

Specimen collection 4: procedure for obtaining a sputum specimen

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Obtaining a specimen involves collecting tissue or fluids for laboratory analysis or near-patient testing, and may be a first step in determining a diagnosis and treatment (Dougherty and Lister, 2015).

Specimens must be collected at the right time, using the correct technique and equipment, and be delivered to the laboratory in a timely manner (Dougherty and Lister, 2015).

Box 1 provides a reminder of the general principle of specimen collection. These are discussed in more detail in part one of this series (Shepherd, 2017).

Sputum production

Mucus production in the respiratory tract is a normal process. It is secreted from goblet cells found in the surface epithelium lining the airways of the respiratory tract and from seromucous glands in the connective tissue layer beneath the mucosal epithelium.

The primary functions of mucus are to:

- Humidify air passing through the respiratory tract;

- Trap dust particles, bacteria and other inhaled debris;
- Destroy bacteria.

Sputum expectoration is abnormal and there is always an underlying pathological cause. Such causes include:

- Effects of smoking on the airway;
- Infection (viral, bacteria or fungal);
- Chronic lung disease, such as chronic obstructive pulmonary disease and asthma;
- Cystic fibrosis.

Secretions in the lower airways create an ideal environment for the growth of bacteria (Dougherty and Lister, 2015) and the presence of infection can increase and change the nature of mucus leading to the need to expectorate and cough.

Principles of sputum specimen collection

The aim of sputum collection is to identify the bacterial, viral or fungal cause of a suspected infection and its sensitivities to antibiotics. A specimen is indicated if patient has:

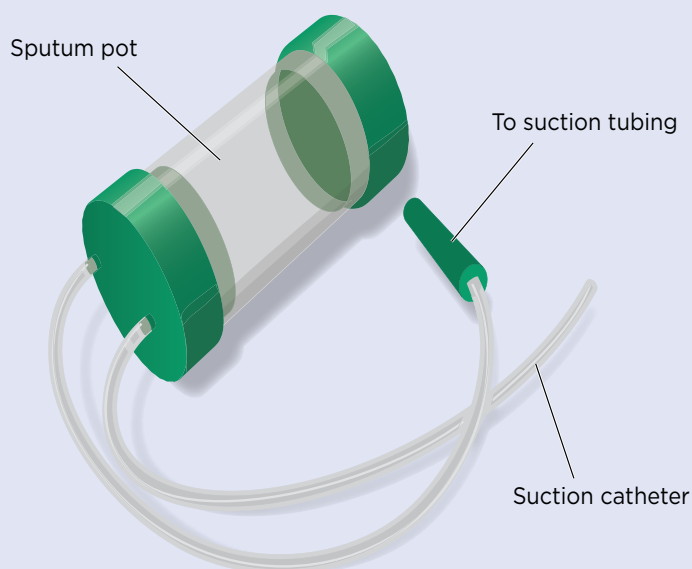
- Clinical signs of infection including a productive cough and purulent sputum;
- Signs of systemic infection;
- Pyrexia of unknown origin (Dougherty and Lister, 2015).

It is difficult to accurately assess the amount of sputum produced but it may be described by its colour and consistency. It is important to consider the characteristics of sputum as part of an overall patient assessment. Sputum may be described using the following terms (Richardson, 2003), which can aid diagnosis of the cause:

- Muroid – containing or resembling mucus;
- Purulent – containing pus;
- Mucopurulent – containing pus and mucus;
- Frothy – visible froth;
- Viscous – thick and sticky;
- Blood-stained – visible blood present.

Yellow, orange or green sputum is commonly associated with bacterial or viral infection (Dougherty and Lister, 2015). Red sputum indicates the presence of blood and may suggest tuberculosis or cancer (Richardson, 2003), or infection, particularly

Fig 1. **Sputum trap**

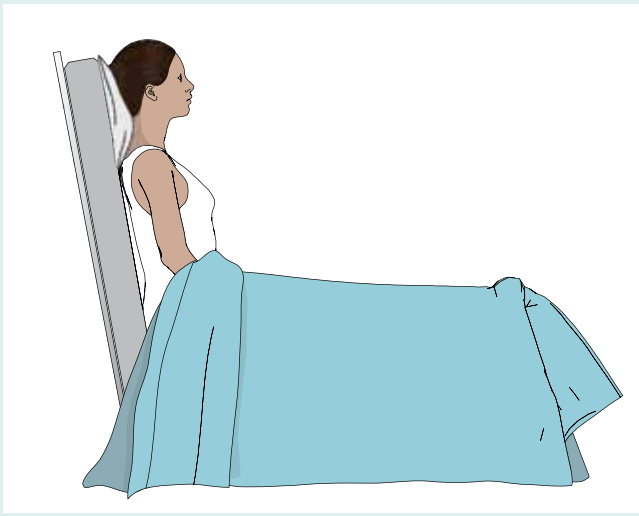


A sputum trap is connected to the suction catheter to collect the sputum using oropharyngeal or endotracheal suctioning

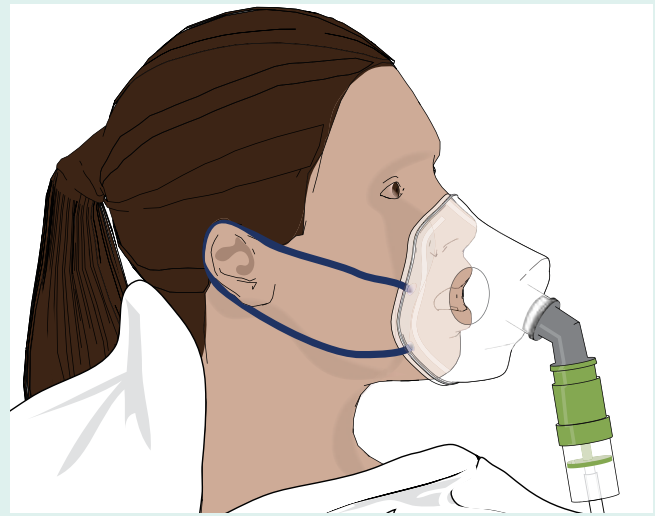
Nursing Practice

Practical procedures

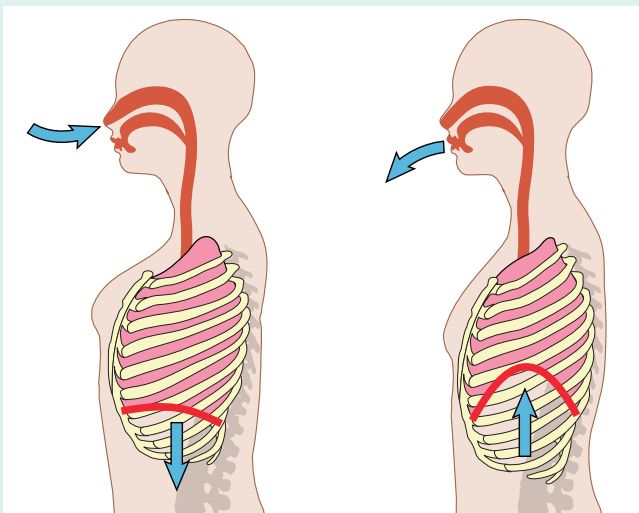
Fig 2. The procedure



2a. Position the patient upright in a chair or in bed in the Fowler position



2b. A sodium chloride nebuliser can help loosen secretions



2c. Ask the patient to take deep breaths – in through the nose and out through the mouth – to help loosen secretions



2d. Collect the specimen in the pot and seal it with a lid to prevent contamination and reduce the risk of cross infection

in bronchiectasis and fungal growths such as aspergilloma in immunocompromised patients. Expectorating large amounts of white frothy sputum may be a sign of pulmonary oedema.

Sputum samples

Sputum samples can be obtained using a non-invasive or invasive method and ideally should be collected before antibiotics are started.

Invasive methods include oropharyngeal or endotracheal suctioning; these are used with patients who are intubated. A sputum trap is connected to the suction catheter to collect the sputum (Fig 1) (Brekle, 2017).

Obtaining sputum using suctioning requires specific skills and nurses need to be aware of potential side-effects, including hypoxia, cardiac instability and mucosal trauma (Dougherty and Lister, 2015). This article describes non-invasive methods.

It is important to note that droplets and aerosols may be generated when collecting sputum specimens, so health professionals should use personal protective equipment as stipulated in local policies (including gloves, apron and face masks) (Brekle, 2017).

Patient preparation

Patients should be provided with an explanation of the specimen required, pointing out the difference between oral secretions

and sputum. They should be instructed to sit up and take several deep breaths to loosen secretions before giving a deep cough to release the sputum. Ideally, the specimen should be no less than the size of a small fingernail.

It is important to assess whether patients experience pain related to respiration – particularly when coughing, for example following chest or abdominal surgery, as this can prevent them taking deep breaths and expectorating. Analgesia should be given and their pain reassessed before attempting to collect a specimen. Patients should also be encouraged to support any wounds using their hands or a pillow (Dougherty and Lister, 2015).

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Practical procedures

Prescribed nebulised sodium chloride 0.9% can help to loosen secretions before specimen collection (Dougherty and Lister, 2015). Physiotherapists can also assist patients with coughing techniques and can teach other clinical staff the active cycle of breathing techniques to help with chest clearance.

Ensuring the patient is well-hydrated can help increase sputum production and the likelihood of obtaining a useful sample.

Ideally specimens should be obtained in the morning as secretions pool in the lung overnight, providing an environment in which bacteria can replicate (Dougherty and Lister, 2015); this is particularly important when testing for tuberculosis. Collecting the sample before breakfast also reduces the risk of contaminating the sample with food. Patients should be advised to not clean their teeth or use a mouthwash before specimen collection as this may kill the bacteria.

It is important to check that the sample contains sputum, as samples contaminated with oropharyngeal secretions and saliva are difficult to interpret and can be misleading (Brekke, 2017). Contamination of the sample can result in inappropriate or delayed treatment.

Equipment

Assemble equipment including:

- Universal container with a wide top;
- Apron;
- Non-sterile gloves;
- Facemask;
- Eye protection (if required);
- Appropriate documentation (according to local policy);
- Nebuliser (if required).

The procedure

1. Explain the procedure to the patient and gain informed consent (Nursing and Midwifery Council, 2015).
2. Decontaminate hands.
3. Position the patient in an upright position in a chair, on the edge of the bed or well-supported by pillows in bed (high Fowler position) as this will ensure maximum lung expansion (Fig 2a).

Urinary catheter series

Part	Date
Part 1: Midstream specimen of urine	Jul
Part 2: Catheter specimen of urine	Aug
Part 3: Stool specimen	Sept
Part 4: Sputum specimen	Oct

Box 1. Professional issues and good practice principles

Nurses must:

- Be aware of their organisation's policies and procedures for specimen collection
- Be able to explain the purpose of the specimen to the patient and the implications for treatment, and to obtain informed consent
- Be competent to undertake the procedure (Nursing and Midwifery Council, 2015); this includes knowing the correct procedure for collection, handling and transportation of the sample (Dougherty and Lister, 2015)
- Be aware of infection control principles involved in collection of tissue and body fluids (Loveday et al, 2015)
- Understand the importance of accurate record keeping. Documentation should include time the specimen was collected, results and changes to treatment that occur in response to the results (Dougherty and Lister, 2015)

The specimen must be:

- Appropriate to the patient's clinical presentation
- Collected at the right time
- Collected in a way that minimises the risk of contamination
- Collected in a manner that reduces risk to all staff (including laboratory staff)
- Collected using the correct equipment
- Documented clearly
- Stored/transported appropriately (Higgins, 2008)

The collection of any tissue/fluid carries a risk to staff from splash or inoculation injury, so standard precautions should be followed (Loveday, 2015).

4. The patient's mouth should be rinsed with water before the sample is collected, to avoid contaminating the sample with food residue. It can also be helpful to remove dentures.

5. Administer a prescribed sodium chloride 0.9% nebuliser to help to loosen secretions if they are thick and difficult to expectorate (Fig 2b).

6. Decontaminate hands and put on an apron, non-sterile gloves and a facemask if you are likely to come into contact with bodily fluids. This reduces the risk of contamination of the specimen and the risk of cross infection.

7. Wear eye protection if you have concerns about splash injury.

8. Ask the patient to take several deep breaths – breathing in through the nose and exhaling through the mouth – to help loosen secretions (Fig 2c).

9. Ask the patient to force a deep cough to ensure a sample is obtained from the lower respiratory tract.

10. The patient should expectorate into the specimen pot and secure the lid to prevent contamination. Ensure the specimen is sputum rather than saliva, as samples

contaminated with oropharyngeal secretions and saliva are difficult to interpret and can be misleading (Fig 2d).

11. Remove gloves, apron and facemask then decontaminate hands to reduce the risk of cross infection.

12. Label the sample and complete microbiology forms.

13. Send the sample to the laboratory as soon as possible (within four hours).

14. Document the procedure in the patient's notes. **NT**

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