Bedside Guide
Routine Tracheostomy Care

Guidance from the Chartered Institute of Ergonomics and Human Factors

Chartered Institute of Ergonomics & Human Factors

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Royal College of Speech & Language Therapists

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Foreword

The Chartered Institute of Ergonomics & Human Factors (CIEHF) received its Royal Charter in 2014 to recognise the uniqueness and value of the scientific discipline and the pre-eminent role of the Institute in representing both the discipline and the profession in the UK. This includes the protected status of "Chartered Ergonomist and Human Factors Specialist" with the post-nominal C.ErgHF awarded to practising Registered Members/Fellows who are among a group of elite professionals working at a world-class level.

This bedside guide is intended for the use of all healthcare staff who are looking after adult patients with tracheostomies. The tasks described should NOT be attempted by those who have not received training or been deemed as competent in tracheostomy care and management.

This guide does not override the responsibility of the healthcare provider to use professional judgement and make decisions appropriate to the circumstances of each patient in consultation with the patient and/or guardian.

Whilst this document is aimed primarily at staff working in secondary care, much of the material is applicable to primary care (GPs, community care homes and carers). It is designed to help you provide consistent, high quality care for your patients with a tracheostomy.

Dr Noorzaman Rashid
Chief Executive
Chartered Institute of Ergonomics and Human Factors

The CIEHF has assembled expert panels consisting of clinicians and healthcare managers, scientists and engineers, academics and researchers, quality improvement, human factors professionals and ergonomists to support the development and review of guidance on a wide range of procedures.
Contact: Covid19@ergonomics.org.uk

Caveat: This Human Factors/Ergonomics (HFE) advice is offered by Chartered Ergonomists & Human Factors Specialists (C.ErgHF) on a rapid response basis in collaboration with the Academic Health Science Network and does not reflect a full HFE analysis. The advice was offered within the Chartered Institute of Ergonomics and Human Factors (CIEHF) scope of practice for a Chartered Registered Member/Fellow https://www.ergonomics.org.uk/Public/membership/registered_member.aspx

This patient has a

TRACHEOSTOMY

There is a potentially patent upper airway (Intubation may be difficult)

Surgical / Percutaneous

☐ Cuffed
☐ Uncuffed

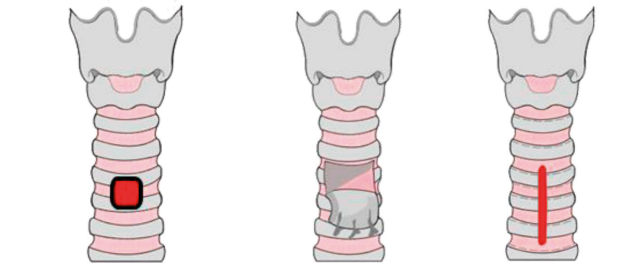
Performed on (date) .....

Tracheostomy tube size (if present) .....

Hospital / NHS number .....

Tube last changed (date) .....

Indicate location and function of any sutures.
Laryngoscopy grade and notes on upper airway management.
Any problems with this tracheostomy.



Emergency Call:

www.tracheostomy.org.uk

Basic Tracheostomy Care Action Cards

Tracheostomy care procedure	Indications	Team Size	Action Card
MANAGE CUFF PRESSURE	• Cuff leak or overpressure • Routine check to ensure cuff pressures within correct range • Frequency: minimum 8-hourly.	1	1
CHANGE TAPES	• Insecure • Contaminated.	2	2
SUCTIONING VIA A TRACHEOSTOMY (OPEN)	• Noisy • Increased respiratory rate • Effortful breathing • Deterioration of vital signs.	1	3a
SUCTIONING VIA A TRACHEOSTOMY (CLOSED)	• Noisy • Increased respiratory rate • Effortful breathing • Deterioration of vital signs.	1	3b
CHANGE INNER TUBE (SEE OVERLEAF)	• Noisy • Increased respiratory rate • Effortful breathing • Deterioration of vital signs.	1	4

Guidelines for use

Scope of Practice: You must be trained to carry out a procedure. You must work within your scope of clinical practice.

Personal Protective Equipment: PPE for aerosol producing procedures must be used. Donning and doffing PPE must be guided by Trust and Unit protocols.

Dangers (hazards): Dangers to patients and clinical personnel are described on each card.

Waste: Disposal of clinical waste must be guided by Trust and Unit protocols.

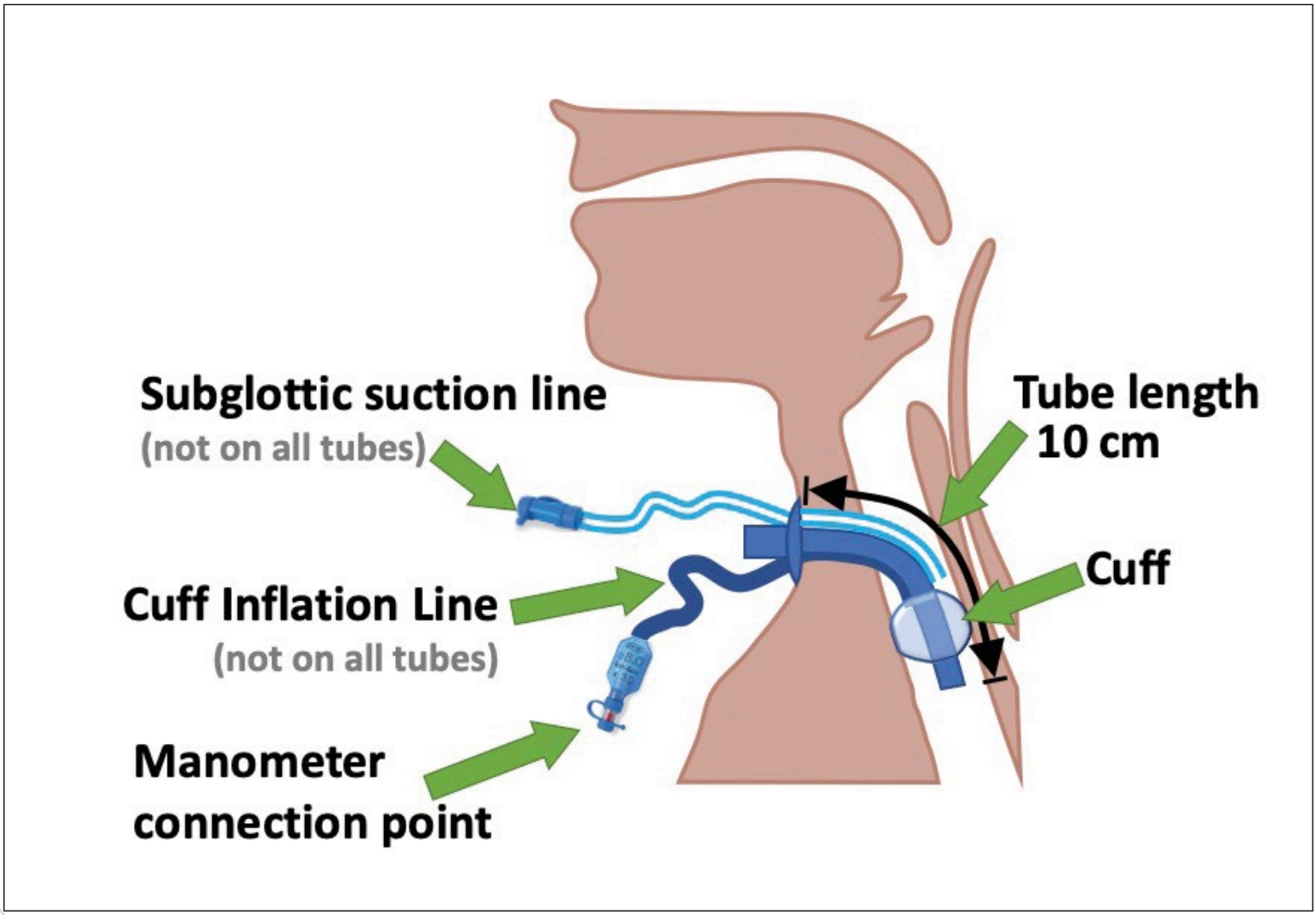
Checklists: Each card has a checklist to help plan and manage the task.

Calling for assistance:
Who to call if a situation escalates is included at the top of each card.

Remember:

- Personnel responding to a call for assistance may need to don PPE. This will increase the response time
- A compromised airway is an **EMERGENCY**
  - Call for emergency assistance
  - Use the emergency flowchart for airway management.

Basic Tracheostomy Care Action Cards



Essential steps to design work better

How to improve the design of work procedures

Create 01

- Ensure it's needed
- Involve the whole team at every stage
- Identify hazards
- Capture how your work is really done
- Ensure it's easy-to-follow

Test 02

- Ask people who will use it to test it
- Use feedback to improve it
- Repeat until everyone is happy with the procedure

Use 03

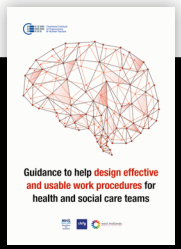
- Train people in its use
- Spend time putting it into practice
- Make sure it's easy to find
- Share it with others

Review 04

- Review regularly
- If it's not being used, understand why
- Update it if it no longer reflects how you really work

For more visit the *10 key steps to designing work better* process journey **https://bit.ly/DesignofWorkProcedures**

Read the full guidance on human-centred design of work procedures



Manage Cuff Pressure

Basic Tracheostomy Care Card

1

Procedure No: **Action Card 1**	Version No: 1.0	Date of publication: 11.06.2020	Escalation contact: _____

Why?

Tracheostomy cuffs ensure direct ventilation to the lungs and prevent air or fluid transfer from the upper or lower airway. Maintain cuff pressure to seal the tracheostomy tube within the trachea safely.

What do I need?

Team: 1-person procedure. You must be trained to carry out this procedure. You must work within your scope of clinical practice.
Equipment: Cuff pressure gauge/manometer OR manometer and air adjustment syringe.

What should I be aware of?

Call for assistance if:

- Airway is compromised – **EMERGENCY**
- Cuff pressure needed to form a seal is close to 35 cmH_2O
- There is cuff leakage when cuff pressure is within **Recommended Pressure Range**
- Frequent cuff pressure adjustment is needed (more than every eight hours).

Dangers for the patient: ⚠

- Trachea damage & airway complications if cuff pressure is greater than 35 cmH_2O for more than 15 minutes
- Hypoxia and difficulty providing ventilation due to a cuff air leak
- Infection due to a cuff leak / low pressure allowing fluids into the lungs.

Dangers for clinical staff:

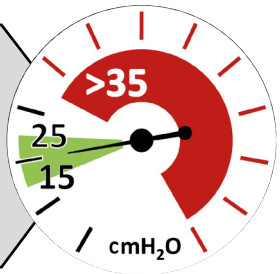
- Aerosolisation of secretions due to cuff leakage.

Checklist:

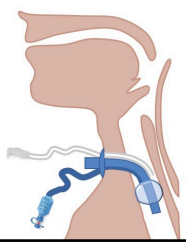
- ☐ Secretion load
- ☐ Patient condition – awake / sedated / cough reflex. Extra sedation required?
- ☐ Identify and check cuffed tracheostomy patients at least every eight hours
- ☐ Infection status of the patient
- ☐ Assistance: clinicians may require time to don PPE. This could delay the response.

Key Points

Keep pressure within Recommended Pressure Range. DO NOT EXCEED 35 cmH_2O



Use minimal cuff pressure to create a seal. Cuffs DO NOT hold the tube in place



Signs of a cuff leak:

- Patient coughing or making vocal noises – speech, snores, grunts
- 'Bubbling' sound – air passing through fluids above cuff or at stoma
- Ventilator alarms or irregular $EtCO_2$/capnography wave form
- Frequent cuff pressure adjustment needed to maintain cuff seal.

TASK FLOWCHART

Manage Cuff Pressure

Basic Tracheostomy Care Card

1

Procedure No: **Action Card 1**	Version No: 1.0	Date of publication: 11.06.2020	Escalation contact: _____

Task Steps

START

STEP 1

Collect manometer (+10ml syringe if required).

STEP 2

Prepare the patient: Inform, consent, position.

STEP 3

Check cuff pressure:
- Connect manometer to inflation line valve
- Read cuff pressure.

Recommended Pressure Range
15 – 25 cmH_2O

DO NOT EXCEED
35 cmH_2O ⚠

WARNING
Do not squeeze the pilot balloon to test cuff pressure ⚠

Is cuff pressure outside the Recommended Pressure Range?

Yes

Adjust cuff pressure to form a seal:
- Pressure too low:
  Gradually pump a small amount of additional air
- Pressure too high:
  Gradually release a small amount of air.

If adjusting air with a syringe, adjust in 0.5ml amounts. Reconnect the manometer between adjustments to recheck cuff pressure.

No

Are there signs of a cuff leak?

Yes

Call for assistance if: ⚠
- Frequent adjustment is needed to maintain a seal
- You cannot form a seal within the recommended pressure range
- The pressure needed to form a seal is close to 35 cmH_2O.

No

STEP 4

Record the cuff pressure changes and any issues in the patient's notes.
NOTE: Increase the frequency of patient cuff pressure checks if there are tracheostomy problems or ventilation changes.

END

Change Tapes

Basic Tracheostomy Care Card

2

Procedure No: **Action Card 2**	Version No: 1.0	Date of publication: 11.06.2020	Escalation contact: _____

Why?

Maintain hygiene and secure position of tracheostomy tube.

What do I need?

Team: This is a 2-person procedure. You must be trained to carry out this procedure. You must work within your scope of clinical practice. Communicate clearly and coordinate your actions. This is crucial when handing over support for the tracheostomy tube.
Equipment: New tapes of correct size (velcro straps / cotton tape / plastic strips integrated with support collar), scissors, antiseptic wipes, barrier cream, stoma dressing.

What should I be aware of?

Call for assistance if:

- Compromised airway - **EMERGENCY**. Use emergency flowchart for airway management
- Tracheostomy tube dislodged or ejected by coughing - Senior nurse/physiotherapist may be competent to assist.

Dangers for the patient:

- Compromised airway: loss or misplacement of the tracheostomy tube during the procedure
- Loose tapes: increased risk of dislodging the tube
- Tight tapes: increased risk of venous congestion and skin damage
- Introducing infection to the stoma and lungs. Use aseptic technique.

Dangers for clinical staff:

- Aerosolisation with increased risk of spreading infection.

Checklist:

- ☐ Agree roles - who does what?
- ☐ Assistance: clinicians may require time to don PPE. This could delay the response
- ☐ Type of tracheostomy – secure / cuffed
- ☐ Secretion load
- ☐ Patient condition – awake / comfortable / sedated / cough reflex. Extra sedation required?
- ☐ Equipment – correct tape size for the patient?
- ☐ Infection status of the patient.

Key Points

All tapes should lie flat against the skin.

Cotton tape only: correct attachment of looped tape to the flange.

Cotton tape only: correct positioning of a tape knot.

TASK FLOWCHART

Change Tapes

Basic Tracheostomy Care Card

2

Procedure No: **Action Card 2**	Version No: 1.0	Date of publication: 11.06.2020	Escalation contact: _____

Task Steps

START

STEP 1
Go over the task together. Make sure you are clear about your role and what to do (one to change the tapes, the other to hold the tracheostomy plate).

STEP 2
Identify and collect equipment and materials.

STEP 3
Prepare the new tapes. Cotton tapes may require cutting to length and pre-looping.

STEP 4
Prepare the patient: Inform, consent (depending on sedation), supine position.

STEP 5
Remove the old tapes and maintain support for the tube. Clean the neck and stoma on one side, then the other. Inspect the patient's skin.

Is the skin in good condition?

No → Flag a skin problem, proceed to next step.

Yes

STEP 6
Prepare the patient's skin. Apply barrier cream if required.

STEP 7
Replace stoma dressing, if used. Replace and fasten tape on both sides of the tracheostomy tube. Cotton tape – loop and tie, see key points overleaf.

⚠ **Tube dislodged or ejected: call for assistance.**

STEP 8
Check tape tightness against the neck. Tightness is correct if a single finger fits underneath the tape.

Is tightness correct?

No → Refasten and recheck.

Yes

STEP 9
Perform final fastening. Cotton tape: add a final knot to both sides of the flange.

STEP 10
Ensure all equipment and used materials are accounted for.

STEP 11
Record the tape change in the patient's notes.

END

Open Suction

Basic Tracheostomy Care Card

3a

Procedure No: **Action Card 3a**	Version No: 1.0	Date of publication: 11.06.2020	Escalation contact: _____

Why?

Maintain a clear airway, maximise comfort and minimise infection.

What do I need?

Team: This is a 1-person procedure. You must be trained to carry out this procedure. You must work within your scope of clinical practice.
Equipment: Appropriately sized catheter tube, as recommended by local guidance, single sterile glove, saline ampoule.

What should I be aware of?

Call for assistance if:

- Compromised airway - **EMERGENCY**. Use emergency flowchart for airway management.
- Unable to pass the catheter / blood in aspirate / tracheostomy tube becomes dislodged or is ejected by coughing.
- Airway not compromised - Senior nurse/physiotherapist may be competent to assist.

Dangers for the patient:

- Compromised airway: displacement of tracheostomy tube
- Airway tissue damage: excessive/inappropriately located suctioning, catheter over-insertion
- Reduced oxygenation from lengthy suctioning procedures.

Dangers for clinical staff:

- Aerosolisation with increased risk of spreading infection
- Contamination from used catheter after withdrawal. Use aseptic technique
- Introducing infection: contaminated catheter tube.

Checklist:

- ☐ Patient condition - strong cough reflex may displace tracheostomy tube
- ☐ Status of tracheostomy tube - are tapes secure and the flaps against the skin?
- ☐ Catheter insertion depth: assess need for deep or shallow, see guide below.
- ☐ Infection status of the patient
- ☐ The type of tracheostomy – secure / cuffed
- ☐ Secretion load and viscosity - consider humidification
- ☐ Assistance: clinicians may require time to don PPE. This could delay the response.

Key Points

Use measurement to guide insertion depth.

	ID without inner cannula	ID with inner cannula	Outside diameter	Length
Shiley LPC	n/a	7.6mm	12.2mm	81mm
Shiley DCT	n/a	7.6mm	12.2mm	79mm
Kapitex Tracheotwist	n/a	8.0mm	11.4mm	76mm
Portex Blue Line Ultra	8.0mm	6.5mm	11.9mm	75.5mm

TASK FLOWCHART

Open Suction

Basic Tracheostomy Care Card

3a

Procedure No: **Action Card 3a**	Version No: 1.0	Date of publication: 11.06.2020	Escalation contact: _____

Task Steps

START

STEP 1

Identify and collect equipment and materials.

STEP 2

Check catheter size, expiry date and integrity of pack.

STEP 3

Turn on and check suction unit.

⚠ **Maximum Pressure 20 KPa / 150 mmHg**

STEP 4

Assess tracheostomy tube (security – cough strength).

STEP 5

Assess patient (vital signs, need for analgesia, need for pre-oxygenation).

Clinical support required?

⚠ *Yes* → **Seek clinical assistance.**

No

STEP 6

Explain procedure to patient and remove tracheostomy devices.

STEP 7

Open catheter. Connect suction pump. Draw out catheter slightly from packaging. Don sterile glove (dominant hand). Remove catheter fully with gloved hand.

STEP 8

Insert catheter to required depth and withdraw slightly. Applying suction, fully withdraw. The whole process from insertion to removal should take 10-15 seconds.

STEP 9

Disconnect catheter, rolling sterile glove down to remove and dispose of catheter.

Tube clear?

⚠ *No* → **Repeat steps 7-9 (max twice). Use a new suction catheter and sterile glove each time. Seek assistance if still not cleared.**

Yes

STEP 10

Replace tracheostomy devices and return oxygenation to pre-suctioning level.

STEP 11

Record in patient notes. Revise suctioning frequency as appropriate.

END

Closed Suction

Basic Tracheostomy Care Card

3b

Procedure No: **Action Card 3b**	Version No: 1.0	Date of publication: 11.06.2020	Escalation contact: _____

Why?

Maintain a clear airway, maximise comfort and minimise infection.

What do I need?

Team: This is a 1-person procedure. You must be trained to carry out this procedure. You must work within your scope of clinical practice.
Equipment: Saline ampoule for cleaning.

What should I be aware of?

Call for assistance if:

- Compromised airway - **EMERGENCY**. Use emergency flowchart for airway management.
- Unable to pass the catheter / blood in aspirate / tracheostomy tube becomes dislodged or is ejected by coughing.
- Airway not compromised - Senior nurse/physiotherapist may be competent to assist.

Dangers for the patient:

- Compromised airway: displacement of tracheostomy tube
- Airway tissue damage: excessive/ inappropriately located suctioning, catheter over insertion
- Reduced oxygenation from lengthy suctioning procedures.

Dangers for clinical staff:

- Aerosolisation with increased risk of spreading infection
- Contamination from used catheter after withdrawal. Use aseptic technique.

Checklist:

- ☐ Patient condition - strong cough reflex may displace tracheostomy tube
- ☐ Status of tracheostomy tube - are tapes secure and the flaps against the skin?
- ☐ Catheter insertion depth: Maximum depth is related to the length of tracheostomy tube
- ☐ Infection status of the patient
- ☐ The type of tracheostomy – secure / cuffed
- ☐ Secretion load and viscosity – consider humidification
- ☐ Assistance: clinicians may require time to don PPE. This could delay the response.

Key Points

Use measurement to guide insertion depth.

	ID without inner cannula	ID with inner cannula	Outside diameter	Length
Shiley LPC	n/a	7.6mm	12.2mm	81mm
Shiley DCT	n/a	7.6mm	12.2mm	79mm
Kapitex Tracheotwist	n/a	8.0mm	11.4mm	76mm
Portex Blue Line Ultra	8.0mm	6.5mm	11.9mm	75.5mm

Cleaning: Connect saline ampule and flush through

TASK FLOWCHART

Closed Suction

Basic Tracheostomy Care Card

3b

Procedure No: **Action Card 3b**	Version No: 1.0	Date of publication: 11.06.2020	Escalation contact: _____

Task Steps

START

STEP 1

Identify and collect equipment and materials.

STEP 2

Check catheter information - date for change, size, integrity.

STEP 3

Turn on and check suction unit.

⚠ **Maximum Pressure 20 KPa / 150 mmHg**

STEP 4

Assess tracheostomy tube (security – cough strength).

STEP 5

Assess patient (vital signs, need for analgesia, need for pre–oxygenation).

Clinical support required?

⚠ *Yes* → **Seek clinical assistance.**

No

STEP 6

Explain procedure to patient and remove tracheostomy devices.

STEP 7

Insert catheter to required depth and withdraw slightly.

STEP 8

Applying suction, fully withdraw. Ensure black indicator mark is visible. The whole process from insertion to removal should take 10-15 seconds.

Tube clear?

⚠ *No* → **Repeat steps 7-8 (max twice) Seek assistance if still not cleared.**

Yes

STEP 9

Return oxygenation to pre-suctioning level.

STEP 10

Flush closed circuit with saline to clean.

STEP 11

Record in patient notes and revise suctioning frequency as appropriate.

END

Change Inner Tube

Basic Tracheostomy Care Card

4

Procedure No: **Action Card 4**	Version No: 1.0	Date of publication: 11.06.2020	Escalation contact: _____

Why?

Maintain a clear airway, maximise comfort and minimise infection.

What do I need?

Team: This is a 1-person procedure. You must be trained to carry out this procedure. You must work within your scope of clinical practice.
Equipment: New inner tube (if replacing), plastic tray, non-woven gauze, tracheostomy tube cleaning swabs and sterile saline (if cleaning and replacing tube).

What should I be aware of?

Call for assistance if:

- Compromised airway - **EMERGENCY**. Use emergency flowchart for airway management.
- Unable to pass the catheter / blood in aspirate / tracheostomy tube becomes dislodged or is ejected by coughing.
- Airway not compromised - Senior nurse/physiotherapist may be competent to assist.

Dangers for the patient:

- Compromised airway: displacement of tracheostomy tube, retention of foam swab
- Procedure requires disconnection from oxygen supply.

Dangers for clinical staff:

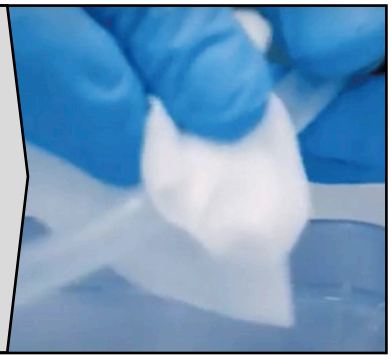
- Aerosolisation with increased risk of spreading infection
- Contamination from used inner tube. Use aseptic technique.

Checklist:

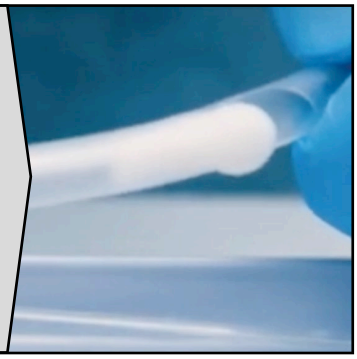
- ☐ Patient condition - strong cough reflex may displace tracheostomy tube
- ☐ Status of tracheostomy tube - are tapes secure and the flaps against the skin?
- ☐ Infection status of the patient
- ☐ Type of tracheostomy – secure / cuffed
- ☐ Secretion load
- ☐ Assistance: clinicians may require time to don PPE. This could delay the response
- ☐ Count foam swabs before and after.

Key Points

Clean outside of tube using non-woven gauze.



Clean inside of tube with tube cleaning swabs.



TASK FLOWCHART

Change Inner Tube

Basic Tracheostomy Care Card

4

Procedure No: **Action Card 4**	Version No: 1.0	Date of publication: 11.06.2020	Escalation contact: _____

Task Steps

START

STEP 1
Identify and collect equipment and materials as guided by local protocol.

STEP 2
Check expiry dates/package integrity. If cleaning, count and record number of swabs.

STEP 3
Assess tracheostomy tube (security / patient cough strength).

STEP 4
Assess patient (vital signs).

Clinical support required?

⚠ *Yes* → **Seek clinical assistance.**

No

STEP 5
Explain procedure to patient. Remove tracheostomy mask and devices, if present.

STEP 6
Remove inner tube, applying counter pressure to tracheostomy flaps.

Change Inner Tube

STEP 7
Dispose of old inner tube.

STEP 8
Replace with new inner tube.

STEP 9
Replace tracheostomy devices and reconnect oxygen via tracheostomy mask.

STEP 10
Record in patient notes.
Revise tube changing frequency as appropriate.

END

Clean Inner Tube

STEP 7
Holding tube over disposable tray, pour saline over tube and into tube.

STEP 8
Wash inside tube (with swab) and outside (with gauze).

STEP 9
Drain and refit cleaned inner tube. Visually inspect tube and count swabs.

STEP 10
Replace tracheostomy devices. Reconnect oxygen via tracheostomy mask.

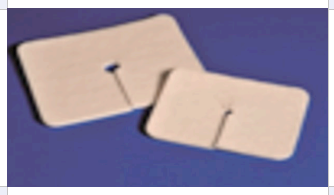
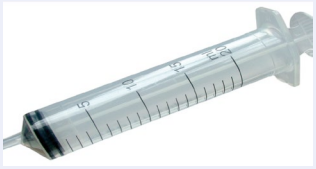
STEP 11
Record in patient notes. Revise tube cleaning frequency as appropriate.

END

Equipment for routine tracheostomy management

For use every shift (or as required)

Storage: Trachi-case			
Equipment	**Picture**	**Quantity**	**Additional information**
Equipment is contained in suitable box e.g.Trachi-case			This should be kept close to bedside and accessed at elbow height
Gloves			Double glove required for AGP
Closed- circuit tracheostomy suction catheter			To protect you and the patient
Sterile water			For cleaning suction tube
Suction catheter			Selection of appropriate suction catheters to accompany suction
Yankauer suction			For oral secretions
Mouth care pack			For oral use only
Spare (disposable) inner cannula of same size			Removed disposable cannula must be disposed of in clinical waste
Clean pot (with lid)			For spare inner cannula

Storage: Trachi-case			
Equipment	**Picture**	**Quantity**	**Additional information**
Sterile dressing pack			For dressing changes
Tracheostomy dressing			To keep the tracheostomy site clean
Scissors			For cutting tracheostomy tape
Spare tracheostomy tube		2	One tube same size Spare tracheostomy tube - one tube smaller
Manometer (cuff pressure check)			The syringe is only needed when the manometer does not include a hand pump
10ml syringe			
Tracheostomy tape or tracheostomy tie or fastening device			To secure the tracheostomy in place
Water soluble lubricating jelly			For Oral Use only
Communication aids			Patient may not be able to verbalise. Patient may require an electrolarynx to communicate to the communication aids additional information
Nurse call bell			Patient may be unable to verbally call for help

Storage: Trachi-case			
Equipment	**Picture**	**Quantity**	**Additional information**
Humidification	Humidification is directed by the needs of the patient. Refer to Humidification Ladder: • 'Dry circuit' HME filter (change every 24 hours or sooner if visibly soiled with secretions) • Add mucolytics • Add saline / hypertonic saline nebulisers • Consider changing to a 'wet circuit'.		

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References

BS EN ISO 9241-125:2017 (Ergonomics of human-system interaction — Part 125: Guidance on visual presentation of information). London: British Standards Institute
Few, S. (2006). Information Dashboard Design: The Effective Visual Communication of Data. Sebastapol, CA; O'Reilly Media.
Inaba, K. Parsons, S. Smillie, R. (2004). Guidelines for Developing Instructions. Boca Raton, FL: CRC Press.
Lee, J. Wickens, C. Liu, Y. Ng Boyle, L. (2017). Designing for People: An Introduction to Human Factors Engineering. Charleston, SC; CreateSpace.
Redish, J. (2007). Letting Go of the Words: Writing Web Content that Works. Burlington, MA; Morgan Kaufman, Elsevier.
Spoehr, K.T., Morris, M.E., & Smith, E.E. (1983). Comprehension of instructions for operating devices. (BBN Report No. 5712). Cambridge, MA: Bolt, Beranek & Newman
Wickens, C. Lee, J. Liu, Y. Gordon-Becker, S. (2003). Introduction to Human Factors Engineering: International Edition. London: Pearson.

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