

[strap] Clinical skills

## [header] How to remove an endotracheal tube

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### Rationale and key points

The decision to remove an endotracheal tube (extubation) is taken when a patient has adequate airway control. This requires an effective cough and an acceptable level of consciousness.

Nurses should be able to identify when a patient is ready for endotracheal tube removal and to recognise contraindications and potential complications.

- ▶ The Glasgow Coma Scale should be used to assess the patient's level of consciousness. Extubation should not be performed on patients with a score of 8 or less.
- ▶ The patient's peak expiratory flow rate should be more than 60L/minute for them to be considered suitable for endotracheal tube removal.

### Reflective activity

Clinical skills articles can help update your practice and ensure it remains evidence based. Apply this article to your practice. Reflect on and write a short account of:

1. How you think this article will change your practice when managing a patient with an endotracheal tube.
2. How you could use this resource to educate your colleagues.

Subscribers can upload their reflective accounts at: [rcni.com/portfolio](http://rcni.com/portfolio)

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## Keywords

clinical skills, clinical procedures, endotracheal tube, extubation, respiratory care, ventilation

[Contributing to the clinical skills series]

[Review]

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## Preparation and equipment

- The nurse should review the need for an endotracheal tube and identify any contraindications to extubation.
- The nurse should assess the patient's strength of cough using a peak flow meter. If the peak expiratory flow rate (PEFR) is less than 60L/minute, the endotracheal tube should not be removed.
- The nurse should assess the patient's level of consciousness using the Glasgow Coma Scale (GCS) (Teasdale and Jennett 1974) (Table 1). If the score is 8 or less than 8 out of 15, the **endotracheal** tube should not be removed.
- The nurse should explain the procedure to the patient and gain informed consent. If the patient lacks capacity to make decisions the practitioner must act in the patient's best interests in accordance with the requirements of the Mental Capacity Act 2005.
- The nurse should ensure that the necessary equipment is available including:
  - 10mL syringe for cuff deflation
  - Personal protective equipment.
    - Apron.
    - Sterile gloves.
    - Non-sterile gloves.
    - Protective eye equipment.
  - Suction equipment
    - Suction meter.
    - Suction tubing.
    - **Select the correct size suction catheter. The following formula may be used to determine the appropriate size catheter: suction catheter size (French) =  $2 \times (\text{size of endotracheal tube} - 2)$ .**
    - **[Q: A selection of flexible suction catheters?] as above**
  - Face mask with oxygen supply.
  - Emergency intubation kit in case of a failed extubation.
  - Peak flow meter.
  - Yankauer catheter
- The nurse should check that the suction **meter** is functioning correctly.

- The nurse should seek the assistance of an appropriately trained colleague. Two appropriately trained healthcare practitioners are required to safely extubate a patient.

Table 1 Glasgow Coma Scale

Elements	Score
<b>Eye opening</b>	
▶ Spontaneous	4
▶ To sound	3
▶ To pressure	2
▶ None	1
<b>Verbal response</b>	
▶ Oriented	5
▶ Confused	4
▶ Words	3
▶ Sounds	2
▶ None	1
<b>Motor response</b>	
▶ Obeys commands	6
▶ Localising	5
▶ Normal flexion	4
▶ Abnormal flexion	3
▶ Extension	2
▶ None	1
<b>Maximum score 15</b>	

- (Teasdale and Jennett 1974)



[end table]

## Procedure

1. Stop nasogastric feeding at least two hours before the procedure to reduce the risk of aspiration of stomach contents (Coombs *et al* 2013).
2. Wash or decontaminate your hands and apply personal protective equipment – eye protection, non-sterile gloves and an apron.
3. **Ensure you have access to emergency intubation equipment in case of extubation failure**
4. Undo the tapes that are securing the endotracheal tube, ensuring that the tube is held in position by the person assisting with the procedure.
5. Select the correct size suction catheter. The following formula may be used to determine the appropriate size catheter: suction catheter size (French) = 2x(size of **endotracheal** tube-2). **French is the term for the suction catheter size only (same as cms /mls etc)**
6. Open the suction catheter packaging and attach the suction catheter end to the suction tubing, ensuring that the catheter remains sterile.
7. Turn on and set the suction meter to 80-120mmHg (Pedersen *et al* 2009).
8. Put a sterile glove on the hand you are going to use to hold the suction catheter and maintain the sterility of this hand.
9. Disconnect the endotracheal tube from the ventilator tubing and silence the ventilator alarms.
10. Remove the suction catheter from its packaging, ensuring that it remains sterile and that it only comes into contact with the hand covered by the sterile glove.
11. Insert the suction catheter into the endotracheal tube and advance it gently until resistance is felt, signifying that the catheter has reached the carina (Figure 1). Then withdraw the suction catheter by 1-2cm (Pedersen *et al* 2009).

12. Apply suction by occluding the suction port located at the proximal end of the suction catheter. Suction should be applied continuously rather than intermittently.
13. The practitioner assisting with the procedure should deflate the endotracheal tube cuff with the 10ml syringe (Figure 2).
14. Withdraw the endotracheal tube with the suction catheter in place, while maintaining suction. Suction should be applied only during catheter withdrawal. The withdrawal should be smooth and take no longer than 15 seconds.
15. Encourage the patient to cough and suction any oral secretions using a Yankauer catheter.
16. Commence oxygen therapy using a face mask.
17. Dispose of all waste according to local policy guidelines. Dispose of any personal protective equipment and wash your hands.
18. Assess the patient for any changes in observations. Reassure the patient and ask them to report if they feel any difficulty in breathing following the procedure.
19. Document the procedure in the patient's notes.

## Evidence base

Several factors should be assessed before extubation (removal of an endotracheal tube from the trachea) is performed.

It is essential that the patient has adequate airway control to prevent aspiration following extubation. An effective cough is a pre-requisite for extubation. The strength of the patient's cough should be measured using a peak flow meter attached to the end of the endotracheal tube (Figure 2). A peak expiratory flow rate (PEFR) less than 60L/minute increases the likelihood that extubation will fail (Coombs *et al* 2013). High volumes of secretions and tenacity of secretions will also affect the quality of the patient's cough. Thick, sticky secretions require a stronger cough to clear; this should be taken into consideration, before performing extubation.

Assessment of the patient's neurological status is required using the GCS (Teasdale and Jennett 1974) (Table 1). A decreased level of consciousness and/or an inability to follow commands increases the likelihood that extubation will fail. Therefore, the GCS score should be greater than 8 out of 15 before extubation is considered (Coombs *et al* 2013). The combination of a reduced PEFR with an inability to follow commands (reduced GCS) and the presence of tenacious secretions results in a 100% likelihood of failed extubation (Rothaar and Epstein 2003).

Laryngeal oedema can negatively affect extubation by causing a post-extubation stridor. This can be assessed by the presence of an air leak when the endotracheal cuff is deflated and may be prevented by the use of corticosteroids before removal of the endotracheal tube (Coombs *et al* 2013).

## Useful resources

American Association for Respiratory Care, Restrepo RD, Brown JM 2nd, Hughes JM (2010) AARC clinical practice guidelines. Endotracheal suctioning of mechanically ventilated patients with artificial airways. *Respiratory Care* 55, 6, 758-764.

Glasgow Coma Scale [www.glasgowcomascale.org](http://www.glasgowcomascale.org) (Last accessed: March 8 2016.)

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[Disclaimer]

## References

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Rothaar RC, Epstein SK (2003) Extubation failure: magnitude of the problem, impact on outcomes and prevention. *Current Opinion in Critical Care*. 9, 1, 59-66.

Pedersen CM, Rosendahl-Nielsen M, Hjermand J, Egerod I (2009) Endotracheal suctioning of the adult intubated patient -- what is the evidence? *Intensive and Critical Care Nursing*. 25, 1, 21-30.

Teasdale G, Jennett B (1974) Assessment of coma and impaired consciousness. A practical scale. *The Lancet*. 2, 7872, 81-84.

Figure 1 Deflating the endotracheal tube cuff

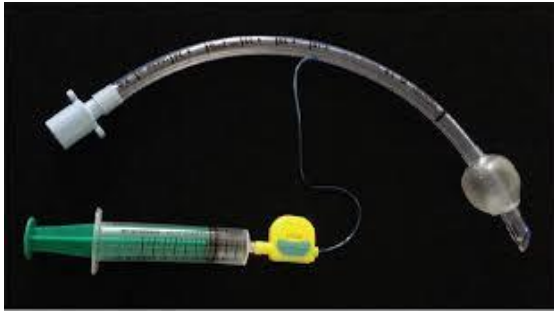


Figure 2

A peak expiratory flow meter attached to the end of the endotracheal tube