How the work of respiratory physiotherapists changes the tracheostomy management and decannulation in a NICU department: an Italian experience

Davide Papi, Giulia Montigiani, Luca Bucciardini

Neuro Intensive Care Unit, Careggi University Hospital, Florence, Italy

Abstract

Tracheotomy is a clinical procedure that is often necessary though not without complications, hence the need for appropriate and timely decannulation. The inclusion of trained respiratory physiotherapists (RPT) in the staff and the use of shared protocols could help the team to manage the patient with a tracheostomy cannula. The objective of this study was to describe the difference in the rate of decannulation and clinical outcomes of tracheostomized patients admitted to a neuro-intensive care unit (NICU) team after the inclusion of a group of physiotherapists specialized in respiratory physiotherapy and a new phoniatric protocol. It is a 6-year retrospective study, in which two periods of 3 years each were compared: in the first period (P1: September 2013-August 2016) physiotherapists were called to treat NICU patients on a consultative basis (2 hours/day for 5 days a week); in the second period (P2: September 2016-August 2019) two full-time respiratory physiotherapists were present on the ward (7 hours/day, 6/7 days/week). In the P2 period, a decannulation protocol was used. Patients who had undergone a tracheostomy procedure and who were alive at the time of discharge were retrospectively evaluated. We described the number of decannulations, the length of stay in NICU and decannulation time, the diagnosis of decannulated patients and the number of deaths. In total, 928 patients were analysed: 468 in P1, and 460 in P2. The total length of stay or the number of deaths did not differ significantly between the two periods, but the number of decannulated patients before discharge was higher in P2 (n=143; 64%) than in P1 (n=79; 36%; p<0.001). More patients with neurological pathologies involving possible swallowing disorders, such as cerebral haemorrhage, head trauma and stroke, have been successfully decannulated in P2 than in P1 (120 patients in P2 *vs* 54 in P1). A multidisciplinary approach, including respiratory physiotherapist, dedicated to tracheostomy management, decannulation and early mobilization in NICU is safe and feasible and seems to improve the number of severe patients decannulated even if no change was observed in NICU length of stay or deaths. Further studies must confirm our results in other ICU settings.

Correspondence: Davide Papi, Neuro Intensive Care Unit, Careggi University Hospital, Via Reginaldo Giuliani 9, Firenze, Italy.
Tel. +39.329407867.
E-mail: davidepapi@gmail.com

Key words: decannulation; tracheostomy; physiotherapy; intensive care unit.

Contributions: DP, data collection, statistical analysis, article writing, article translation; GM, data collection, article writing, proofreading; LB, proofreading. All the authors read and approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

Conflict of interest: the authors declare that they have no competing interests, and all authors confirm accuracy.

Ethics approval: the Ethics Committee approved this retrospective study and waived the need to obtain consent for the retrospective compilation, analysis, and publication of the anonymized clinical data.

Informed consent: at hospital admission, patients gave informed consent for the scientific use of their clinical data.

Received: 3 January 2022.
Accepted: 6 October 2022.
Early view: 24 November 2022.

Monaldi Archives for Chest Disease 2023; 93:2451
doi: 10.4081/monaldi.2022.2451

Introduction

Tracheostomy is a medical-surgical procedure increasingly used in the intensive care unit (ICU), especially in the neuro-intensive care unit (NICU) [1,2]. The main indications of this technique are the support of mechanical ventilation, weaning from invasive mechanical ventilation with the orotracheal tube, and prevention of complications of the same [3]; if done promptly, it is associated with a reduction in long-term mortality [4] and a reduction in ICU length of stay [5].

However, tracheostomy is often associated with problems or complications [6]: low patient compliance, unphysiological coughing, reduced humidification, increased upper airway resistance, alterations in swallowing dynamics, and occlusion of the cannula. These conditions bring difficult management and increasing of costs [7-10]; hence it is necessary to propose the decannulation procedure

as soon as possible [11]. Individual clinicians are able to identify factors deemed important for decannulation, but their opinions vary significantly [7,12,13], although in most hospitals salivary secretion screening is the most widely used test [14].

Regardless of the multiplicity of theories concerning the individual factors favouring decannulation [13,15-18], and the different approaches for the various pathologies [19], the benefits of using weaning protocols [17,20,21] and adopting a multidisciplinary approach [14,22] are evident, and the number of studies that include the figure of the RPT in the decannulation process [12,23-26] is also increasing.

Focusing on tracheostomized patients, the objective of this retrospective study was to describe the effect on decannulation rate and clinical outcome of the inclusion of a group of physiotherapists specialized in respiratory physiotherapy (RPT) and a new phoniatric protocol in an Italian neurointensive care unit.

Materials and Methods

This is a retrospective study performed in the neurointensive care unit at Careggi University Hospital (CUH), Florence, Italy. In September 2016, two RPT were included full-time in the interdisciplinary team of the NICU, before that period physiotherapists (PT) were called to treat patients only on medical advice. Data were collected retrospectively between December 2020 and February 2021, evaluating the institutional electronic databases of CUH, regarding the period from September 2013 to August 2019. Data collection was performed using Archimed® software, developed by the CUH as a management system.

The data were divided into two periods:

- P1: from September 2013 to August 2016
- P2: from September 2016 to August 2019

We included only the patients who had undergone a tracheostomy and the two periods were compared in order to verify their homogeneity in terms of sex, age and diagnosis. Exclusion criteria were the presence of tongue-heteroplasia, requiring surgery. As a retrospective study, participants did not provide any specific written informed consent, however, at admission, they gave, in advance, informed consent for the scientific use of their clinical data.

Measures

The following parameters were considered during the two periods:

i) Diagnosis. The diagnosis was divided into: cerebral haemorrhage, head trauma, stroke, polytrauma, respiratory failure, brain tumour, spinal cord injury, and other pathologies.
ii) Days of hospitalisation, in all patients and in those who were decannulated.
iii) Days from admission to the tracheostomy procedure.
iv) Number of patients decannulated before discharge and decannulation time.

Protocols

In P1 PTs works in NICU only on medical advice. In particular, two PTs with neurology specialization worked both in NICU and in the department of neurology and neurosurgery. The average time they could dedicate to the NICU was about 2 hours/day. Patients were mainly treated with passive and active mobilization if there was a suspicion of polyneuropathy. No respiratory treatments, swallow screening or decannulation protocols were carried out. A phoniatric physician (otolaryngologist and laryngologist specialized in specific swallowing disorders) was present, but only on medical advice. Beyond these consultations, there were no other shared elements or protocols for progressing toward the decannulation of patients.

In P2 two RPT were included full-time in the ward (7 hours per day, 6 days per week). They specialized in a respiratory physiotherapy university master's degree organized by the University of Milan, Italy. Their activities were: taking part in morning briefings, promoting a protocol of mobilization and early verticalization, encouraging greater interaction with the phoniatric physician, collaborating with doctors and nurses in a new protocol of decannulation, supporting the use by NICU team of respiratory devices (mechanical bronchial hygiene devices, non-invasive ventilator, high flow devices). Figure 1 describes in detail the new protocol of decannulation. Table 1 provides an overview of the main differences in terms of staff, procedures and technologies between P1 and P2 and Figure 1 is a flow chart of the decannulation protocol used. There was no availability of a speech therapist in both periods. In P1 and P2 there was no variation in the number of beds (16), the ratio of nurses/patients (1/3) and the ratio of intensivists/patients (1/4).

Statistical analysis

R® 3.6.0 software for statistical analyses (free software; R Core Team, Vienna, Austria) and Microsoft Excel® 2019 (Microsoft, Redmond, WA, USA) for graphs were used. Measures were analysed by descriptive statistics (mean and standard deviation). To assess differences between patients in the two periods, the unpaired *t*-test was used for continuous variables while the chi-square test was used for binary and categorical variables ones. A $p<0.05$ was considered significant.

Results

A total of 928 patients were considered, 591 men and 337 women, mean age 58±16 years. Table 2 describes the anthropometric and clinical data of the patients at the hospital admission. P1 and P2 proved to be homogeneous in the number of patients, sex, age and admission diagnosis. No statistical difference between P1 and P2 was found regarding the number of deaths and days of hospitalization in NICU. Table 3 shows the main result and outcome difference between the two periods. In P2 we found a longer time before the tracheostomy procedure, a higher number of patients decannulated, with a higher length of stay. Moreover, a difference in decannulated patients regarding the pathologies between P1 and P2 emerges in P2 decannulated more patients with cerebral haemorrhage, head trauma, ischemic stroke and spinal cord injury while in P1 more patients with polytrauma were decannulated (Figure 2).

Discussion

Our study describes the safety and feasibility of the RPT integration in a multidisciplinary team dedicated to the management of tracheostomy and decannulation and the promotion of early autonomy recovery. The comparison with the previous period without the RPT integration shows an increase in the percentage of patients decannulated before discharge from the ICU, including comorbid and more severe patients. The large sample size and homogeneity of the two groups allowed for direct comparison.

Tracheotomies were performed earlier in P1 patients than in P2.

The reasons can vary and can be attributed to changes in organizational settings, health personnel, and general protocols over time. However, given the presence of the RPT with respiratory specialization, we can assume that more extubation attempts (also using non-invasive ventilation trials) could be performed prior to tracheostomy positioning.

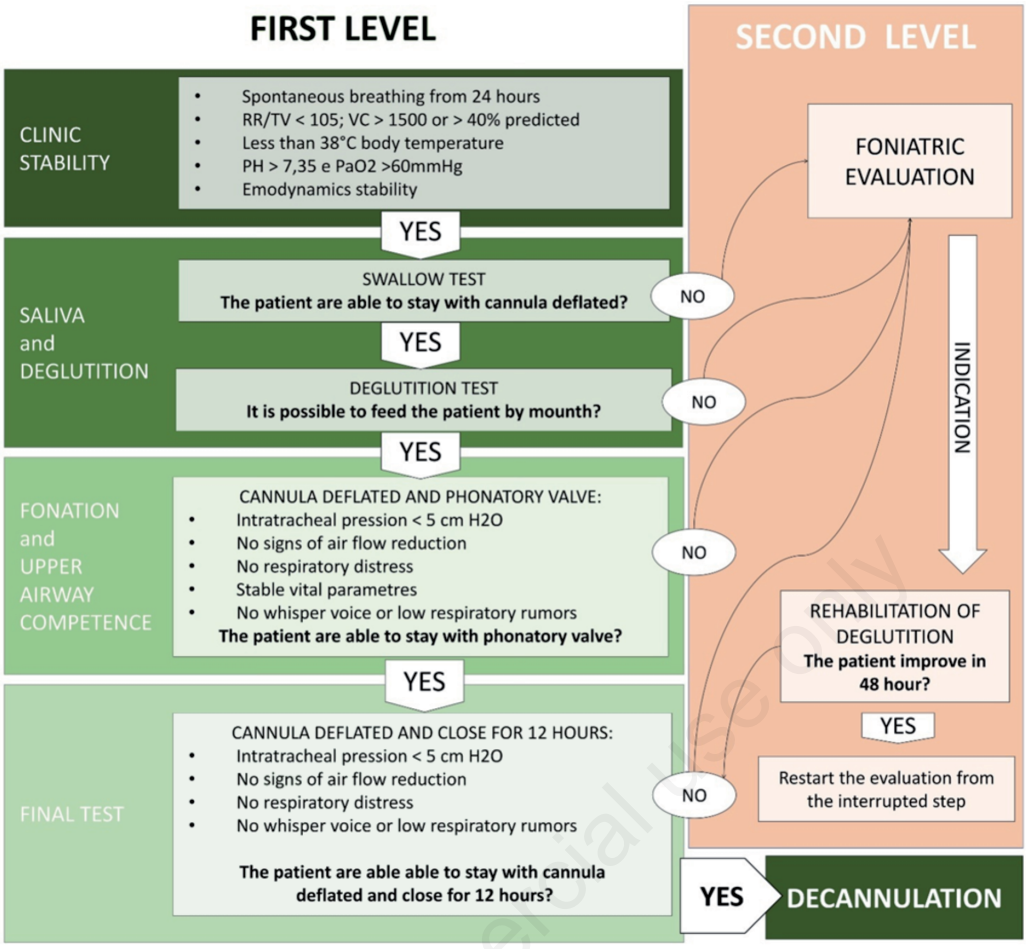
The high standard deviation would corroborate this fact because in P2 there were many cases of late tracheotomy, performed after more than two weeks. Nevertheless, it is interesting to note that this relative delay of the tracheostomy procedure had little impact on the outcome, since the number of patients decannulated was greater in P2 anyway. The mortality rate also showed no relevant differences in P1 and P2.

In agreement with the literature, in both periods the procedures can be considered as performed "early" as they were carried out in less than 10 days [5,27], but only in P1, this fact was not associated with a higher number of decannulations. A very interesting factor is the net increase in the number of decannulations in P2, which turned out to be almost double compared to P1. This result, however, cannot be read-only as an effect of the presence of respiratory physiotherapists, but probably with their inclusion in the multidisciplinary team that can enhance the management of tracheostomised patients.

Table 1. Main differences in staff, procedures and technologies between period 1 and period 2.

	Period 1 September 2013 - August 2016	Period 2 September 2016 - August 2019
Health professionals		
Physiotherapy staff	Two PT specialists in neurological rehabilitation called on consult basis	Two PT specialists in cardio-respiratory rehabilitation
Physiotherapists work time in NICU	2 h/day, 5 days a week	7 h/day, 6 days a week
Phoniatric physician	Yes, but only on advice	Yes, but he also helped to develop a shared protocol for decannulation, in which the phoniatric evaluation represented a second level compared to one already performed by the RPT or nurses
Protocols and interventions		
Mobilization	Yes, passive mobilization to prevent ICU-acquired weakness (ICU-AW)	Yes, active/passive mobilization by structured program on all patients
Fast progression towards verticalization (when allowed)	No	Yes: discharge of patient with postural wheelchair; maintenance of standing; ambulation with aids
Cough assessment	Yes, made by medical and nursing staff with clinical evaluation	Yes, performed by RPT with clinical evaluation and spirometer (MicroLab ML3500), whenever possible. Considered PEF <170 L/min as ineffective cough
Cough assistance (if needed)	Yes, with only manual manoeuvres by PT and nurses	Yes, with manual manoeuvres and / or with the cough assist (E70 Philips). The cough assistance was performed with both inflated and deflated cannula; both in manual and automatic; by both nurses and RPT
Swallow test	No	Yes, carried out mainly by the RPT (described later)
Deglutition test	Yes, done by nurses evaluating only the indirect signs (cough) with water or thickened liquids administration	Yes, carried out mainly by the RPT (it is described later)
Decannulation protocol	There was no shared protocol, decannulation was evaluated by medical staff after clinical evaluation	Yes, carried out by RPT, a phoniatric physician, intensivists. It was developed in agreement with a phoniatric physician (Figure 1)
Rehabilitation of swallowing	No	Yes, performed by the RPT: mobilisation of the larynx and hyoid and normalisation of hyoid muscle tone; cold stimulations on the tongue and palate; manoeuvres to facilitate laryngeal elevation during swallowing; facilitated positioning of the head and neck; detailed instructions on swallowing and feeding management provided to the ICU team
Training courses made by RPT for staff	No	Yes: training courses were held for both department and company staff. The main topics of the courses were: management of tracheostomy and progression to ICU decannulation, use of NIV and cough assistance, physiology of swallowing, swallowing assessment methods
Device		
NIV	Yes, mainly performed by intensivists with ICU ventilators	Yes, carried out by RPT, intensivists, and nurses, both with ICU and home ventilators

PT, physiotherapist; RPT, respiratory physiotherapists; ARIR, Associazione Riabilitatori Insufficienza Respiratoria; ICU, intensive care unit; PEF, peak expiratory flow rate; NIV, non-invasive ventilation; OSH, operator social health.



RR, respiratory rate; TV, tidal volume; VC, vital capacity.

SWALLOW TEST	The following test was used to assess the ability to keep cannula deflated and fenestrated cannula composed: - an evaluation of buccal praxis, main muscles involved in swallowing, presence and quality of voluntary swallowing was performed; - the sub-glottic space was cleaned with the following alternative methods: sub-glottic aspiration if present; deflating cannula and suctioning it with a probe; deflating and insufflating air with in-exsufflator, in this case the secretions were aspirated into the mouth; - still with a deflated cannula, the mouth was coloured with methylene blue and aspirated into the cannula with a probe 5' - 30' - 60' after administration. The presence of blue in the cannula defined the impossibility to stay with deflated and fenestrated cannula; - guidance was given to physicians and nurses on the management of the tracheotomy cannula.
DEGLUTITION TEST	To assess the ability to take semi-solid consistency on the day following the swallowing test, the following test was performed: - patient in a sitting position. With a deflated cannula, against a fenestrated cannula and phonatory valve, a bolus of water gel coloured with methylene blue was administered by mouth; - with the aid of a phonendoscope, the following were observed and evaluated: quality and duration of the oral phase; anticipated swallowing; activation of the pharyngeal reflex; signs of inspiration-aspiration; and signs of supraglottic stagnation after the act of swallowing; - the gel was aspirated into the cannula 10' after administration. The presence of blue in the cannula defined the inability to feed by mouth; - guidance was given to physicians and nurses on the management of the tracheotomy cannula.
FONIATRIC EVALUATION	- clinical evaluation of swallowing and oral praxis; - Endoscopic Fiberoptic Evaluation of Swallowing (FEES) assessing: oro-pharyngeal reflexes, pharyngeal reflexes, inhalation, aspiration.

Figure 1. Flow chart of the decannulation protocol.

Collaboration with the phoniatric physician was another strength of this integration, which allowed the creation and sharing of a decannulation protocol in which the respiratory physiotherapist is one of the key figures in the functional evaluation of swallowing. It is interesting to note that in our decannulation protocol, the phoniatric assessment is only the second level of a first intervention performed by the RPT or nursing staff. The consequence of this is that many patients were effectively decannulated without the support of the phoniatrics because they immediately showed the necessary requirements for decannulation. Therefore, the decannulation protocol has given rise to a reduction in evaluation time, the empowerment of all NICU staff and the reduction in improper phoniatric consultations.

In addition, early mobilization modalities proposed in P2 could have impacted in a positive way the patient outcome. Patients who were moved to a sitting position after early mobilization demonstrated greater interest in the outside world, a more sustained mood, and greater alertness than those who remained in bed. This increased attempts at communication and verbalization, with an indirect effect on swallowing rehabilitation. Furthermore, sitting improves lung function parameters [28] and weaning from VMI while regaining ventilatory autonomy is required to begin the decannulation protocol.

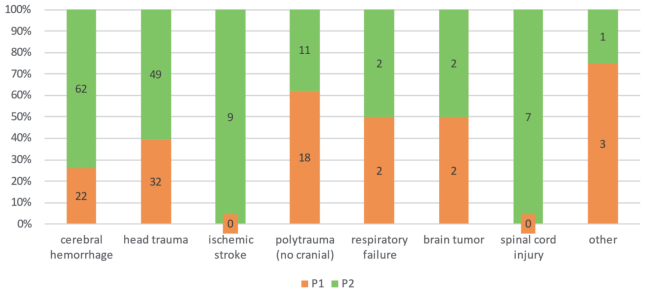


Figure 2. Rate of decannulated patients according to diagnosis.

Table 2. Anthropometric and clinical measures.

	Period 1	Period 2	p
Patients (n)	468	460	0.792
Age, years ± SD	59±16	58±16	0,542
Sex, n (%)	288 (61.54) M 180 (38.46) F	303 (65.87) M 157 (34.13) F	0.192
Main diagnosis, n (%)			0.191
Cerebral haemorrhage	199 (42.52)	212 (46.09)	
Head trauma	130 (27.68)	143 (31.08)	
Ischemic stroke	38 (8.12)	31 (6.74)	
Polytrauma (non-cranial)	33 (7.05)	15 (3.26)	
Respiratory failure	24 (5.13)	19 (4.13)	
Brain tumour	17 (3.63)	12 (2.61)	
Spinal cord injury	21 (4.49)	21 (4.57)	
Other	6 (1.28)	7 (1.52)	

Table 3. Outcome differences between period 1 and period 2.

	Total	Period 1	Period 2	p
Deaths, n (%)	125 (13, 46)	69 (14, 74)	56 (12,17)	0.245
Time from admission to tracheotomy, days ±SD	2.23±2.56	1.95±2.05	2.50±2.95	0.002
Number of decannulated patients, n (%)	222	79 (36)	143 (64)	<0.001
Hospitalization time for all patients tracheotomized, days ±SD	24.29±18.35	23.98±17.81	25.39±18.84	0.345
Hospitalization time of decannulated patients, days ±SD	28.71±17.54	25.58±14.69	30.45±18.76	0.042
Decannulation time, days ±SD	22.27±16.30	19.09±11.68	24.03±18.16	0.014
Main diagnosis among decannulated patients, n (%)				<0.001
Cerebral haemorrhage		22 (27.8)	62 (43.4)	
Head trauma		32 (40.6)	49 (34.3)	
Ischemic stroke		0 (0)	9 (6.3)	
Polytrauma (non-cranial)		18 (22.8)	11 (7.6)	
Respiratory failure		2 (2.5)	2 (1.4)	
Brain tumour		2 (2.5)	2 (1.4)	
Spinal cord injury		0 (0)	7 (4.9)	
Other		3 (3.8)	1 (0.7)	

Of fundamental importance was the sharing of the procedures and technologies included by the RPT in P2 with the medical and nursing staff, also with specific *ad hoc* daily meetings. We found that the staff training courses held by the RPT helped to overcome the initial, physiological prejudice that the figure of the PT still often evokes in many intensive care units [29], as well as introducing and then applying new technologies and practices that previously were little known.

In our experience, hospitalization times do not change if RPT is present in the ICU ward. This could be because days of hospitalization depend on several factors, including the need for new clinical and surgical interventions and the availability of beds in other hospitals or rehabilitation facilities. The average length of stay of decannulated patients is consistent with that found in the literature [4], but it is longer than that of non-decannulated patients. In particular, since both decannulation times and length of stay are longer in P2 than in P1, we wondered why patients treated in the group with an integrated team were decannulated later than those in the other group. This data should be read together with the data of the different pathologies: in P1 more polytraumatized patients without head trauma were decannulated, who were therefore very cooperative, so it is reasonable to speculate that they had fewer swallowing problems; in P2 the patients decannulated were those with more complex pathologies and lower level of consciousness, such as cranial haemorrhage and stroke, which typically lead to swallowing problems. In fact, during P2, most long-term patients awaiting rehabilitation recovery, such as cerebral haemorrhage and ischemic stroke, who would normally remain in the NICU for several days, could be decannulated.

Limitations

The main limitation of the study is its retrospective nature and that it was carried out in two different periods. Therefore, we cannot exclude that the results may have been influenced by changes in staff other than the physiotherapy team, as well as by contingent changes in technology and clinical practices, which however tend to evolve naturally. Another important limitation is related to the sample which included only tracheostomized patients. Consequently, no conclusions can be drawn on the general sample of patients admitted to intensive care and the study can only be descriptive. Also, the results are not necessarily extendable to other ICUs, where there has been no real integration of RPT staff into the multidisciplinary team or where PTs lack respiratory-specific training.

Practical implications

In agreement with previous work [29], the inclusion of the RPT figure in the multidisciplinary team during the evaluation and treatment of tracheostomy cannula patients in our neurological intensive care unit has demonstrated the ability to more effectively manage the decannulation process.

Conclusions

The integration of the RPT in a multidisciplinary team inside the NICU, in order to share decannulation protocol and promote the early recovery of the autonomy of the tracheostomized patient is feasible and safe. It seems to promote the increase of decannulated patients rate before discharge and to allow the management of more complex patients. In relation to this relevant finding, further studies are needed to confirm our results in other ICU settings.

References

1. Krishnamoorthy V, Hough CL, Vavila MS, et al. Tracheostomy after severe acute brain injury: trends and variability in the USA. Neurocrit Care 2019;30:546–4.
2. Robba C, Galimberti S, Graziano F, et al. Tracheostomy practice and timing in traumatic brain-injured patients: a CENTER-TBI study. Intensive Care Med 2020;46:983–4.
3. Hillejan L, Rawert H. [Tracheotomy - surgical and percutaneous]. [Article in German with English abstract]. Zentralbl Chir 2015;3:339–58.
4. McCredie VA, Alali AS, Scales DC, et al. Effect of early versus late tracheostomy or prolonged intubation in critically ill patients with acute brain injury: a sytematic review and meta-analysis. Neurocrit Care 2017;26:14–25.
5. De Franca SA, Tavare WM, Salinet ASM, et al. Early tracheostomy in severe traumatic brain injury patients: A meta-analysis and comparison with late tracheostomy. Crit Care Med 2020;3:e325–31.
6. Fernandez-Bussy S, Mahajan B, Floch E, et al. Tracheostomy tube placement: early and late complications. J Bronchol Interv Pulmonol 2015;22:357–64.
7. Santus P, Gramegna A, Radovanovic D, et al. A systematic review on tracheostomy decannulation: a proposal of a quantitative semiquantitative clinical score. BMC Pulm Med 2014;14: 1–8.
8. Cox CE, Carson SS, Holmes GM, et al. Increase in tracheostomy for prolonged mechanical ventilation in North Carolina, 1993-2002. Crit Care Med 2004;32:2219–26.
9. Hussey JD, Bishop MJ. Pressures required to move gas through the native airway in the presence of a fenestrated vs a nonfenestrated tracheostomy tube. Chest 1996;110:494-7.
10. Keren O, Cohen M, Lazar-Zweker I, Groswasser Z. Tracheotomy in severe TBI patients: Sequelae and relation to vocational outcome. Brain Inj 2001;15: 531-6.
11. Jenkins R, Badjiatia N, Haac B, et al. Factors associated with tracheostomy decannulation in patients with severe traumatic brain injury. Brain Inj 2020;341106-11.
12. Kutsukutsa J, Kuupiel D, Monori-Kiss, et al. Tracheostomy decannulation methods and procedures for assessing readiness for decannulation in adults: A systematic scoping review. Int J Evid Based Healthc 2019;17:74–91.
13. Stelfox HT, Crimi C, Berra L, et al. Determinants of tracheostomy decannulation: an international survey. Crit Care 2008;12:R26.
14. de Medeiros GC, Sassi FC, Lirani-Silva C, de Andrade CRF. Criteria for tracheostomy decannulation: Literature review. Codas 2019;31:e20180228.
15. Perin C, Meroni R, Rega V, et al. Parameters influencing tracheostomy decannulation in patients undergoing rehabilitation after severe acquired brain injury (sABI). Int Arch Otorhinolaryngol 2017;21:383-9.
16. Enrichi C, Battel I, Zanetti C, et al. Clinical criteria for tracheostomy decannulation in subjects with acquired brain injury. Respir Care 2017;62;1255–63.
17. Reverberi C, Lombardi F, Lusuardi M, et al. Development of the decannulation prediction tool in patients with dysphagia after acquired brain injury. J Am Med Dir Assoc 2019;20:470-5.
18. Hernández Martínez G, Rodriguez M-K, Vaquero M-C, et al. High-flow oxygen with capping or suctioning for tracheostomy decannulation. N Engl J Med 2020;383:1009–17.
19. Kim DH, Kang SW, Choi WA, Oh HJ. Successful tracheostomy decannulation after complete or sensory incomplete cervical spinal cord injury. Spinal Cord 2017;55:601–5.

20. MacIntyre NR, Cook DJ, Ely EW Jr, et al. Evidence-based guidelines for weaning and discontinuing ventilatory support: a collective task force facilitated by the American College of Chest Physicians; the American Association for Respiratory Care; and the American College of Critical Medicine. Chest 2001;120:375-95.
21. O'Connor H, White AC. Tracheostomy decannulation. Respir Care 2010;55:1076–81.
22. Garrubba M, Turner T, Grieveson C. Multidisciplinary care for tracheostomy patients: a systematic review. Crit Care 2009;13: R177.
23. StillerK. Physiotherapy in intensive care: an updated systematic review. Chest 2013;144:825–47.
24. Combes A, Luyt C-E, Nieszkowska A, et al. Is tracheostomy associated with better outcomes for patients requiring long-term mechanical ventilation? Crit Care Med 2007;35:802–7.
25. Divo MJ. Post-tracheostomy care: bundle up for success! Respir Care 2017;62:246-7.
26. Frank U, Mäder M, Sticher H. Dysphagic patients with tracheotomies: a multidisciplinary approach to treatment and decannulation management. Dysphagia 2007;22:20–9.
27. Andriolo BNG, Andriolo RB, Saconato H, et al. Early versus late tracheostomy for critically ill patients. Cochrane Database Syst 2015;1:CD007271.
28. Mezidi M, Guérin C. Effects of patient positioning on respiratory mechanics in mechanically ventilated ICU patients. Ann Transl Med 2018;6:384.
29. Salvitti S, Repossini E. Perception, experience, and knowledge of early physiotherapy in intensive care units of Rome: a survey. Monaldi 2020;90:1412.