CONDITION

Non-small cell lung cancer

Non-small cell lung cancer is a group of cancers that begin in lung cells and may spread to other parts of the body.

WHAT IT IS
Cancer arising from cells within the lungs

BODY SYSTEM
Lungs and breathing

MAIN SYMPTOMS
Persistent cough, coughing blood, breathlessness, chest pain

WHAT CAUSES IT
Acquired DNA changes, often linked to tobacco smoke

HOW IT IS DIAGNOSED
Imaging followed by biopsy and laboratory testing

MAIN TREATMENT
Surgery, radiotherapy, chemotherapy, targeted therapy, or immunotherapy

CAN IT BE CURED?
Sometimes - early-stage cancer may be cured

IS IT AN EMERGENCY?
Sometimes - severe breathlessness or heavy bleeding

LONG-TERM OUTLOOK
Best when found early; advanced cancer often needs ongoing treatment

Overview

Non-small cell lung cancer, often shortened to NSCLC, is the most common general category of lung cancer. It begins when cells in the lung develop abnormal changes in their DNA. These cells can grow into a tumour, invade nearby tissue, and sometimes spread elsewhere in the body.

NSCLC includes several cell types. The main ones are adenocarcinoma, squamous cell carcinoma, and large cell carcinoma. These names describe how the cancer cells look under a microscope. Adenocarcinoma can occur in people who have never smoked, although smoking remains an important risk factor for lung cancer overall.

NSCLC is different from small cell lung cancer. The two categories tend to grow and respond to treatment differently, so identifying the correct type matters.

The outlook and treatment options are strongly influenced by the stage. Stage describes the size and position of the cancer, whether lymph nodes are involved, and whether it has spread to distant organs. Early-stage NSCLC may be treated with the aim of curing it. Advanced cancer is often treated to control its growth, reduce symptoms, and help you live longer.

Symptoms

Early NSCLC may not cause noticeable symptoms. It is sometimes found during imaging performed for another reason or through a lung cancer screening programme.

Possible symptoms include:

These symptoms have many possible causes and do not automatically mean you have cancer. However, a persistent or unexplained change should be assessed rather than watched indefinitely.

Cancer that has spread may cause symptoms outside the chest. Examples include bone pain, headaches, weakness, confusion, or swelling around the neck and face. The exact symptoms depend on which part of the body is affected.

- A new cough or a cough that does not go away
- A long-standing cough that changes
- Coughing up blood
- Shortness of breath or wheezing
- Chest, shoulder, or upper-back pain
- Repeated chest infections
- A hoarse voice
- Unexplained weight loss, reduced appetite, or tiredness

Causes and risk factors

NSCLC develops because of DNA changes that allow lung cells to grow without the normal controls. These changes usually build up during life. NSCLC is not generally inherited directly from a parent, although inherited traits may influence a person's risk.

Tobacco smoke is the leading preventable risk factor. Risk is affected by how much and how long a person has smoked. Cigars, pipes, and second-hand smoke can also increase risk. Stopping smoking lowers risk over time, including after many years of smoking.

Some people with NSCLC have never smoked. Other factors that may contribute include:

Having a risk factor does not mean you will develop NSCLC. Some people develop it without a clear cause.

- Radon, a naturally occurring radioactive gas that can collect indoors
- Workplace exposure to substances such as asbestos, silica, diesel exhaust, arsenic, or some metals
- Air pollution
- Previous radiotherapy to the chest
- A personal or family history of lung cancer
- Long-term lung conditions that cause scarring

Diagnosis

Assessment usually begins with questions about your symptoms, smoking and work history, general health, and medicines. A clinician may listen to your chest and check for swollen lymph nodes or other physical changes.

A chest X-ray may be an initial test, but it cannot reliably confirm or exclude lung cancer. A CT scan gives more detailed images of the lungs and nearby structures.

A definite diagnosis usually requires a biopsy. This means removing cells or a small tissue sample for examination in a laboratory. The method depends on where the abnormal area is located. Options may include:

A pathologist examines the sample to confirm whether cancer is present and identify its type. The sample may also be tested for biomarkers. These are features of the cancer cells, such as particular gene changes or the level of a protein called PD-L1. Results can show whether targeted therapy or immunotherapy may be useful.

Further tests establish the stage. These may include PET-CT, brain MRI or CT, and sampling of lymph nodes. Blood tests check general health and how well organs such as the liver and kidneys are working. Breathing and heart tests may be needed before surgery or certain other treatments.

- Bronchoscopy, using a thin camera passed through the mouth or nose into the airways
- A needle biopsy guided by CT imaging
- Ultrasound-guided sampling of lymph nodes through the airways or food pipe

- Surgery when a less invasive biopsy is not suitable or has not provided an answer

Treatment and management

Treatment is based on the cancer's type, stage, biomarkers, position, and whether it can be removed safely. Your general health, lung function, priorities, and possible treatment effects also matter. Care is usually planned by a team that includes cancer, lung, radiology, pathology, surgery, and specialist nursing professionals.

Surgery may be offered for cancer that is confined to the lung or nearby areas and can be removed. The surgeon may remove a small part of the lung, one lobe, or occasionally an entire lung. Nearby lymph nodes are usually checked. Some people receive drug treatment before or after surgery to reduce the risk of cancer returning.

Radiotherapy uses focused radiation to damage cancer cells. Highly targeted radiotherapy may be used instead of surgery for some small, early cancers. It can also be combined with chemotherapy for locally advanced cancer or used to ease pain, bleeding, airway blockage, or symptoms from cancer elsewhere.

Chemotherapy uses medicines that damage rapidly dividing cells. It may be given before or after surgery, alongside radiotherapy, or as treatment for advanced cancer. Side effects depend on the medicines used and can often be reduced with supportive treatment.

Targeted therapy acts on a particular change that helps cancer cells grow. It is suitable only when testing finds a matching biomarker. Because cancer can change over time, another tissue biopsy or a blood test for tumour DNA may sometimes be considered if treatment stops working.

Immunotherapy helps the immune system recognise or attack cancer. It may be given alone or with chemotherapy, depending on the stage, biomarker results, and other health factors. It can sometimes make the immune system inflame healthy organs, so new symptoms during treatment should be reported promptly.

Supportive and palliative care can be provided alongside cancer treatment at any stage. It can help with breathlessness, cough, pain, fatigue, appetite, sleep, and emotional or practical concerns. Receiving palliative care does not necessarily mean cancer treatment has stopped.

Complications

NSCLC can block an airway, cause part of the lung to collapse, or lead to repeated infections. Fluid may collect around the lung, making breathing more difficult. A tumour can also cause

bleeding or press on nearby nerves, blood vessels, or the food pipe.

Cancer cells may spread to places such as the brain, bones, liver, adrenal glands, or the other lung. This can cause problems including pain, fractures, weakness, seizures, or changes in thinking.

Treatment may also cause complications. Examples include infection when blood cell counts are low, inflammation of the lungs, blood clots, nerve symptoms, or reduced lung capacity after surgery. Your team should explain which effects are relevant to your treatment and how they will be monitored.

Prevention

Not every case of NSCLC can be prevented. People who have never smoked and have no recognised exposure can still develop it.

Not smoking is the most effective way to reduce avoidable risk. If you smoke, stopping is beneficial at any age. Support may include counselling, nicotine replacement, or stop-smoking medicines where appropriate.

You can also reduce exposure to second-hand smoke. Testing a home for radon may be useful in areas where radon levels are a concern. Workplace safety measures should be followed around asbestos, silica, diesel exhaust, and other substances linked to lung cancer.

Low-dose CT screening does not prevent cancer, but it can find some lung cancers earlier. Screening is intended for people at higher risk, usually based on age and smoking history. Eligibility differs between countries and programmes. A chest X-ray is not an alternative to recommended low-dose CT screening.

Living with it and what to expect

The course of NSCLC differs from person to person. Early cancer may be removed or destroyed, followed by regular scans and appointments to look for recurrence and manage treatment effects. Follow-up is usually more frequent at first and may become less frequent over time.

Recovery after lung surgery can take weeks or months. Breathlessness and reduced stamina may improve gradually, although some loss of lung capacity can remain. Pulmonary rehabilitation, which combines exercise and education for people with breathing problems, may help selected people.

Locally advanced or metastatic NSCLC often needs treatment over months or years. Treatment may continue while it controls the cancer and side effects remain manageable. If the cancer grows, repeat testing may identify another treatment option. Some people have long periods when the cancer is stable; others have cancer that changes more quickly.

Fatigue, breathlessness, uncertainty, and the demands of appointments can affect work, relationships, sleep, and mood. Practical support, symptom treatment, rehabilitation, counselling, and peer support can all form part of care. If you smoke, stopping can improve treatment tolerance and general lung health even after diagnosis.

No follow-up plan can guarantee that cancer will not return or progress. Keeping routine appointments and reporting new symptoms allows changes to be assessed without assuming that every symptom is caused by cancer.

When to get medical help

Arrange a routine medical assessment if you have a persistent cough, a change in a long-standing cough, unexplained weight loss, repeated chest infections, ongoing chest discomfort, or worsening breathlessness. Small streaks of blood in mucus also need prompt assessment, even if you otherwise feel well.

If you are receiving cancer treatment, contact your cancer team promptly about a fever, shaking chills, a new rash, diarrhoea that continues, worsening cough, new breathlessness, unusual weakness, or other symptoms they have told you to report. Follow the team's specific instructions for treatment-related fever.

Seek emergency help for:

These signs can have causes other than cancer, but they require immediate assessment.

- Severe or rapidly worsening difficulty breathing
- Coughing up more than a small amount of blood
- New weakness on one side, a seizure, collapse, or severe confusion
- Sudden chest pain, especially with breathlessness
- Blue or grey lips, extreme drowsiness, or inability to speak normally

Common questions

Is non-small cell lung cancer curable?

Sometimes. Early-stage cancer that can be removed with surgery or treated with focused radiotherapy may be cured. Cure becomes less likely once cancer has spread to distant organs, but treatment may still shrink it, slow its growth, relieve symptoms, and extend life.

How fast does NSCLC grow?

There is no single growth rate. Some tumours change slowly, while others grow or spread more quickly. Cell type, stage, and genetic features all matter. Comparing scans taken at different times gives more useful information than estimating growth from one image.

Can you get NSCLC if you have never smoked?

Yes. NSCLC can occur in people who have never smoked. Radon, air pollution, workplace exposures, previous chest radiotherapy, inherited susceptibility, and chance DNA changes may contribute. Sometimes no clear cause is found.

What is the difference between NSCLC and small cell lung cancer?

They are different categories based on how the cells look and behave. Small cell lung cancer usually grows and spreads more quickly. NSCLC includes adenocarcinoma, squamous cell carcinoma, and large cell carcinoma, and has a wider range of surgical and biomarker-guided treatment options.

What does stage 4 NSCLC mean?

Stage 4 means the cancer has spread beyond its original lung and nearby structures, or has produced certain separate areas of cancer or fluid around the lung or heart. It is usually not considered curable, but modern drug treatments and radiotherapy can sometimes control it for meaningful periods.

Why does my tumour need genetic testing?

The testing looks for changes that cancer cells use to grow. If a treatable change is present, a matching targeted medicine may be an option. This is testing of the tumour rather than necessarily a test for a condition inherited by your family.

Sources

- National Cancer Institute. Non-Small Cell Lung Cancer Treatment (PDQ®)-Patient Version . Cancer Information Summaries
- National Institute for Health and Care Excellence. Lung cancer: diagnosis and management . NICE guideline NG122, published 2019, updated 2024

- National Comprehensive Cancer Network. NCCN Guidelines for Patients: Non-Small Cell Lung Cancer . Patient guideline
- American Cancer Society. About Lung Cancer; Signs and Symptoms; Treating Non-Small Cell Lung Cancer . Patient information
- Centers for Disease Control and Prevention. Lung Cancer: Risk Factors, Symptoms, and Screening . Patient and public health information
- US Preventive Services Task Force. Screening for Lung Cancer: US Preventive Services Task Force Recommendation Statement . JAMA. 2021;325(10):962-970