**

Removal of the entire lobe of that lung (upper, middle or lower) with its accompanying arteries, veins and bronchus.



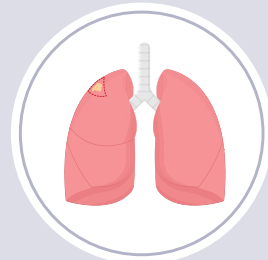
### **Segmentectomy**

Removal of the entire segment of that lung with its accompanying arteries, veins and bronchus.



### **Pneumonectomy**

Removal of one side of the entire lung (right or left) with its accompanying arteries, veins and bronchus.



### **Wedge Resection**

Removal of a part of the lung **without** the arteries, veins and bronchus.

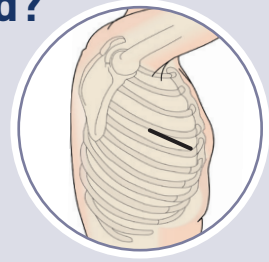


**Scan this QR code to learn more about lung surgery at NUHCS**

In addition to removing the lung, if there is suspicion of cancer, your surgeon will remove the surrounding lymph nodes to check for cancer spread to these areas. This will help remove early spread of cancer cells to these lymph nodes and help the surgeon accurately stage the cancer.

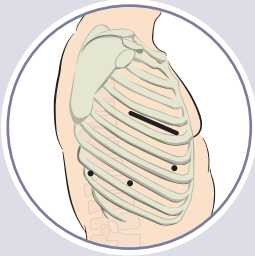
# How is the Surgery Performed?

Lung surgery is performed under general anaesthesia and there are many approaches possible. Your surgeon will discuss with you the optimal approach to facilitate the safe removal of the disease. Here are some common methods of performing lung surgery.



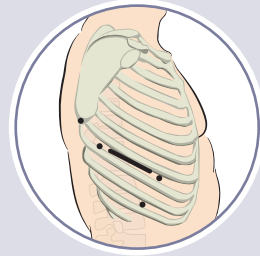
## Uniportal VATS (UVATS)

Minimal invasive surgery that involves accessing the lungs through a single 3cm incision.



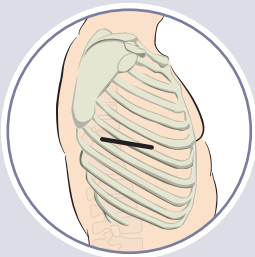
## Video Assisted Thoracoscopic Surgery (VATS)

Keyhole surgery using a telescopic camera to perform the surgery via smaller incisions to facilitate recovery and minimize pain.



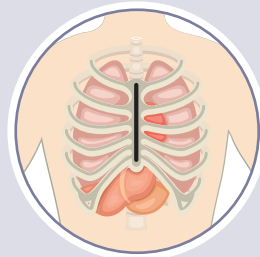
## Robotic Assisted Thoracoscopic Surgery (RATS)

Keyhole surgery using the aid of a robot to perform the surgery via smaller incisions to facilitate recovery and minimize pain.



## Open Thoracotomy

A conventional incision about 15cm long along your side and towards the shoulder plate to reach the lungs.



## Median Sternotomy

Splitting of the breast bone to reach the heart and lungs.



# What are the Risks of Surgery?

Your surgeon will advise on the potential risks of surgery specific to you. In general, here are some of the common risks:

- General anaesthesia risks including stroke, heart attack and death
- Bleeding requiring conversion
- Infection requiring wound dressings
- Air leak requiring discharge with chest drain
- Pain
- Atrial fibrillation
- Phrenic nerve injury causing diaphragmatic paralysis
- Injury to heart and major vessels
- Reoperation
- \_\_\_\_\_
- \_\_\_\_\_



## Ok, I'm agreeable for surgery, what's next?

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In order to safely perform the surgery, your surgeon will arrange necessary tests for you prior to the surgery. This may include blood tests, additional scans, heart and lung tests to ensure that you are fit to undergo surgery. You will also be seeing the anaesthetist prior to the surgery to better understand the anaesthesia plan for that day. They will also advise on the necessary medications to omit prior to surgery.

You will be contacted one working day prior to the surgery date to receive final instructions on what time and where to report. For most cases, you are allowed to admit on the morning of the surgery so you can get a good night's rest at home the day before.

In the lead up to surgery, you are advised to continue exercising to build your stamina and eat more to increase your body's nutrients. Please do not take traditional medications before and after surgery as they will often lead to unexpected complications such as bleeding.



# Surgery Day

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It is normal to feel nervous on your surgery day. You will be brought to the operating theatre and the team will check on you multiple times before administering anaesthesia. You will not be aware or feel any pain once you are under general anaesthesia.

When you wake up, it is normal to feel tired and drowsy. You will likely be in the recovery area (Post-Anaesthesia Care Unit) for observation before being brought to the ward. If you are in pain, please tell us so that we can help you with it. It is advisable to prop yourself up at least 35-40 degrees to assist with breathing and to cough up phlegm, if any, to facilitate recovery.

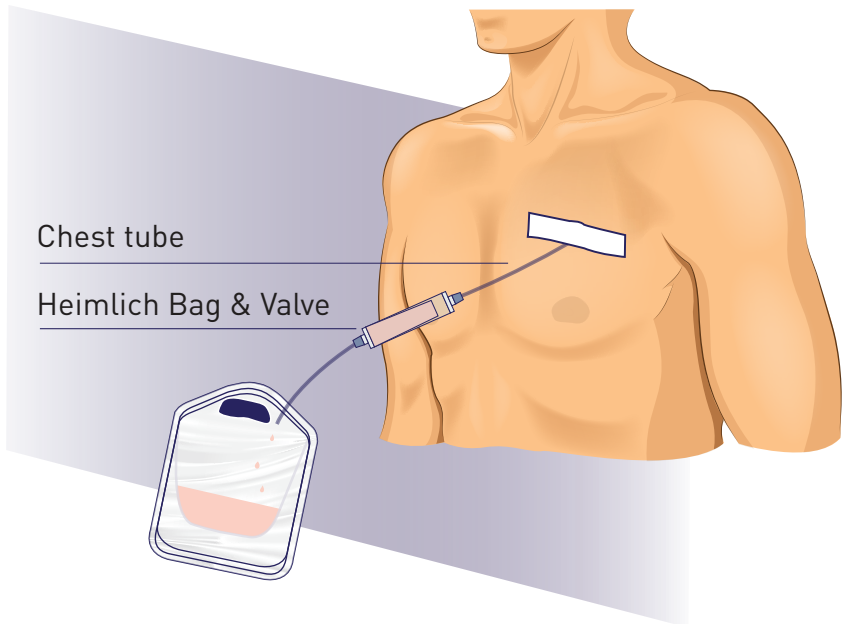


## Post-Operative Care

On the first Post Operative Day (POD), a physiotherapist will be assisting you with mobilization and deep breathing exercises.

There will be a chest drain coming out from you to drain the remaining fluid and air within your chest. This will be connected to a box which the doctor will check daily to determine your progress and recovery. Once it is safe, the chest drain may be removed on POD Day 1 – 3.

In some cases when you have persistent air leak after surgery, the chest drain may be kept and connected to a one-way valve called a Heimlich bag. Caregiver training will be provided upon discharge and you will be reviewed in the clinic weekly to assess the removal of the drain.



After your chest drain is removed, please follow the discharge post-op care listed below:

## 1. Wound care

- Shower with mild soap & water
- Ensure surgical wound is thoroughly rinsed
- Dab wound dry with a towel first and then tissue paper
- Do not rub or scratch wound
- Avoid any cream/ointment/powder to the wound
- If there are blue stitches sticking out from your incisional wound, they will be removed on your next clinic visit



## 2. Signs & symptoms of wound infection as follows:



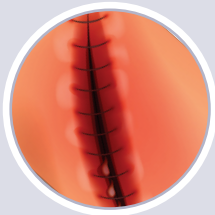
Unpleasant smell from the wound



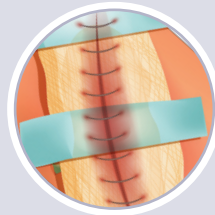
Increasing or persistent pain at the wound site



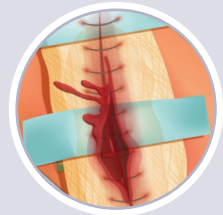
Fever above 38°C



Redness



Discharges



Excessive bleeding



**Call your Thoracic Nurse or Case Manager (office hours 9am-5pm) regarding surgical wound and pain management.**

**Name card will be provided.**

### 3. Self recovery at home

#### Incisions

You may continue to experience itchiness or tingling sensations and pain in the chest around the incision area for about 6 months. It may take up to 1 year for the itchiness/tingling sensation to be reduced.

- Soreness and numbness may occur on your incisions, back and shoulders. In the first 4-6 weeks, changes in the weather, lying in one position too long or not getting enough exercise may cause you to feel more stiff and sore.
- Bruising (especially along the incisional wound), will fade and eventually disappear.
- The lump or swelling at the top of your incision will gradually reduce over the next 3 months.
- Sharp, shooting pains that lasts momentarily may take up to 6 months to disappear.



### 4. Medication adherence

- Take the pain medications as prescribed
- Make sure the medications can last till the next follow-up appointment
- Seek medical help if there are side effects such as rash, fever, vomiting, diarrhea, severe bruising etc.





## 5. Importance of early exercise and return to physical activity

- Your physiotherapist will provide you with a customized exercise after your surgery.
- You will be encouraged to start early mobility and adequate deep breathing exercises as required.
- Good posture is important for optimal wound healing and maintenance of range and strength.
- Regular walking with slow deep breathing exercises is essential to prevent complications after surgery.
- Avoid any heavy lifting for at least 1 month after surgery.
- Only resume your usual exercise after discussion with your doctor during your next clinic session.



## 6. Lifestyle and diet modification

- STOP smoking
- Resume a well-balanced diet as soon as possible
- Increased protein intake is encouraged



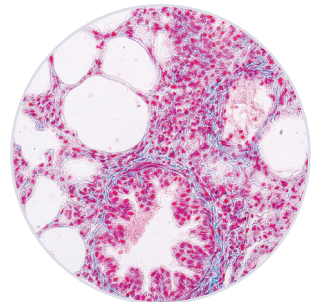
### Seek IMMEDIATE MEDICAL ATTENTION

If you experience any of the following symptoms: fever, dizziness, fainting spells, excessive tiredness, weakness, or having chest tightness and increasing shortness of breath, nausea and vomiting without apparent cause.



## When Will I Know My Results?

We send all specimens for full testing under the microscope with the pathologists. This is to be 100% sure of the diagnosis once we have removed the lesion. As such they will usually take 1-2 working weeks for the results to be out. For now, focus on recovering from the surgery.



# Staging for Lung Cancers

Depending on various factors such as the size, the extent and the spread of the cancer, it will be assigned a stage. We currently use the 8<sup>th</sup> edition of lung cancer staging to stage lung cancers. Based on the characteristics of your cancer, your surgeon will explain to you what stage you are at.

TNM 8 <sup>th</sup> - Primary tumor characteristics	
T <sub>x</sub>	Tumor in sputum/bronchial washings but not be assessed in imaging or bronchoscopy
T <sub>0</sub>	No evidence of tumor
T <sub>is</sub>	Carcinoma in situ
T <sub>1</sub>	≤ 3 cm surrounded by lung/visceral pleura, not involving main bronchus
T <sub>1a(mi)</sub>	Minimally invasive carcinoma
T <sub>1a</sub>	≤ 1 cm
T <sub>1b</sub>	1 to ≤ 2 cm
T <sub>1c</sub>	> 2 to ≤ 3 cm
T <sub>2</sub>	> 3 to ≤ 5 cm or involvement of main bronchus without carina, regardless of distance from carina or invasion visceral pleural or atelectasis or post obstructive pneumonitis extending to hilum
T <sub>2a</sub>	>3 to ≤4cm
T <sub>2b</sub>	>4 to ≤5cm
T <sub>3</sub>	>5 to ≤7cm in greatest dimension or tumor of any size that involves chest wall, pericardium, phrenic nerve or satellite nodules in the same lobe
T <sub>4</sub>	> 7cm in greatest dimension or any tumor with invasion of mediastinum, diaphragm, heart, great vessels, recurrent laryngeal nerve, carina, trachea, oesophagus, spine or separate tumor in different lobe of ipsilateral lung
N <sub>1</sub>	Ipsilateral peribronchial and/or hilar nodes and intrapulmonary nodes
2	Ipsilateral mediastinal and/or subcarinal nodes
3	Contralateral mediastinal or hilar; ipsilateral/contralateral scalene/ supraclavicular
M <sub>1</sub>	Distant metastasis
M <sub>1a</sub>	Tumor in contralateral lung or pleural/pericardial nodule/malignant effusion
M <sub>1b</sub>	Single extrathoracic metastasis, including single non-regional lymphnode
M <sub>1c</sub>	Multiple extrathoracic metastases in one or more organs

	No	N1	N2	N3
<b>T1</b>	IA	IIB	IIIA	IIIB
<b>T2a</b>	IB	IIB	IIIA	IIIB
<b>T2b</b>	IIA	IIB	IIIA	IIIB
<b>T3</b>	IIB	IIIA	IIIB	IIIC
<b>T4</b>	IIIA	IIIA	IIIB	IIIC
<b>M1a</b>	IVA	IVA	IIVA	IVA
<b>M1b</b>	IVA	IVA	IVA	IVA
<b>M1c</b>	IVB	IVB	IVB	IVB

## FAQ: My lung cancer is stage \_\_\_\_\_.

### So I'm stage \_\_\_\_\_, what now?

Your case will be discussed at a multidisciplinary board to get various specialty doctor's input on what is your next best course of action. If it is in the early stage, regular follow up with your surgeon may be enough. If there is a potential to consider further treatment such as chemotherapy, targeted therapy, immunotherapy or radiation therapy, you will be referred to the relevant specialty doctor to discuss the course of action.

### I have never smoked, why did I get cancer?

It is increasingly shown that in Asians, there are many non-smokers especially women who develop lung cancer.<sup>1</sup> This is likely due to an underlying gene mutation (eGFR mutation) in your lung. Despite the development of cancer resulting from this mutation, the good news is that there is targeted therapy available to treat cancers arising from this mutation (such as Osimertinib). Consult your oncologist for the best option to treat your disease.



## I do not want chemotherapy as I am scared of it

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Chemotherapy has improved greatly over the past few years. Nowadays, there are many newer and safer medicines that can help improve your survival even after surgery. Continual research and development efforts in the pharmaceutical industry may yield novel drug candidates, potentially leading to the introduction of new medications into the market. Check with your oncologist if you are eligible for the following targeted therapy or immunotherapy options.



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**Reference:** 1. Yang P. PS01. 02 national lung cancer screening program in Taiwan: the TALENT study. *Journal of Thoracic Oncology*. 2021 Mar 1;16(3):S58.

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Main Building Zone F  
Operating Hours: 8:00am - 5:30pm (Monday - Friday)  
Closed on Weekends & Public Holidays
- NUHCS Heart Clinic @ Ng Teng Fong General Hospital (NTFGH)  
Tower A - Specialist Outpatient Clinics Level 3, Clinic A34  
Operating Hours: 8:00am - 5:30pm (Monday - Friday)  
8:30am - 12:30pm (Saturday)  
Closed on Sundays & Public Holidays
- NUHCS Heart Clinic @ Alexandra Hospital (AH)  
Operating Hours: 8:30 am - 5:30 pm (Monday - Friday)  
Closed on Weekends & Public Holidays
- NUHCS Heart Clinic @ Jurong Medical Centre (JMC)  
Operating Hours: 8:30 am - 5:30 pm (Monday - Friday)  
Closed on Weekends & Public Holidays

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