International Pediatric Otolaryngology Group (IPOG) management recommendations : pediatric tracheostomy decannulation

International Pediatric Otolaryngology Group (IPOG) management recommendations: Pediatric Tracheostomy Decannulation

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Abbreviations: IPOG - International Pediatric Otolaryngology Group; PSG - Polysomnography;

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Abstract

Objectives: To provide recommendations to otolaryngologists, pulmonologists, and allied clinicians for tracheostomy decannulation in pediatric patients.

Methods: An iterative questionnaire was used to establish expert recommendations by the members of the International Pediatric Otolaryngology Group.

Results: Twenty-six members completed the survey. Recommendations address patient criteria for decannulation readiness, airway evaluation prior to decannulation, decannulation protocol, and follow-up after both successful and failed decannulation.

Conclusion: Tracheostomy decannulation recommendations are aimed at improving patient-centered care, quality and safety in children with tracheostomies.

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6. Conflict of interest
7. Acknowledgements

1. Objectives

To provide recommendations on the assessment of decannulation readiness and stepwise approach to tracheostomy decannulation in children with tracheostomies.

2. Target population

All children with tracheostomy tubes who are being assessed for decannulation.

3. Intended users

These recommendations are targeted for:

1. Otolaryngologists and pulmonologists who manage decannulation of patients with tracheostomies.

2. Allied clinicians, including pediatricians, who collaborate in the management of these patients.

4. Methods

Recommendations are based on review of the literature and expert opinion of the members of the International Pediatric Otolaryngology Group (IPOG). The mission of IPOG is to develop expertise-based recommendations for the management of pediatric otolaryngologic disorders with the goal of improving patient-centered care, quality and safety.

An online survey was formulated by the three of the authors (CKH, AdA, MJR). The survey was distributed to members of the group by email and responses were collected using the online survey service, Survey Monkey®. The results were analyzed and presented to the group at which

time constructive feedback was incorporated. The final recommendations are presented in this document. Answers to criteria for decannulation and steps to decannulation were scored as never, sometimes, usually and always. These findings are presented in Table 1 and Table 2, respectively. For additional questions regarding specifics of decannulation protocols and factors in decannulation failure, we present the percentage of above authors who agree with each statement.

5. Recommendations and justification

Twenty-six members of the IPOG completed the survey. The recommendations are outlined in the following sections.

Section 1: Criteria for decannulation readiness

Section 2: Steps to decannulation

Section 3: Decannulation protocol

Section 4: Decannulation failures

Disclaimer

This report has been prepared by the members of the International Pediatric Otolaryngology Group (IPOG). Managementecommendations are based on the collective opinion of the members of the group. Any person seeking to apply or consult the report is expected to use independent medical judgement in the context of individual patient and institutional circumstances.

Section 1: Criteria for decannulation readiness

Members of the IPOG identified 7 major factors to consider when assessing a child's readiness for decannulation (**Table 1**). While variations in practice exist, there were 3 factors that were always taken into account by ≥70% of experts; the findings from airway endoscopy (sites of persistent airway obstruction, granulation tissue, difficulty of laryngeal exposure), the patient's oxygenationstatus, and secretion management/presence of aspiration. The presence of comorbid conditions that could preclude decannulation were always considered by 65.4% of experts with the remainder usually or sometimes considering comorbidities. In select cases, findings from polysomnography (PSG) were felt to be helpful in determining decannulation readiness. In addition to the factors listed in Table 1, other factors for consideration included whether or not the patient will undergo future surgical procedures requiring a secured airway in the next 3-6 months and the grade of laryngeal exposure for intubation on direct laryngoscopy.

The identified factors are similar to those listed in the clinical consensus statement on tracheostomy care published in 2013 by Mitchell et al [1], which recommended the following criteria: 1) Absence of ventilatory support for at least 3 months, 2) Absence of aspiration events that would preclude decannulation, and 3) Flexible laryngoscopy with findings of airway patency and at least one mobile vocal cord.

Decisions regarding readiness for decannulation primarily reflect the clinical judgement of the treating physician (38.5%), based on clinical criteria listed in Table 1 (38.5%), a combination of clinical judgement and clinical criteria (11.5%), or using evidence-based algorithms (11.5%). Family readiness for decannulation is also a factor considered by some clinicians as decannulation often means the loss of home nursing support.

Section 2: Steps to decannulation

Decannulation is approached in a stepwise fashion by all members of the IPOG. These steps are summarized in **Table 2**. Patients should undergo airway endoscopy, which may include both rigid and flexible endoscopy, prior to proceeding to decannulation (92.3%) and should undergo a trial of capping the tracheostomy tube (80.7%). The tracheostomy tube is always downsized prior to capping by 56% of the members and in select cases by 44% of members. Depending on the age and size of the child, downsizing either may not be possible or will not provide an adequate airway to tracheostomy lumen ratio. In these cases, a downsizing and capping trial may not be appropriate and should be evaluated on a case-by-case basis.

For patients who undergo a period of tracheostomy capping, significant variation in practice exists regarding the length of the capping trial and for what portions of the day the patient is allowed to wear the cap (**Table 3**). IPOG members report capping trial lengths spanning from less than 24 hours to 3 months, although no members continue a capping trial beyond 3 months prior to proceeding with either a decannulation trial or other intervention. Similarly, there was a lack of consensus regarding which portions of the day and night patients were allowed to leave the cap in place. Most commonly, patients are allowed to cap the tracheostomy during the day but remove the cap at night or while sleeping (40%); although nearly 44% of IPOG members will allow for night-time capping in the presence of reliable continuous pulse oximetry, night-time nursing, or if an in-hospital trial of night-time capping has been completed. The literature also reports wide variation in the use and duration of capping, with some centers decannulating without any period of capping [10], while others cap for 12 hours [17] and some recommend

capping for “several” weeks [18]. Given the wide variation amongst the experts, no definitive recommendation can be made by this group in regards to duration of capping or whether capping should occur only while awake or 24 hours a day.

The use of polysomnography (PSG) is advocated in several pediatric decannulation algorithms due to its ability to provide quantitative data regarding the physiology of the upper airway during sleep. [2-5] PSG with a capped tracheostomy tube is obtained by 19.2% of IPOG members for all patients, and 76.9% in select cases. A smaller percentage of IPOG members routinely obtain uncapped PSG prior to decannulation (8.3% all, 62.5% select cases, and 29.2% never). For those members who utilize PSG, **Table 4** summarizes the practice patterns. Of note, PSG obtained in a pediatric sleep lab is resource intensive and may not be readily available or accessible in all places. For these reasons, the use of PSG has not been uniformly advocated. [1,6] Among IPOG members, PSG is primarily obtained in patients with additional unaddressed sources of airway obstruction or in patients with comorbidities that would increase their likelihood of central and/or obstructive sleep apnea in the absence of a tracheostomy. It is also worth noting that a reassuring PSG does not guarantee that decannulation will be successful, particularly if patients have some degree of support being provided by the tracheostomy tube itself. Likewise, a PSG demonstrating OSA does not necessarily reflect the patients decannulated state, as the tracheostomy tube can create some degree of obstruction of the airway that will not be present following decannulation.

Section 3: Decannulation protocol

The majority of members (76.9%) have a decannulation protocol in place at their institutions. **Table 5** summarizes the surveyed decannulation practices. Decannulation occurs primarily in the hospital during an inpatient stay, most often in an intensive care setting or step-down unit. No members perform decannulation in the recovery unit following airway endoscopy, and very rarely are patients decannulated in a clinic setting. There is variation in practice regarding the length of the inpatient stay during a decannulation trial, with the most common length of stay reported between 24-48 hours. This is similar to what is reported in the literature [10, 13, 17, 18].

Following a successful decannulation trial, further airway endoscopic surveillance is performed if residual stenosis is present (61.5%) and for long term assessment of airway growth (50%). Over one-third of IPOG members do not perform routine post-decannulation airway endoscopy, unless new airway concerns arise.

Section 4: Decannulation failures

Several institutional-based decannulation protocols have been published, with decannulation failure rates ranging from 8% to 22.3%. [2, 4-16] IPOG members identified six primary patient characteristics that contribute to failed decannulation (**Table 6**), which include upper airway obstruction, glottic and/or subglottic obstruction, pulmonary comorbidities, hypotonia, secretion intolerance, and level of consciousness. These comorbid characteristics exist along a spectrum of severity and will affect the likelihood of successful decannulation to a variable degree. Decannulation failure can be minimized through appropriate patient selection and pre-decannulation evaluation. No consistent institutional level factors that contribute towards failed decannulation were identified. In cases of failed decannulation, 58% of IPOG members utilize

PSG to help characterize unresolved anatomic obstruction or to further study comorbid conditions.

6. Conclusion

Readiness for decannulation should be determined based upon airway endoscopy findings, a patient's oxygen requirement and secretion management. Decannulation should proceed in a stepwise fashion with airway endoscopy and a capping trial always being performed prior to decannulation. There is significant variation in the duration of capping recommended prior to decannulation. Decannulation should take place in the inpatient setting with observation of a minimum of 24-48 hours. Decannulation failure may be attributed to multiple patient factors. Based on the IPOG survey responses, a protocol for pediatric tracheostomy decannulation is summarized in **Figure 1**.

7. Conflict of Interest

None

8. Acknowledgements

Drs. Aimee Kennedy, Catherine Hart, Alessandro de Alarcon and Michael Rutter were the lead authors and Dr. Reza Rahbar provided primary consulting and guidance regarding the design of the recommendations. All remaining authors are listed in alphabetical order. The authorship list follows the agreement of the members of the IPOG. All authors have contributed to the conception and design of the work, drafting and revising the recommendations for important

intellectual content, final approval of the version to be published, and agreement to be accountable for all aspects of the work.

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Figures/Tables

Table 1. Criteria to determine decannulation readiness.

	Always (% of respondents)	Usually (% of respondents)	Sometimes (% of respondents)	Never (% of respondents)
Level of consciousness	57.7	23.1	11.5	7.7
Secretion management	73.1	23.1	3.9	0
Comorbidities	65.4	26.9	7.7	0
Oxygenation	76	16	4	4
Respiratory rate	50	29.2	16.7	4.2
Airway endoscopy findings	92.3	0	3.85	3.85
Sleep study findings	30.8	26.9	38.5	3.8

Table 2. Steps taken prior to decannulation.

	Always (% of respondents)	Usually (% of respondents)	Sometimes (% of respondents)	Never (% of respondents)
Use of speaking valve	40.0	24.0	32.0	4.0
Downsizing of tracheostomy tube	56.0	24.0	20.0	0.0
Capping of tracheostomy tube	80.8	11.5	7.7	0.0
Polysomnography with capped tube	19.2	23.1	53.9	3.9
Polysomnography with uncapped tube	8.3	4.1	58.3	29.2

Table 3. Tracheostomy capping practices prior to decannulation.

How long must tracheostomy be capped before a decannulation trial?	% of Respondents
0-23 hours	16
24-72 hours	16

3-7 days	12
1-4 weeks	20
1-3 months	20
> 3 months	0
Any, depending on clinical scenario	16
If capped, which parts of the day do you allow the cap to stay in place?	
Cap 24 hours a day	16
During day only, uncap with sleep	40
During the day, and night only with continuous pulse oximetry	20
During the day, and night only with night-time nursing	24

Table 4. Role of polysomnography (PSG) in decannulation.

When do you obtain a PSG with regard to decannulation?	**% of Respondents**
Never	3.9
Before decannulation	46.1
Before decannulation (*only if concerning comorbidities)*	15.4
Before and after decannulation	19.2
Only following failed decannulation	15.4
Reasons for obtaining a pre-decannulation PSG?	
Unaddressed anatomic obstruction	83
Significant comorbid conditions	89
Clinical suspicion of treating physician	61
Part of decannulation protocol	11

Table 5. Decannulation practices.

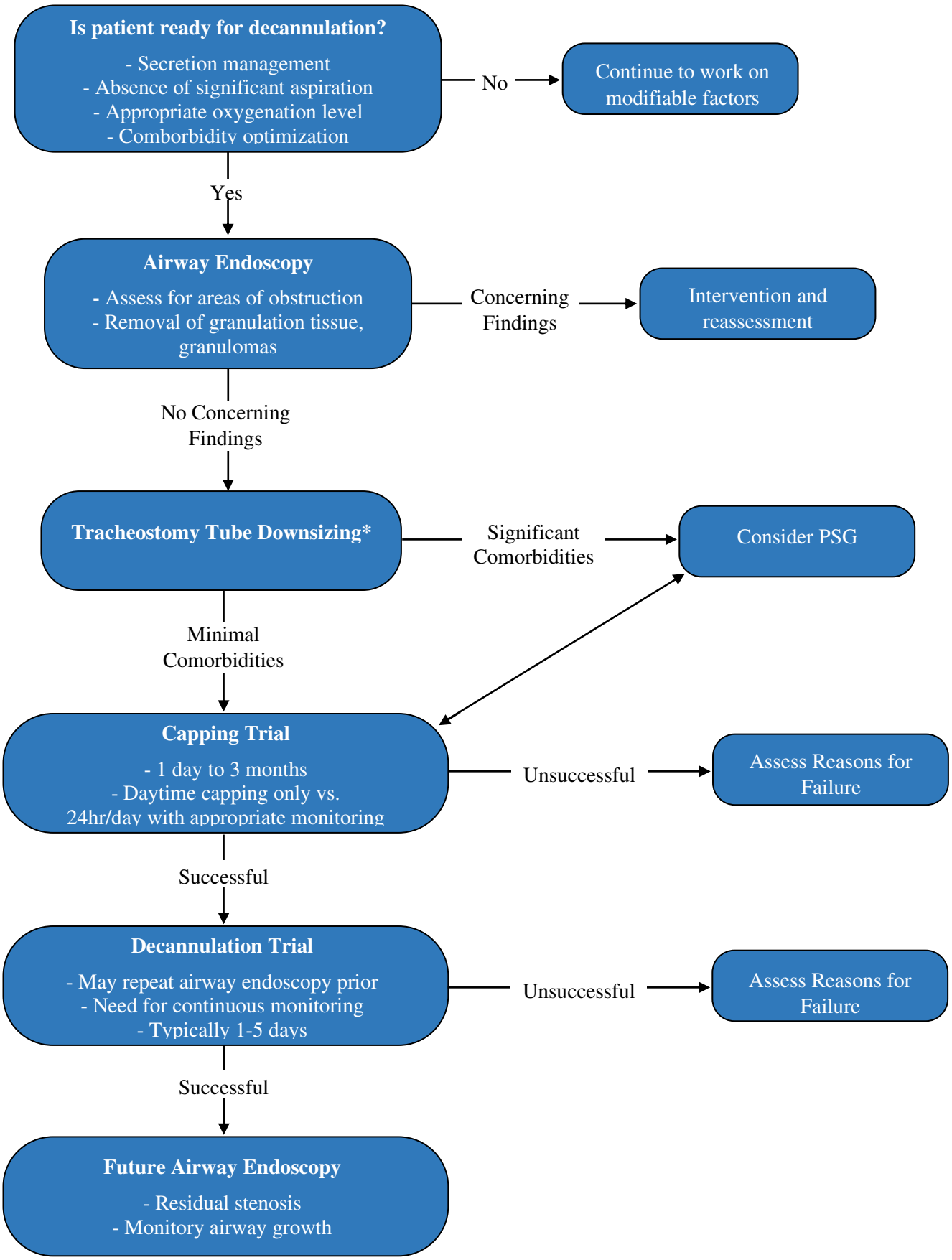
Where do most decannulations take place?	**% of Respondents**
In the operating room	13.5
In the recovery area following airway endoscopy	0

In the hospital, as an inpatient	84.6
In the office, as an outpatient*	1.9
If the patient is admitted, what is the average length of stay?	
0-23 hours	11.5
24-48 hours	53.85
3-5 days	30.8
6-8 days	3.85
> 8 days	0

*Member primarily decannulates patients in the OR following endoscopy, but will decannulate in the office if a recent endoscopy has been performed.

Table 6. Factors contributing to failed decannulations.

Principal patient characteristics contributing to failed decannulation	**% of Respondents**
Upper airway obstruction	60
Glottic and/or subglottic obstruction	48
Pulmonary Comorbidities	72
Hypotonia	68
Inability to tolerate secretions	84
Level of consciousness	4
Principal institutional factors contributing to failed decannulation	
Practitioner inexperience	11
Limited patient numbers	0
Lack of a standardized protocol	8
Inadequate facilities or resources	8
No identifiable factor	85



*If clinically appropriate based on patient age and size

Figure 1. Pediatric Decannulation Pathway.