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ORIGINAL RESEARCH

Determining the Prevalence, Implementation Approaches, and Opinions of Above Cuff Vocalization: A Survey of Health Care Professionals

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Abstract

Objective: To conduct an international survey to investigate the use of above cuff vocalization (ACV) and how practice and opinion differs.

Design: Observational, cross-sectional online survey.

Setting: Critical care, acute, rehabilitation, long-term care, and community.

Participants: Health care professionals involved in tracheostomy care or weaning (N=243).

Interventions: Not applicable.

Main Outcome Measures: Tracheostomy management, prevalence, personal experiences and opinions, and barriers to use. Quantitative data were reported descriptively, and content analysis was conducted with qualitative data.

Results: The survey was completed by 243 health care professionals from 9 professional groups and 25 countries, with most responses from the United Kingdom (54%) and speech and language therapists (55%). ACV was used in 39% of services (n=93). Sixty percent (n=50/83) of health care professionals with direct experience of ACV had used it with <10 people. Implementation of ACV varied widely concerning procedures, contraindications, safety processes, professionals involved, competencies, staff training, delivery, and outcome measures. The top benefits were communication (n=76/93; 82%), mood (n=62/93; 67%), and laryngeal sensation (n=49/93; 53%). Complications included discomfort (n=54/93; 58%) and strained vocal quality (n=39/93; 42%). Barriers to ACV implementation included lack of knowledgeable staff (n=92/238; 39%) and lack of access to training (n=73/238; 31%).

Conclusions: ACV uptake varies internationally with no standardized approach to ACV delivery. Diversity of opinions on approaches and benefits exist. Serious complications are infrequent, but minor complications are common. Future research is needed to establish optimal ACV implementation to maximize benefits and minimize risks.

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A tracheostomy is a life-saving intervention that facilitates the management of airway obstruction and enables prolonged mechanical ventilation in critical care. However, many patients with tracheostomies experience dysphagia and communication impairment, usually as a result of a combination of factors including intubation trauma, disuse atrophy, intensive care unit

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−acquired weakness, absence of translaryngeal airflow, altered respiratory-swallow pattern, and the presence of the tracheostomy itself.[1,2] Critical care patients have reported that thirst and difficulty communicating were some of their most distressing and well-recalled memories.[3-8] Prolonged tracheostomy cuff inflation, which prevents airflow through the vocal cords into the upper airway, also contributes to these issues. As well as preventing vocalization, lack of airflow can result in laryngeal and oropharyngeal desensitization.[9,10] Sensory input in the oropharynx is key for triggering functional swallowing[11] and in the larynx for triggering airway protective reflexive coughing.[12] People with tracheostomies often exhibit reduced swallowing frequency[13,14] and difficulties swallowing saliva and oral intake.[15]

Above cuff vocalization (ACV), also known as "talking tracheostomy"[16] and "external subglottic airflow,"[13] has been used for more than 50 years.[17] This technique restores airflow to the larynx and oropharynx through the application of an external flow of medical air, or oxygen, via the subglottic port of the tracheostomy. Limited and low-quality evidence is available,[18] but there are reports of various benefits including for communication,[14,19-23] swallowing,[13,14,19,24] quality of life,[25] and cough.[14] Various studies evidence serious complications[26-28] and minor complications[14,19-21,29] from using ACV. Currently there are large knowledge gaps for ACV. Our aims are to provide information about current ACV practice and identify gaps for further research. The objectives of this study were to conduct an international survey to investigate the use of ACV and how practice and opinion differs.

Methods

This descriptive observational study using a cross-sectional, online, single-event survey investigated ACV prevalence, practice, and opinions. This study was performed in line with the principles of the Declaration of Helsinki. Ethical approval was obtained from the School of Medicine Research Ethics Committee at the University of Leeds (05/02/2019/MREC 18-037).

Survey development

A novel, open, online survey was developed in English using *Jisc Online Surveys*. The target population was any health care professional (HCP) involved in ACV and tracheostomy weaning. The HCPs involved vary across the United Kingdom (UK) and internationally and can include advanced critical care practitioners (ACCPs), physicians, nurses, occupational therapists, physiotherapists, respiratory therapists, tracheostomy specialist nurses, and speech and language therapists (SLTs). Supplemental appendix S1 (available online only at http://www.archives-pmr.org/) outlines the survey development. The final refined survey included 73 questions; these were predominantly closed questions, with some open questions. The survey was routed, with participants directed in various paths through the survey dependent on their responses. Supplemental appendices S2 and S3 (available online only at http://www.archives-pmr.org/) present the survey and participation information sheet, respectively.

List of abbreviations:

ACCP	**advanced critical care practitioner**
ACV	**above cuff vocalization**
FEES	**fiberoptic endoscopic evaluation of swallowing**
HCP	**health care professional**
SLT	**speech and language therapist**
UK	**United Kingdom**

Data sampling

The survey was disseminated internationally from May 24 to November 30, 2019. Convenience sampling was used, a type of nonprobability sampling where data are collected from an easily accessible population, with distribution via readily available networks. Survey completion was voluntary with no provision of incentives. To ensure responses from all relevant HCPs, the survey was distributed via professional, tracheostomy, and critical care networks and using social media. Thirty professional networks and societies were approached, and 17 agreed to disseminate the survey. Dissemination approaches of these networks varied from social media posts, emails, and newsletter advertisements. Most networks adopted a multifaceted approach, using a combination of social media, emails, and advertisements, and initiated multiple reminders during the dissemination period. The survey was also advertised at 2 multidisciplinary conferences: the European Society for Swallowing Disorders and the UK Critical Care Research Forum. Supplemental appendix S4 (available online only at http://www.archives-pmr.org/) presents the advertisements, and supplemental appendix S5 (available online only at http://www.archives-pmr.org/) lists the professional networks that disseminated the survey.

Data analysis and reporting

Responses were exported into Microsoft Excel 2016[a] and analyzed for each respondent; data from incomplete responses were included. Omissions of questions were recorded as "no response." Quantitative data were reported descriptively. Qualitative content analysis was conducted using NVivo 12 software.[b] This survey was reported in accordance with the Checklist for Reporting Results of Internet E-Surveys,[30] including reporting of the participation and completion rate as preferable to response rate.[30]

Results

A total of 243 responses were included in the analysis, with 1 response excluded because the survey was terminated immediately after consent. A further 5 respondents terminated the survey early, and these were analyzed up until the point of termination because many questions were stand alone. This factor, along with survey routing design that leads to bypassing of questions, results in a varying denominator. The participation rate (percentage of visitors to the online survey webpage who participated in the survey) was 9%. The completion rate (percentage of those who participated in the survey who completed the survey in full) was 98%.

The survey was completed by respondents from 25 countries. The highest number of respondents came from the UK (n=131; 54%), followed by Australia (n=26; 11%), and the United States (n=25; 10%). Table 1 describes respondent characteristics.

The working group finalized the survey results into the following sections: tracheostomy management, availability of SLT

Table 1 Characteristics of respondents

Characteristics	n	%
Professional group		
Speech and language therapists	134	55.1
Physicians	38	15.6
Nurses	31	12.8
Physiotherapists	27	11.1
Advanced critical care practitioners	8	3.3
Occupational therapists	2	0.8
Advanced nurse practitioners	1	0.4
Respiratory therapists	1	0.4
Tracheostomy specialist nurses	1	0.4
Total no. of responses (N)	243	
Clinical areas		
Critical care	205	84.4
Acute	111	45.7
Rehabilitation	51	21
Long-term care	12	4.9
Community	10	4.1
Total no. of responses (N)	243	
Direct involvement in ACV		
Yes	83	89.3
No	10	10.8
Total no. of responses (N)	93	
Duration of involvement in ACV		
<6 mo	10	12.1
6-12 mo	17	20.5
1-2 y	28	33.7
3-4 y	9	10.8
≥5 years	19	22.9
Total no. of responses (N)	83	
No. of patients involved with ACV		
<10	50	60.2
10-50	23	27.7
51-100	3	3.6
>100	4	4.8
Don't know	2	2.4
No response	1	1.2
Total no. of responses (N)	83	

services, prevalence of ACV use, ACV implementation, ACV safety, ACV benefits, and barriers to ACV use.

Tracheostomy management

Tracheostomy management approaches, which are likely to affect ACV use, varied widely. There was no consistency for the earliest or typical time first tracheostomy cuff deflation occurs, highest level of positive end expiratory pressure, or pressure support at which cuff deflation is considered (supplemental appendix S6, available online only at http://www.archives-pmr.org/). Furthermore, 31% (n=76/242) reported none of their patients' first tracheostomy tubes had a subglottic port and a tracheostomy change was required for ACV use.

Availability of SLT services

Sixty percent (n=145/242) had SLT input 5 days per week, whereas 36% (n=87/242) had less frequent input. Fiberoptic endoscopic evaluation of swallowing (FEES) was available for 62% of respondents (n=150/242), with 34% (n=82/242) having no access.

Prevalence of ACV use

Thirty-nine percent (n=94/242) were using ACV in their clinical services. The demographics of respondents using ACV were UK (n=55/94; 59%), Australia (n=14/94; 15%), United States (n=8/94; 9%), Sweden (n=3/94; 3%), and other countries (n=14/94; 15%). The professional groups represented included SLTs (n=58/94; 62%), physiotherapists (n=13/94; 14%), physicians (n=10/94; 11%), ACCPs (n=5/94; 5%), nurses (n=4/94; 4%), occupational therapists (n=2/94; 2%), and other (n=2/94; 2%). Most services used ACV with small numbers of patients, with 95% (n=88/93) using it with ≤10 patients in the previous month. A small proportion had been using ACV for >10 years (n=7/93; 8%), 71% (n=66/93) had used it for 1-10 years, and 24% (n=22/93) had used it for <1 year.

ACV implementation

Thirty-seven percent were using ACV guidelines, protocols, or patient-specific guidelines in their services (n=34/93). Figure 1 outlines implementation of these and competency documents. Of those using documents, 74% (n=25/34) stated they were extremely or very beneficial. The top benefits reported were providing clarity on approach to ACV (n=32/34; 94%) and minimizing risk (n=31/34; 91%). Of those not using documents, 92% (n=47/51) thought it would be beneficial to introduce them.

A contraindications list was used by 50% (n=46/93), but there was considerable variability in content (see supplemental appendix S7, available online only at http://www.archives-pmr.org/). This variability in procedural ACV implementation was apparent even in the responses of those who had been using ACV for >5 years.

Few respondents reported using competencies for staff assessing for suitability for ACV (n=17/93; 18%) or delivering ACV (n=15/93; 16%). However, most respondents thought competencies were needed for staff assessing patients for ACV (n=73/93; 78%) and for delivering ACV (n=74/93; 80%). Training for staff delivering ACV was in place for 47% (n=44/93) and for staff carrying out ACV initial assessments in 35% (n=33/93). Most respondents stated staff should receive training for ACV assessment (n=86/93; 92%) and delivery (n=92/93; 99%).

There was a wide range of ACV implementation approaches (table 2). The most common reasons given for not introducing ACV earlier included patient alertness levels (n=32/93; 34%), lack of available staff to assess (n=29/93; 31%), and concerns regarding risk of subcutaneous emphysema (n=25/93; 27%). Some of the "other" reasons given included: lack of appropriate tracheostomy tube with a subglottic port (n=8/93; 9%), ACV considered a last resort (n=6/93; 6%), and early cuff deflation achieved (n=5/93; 5%). Some respondents reported there should be defined upper limits for flow rate (n=51/93; 55%), total time of ACV (n=26/93; 28%), and number of ACV episodes (n=13/93; 14%). However, there was no agreement about what these optimal approaches should be (supplemental appendix S8, available online only at http://www.archives-pmr.org/).

SLTs most commonly determine patient suitability for ACV assessment (n=64/93; 68%), followed by physicians (n=48/93; 51%) and physiotherapists (n=30; 32%). Most services conduct

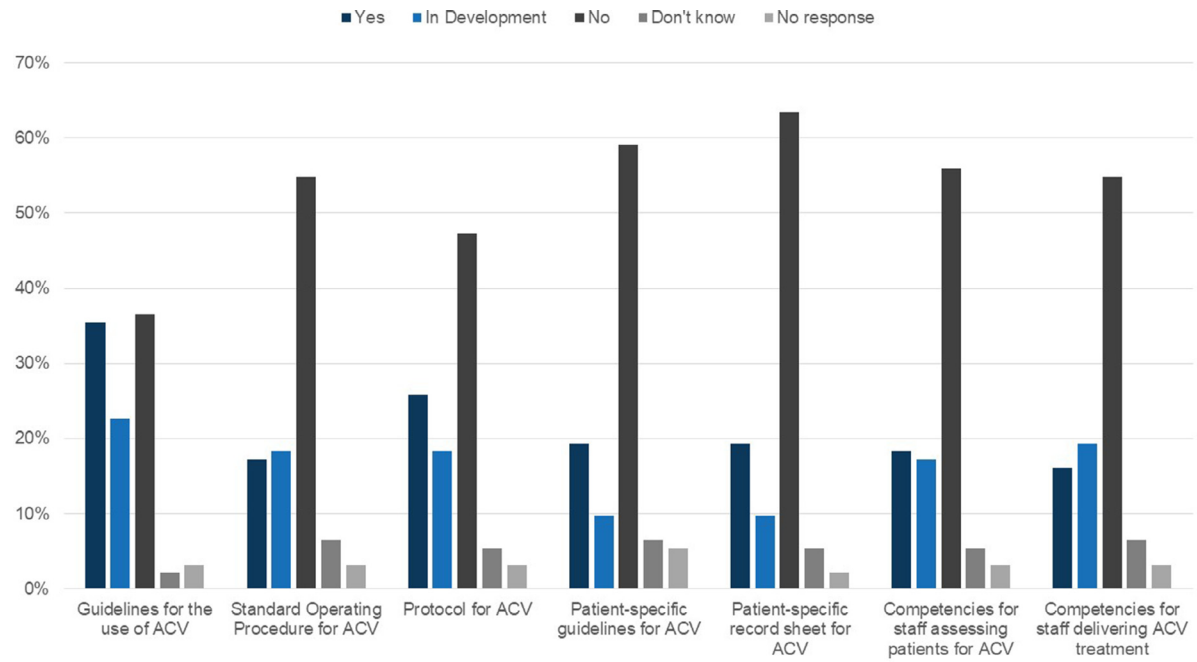

Fig 1 Percentage of respondents who have implemented various documents for ACV delivery (n=93).

assessments to verify patients are safe and appropriate for further ACV sessions (n=70/93; 75%), and these are most commonly completed by SLTs (n=59/71; 83%), physiotherapists (n=26/71; 37%), and physicians (n=18/71; 25%). Respondents stated the following groups are best placed to carry out ACV assessments: SLTs (n=88/93; 95%), physiotherapists (n=46/93; 49%), nurses (n=32/93; 34%), physicians (n=29/93; 31%), and ACCPs (n=29/93; 31%). Various reasons were given for why certain professional groups were thought to be better placed to carry out these assessments. The most common skills or knowledge reported as essential for ACV assessment were voice, speech and communication, upper airway anatomy and physiology, tracheostomy, and saliva management.

ACV is mostly commonly delivered by SLTs (n=56/93; 60%), physiotherapists (n=18/93; 19%), and nurses (n=7/93; 8%). Family participation is limited; 49% (n=46/93) stated they never or rarely involved families, 17% (n=16/93) reported families were sometimes involved, and 13% (n=12/93) reported that families were very often or always involved.

ACV safety

More than two-thirds of respondents stated they would stop treatment because of excessive coughing (n=72/93; 77%), lack of evidence of air passing through the upper airway (n=72/93; 77%), subcutaneous emphysema (n=76/93; 82%), or patient discomfort or pain (n=82/93; 88%). There was less agreement for the signs or symptoms that would result in discontinuing any further ACV trials, with the highest being subcutaneous emphysema (n=58/93; 62%), and achieving cuff deflation (n=47/93; 51%).

Most respondents reported that ACV delivery and complications were recorded (n=90/93; 97%). Safety monitoring was most commonly conducted by SLTs (n=42/93; 45%), followed by nurses (n=12/93; 13%). Eighteen percent (n=17/93; 18%) did not know if any measures had been introduced to avoid or reduce the risk of complications. Of those who did have strategies in place, the top 2 were only trained or competent staff delivering ACV (n=52/93; 56%) and all patients being assessed by a trained or competent assessor (n=51/93; 55%).

A wide variety of complications or symptoms were observed by respondents with the most common being discomfort (n=54/93; 58%), strained vocal quality (n=39/93; 42%), air escape via stoma (n=32/93; 34%), and drying of the laryngeal mucosa (n=23/93; 25%). More serious complications were less common: 8% (n=7/93) reported 1-4 incidences of subcutaneous emphysema, 11% (n=10/93) reported 1-6 occurrences of air trapping, and 10% (n=9/93) reported 1-4 incidences of bleeding. A substantial proportion of respondents (n=27-29/93; 29%-31%) did not know if patients had any of these complications.

ACV benefits

Few respondents collected outcomes measures to evaluate the effect of ACV (n=10/93; 11%), and there was considerable variation in outcomes used. Thirteen percent (n=12/93) often or always used FEES to monitor outcomes or safety, 49% (n=46/93) never or rarely used FEES, 26% (n=24/93) sometimes used FEES, and 12% (n=11/93) did not know. The top 5 perceived benefits reported were improved communication (n=76/93; 82%), improved mood (n=62/93; 67%), improved laryngeal sensation (n=49/93; 53%), increased frequency of swallowing (n=43/93; 46%), and reduced volume of subglottic secretions (n=39; 42%). The extent of this perceived effectiveness is outlined in figure 2.

There was a lack of clarity regarding which types of patients benefited most from ACV (supplemental appendix S9, available online only at http://www.archives-pmr.org/). Techniques used to improve effectiveness or success of ACV included adjusting the position and/or posture of the patient (n=58/93; 62%), SLT training the patient (eg, vocal exercises) (n=46/93; 49%), and manually adjusting the tracheostomy position (n=37/93; 40%).

Table 2 ACV implementation approaches

		n	%
Earliest introduction of ACV	0-24 hrs	3	3.2%
	25-48 hrs	10	10.8%
	49-72 hrs	14	15.1%
	>72 hrs	45	48.4%
	Don't know	21	22.6%
	Total number of responses (N)	**93**	
Typical timing of introduction of ACV	0-24 hrs	0	0%
	25-48 hrs	3	3.2%
	49-72 hrs	9	9.7%
	>72 hrs	55	59.1%
	Don't know	25	26.9%
	No response	1	1.1%
	Total number of responses (N)	93	
Type of air used	Humidified oxygen	14	15.1%
	Non-humidified oxygen	45	48.4%
	Medical air	25	26.9%
	Don't know	9	9.7%
	Total number of responses (N)	**93**	
Airflow delivery	Intermittent	28	30.1%
	Continuous	34	36.6%
	Both intermittent and continuous (with equal frequency)	3	3.2%
	Both intermittent and continuous (with intermittent used more frequently)	9	9.7%
	Both intermittent and continuous (with continuous used more frequently)	9	9.7%
	Don't know	10	10.8%
	Total number of responses (N)	**93**	
Upper airflow limit	2 L/min	1	1.1%
	3 L/min	3	3.2%
	5 L/min	30	32.3%
	6 L/min	11	11.8%
	7 L/min	2	2.2%
	8 L/min	13	14%
	9 L/min	1	1.1%
	10 L/min	10	10.8%
	15 L/min	4	4.3%
	No upper limit	4	4.3%
	Don't know	14	15.1%
	Total number of responses (N)	**93**	
Upper limit of airflow duration per day	<15 mins	7	38.9%
	15-30 mins	3	16.7%
	31-60 mins	4	22.2%
	61-90 mins	0	0%
	91-120 mins	1	5.6%
	>120 mins	0	0%
	Don't know	2	11.1%
	No response	1	5.6%
	Total number of responses (N)	**18**	
Typical daily duration of airflow per day	<15 mins	27	29.0%
	15-30 mins	21	22.6%
	31-60 mins	9	9.7%
	61-90 mins	3	3.2%
	91-120 mins	2	2.2%
	>120 mins	4	4.3%
	Don't know	27	29.0%
	Total number of responses (N)	**93**	
Usual advice on number of ACV episodes per day	no advice given	10	10.8%
	Hourly	1	1.1%
	1-2 times daily	8	8.6%
	3-4 times daily	14	15.1%
	5-6 times daily	1	1.1%
	>6 times daily	2	2.2%
	when requested by patient	40	43%
	whenever staff communicate with patient	31	33.3%
	when relatives visit	34	36.6%
	Don't know	11	11.8%
	Other	16	17.2%
	Total number of responses (N)	**93**	
Typical number of days duration having ACV	1 day	1	1.1%
	2-5 days	19	20.4%
	6-7 days	4	4.3%
	1-4 weeks	13	14%
	>1 month	3	3.2%
	ongoing (e.g. long-term tracheostomy)	18	19.4%
	Don't know	33	35.5%
	No response	2	2.2%
	Total number of responses (N)	**93**	

Barriers to ACV use

Respondents reported a variety of barriers to ACV implementation (fig 3). The most extreme barriers reported were lack of access to staff with the knowledge to implement (n=92/238; 39%), lack of access to training (n=73/238; 31%), and not using tracheostomy tubes with subglottic ports (n=74/238; 31%).

Discussion

This is the first study to report health care professionals' opinions and experiences of ACV. Despite this technique first being reported in 1967,[17] there are still many centers not using ACV. Those using ACV have limited experience both in time and patient numbers. More than three-quarters of respondents stated their services had started using ACV in the past 6 years; a potential reason could be improved awareness brought about by the recent increase in research since 2014.[14,19,20,25]

The results demonstrate huge variability in ACV implementation in terms of safety processes and procedures, training, competencies, staff involvement, and approach to assessment and delivery. The variability in tracheostomy management may be contributing to the variability in ACV use; centers practicing early cuff deflation are less likely to observe benefits from an intervention that is generally delayed until 72 hours post tracheostomy insertion. Furthermore, if tracheostomies with subglottic ports are not routinely used and a tracheostomy tube change is required, then some centers may question the costs and benefits of ACV. Another potential reason for the variability in ACV uptake and implementation approaches may be the inconsistent availability of SLTs. Many respondents highlighted that SLTs are key members of the team in ACV implementation, from production of guidelines and training delivery to the assessment of patients for suitability and monitoring of safety. This aligns with the research literature, which emphasizes the importance of SLT involvement in ACV introduction, for example, in providing daily rehabilitation to prevent complications such as strained or hoarse voice quality or air trapping [19,20,22,23] and using FEES to ensure safety.[20,23] More than one-third of

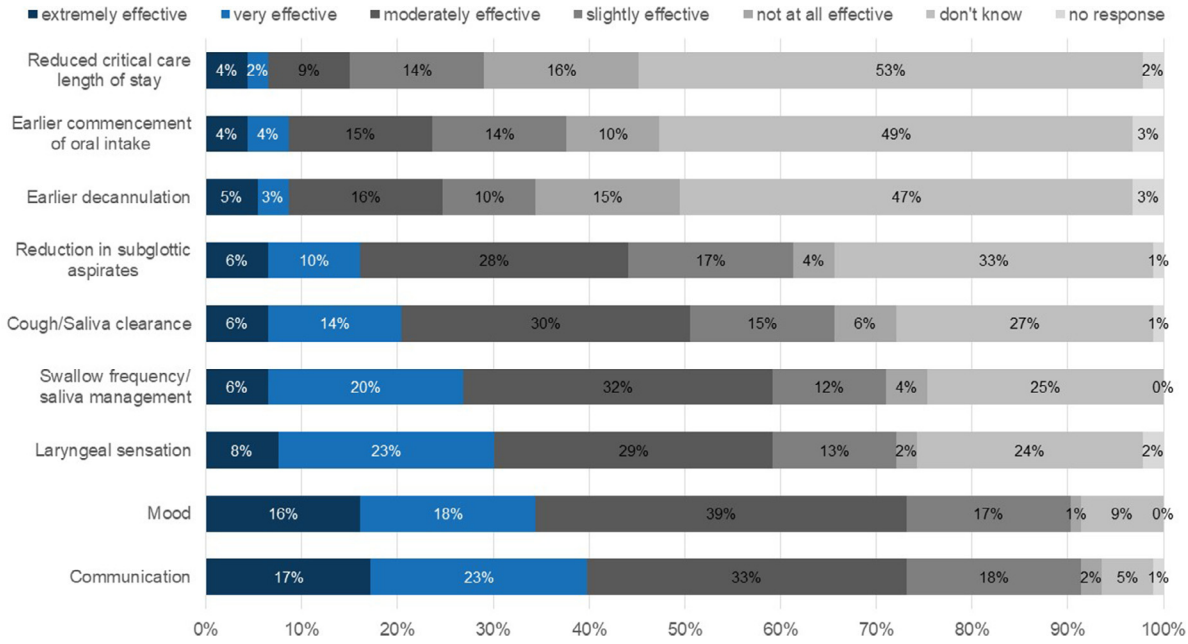

Fig 2 Perceived effectiveness of ACV for different domains.

services had inconsistent SLT presence or access to FEES, and this may affect the ability to safely, effectively, and consistently introduce ACV. A large proportion of the day-to-day delivery of ACV appears to be supported by SLT, suggesting patients in some settings may receive ACV less frequently than needed. This is evidenced by more than half stating that typical daily ACV duration is <30 minutes. The benefits received from such a short duration of therapy are unclear, particularly because communication is a daily function needed throughout the day. The variability in approach to ACV implementation is predictable given the scarcity of evidence supporting any one approach and the lack of national or international guidance.[18] Perhaps less predictable is the lack of agreement among respondents about their opinions of optimal approaches. Several possible explanations exist for this finding including limited experience, variability in tracheostomy weaning approaches, or variable caseloads or settings.

This study demonstrates minimal use of outcome measures. This may be due to ACV research having inconsistent use of outcome measures and a heavy reliance on descriptive, subjective measures.[18] It may also be a result of the lack of consensus on core outcome measures for dysphagia or communication in critical care.[31,32] Many respondents reported benefits for communication, mood and certain aspects of swallowing. However, few reported that these improvements translated into functional gains such as

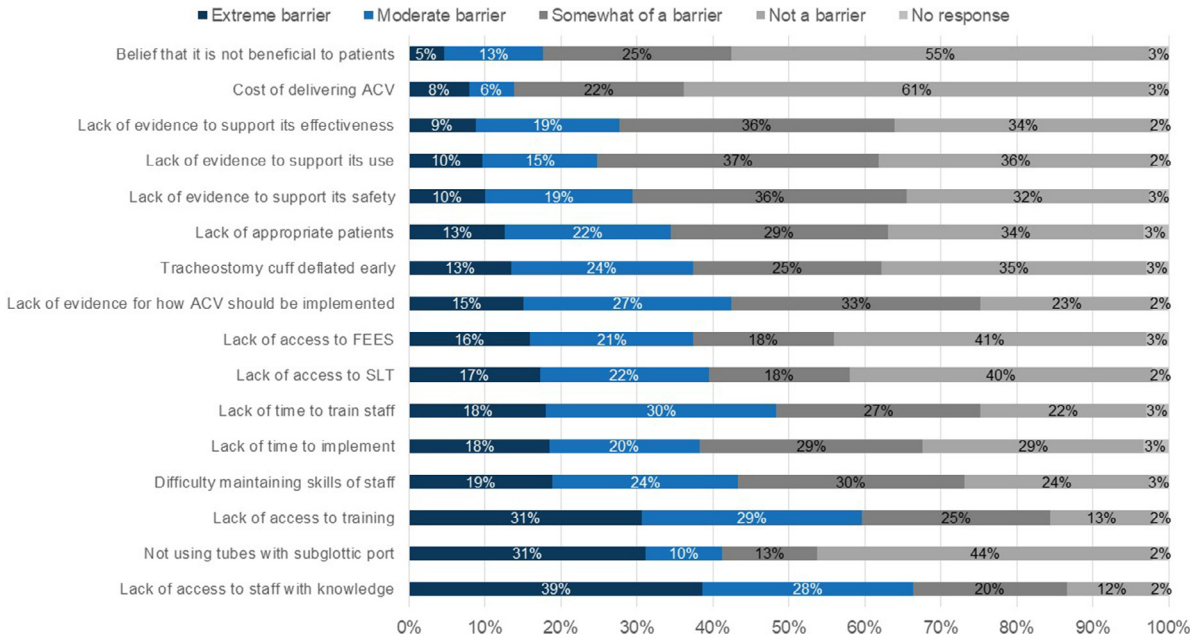

Fig 3 Barriers to ACV implementation.

earlier commencement of oral intake, decannulation, or critical care step-down. The lack of objective outcome measures means the subjective reports of the benefits of ACV must be interpreted cautiously because research has highlighted that clinicians more commonly overestimate the benefit of treatment,[33] particularly when outcomes are subjective.[34] This highlights the need for the development of specific core outcome sets appropriate for ACV. The potential benefits and frequency of complications appear unclear, and more research in this area is needed.

There were many reported barriers to the successful implementation of ACV, the most important being staff training. The development of internationally acceptable standardized training would be beneficial to promote more widespread and safe adoption of ACV. However, the wide variety of implementation approaches, combined with the lack of agreement on optimal approaches and the limited evidence base, indicates an expert consensus on a standardized ACV approach may be difficult to reach. Further investigation of these themes with HCPs would be beneficial to explore whether consensus is possible. ACV has been classified by many experts as an aerosol-generating procedure, which has resulted in many centers limiting or stopping the use of ACV during the coronavirus disease 2019 pandemic.[35–37] The current situation presents an excellent opportunity to develop guidelines, competencies, and training before ACV is reintroduced.

Study limitations

Our survey development and piloting was thorough, dissemination was widespread, and we received a satisfactory number of responses. There was a high survey completion rate (98%), which indicates the survey was acceptable to participants. Although the participation rate was low (9%), this was a measure of those individuals visiting the initial survey page. The survey was disseminated widely on social media but was not designed to be completed using a mobile phone. The low participation rate is likely because people clicked on the survey link on their mobile devices to ascertain relevance before completing later on a computer. We appeared to have sample bias with responses predominately from the UK. Various potential reasons for this include more support for distribution of the survey from societies and networks within the UK, varying terminology between countries, and varying use and interest in the intervention between countries. Additionally, our survey was conducted in English, which may have limited responses from non-English speaking countries or made it more difficult for accurate completion. Some of the networks contacted to request dissemination of the survey did not respond; others would only distribute surveys of members or had a rule to not disseminate surveys. More than half of respondents were SLTs, which may be reflected in the current findings. However, we would expect more responses from SLTs given the benefits of ACV are predominantly for communication and swallowing, which are the specialist field of SLTs. The limited response from some professional groups can be accounted for by differences in roles between countries, for example, only occupational therapists in Denmark are involved in dysphagia and tracheostomy management. There was a lack of agreement for most of the questions regarding implementation, both between and within professional groups.

Conclusions

Our survey revealed no standardized approach to the delivery of ACV and variability in implementation approaches and uptake. These results suggest a consensus on an optimal or standardized approach to ACV delivery is needed. Furthermore, opinions on the effectiveness of ACV are variable. Anecdotally, serious complications are infrequent, but minor complications are common. Further research is needed to investigate the cost-effectiveness of ACV and explore healthcare professionals' opinions of ACV and the potential to reach consensus on an optimal approach to ACV delivery and implementation.

Suppliers

a. Excel 2016; Microsoft Corporation.
b. NVivo 12 software; QSR International.

Keywords

Communication; Critical care; Deglutition; Rehabilitation; Surveys and questionnaires; Tracheostomy; Voice

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References

1. Zuercher P, Moret CS, Dziewas R, Schefold JC. Dysphagia in the intensive care unit: epidemiology, mechanisms, and clinical management. Crit Care 2019;23:103.

2. Nakarada-Kordic I, Patterson N, Wrapson J, Reay SD. A systematic review of patient and caregiver experiences with a tracheostomy. Patient 2018;11:175–91.
3. Rose L, Nonoyama M, Rezaie S, Fraser I. Psychological wellbeing, health related quality of life and memories of intensive care and a specialised weaning centre reported by survivors of prolonged mechanical ventilation. Intensive Crit Care Nurs 2014;30:145–51.
4. Kjeldsen CL, Hansen MS, Jensen K, Holm A, Haahr A, Dreyer P. Patients' experience of thirst while being conscious and mechanically ventilated in the intensive care unit. Nurs Crit Care 2017;23:75–81.
5. Freeman-Sanderson AL, Togher L, Elkins M, Kenny B. Quality of life improves for tracheostomy patients with return of voice: a mixed methods evaluation of the patient experience across the care continuum. Intensive Crit Care Nurs 2018;46:10–6.
6. Foster A. More than nothing: the lived experience of tracheostomy while acutely ill. Intensive Crit Care Nurs 2010;26:33–43.
7. Sherlock ZV, Wilson JA, Exley C. Tracheostomy in the acute setting: patient experience and information needs. J Crit Care 2009;24:501–7.
8. Happ MB. Interpretation of nonvocal behavior and the meaning of voicelessness in critical care. Soc Sci Med 2000;50:1247–55.
9. Sasaki CT, Suzuki M, Horiuchi M, Kirchner JA. The effect of tracheostomy on the laryngeal closure reflex. Laryngoscope 1977;87:1428–33.
10. Siebens AA, Tippett DC, Kirby N, French J. Dysphagia and expiratory air flow. Dysphagia 1993;8:266–9.
11. Sulica L, Hembree A, Blitzer A. Swallowing and sensation: evaluation of deglutition in the anesthetized larynx. Ann Otol Rhinol Laryngol 2002;111:291–4.
12. Goldsmith T. Evaluation and treatment of swallowing disorders following endotracheal intubation and tracheostomy. Int Anesthesiol Clin 2000;38:219–42.
13. Kothari M, Bjerrum K, Nielsen LH, Jensen J, Nielsen JF. Influence of external subglottic air flow on dysphagic tracheotomized patients with severe brain injury: preliminary findings. Ann Otol Rhinol Laryngol 2017;126:199–204.
14. McGrath BA, Wallace S, Wilson M, et al. Safety and feasibility of above cuff vocalisation for ventilator-dependant patients with tracheostomies. J Intensive Care Soc 2019;20:59–65.
15. Ding R, Logemann JA. Swallow physiology in patients with trach cuff inflated or deflated: a retrospective study. Head Neck 2005;27:809–13.
16. Leder SB. Prognostic indicators for successful use of "talking" tracheostomy tubes. Percept Mot Skills 1991;73:441–2.
17. Whitlock RM. A means of speaking for patients with cuffed tracheostomy tubes. BMJ 1967;3:547.
18. Mills CS, Michou E, King N, et al. Evidence for above cuff vocalization in patients with a tracheostomy: a systematic review. Laryngoscope 2021 May 1. [Epub ahead of print].
19. McGrath B, Lynch J, Wilson M, Nicholson L, Wallace S. Above cuff vocalisation: a novel technique for communication in the ventilator-dependent tracheostomy patient. J Intensive Care Soc 2016;17:19–26.
20. Pandian V, Smith CP, Cole TK, et al. Optimizing communication in mechanically ventilated patients. J Med Speech Lang Pathol 2014;21:309–18.
21. Gordan V. Effectiveness of speaking-cuffed tracheostomy tube in patients with neuromuscular diseases. Crit Care Med 1984;12:615–6.
22. Leder SB. Verbal communication for the ventilator-dependent patient: Voice intensity with the portex "talk"® tracheostomy tube. Laryngoscope 1990;100:1116–21.
23. Leder SB, Traquina DN. Voice intensity of patients using a communitrach I® cuffed speaking tracheostomy tube. Laryngoscope 1989;99:744–7.
24. Naito Y, Mima H, Itaya T, Yamazaki K, Kato H. Continuous oxygen insufflation using a speaking tracheostomy tube is effective in preventing aspiration during feeding. Anesthesiology 1996;84:448–50.
25. Pandian V, Cole T, Kilonsky D, et al. Voice-related quality of life increases with a talking tracheostomy tube: a randomized controlled trial. Laryngoscope 2020;130:1249–55.
26. Akhtar TM, Bell M. Vocalaid" and surgical emphysema. Anaesthesia 1993;48:272–3.
27. Calamai I, Giuntini R, Tomeo F, Spina R. Sudden appearance of neck and face emphysema during above cuff vocalisation. Intensive Care Med 2018;44:1951–2.
28. Feneck RO, Scott WE. Misconnexion of a cuffed "speaking" tracheostomy tube.: a report of the consequences, and recommendations for future use of similar tracheostomy tubes. Anaesthesia 1983;38:47–51.
29. Leder SB, Astrachan DI. Stomal complications and airflow line problems of the communi-trach I® cuffed talking tracheotomy tube. Laryngoscope 1989;99:194–6.
30. Eysenbach G. Improving the quality of web surveys: the Checklist for Reporting Results of Internet E-Surveys (CHERRIES). J Med Internet Res 2004;6:e34.
31. Dinglas VD, Cherukuri SPS, Needham DM. Core outcomes sets for studies evaluating critical illness and patient recovery. Curr Opin Crit Care 2020;26:489–99.
32. Zaga CJ, Cigognini B, Vogel AP, Berney S. Outcome measurement tools for communication, voice and speech intelligibility in the ICU and their clinimetric properties: a systematic review. J Intensive Care Soc 2020 Nov 2. [Epub ahead of print].
33. Hoffmann TC, Del Mar C. Clinicians' expectations of the benefits and harms of treatments, screening, and tests: a systematic review. JAMA Intern Med 2017;177:407–19.
34. Wood L, Egger M, Gluud LL, et al. Empirical evidence of bias in treatment effect estimates in controlled trials with different interventions and outcomes: meta-epidemiological study. BMJ 2008;336:601–5.
35. McGrath BA, Brenner MJ, Warrillow SJ, et al. Tracheostomy in the COVID-19 era: global and multidisciplinary guidance. Lancet Respir Med 2020;8:717–25.
36. Vergara J, Starmer HM, Wallace S, et al. Swallowing and communication management of tracheostomy and laryngectomy in the context of COVID-19: a review. JAMA Otolaryngol Head Neck Surg 2020 Oct 15. [Epub ahead of print].
37. Zaga CJ, Pandian V, Brodsky MB, et al. Speech-language pathology guidance for tracheostomy during the cOVID-19 pandemic: an international multidisciplinary perspective. Am J Speech Lang Pathol 2020;29:1320–34.