Tracheostomy Emergencies with Trachy Tracey

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Learning objectives

• Describe the difference in anatomy between a tracheotomy and a laryngectomy

• Understand why we use tracheostomies in critical care

• Describe what a tracheostomy ‘red flag’ is, and describe an appropriate response when faced with one.

• List what equipment you need in your bedscape and demonstrate how to use it effectively in an emergency

• Demonstrate the assessment and management of a patient with a blocked/displaced tracheostomy.
Major complications of airway management in the UK

Report and findings
March 2011
NAP 4 Design

• Types of airway devices used during anaesthesia

• How often major complications leading to serious harm occur in association with airway management, in ICU and ER settings

• Nature of these events and learning acquired to reduce frequency and consequences
NAP4 Findings

- 20% (36/184) of all airway incidents occurred in ICU.
- 70% of reported events and 60% of deaths involved complications with tracheostomies.
- Displaced tracheostomy were the greatest cause of major morbidity and mortality in ICU. This concurs with a previous study in 2004 which found that 60% of airway incidents involved tracheostomies becoming blocked or displaced (McGrath and Thomas 2004).
NAP Findings

- Obese patients at increased risk of such events and adverse outcome

- Failure to use capnography in ventilated patients contributed to >70% of ICU related deaths

- Tracheostomy guidelines were not readily available for trainees and nurses. A survey in the northwest of England showed that only 2 out of 16 units had tracheostomy guidelines readily available (Bates 2010)
Tracheostomy related problems accounted for the 5th highest incidence of all primary airway problems!!
Interpretation of results

• Many of the events and deaths reported to NAP4 were potentially avoidable.

• Obese patients at increase risk of such events and adverse outcome.

• Movement and transfer of patients are high risk procedures resulting in an increase in adverse airway events.
Recommendations from NAP4

• Algorithms (strategies) **must** be available for all staff for the management of accidental decannulation and/or a blocked tracheostomy tube with a step-wise approach to management of a compromised airway.

• All staff involved in the care of patients with tracheostomies should receive training in maintaining the airway and in safe movement of patients. Including training re capnography interpretation.

• There must be clear lines of communication for escalation of airway events to advanced airway skilled personnel.
Tracheostomy or laryngectomy?

**Tracheostomy**, is a semi-permanent or permanent opening to the trachea.

**Laryngectomy** is the surgical removal of the larynx, usually completely and permanently. The remnants of the trachea are stitched to the anterior neck. There is no connection from the nose or mouth to the lungs!!

It can be very hard to tell the difference on visual inspection.
What type of tracheostomy does my patient have?

'Mouth breather'

'Neck breather'

The figure above shows a laryngectomy on the right and a tracheostomy on the left. The left hand figure still has a potentially patent upper airway.
Position between the 2\textsuperscript{nd} and 3\textsuperscript{rd} Tracheal cartilage
This patient has had a TRACHEOSTOMY

In Emergency:
CALL FOR HELP
Call 2222 for Emergency Team

Give oxygen via BOTH stoma & mouth

- Oxygen to face & stoma
- Remove cap/inner tube
- Pass a suction catheter
- Deflate cuff/remove tube
- Consider ventilation via upper airway or stoma using a mask or tube
  (If ventilating via mouth occlude stoma site)

Surgical / Percutaneous: ..................................................
Performed on: ..............................................................
Tracheostomy tube size: ...............................................  
(Note: The upper airway may provide an intact airway)

Ref. Medical Photography/Karen Watson/March 2013
This patient has had a LARYNGECTOMY

In Emergency:
CALL FOR HELP
Call 2222 for Emergency Team

Perform on: ...........................................
Tracheostomy tube size: ..........................
(Note: there is NO connection between the trachea and the mouth/nose)

DO NOT give oxygen via mouth!

- Apply Oxygen to stoma
- Remove cap/inner tube
- Pass a suction catheter
- Deflate cuff/remove tube
- Consider ventilation via stoma using a mask or tube

Tracheostomies are performed on about 24% of patients in ICU, so what are their benefits

- To facilitate sedation reduction
- Reduction in WOB (up to 50%)
- Improved secretion clearance
- Reduction in trauma to oropharynx and larynx
- Reduction in VAP
- Reduction in length of mechanical ventilation (pro-weaning)
- Reduced length of ICU and hospital length of stay

(Bouderker MA et al 2004, Rumback MG et al 2004)
'Red flags'

- Early warning signs that *may* indicate tracheostomy is blocked / displaced
- Subdivided into:
  - **Airway** red flags
  - **Breathing** red flags
  - **Tracheostomy** red flags
  - **General** red flags
Airway red flags

• Look / listen / feel at mouth and stoma:

• With the cuff up, presence of:
  • Speech, grunting, snoring, stridor
  • Audible air leaks
  • Bubbles of saliva at mouth or nose

Is there gas escaping above the cuff?????

May indicate cuff is damaged or tube tip not correctly sited
Breathing red flags

- Look / listen / feel at mouth and stoma:
  - Apnoea (USE CAPNOGRAPHY !!)
  - Hypoxia
  - Dyspnoea/difficulty breathing
    - Accessory muscle use
    - Increased respiratory rate
    - Higher airway pressure / lower tidal volumes
    - Making whistling noises/noisy breathing
Tracheostomy red flags

- Look / listen / feel at mouth and stoma:
  - Visible displacement of trachy tube (if an adjustable flange check previous documented positioning)
  - Blood / bloody secretions (Note: fresh tracheostomies can bleed a little)
  - Increased discomfort / pain
  - Increasing amounts of air needed to keep cuff inflated (damaged cuff, air leak, displaced tube needing hyper-inflation to keep a seal!)
General red flags

- Any physiological changes in condition may be due to an airway problem:
  - Respiratory rate
  - Heart rate
  - Blood pressure
  - Level of consciousness
  - Anxiety, restlessness, agitation, confusion
Now let's save Trachy Tracey!
Emergency tracheostomy management - Patent upper airway

Call for airway expert help
Look, listen & feel at the mouth and tracheostomy
A Mapleson C system (e.g. 'Waters circuit') may help assessment if available
Use waveform capnography when available: exhaled carbon dioxide indicates a patent or partially patent airway

No

Call Resuscitation Team
CPR if no pulse / signs of life

Is the patient breathing?

Yes

Apply high flow oxygen to BOTH
the face and the tracheostomy

Assess tracheostomy patency

Remove speaking valve or cap (if present)
Remove inner tube
Some inner tubes need re-inserting to connect to breathing circuits

Can you pass a suction catheter?

Yes

The tracheostomy tube is patent
Perform tracheal suction
Consider partial obstruction
Ventilate (via tracheostomy) if not breathing
Continue ABCDE assessment

No

Deflate the cuff (if present)
Look, listen & feel at the mouth and tracheostomy
Use waveform capnography or Mapleson C if available

Is the patient stable or improving?

Yes

Tracheostomy tube partially obstructed or displaced
Continue ABCDE assessment

No

REMOVE THE TRACHEOSTOMY TUBE
Look, listen & feel at the mouth and tracheostomy. Ensure oxygen re-applied to face and stoma
Use waveform capnography or Mapleson C if available

Call Resuscitation team
CPR if no pulse / signs of life

Is the patient breathing?

Yes

Continue ABCDE assessment

No

Primary emergency oxygenation

Standard ORAL airway manoeuvres
Cover the stoma (swabs / hand). Use:
Bag-valve-mask
Oral or nasal airway adjuncts
Supraglottic airway device e.g. LMA

Secondary emergency oxygenation

Tracheostomy STOMA ventilation
Paediatric face mask applied to stoma
LMA applied to stoma

Attempt ORAL intubation
Prepare for difficult intubation
Uncut tube, advanced beyond stoma

Attempt intubation of STOMA
Small tracheostomy tube / 6.0 cuffed ETT
Consider Aintree catheter and fibreoptic
Scope / Bougie / Airway exchange catheter

The first three steps

- Call for help

- Look, listen and feel at the mouth and tracheostomy. Is patient making any respiratory effort? Look at end tidal CO2 trace - is it there? Has it changed?

- Apply high flow oxygen to both face and tracheostomy
  
  - Think - how will you do this with your patient in your bedspace? Type of 02 mask/flow rates/humidification ??)

- Think - what are the potential benefits / pitfalls of using a C -circuit?

Assessment of respiratory effort/ lung compliance - YES

Further airway compromise/trauma/surgical emphysema !!!
The displaced trachy

- What would happen if you bagged through this tracheostomy tube? (Further airway compromise/trauma/surgical emphysema ?!!!)

- Think: what evidence do I have that the trachy tube is in the trachea?

- ETCO2 ??
Assess trachy patency

- Remove speaking valve or cap if present. Remove inner tube
- Can you pass a suction catheter?
  - Yes: the trachy tube is at least partially patent
  - No: deflate the cuff - look / listen / feel at mouth and stoma - look at end-tidal CO₂ trace
CO2 Trace
Normal /absent/obstructed?

- A – B  Baseline
- B – C  Expiratory Upstroke
- C – D  Expiratory Plateau
- D  ETCO$_2$ value
- D – E  Inspiration Begins

Resp Rate = 24

Loss of Plateau  etCO$_2$: >45 mmHg

15 sec.
Cuff up vs cuff down

With the cuff down, you may be able to entrain air past a displaced tracheostomy.
Is the patient stable or improving?

- Oxygen saturations stable and >88%?
  - No: REMOVE THE TRACHEOSTOMY. Reapply oxygen to face. 'Bag' if necessary. Cover stoma with occlusive dressing.
Key points

• If you cannot see ETC02 with every breath on the capnograph it is safer to assume the tracheostomy is not in the trachea. If you cannot pass a suction catheter it is safer to assume the tracheostomy tube is not in the trachea.

• DO NOT give assisted breaths via a C Circuit unless you have evidence the trachy tube is in the trachea eg. capnograph trace.

• Oxygenation is always your priority!!
Tracey says........

1. Call for help!!

2. Look, listen and feel at the mouth and stoma. Look at capnograph!!

3. Give oxygen at the mouth and tracheostomy!!
Tracey says....

A girl needs oxygen to survive!!

If my trachy tube is blocked or displaced and I am deteriorating..TAKE IT OUT!!!!
Any Questions?
Useful educational resources

• UK National Tracheostomy Safety Project
  www.tracheostomy.org.uk

• https://www.nice.org.uk/guidance/ipg462

• www.e-lfh.org.uk/programmes/tracheostomy-safety
SCENARIO’S
Scenario 1- Blocked Tracheostomy

Clinical setting and history (may be adapted to candidates’ background)

S. Bedside nurse in intensive care unit, calling for assistance with patient in an isolation cubicle.

B. 70-year-old patient admitted 3 weeks ago with Flu A. Previous history of MI treated by coronary stenting. Percutaneous tracheostomy performed 1 week ago to facilitate ventilation weaning.

A. Patient presently being treated for a VAP continues to have a productive chest with MP2-3 secretions. Nurse is concerned about patients reduced SPO2 to 82%, reduced chest expansion and increasing agitation. RR 40 shallow obstructive pattern

R. Inspired O2 has been increased from 30% to 100%. Assessment is required urgently as patient's condition is not improving.

Clinical course

- Patient ventilation worsening, SPO2 82%, poor chest expansion, agitated
- Poor C-Circuit compliance, capnography reading 14 kpa
- Speaking valve removed- no change in condition
- Unable to pass suction catheter
- Patient not improving, SPO2 78%, capnography reading 20 kpa
- Post removal of tracheostomy, oxygen applied and assisted ventilation, SPO2 improving to 92%, capnography waveform present , reading 8 kpa

Interventions

- Call for expert airway help
- Look, listen and feel at the mouth and tracheostomy - use C-Circuit/ waveform capnography
- Is the patient breathing? YES
- Apply high flow oxygen to BOTH the face and the tracheostomy
- Assess tracheostomy patency- remove speaking valve/cap if present, remove inner tube
- Attempt to pass suction catheter
- Unable to pass suction catheter
- Deflate the cuff- look, listen and feel at the mouth and tracheostomy - use C-Circuit/ waveform capnography
- Is patient improving- NO

REMOVE THE TRACHEOSTOMY TUBE

- Place high flow oxygen on the face and tracheostomy stoma site. Look, listen and feel at the mouth and tracheostomy site - use C-Circuit/ waveform capnography
- Is the patient breathing? YES
- Assist ventilation as indicated.
- Standard oral airway manoeuvres- cover stoma site with occlusive dressing. Use BMV/OPA/NPA/I-gel /LMA to support breathing as indicated until expert help arrives.
- Consider tracheostomy stoma ventilation- paediatric face mask or LMA applied to stoma site with BMV if oral BMV/assist not effective

Handover

Expert airway help arrives. Preparation made for difficult intubation. Patient is successfully re-intubated orally, uncut OETT advanced beyond stoma
Scenario 2- Displaced Tracheostomy

Clinical setting and history (may be adapted to candidates’ background)

S. Bedside nurse in intensive care unit, calling for assistance with patient
B. 68-year-old patient admitted 2 days ago from cardiothoracic ICU. Previous history of an AVR performed 3 weeks ago, IHD, HTN, NIDDM and OA. Percutaneous tracheostomy performed 1 week ago to facilitate ventilation weaning.

A. Patient recently hoisted back to bed. Following return to bed the patients MV has significantly reduced. SPO2 have dropped to 85% and capnography waveform is non recordable. The tracheostomy tube appears to be angled in a different position than had previously been noted prior to moving the patient back to bed. There is an audible leak.

R. Inspired O2 has been increased from 40% to 100%. Patient has been positioned upright. Assessment is required urgently as patient’s condition is not improving

Clinical course

- Patient condition worsening, SPO2 80%,poor chest expansion, increasingly agitated
- No independent C-Circuit ventilation, no capnography reading
- Speaking valve removed- no change in condition
- Unable to pass suction catheter
- Patient not improving, SPO2 75%, no capnography reading
- Post removal of tracheostomy, oxygen applied and assisted ventilation, SPO2 improving to 90%, capnography waveform re-established, chest expansion improved

Interventions

- Call for expert airway help
- Look, listen and feel at the mouth and tracheostomy - use C-Circuit/ waveform capnography
- Is the patient breathing? YES
- Apply high flow oxygen to BOTH the face and the tracheostomy
- Assess tracheostomy patency- remove speaking valve/cap if present, remove inner tube
- Attempt to pass suction catheter
- Unable to pass suction catheter
- Deflate the cuff- look, listen and feel at the mouth and tracheostomy - use C-Circuit/ waveform capnography
- Is patient improving- NO
- REMOVE THE TRACHEOSTOMY TUBE
- Place high flow oxygen on the face and tracheostomy stoma site. Look, listen and feel at the mouth and tracheostomy site - use C-Circuit/ waveform capnography
- Is the patient breathing? YES
- Assist ventilation as indicated.
- Standard oral airway manoeuvres- cover stoma site with occlusive dressing. Use BMV/OPA/NPA/I-gel /LMA to support breathing as indicated until expert help arrives.
- Consider tracheostomy stoma ventilation- paediatric face mask or LMA applied to stoma site with BMV if oral BMV/assist not effective

Handover

Expert airway help arrives. Preparation made for difficult intubation. Patient is successfully re-intubated orally, uncut OETT advanced beyond stoma
**Scenario 3- Blocked Tracheostomy**

**Clinical setting and history (may be adapted to candidates’ background)**

S. Bedside nurse in intensive care unit, calling for assistance with patient being ventilated via a tracheostomy

B. 74-year-old patient admitted 4 weeks ago following OOHCA. Previous history of MI, stenting, LVSD, DM, PVD and COPD. Tracheostomy performed 3 weeks ago due to failure to wean ventilation secondary to poor cardiopulmonary reserve.

A. Patient presently being ventilated on ASB with escalating times on a T-piece. Recently a humidified circuit has been established secondary to ongoing thick secretions. Having recently suctioned the patient, the nurse reports the patient has had a sudden drop on SPO2 to 84% and is becoming increasingly agitated.

R. The nurse has increased the FIO2 to 100% from 45% and has attempted to suction the patient, unsuccessfully. Assessment is required urgently as the patient’s condition is not improving.

**Clinical course**

- Patient condition worsening, SPO2 80%, paradoxical chest movements, increasing agitation, ineffective ventilatory pattern
- Poor C-Circuit compliance, capnography reading unobtainable
- No speaking valve/cap present
- Unable to pass suction catheter
- Patient not improving, SPO2 75%, capnography still not recording
- Post removal of tracheostomy, oxygen applied and assisted ventilation, SPO2 improving to 90%, capnography waveform established, reading 10 kpa. Equal and bilateral chest expansion.

**Interventions**

- Call for expert airway help
- Look, listen and feel at the mouth and tracheostomy - use C-Circuit/ waveform capnography
- Is the patient breathing? **YES**
- Apply high flow oxygen to **BOTH** the face and the tracheostomy
- Assess tracheostomy patency- remove speaking valve/cap if present, remove inner tube
- Attempt to pass suction catheter
- **Unable to pass suction catheter**
- Deflate the cuff- look, listen and feel at the mouth and tracheostomy - use C-Circuit/ waveform capnography
- Is patient improving- **NO**
- **REMOVE THE TRACHEOSTOMY TUBE**
- Place high flow oxygen on the face and tracheostomy stoma site. Look, listen and feel at the mouth and tracheostomy site - use C-Circuit/ waveform capnography
- Is the patient breathing? **YES**
- Assist ventilation as indicated.
- Standard oral airway manoeuvers- cover stoma site with occlusive dressing. Use BMV/OPA/NPA/I-gel/LMA to support breathing as indicated until expert help arrives.
- Consider tracheostomy stoma ventilation- paediatric face mask or LMA applied to stoma site with BMV if oral BMV/assist not effective

**Handover**

Expert airway help arrives. Preparation made for difficult intubation. Patient is successfully re-intubated orally, uncut OETT advanced beyond stoma
Scenario 4- Displaced Tracheostomy

Clinical setting and history (may be adapted to candidates’ background)

R. Bedside nurse in intensive care unit, calling for assistance with agitated patient
B. 58-year-old patient admitted 2 weeks ago with CAP. Previous history of ETOH excess, smoker and poor nutritional state. Tracheostomy performed 2 days ago to facilitate ventilation weaning.
A. Patient is delirious and CAM ICU positive, requiring regular haloperidol. He has been pulling at his tracheostomy and attempting to climb out of bed. Following an episode of agitation, the nurse reports she is unable to get a capnography trace, the patients SPO2 has dropped to 85% and there is a large air leak sound at the tracheostomy site.
R. Inspired O2 has been increased to 100% from 40%, haloperidol has been administered and the nurse is attempting to monitor the cuff pressure from the tracheostomy tube, unsuccessfully. Assessment is required urgently as the patient’s condition is not improving.

Clinical course

- Patient condition worsening, SPO2 80%, patient increasingly agitated
- No independent C-Circuit ventilation, no capnography reading
- Speaking valve removed- no change in condition
- Unable to pass suction catheter
- Patient not improving, SPO2 78%, no capnography reading
- Post removal of tracheostomy, oxygen applied and assisted ventilation, SPO2 improving to 92%, capnography waveform re-established, bilateral chest expansion

Interventions

- Call for expert airway help
- Look, listen and feel at the mouth and tracheostomy - use C-Circuit/ waveform capnography
- Is the patient breathing? YES
- Apply high flow oxygen to BOTH the face and the tracheostomy
- Assess tracheostomy patency - remove speaking valve/cap if present, remove inner tube
- Attempt to pass suction catheter
- Unable to pass suction catheter
- Deflate the cuff- look, listen and feel at the mouth and tracheostomy - use C-Circuit/ waveform capnography
- Is patient improving- NO
- REMOVE THE TRACHEOSTOMY TUBE
- Place high flow oxygen on the face and tracheostomy stoma site. Look, listen and feel at the mouth and tracheostomy site - use C-Circuit/ waveform capnography
- Is the patient breathing? YES
- Assist ventilation as indicated.
- Standard oral airway manoeuvres- cover stoma site with occlusive dressing. Use BMV/OPA/NPA/I-gel/LMA to support breathing as indicated until expert help arrives.
- Consider tracheostomy stoma ventilation- paediatric face mask or LMA applied to stoma site with BMV if oral BMV/assist not effective

Handover

Expert airway help arrives. Stoma intubated using bougie and a Size 6 cuffed tracheostomy tube.