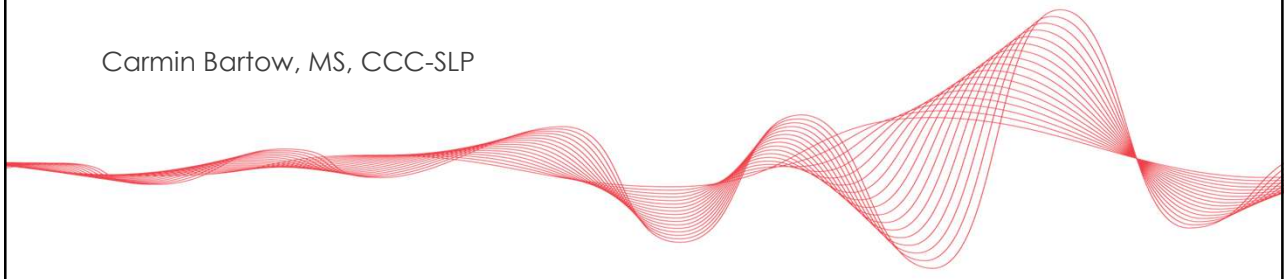
Above Cuff Vocalization (ACV) for Tracheostomy: Evidence-Based Practice and Clinical Implementation

Carmin Bartow, MS, CCC-SLP



We are passionate about making life easier for people living with a neck stoma, by providing personalized care and innovative solutions.

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PR0269-06

Disclosures: The following individuals have financial relationship or relationship affiliations to disclose

They are employed by the Educational Division of Atos Medical. There are no other nonfinancial relationships to disclose.

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Learning Objectives

List the basic steps for using ACV in patients with tracheostomies and mechanical ventilation.

Describe the positive effects of ACV on communication and swallowing.

Identify and troubleshoot potential complications of ACV.

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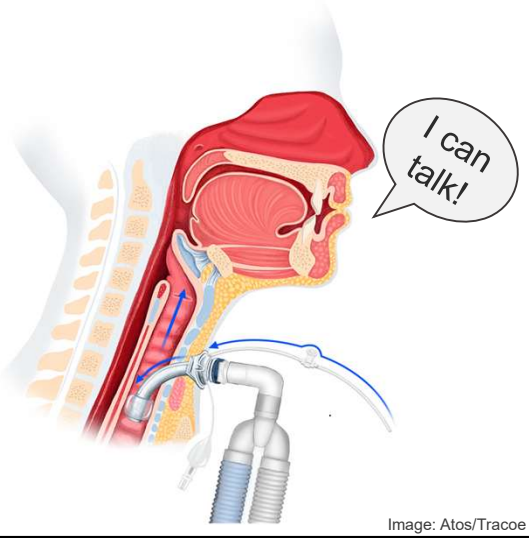
The basics of ACV

TRACOE

ACV is a voicing technique typically used with patients who require cuff inflation during mechanical ventilation

- Tracheostomy tube with a subglottic suction channel is needed
- The suction channel is used to introduce air into the subglottic lumen
- This airflow travels into the upper airway restoring audible voice



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Impact of tracheostomy on communication and swallowing

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Mechanical ventilation and the cuff

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Purpose of the cuff	To separate the upper and lower airway and prevent air leak during mechanical ventilation To slow secretions from entering the lower airway

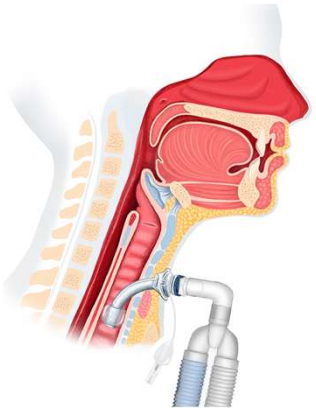

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Image (right): Dräger – Used with permission

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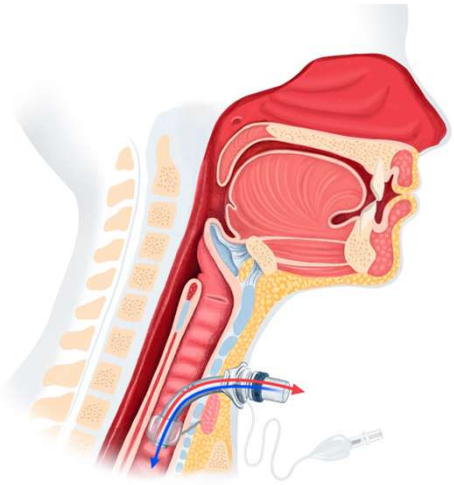
Let's consider the important functions being bypassed



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Negative impact of tracheostomy on **communication**

Participation, QOL impact

- One of the **most frustrating experiences** reported by patients with tracheostomies and a major factor impacting QOL (Pandian et al. 2014)
- Led to **reduced participation** in treatment (Magnus and Turkington, 2006)
- Restricted the patients' ability to understand information and to participate in care, which led to **universally reported negative emotions**
  - Patients reported feeling of **"frustration", "hopelessness", "confusion", "anger"** related to being unable to communicate (Freeman-Sanderson et al. 2018)

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Pandian et al. (2014); Magnus and Turkington (2006); Freeman-Sanderson et al. (2018)

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Negative impact of tracheostomy on **communication**

Safety concerns

- Patients with communication difficulties were 3x more likely to experience preventable adverse events than patients without communication problems (Barlett et al. 2008)

Violation of patient rights

- The Joint Commission, 2010 states that **hospital staff must address the patient's communication needs** before conducting an assessment, providing treatment, obtaining informed consent, discussing end-of-life, or engaging the patient in care discussions

Ineffective pain management

- Difficulty communicating with healthcare providers is a significant barrier to adequate pain relief (Limaye and Katz, 2006)

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Bartlett et al. (2008); Limaye and Katz (2006)

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Negative impact of tracheostomy on **swallowing**

Does airflow matter?

The mechanoreceptors provide afferent input to the brainstem which modifies the efferent signal for swallowing, key to effective coordinated swallowing

Lack of airflow in the upper airway → **Reduced sensory input for swallowing**

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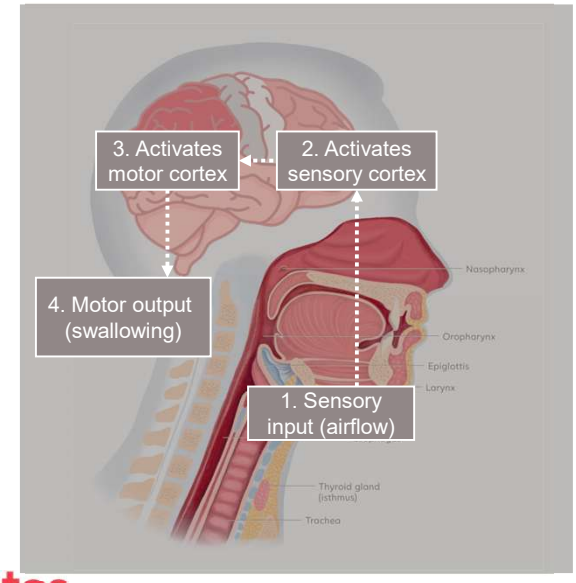
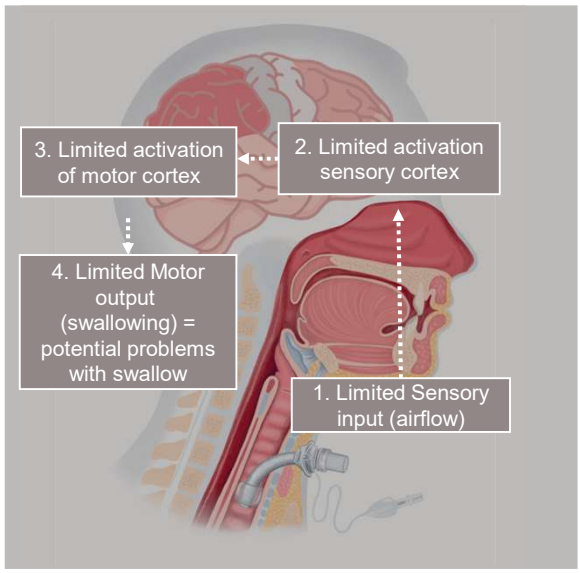
Implications of a tracheostomy on swallow





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Raju and Tardi (2021); Yip and Lui (2022); Hess et al. (2014)

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Reduced sensory input and reduced motor output with tracheostomy

Ponfick et al. (2015) studied patients with critical illness polyneuropathy (CIP) and tracheostomy

- 91% exhibited dysphagia
- 71% exhibited impaired laryngeal sensation

Dysphagia in CIP may result from various contributing factors, including a "learned nonuse" of swallowing muscles

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Ponfick et al. (2015); Robbins et al. (2008)

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Therapeutic goal: Establish upper airway airflow

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Restoring airflow to the upper airway with tracheostomy **and mechanical ventilation**

- Full or partial cuff deflation for leak speech
- Full cuff deflation and in-line speaking valve
- Above cuff vocalization (ACV)

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Leak speech

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Leak speech

What is it?

- Leaking air around the tracheostomy tube into the upper airway for the purpose of phonation

How to do it?

- SLP / RT teamwork
- Slowly deflate cuff
  - May not need to fully deflate the cuff
- Listen for upper airway sounds / phonation
- Watch for drop in expiratory volumes
- Ventilator adjustments as needed

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Leak speech

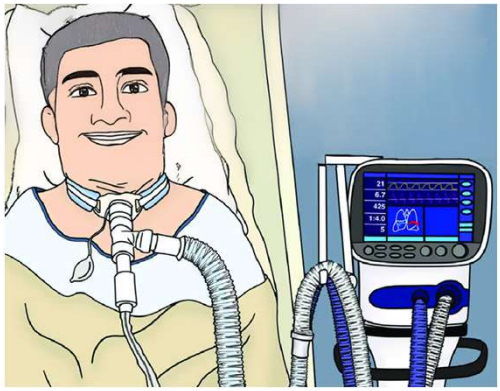
Suggested readiness parameters

Patient parameters

- Awake, alert, medically stable, adequate airway patency

Vent parameters

- PEEP ≤ 10
- FI02 ≤ 50%
- PIP ≤ 35 - 40



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Speaking valve

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Speaking valve in line with mechanical ventilation

What is it?

- Deflating the cuff
- Placing a PMV in the vent circuit to restore exhalation through the upper airway

How to do it?

- RT / SLP teamwork
- Complete cuff deflation
- If significant drop in expiratory volume, place valve with appropriate adapters
- Ventilator adjustments as needed
- May need continuous monitoring

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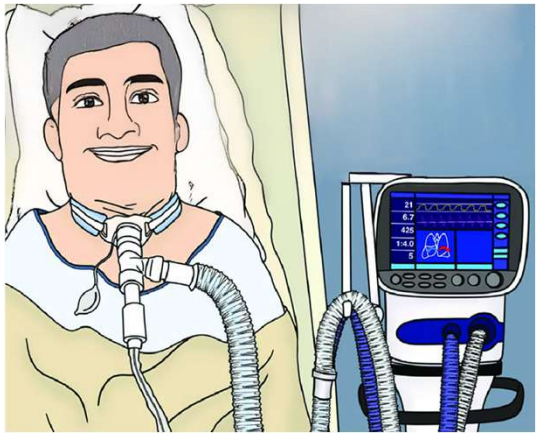
Cuff deflation and in-line speaking valve

Suggested readiness parameters

- Patient parameters
  - Awake, alert, medically stable, adequate airway patency
- Vent parameters
  - PEEP ≤ 10
  - FI02 ≤ 50%
  - PIP ≤ 35-40



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What if…

The ventilator settings do not meet the readiness criteria for in-line speaking valve?

Your patient and vent settings meet criteria but can only use in-line valve for short periods?

Above Cuff Vocalization (ACV)

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Above Cuff Vocalization (ACV)

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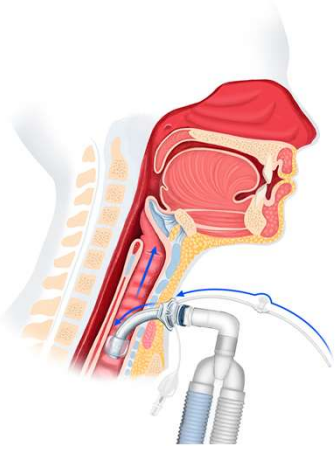
Above Cuff Vocalization

What is it?

- A voicing technique to restore airflow above the inflated cuff and into the subglottic lumen

How to do it?

- Tracheostomy tube with a subglottic suction port is needed
- The suction port is attached to a source of compressed air
- Airflow is introduced into the subglottic lumen
- This airflow travels into the upper airway restoring audible voice



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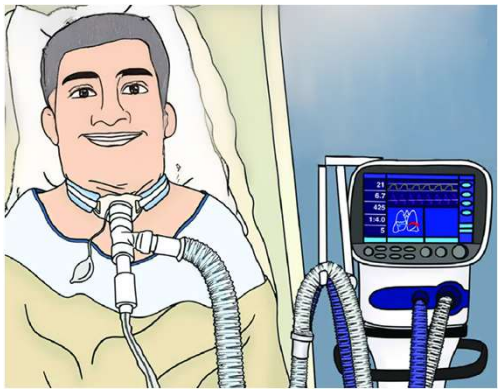
Above Cuff Vocalization

Suggested readiness parameters

Patient parameters

- Awake, alert, medically stable, adequate airway patency



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The basics of ACV

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ACV is a voicing technique typically used with patients require cuff inflation during mechanical ventilation

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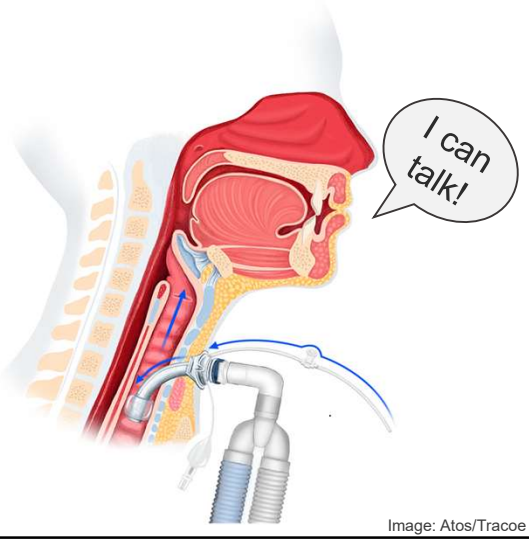

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Subglottic suction tracheostomy tubes

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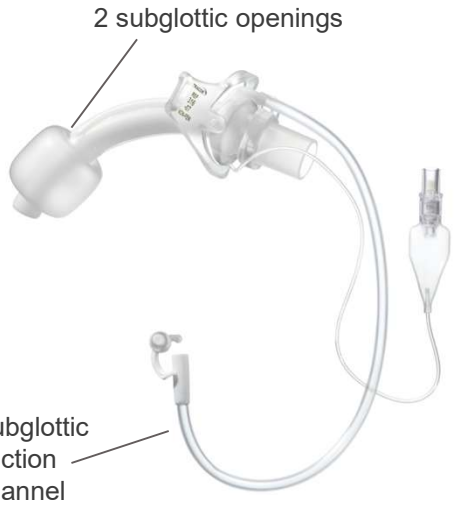
Tracheostomy tube with subglottic suctioning

Standard tracheostomy tube with the addition of a subglottic suction channel

The additional tubing has small openings seated above the cuff which allows for subglottic suctioning

Can help prevent Ventilator Associated Pneumonia (VAP)



Tracoe Twist Plus Extract

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Image: Atos/Tracoe

Papazian LK et al. (2020); Pozuelo-Carrascoso, D. et al. (2020); Muscedere et al. (2011)

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Tracheostomy tubes with subglottic suction can help prevent ventilator associated pneumonia (VAP)

VAP

Subglottic secretions above the cuff are associated with bacterial colonization of the lower respiratory tract, causing VAP

VAP is a significant cause of morbidity and mortality in critically ill patients who require tracheostomy and mechanical ventilation

Subglottic suctioning

Reduces the volume of secretions

Reduces risk of bacterially contaminated secretions entering the lower respiratory tract

Reduces VAP

For this reason, subglottic suctioning is recommended as one of the preventative measures for VAP

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Terragni et al. (2020); Souza & Santan (2012); Papazian et al. (2020); Pozuelo-Carrascoso et al. (2020); Damas et al. (2015); Muscedere et al. (2011)

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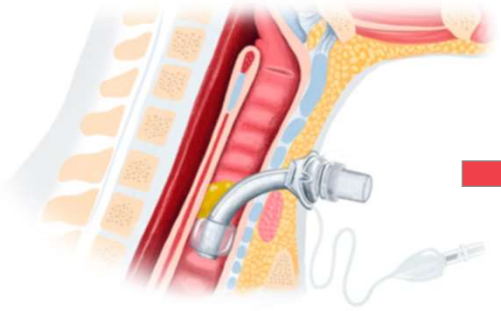
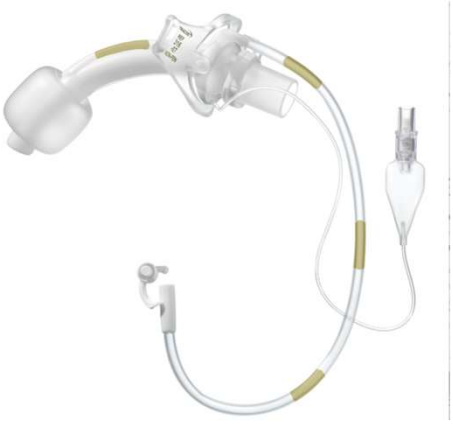
Subglottic suctioning

The Problem



The Solution



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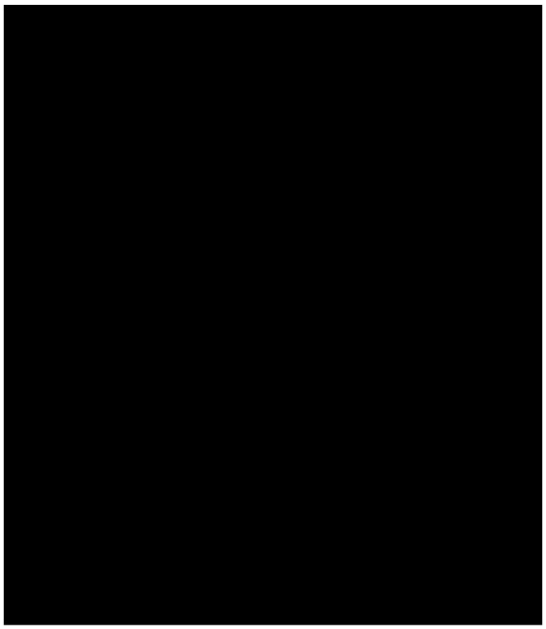
Tracoe Extract tracheostomy tubes feature an innovative design with a flat, subglottic suction channel, and strategically designed and placed suction points.
This helps to ensure that secretions are suctioned more rapidly and thoroughly.



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So, if these trachs can help reduce VAP

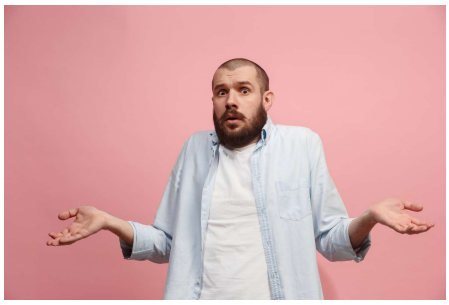
AND

Allow ACV

AND

Use of in-line speaking valves…

Why aren't we using them more often??



Great opportunity for RT advocacy

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ACV evidence: Communication and swallowing

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Above Cuff Vocalization is not new

In the **mid 1960s**, Dr. RML Whitlock described a simple tracheostomy tube attachment to facilitate communication for patients with an inflated cuff.

"The speaking-aid not only makes communication easier but also relieves the patient from the frustration and fear of not being able to make his requirements known".

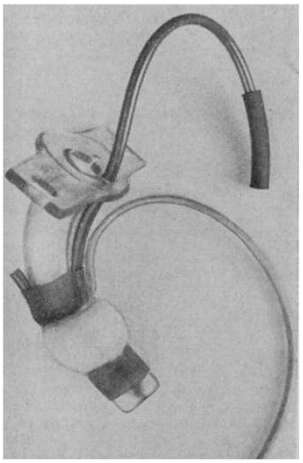

Image: Atos/Tracoe

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ACV for improved communication

Median time to speech decreased from 13 days to 9 days after implementation of ACV (Gajic et al. 2024)

88% of patients could speak with an audible voice or a whisper (Petosic et al. 2021)

- **Whispered speech is not a fail**

80% of patients achieved an audible voice (McGrath et al. 2018)

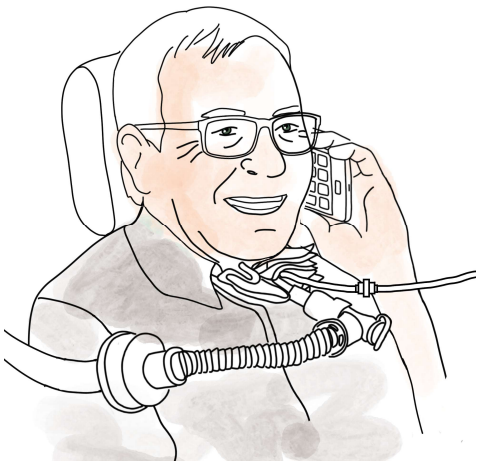

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Image: Atos/Tracoe

Gagic et al. (2024); Petosic et al. (2021); McGrath et al. (2018)

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ACV for improved QOL

ACV improved voice related QOL (V-RQOL) (Petosic et al. 2021)

ACV improved patient-reported QOL (Pandian et al. 2020)

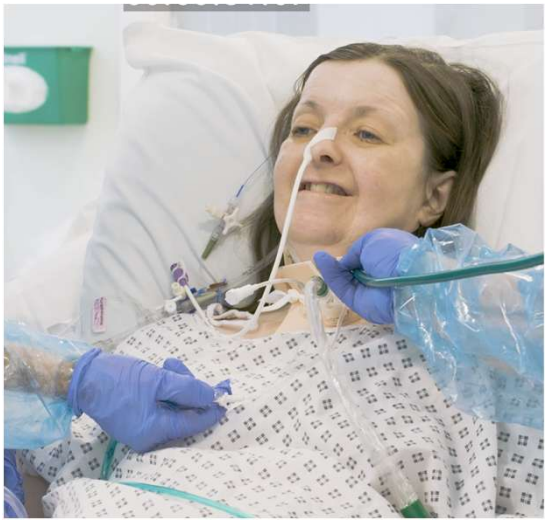

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Image: Atos/Tracoe

Petosic et al. (2021); Pandian et al. (2020)

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What about delirium?

Communication-vulnerable patients have an increased diagnosis of psychopathology

(JCAHO webinar, *Call to Action: Improving Care to Communication Vulnerable Patients)*

Maybe the inverse is true

Patients who received care through a humanistic lens, including restoration of communication reported enhanced emotional and mental well-being, reduced distress, better understanding of their reality, and decreased delirium. (Batty, 2009)

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Batty (2009)

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ACV for improved **swallowing, coughing, and secretion management**

Improvements were seen in unstimulated cough, swallow frequency, and aspiration ratings measured during ACV compared to no ACV

Authors postulate improvements may be due to:

- Increase in laryngeal sensitivity and afferent activity
- Physiologic effect of airflow facilitating upward movement of secretions

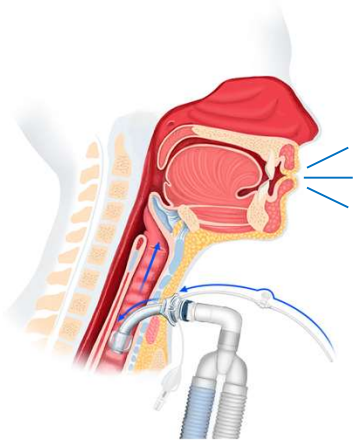

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Image: Atos/Tracoe

McGrath et al. (2018)

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ACV for improved **swallowing, coughing, and secretion management**

Kothari et al. (2016) investigated the influence of External Subglottic Airflow (ESAF) on swallowing in patients with severe brain injury

Findings:

Increased swallow frequency during ESAF (ACV)

Reduced volume of secretions after ESAF (ACV)

Kothari et al. (2016)

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Video: Atos/Tracoe

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Candidacy and contraindications

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Candidacy considerations

Ideal candidates for ACV when used for communication:

Awake and alert

Have a subglottic suction tracheostomy tube

Require cuff inflation

- But not necessarily at all times

Intact laryngeal function

No upper airway obstruction

Have an established stoma (without edema or bleeding)

Criteria may vary if using ACV to stimulate laryngeal sensation and swallowing

Image: Atos/Tracoe

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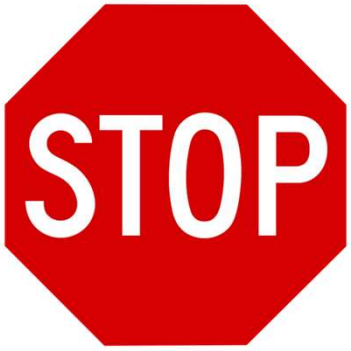
Contraindications

Upper airway obstruction

New tracheostomy
- Less than 48 hours post-tracheotomy

Bleeding or edema at stoma



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ACV steps and troubleshooting

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Multidisciplinary approach

HCPs involved in ACV:
MD
RT
SLP
APN
RN

Staff training is necessary

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ACV steps – education

The following ACV steps are not intended to be specific recommendations. They are suggestions for how to approach ACV. You and your teams should create a protocol for ACV at your facility.

Obtain physician order

Explain the procedure to the patient

- Explain what you are doing and what the patient may feel
- Don't guarantee voice

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Image: Atos/Tracoe

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ACV steps – subglottic suction

Clear the secretions from the subglottic space with a syringe or suction before applying ACV

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Image source: Atos/Tracoe

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ACV steps – connectors

Connect 02 tubing to the subglottic suction line with or without the thumb port

Without thumb port

With thumb port

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Images: Atos/Tracoe

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ACV steps – connect 02 tubing to source of compressed air

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Image: Atos/Tracoe

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ACV steps – introduce airflow

Introduce air slowly through the subglottic suction line into the upper airway starting with 1 LPM

Slowly increase to a typical flow rate of 3–6 LPM depending on patients' needs

Monitor patient's reactions and tolerance

Adjust flow and timing as needed

Flow rates should not exceed 10 LPM

- For many patients this will need to remain lower

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Image: Atos/Tracoe

Petosic et al. (2021)

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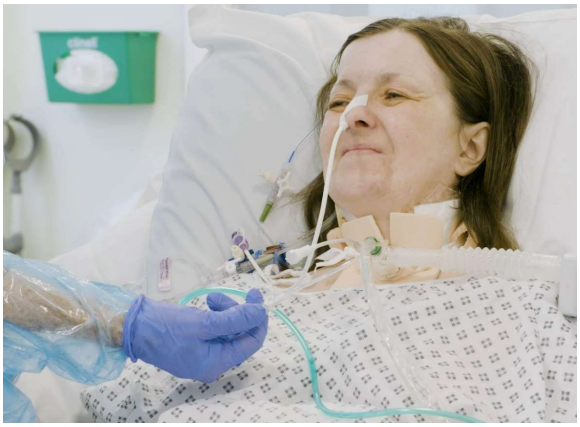
ACV steps – occlude thumb port for voicing and train patient / family (if appropriate and within your facility guidelines)



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Images: Atos/Tracoe

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Complications and troubleshooting

Discomfort	Endoscopy or FEES for direct visualization
	Head/tube position adjustments
	Reduce flow rate and / or ACV length of time
Dysphonia	Increase flow rate
	Practice / Voice therapy
Air escaping from stoma	Gentle pressure on neck flange
	Adjust vent tubing / vent arms
	Lower flow rate
Emphysema of the neck and face	Immediately discontinue ACV
	Notify MD

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Mills et al. (2022); Calamai et al. (2018)

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Let's try an experiment…

What is the reported lip-reading accuracy?

- 0-10%
- 10-20%
- 20-40%
- 40-60%

Answer: 10-20%

Based on what we have discussed about effective communication for safety, patient rights, pain management, participation in treatment, QOL, is lip-reading good enough?

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NO

Alteri et al. (2011)

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Why use ACV?

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Benefits of Above Cuff Vocalization

Crucial in delivering patient-centered care
Does not require cuff deflation
Does not require alterations to vent settings
May be able to train patient and family to use ACV
Improved communication / faster time to voicing
Promotes laryngopharyngeal sensory stimulation
Increased swallow frequency
Reduced secretions
Improvement in QOL

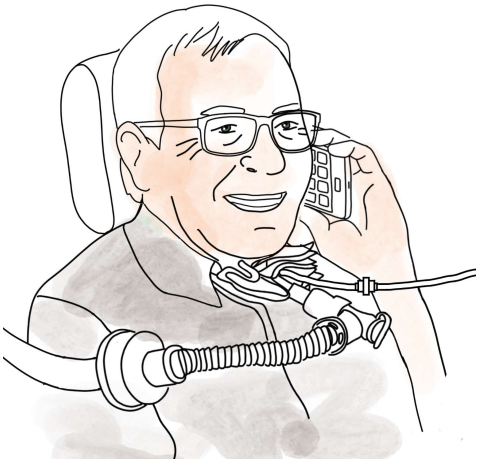

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Image: Atos/Tracoe

Wallace et al. 2022; Kothari, 2017; Petosic et al. 2021; Mills et al. 2022

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Video: Atos/Tracoe

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“Life is so much easier with a voice” ☺

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Thank you for attending!

Any questions?

carmin.bartow@atosmedical.com

References available upon request

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