


## Original Investigation

# Inpatient Nursing and Parental Comfort in Managing Pediatric Tracheostomy Care and Emergencies

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**IMPORTANCE** Tracheostomy is a critical and often life-saving intervention, but associated risks are not negligible. The vulnerability of the pediatric population underlies the importance of caregiver comfort and competence in tracheostomy care.

**OBJECTIVE** To assess inpatient nursing staff and parental perspectives in managing tracheostomy care.

**DESIGN, SETTING, AND PARTICIPANTS** Cross-sectional analysis of survey data from (1) a volunteer sample of inpatient nurses in a tertiary care, freestanding pediatric hospital in the Midwest, assigned to clinical wards that provide care for children with tracheostomy tubes and (2) a consecutive sample of families whose child underwent tracheostomy tube placement at the same institution between March 1 and December 31, 2013.

**MAIN OUTCOMES AND MEASURES** Nurse and parental comfort in managing acute and established tracheostomy tubes. Nursing data were analyzed with attention to years' experience and primary unit of practice.

**RESULTS** Respondents included 129 of 820 nurses (16% response rate) and family members of 19 of 38 children (50% response rate). When queried about changing established tracheostomies, 59 of 128 nurses (46%) reported being "totally comfortable," including 46 of 82 intensive care unit (ICU) nurses (56%) vs 13 of 46 floor nurses (28%) ( $P = .002$ ) and 48 of 80 nurses with at least 5 years' experience (60%) vs 12 of 49 less experienced nurses (24%) ( $P < .001$ ). For managing accidental decannulation of a fresh tracheostomy, 61 nurses (47%) described being completely uncomfortable, including 27 of 83 ICU nurses (33%) vs 34 of 46 floor nurses (73%) ( $P = .006$ ), and 33 of 80 nurses with at least 5 years' experience (41%) vs 28 of 49 less experienced nurses (57%) ( $P = .03$ ). Most families felt prepared for discharge (16 of 17 [94%]) and found the health care team accessible (16 of 17 [94%]), although only 5 of 18 families (28%) indicated that tracheostomy teaching was consistent.

**CONCLUSIONS AND RELEVANCE** Nurses' comfort with tracheostomy was higher among nurses with at least 5 years' experience and primary ICU location. Whereas parental comfort with tracheostomy care was high, lack of consistent instruction highlights the role for standardized education in tracheostomy care.

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Tracheostomy is an indispensable procedure for affording a secure airway, pulmonary hygiene, and stable prolonged mechanical ventilation in pediatric patients, but the potential for complications is substantial.<sup>1,2</sup> Among the most feared complications in these patients is loss of airway with resulting hypoxia, due to accidental decannulation, mucus plugging, bleeding, or complication during tracheostomy change.<sup>3</sup> There is growing awareness that many such tracheostomy-related adverse events are preventable, which has prompted international interest in quality improvement efforts in this area.<sup>4,5</sup> This increased emphasis on the clinical care of the patient with a tracheostomy tube can be seen in the recently published consensus guidelines for tracheostomy care.<sup>6</sup> Nursing staff and parental comfort and education are critical safety considerations for these vulnerable patients, particularly in the transition from hospital to home.<sup>6,7</sup>

Considerable time and effort is required in preparing families for the transition to home, yet data on the quality of the tracheostomy care education that a caregiver receives is lacking. At CS Mott Children's Hospital, we recently implemented a tracheostomy teaching team that includes nurses with specialized tracheostomy experience, respiratory therapists, an advanced practiced nurse, and a surgeon. The team provides a bridge between inpatient and outpatient caregiver education and supervision. We explored nursing and family perspectives on tracheostomy management, taking into consideration the effect of years of nursing experience, intensive care unit (ICU) work, and time since last tracheostomy change on comfort level. Such information reflects perception of adequate nursing support, skill, and resource availability in providing care for a child with a tracheostomy tube. We also solicited data relating to family perspectives on tracheostomy care and education.

## Methods

This project was a quality improvement-based initiative, and accordingly institutional review board exemption approval was obtained from the University of Michigan. Consent was waived because this was a quality improvement project. Pre-data collection meetings with nurse managers or clinical nurse specialists of each of the units of interest were conducted separately, and their support was enlisted in the completion of the survey. A 2-week enrollment period window was allowed to collect the data. Effort was made to distribute the survey appropriately to both night and day shift personnel.

### Survey Development and Distribution

A 9-question online survey was created with the goal of assessing nursing comfort with particular tracheostomy care situations, while also exploring support, skill, and resource availability for tracheostomy care. A separate 9-question survey was created for parental caregivers to gain insight into the families' satisfaction with the inpatient teaching and training process. All children undergoing an open tracheostomy by the Division of Pediatric Otolaryngology between March 1 and December 31, 2013, were identified. Families of

these children were provided the family survey to assess their inpatient pediatric tracheostomy experience. Representative survey questions are provided in eTables 1 and 2 in the Supplement.

In the nursing survey, demographic variables collected included primary unit of practice, years of practice, type of nursing degree, and time since the nurse last performed a tracheostomy tube change. Participants' comfort level in managing common tracheostomy situations was queried with response options along a 4-point Likert scale (from 1 "very comfortable" to 4 "completely uncomfortable"). Free-text comments were also available. Response options were grouped to convey either total comfort or varying degrees of discomfort with care-related tasks. Cross-sectional analysis of survey data from inpatient nursing personnel was performed. Responses were compared on the basis of unit of primary practice and length of nursing career. Questions addressed the nurses' comfort with both routine tracheostomy care and special case scenario management in children with existing tracheostomy.

The family survey probed the parental caregivers' perceptions in 2 domains: adequacy of inpatient training and education, as well as access to outpatient resources. Response options were again provided on a Likert-scale format. Free-response data were also collected.

### Setting

The CS Mott Children's Hospital is a 348-bed, free-standing tertiary care children's hospital. At this facility, children with tracheostomy tubes are cared for only in selected units. Excluding the emergency department (technically considered an outpatient location), these units include the neonatal intensive care unit, pediatric intensive care unit, postcardiothoracic unit, surgical step-down floor (intermediate care), chronic ventilatory-dependent unit, and the hematology-oncology unit. Experienced nursing and respiratory therapy personnel work with the individual nurses and help ensure competency of the parental caregivers in tracheostomy tube care management. A child receiving a tracheostomy is a candidate for discharge from the hospital once the outpatient caregivers have demonstrated competency in tracheostomy tube management. The battery of assessments administered includes handling common emergency scenarios, making sure that appropriate supplies are secured for the home, and confirming that the child's medical condition is amenable to outpatient management. In almost all cases, the child receives continuing care as an outpatient by the Division of Pediatric Otolaryngology and is seen on an interval basis.

### Statistical Analysis

Survey data were collected online using Qualtrics, version 60654, and analyzed in SPSS, version 22, Statistics (SPSS Inc). Likert-scale data were converted into trichotomized groups (very comfortable, somewhat comfortable, completely uncomfortable). Descriptive statistics were performed on both data sets.  $\chi^2$  Analysis was conducted on categorical data in the nursing survey data set, with  $P < .05$  considered significant.

Table. Nursing Respondent Demographic Characteristics

Characteristic	No. (%) (N = 129)
<b>Unit</b>	
Intensive care unit	83 (64)
Pediatric	44 (34)
Neonatal	39 (30)
Nonintensive care unit	46 (36)
Moderate care	12 (9)
General floors	34 (26)
<b>Degree</b>	
ADN	27 (21)
BSN	95 (75)
MSN	7 (5)
DPN/PhD	0
<b>Experience, y</b>	
<1	14 (11)
1-4	34 (26)
5-10	23 (18)
11-20	53 (41)
>20	5 (4)

Abbreviations: AND, Associates Degree in Nursing; BSN, Bachelor of Science in Nursing; DPN/PhD, Doctor of Nursing Practice; MSN, Masters of Science in Nursing.

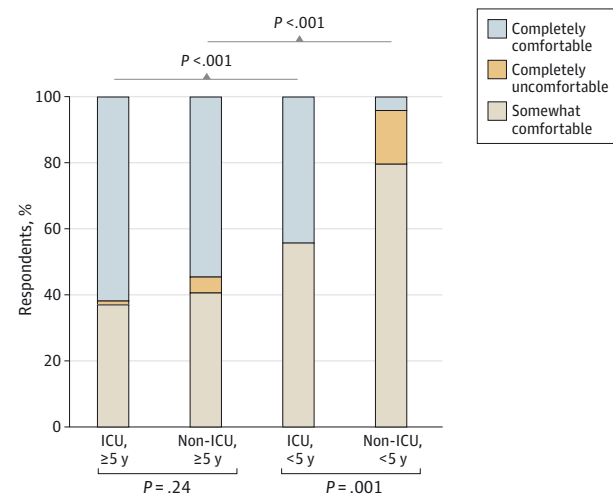
## Results

### Nursing Survey

The survey was made available to approximately 820 registered nurses. Demographic data on unit assignment and duration of nursing experience from the 129 respondents (16% response rate) are presented in the **Table**.

Appreciating the nuances of the subanalysis requires the reader to understand how duration of nursing experience ( $\geq 5$  years vs  $< 5$  years) and nurse work location (primarily ICU vs floor coverage) relate to the gradient of comfort level broken down by Likert scale. The data depicted in **Figure 1** on established tracheostomy changes demonstrate that both years of nursing experience and nursing location affected comfort level with tracheostomy care. Nurses with at least 5 years of nursing experience and nurses who worked primarily in the ICU setting had a significantly increased comfort level with changes of established tracheostomies. These factors were significant individually (main effects analysis) and collectively (interaction). Overall, only 59 of 128 nurses (46%) felt completely comfortable with changing an established tracheostomy tube. This varied by ICU work location (46 of 82 [56%] for ICU vs 13 of 46 [28%] for non-ICU;  $P = .002$ , with only 1 ICU nurse [1%] reporting feeling completely unequipped to handle this situation, compared with 5 non-ICU nurses [11%]), and by experience (48 of 80 [60%] for  $\geq 5$  years' experience vs 12 of 49 [25%] for  $< 5$  years;  $P < .001$ ). Early-career ( $< 5$  years) non-ICU nurses reported the greatest discomfort when dealing with simple tracheostomy changes.

Figure 1. Nurses' Comfort With Changing Established Tracheostomy



At least 5 years of experience and primary intensive care unit (ICU) assignment were associated with increased comfort in managing nonemergent tracheostomy change.

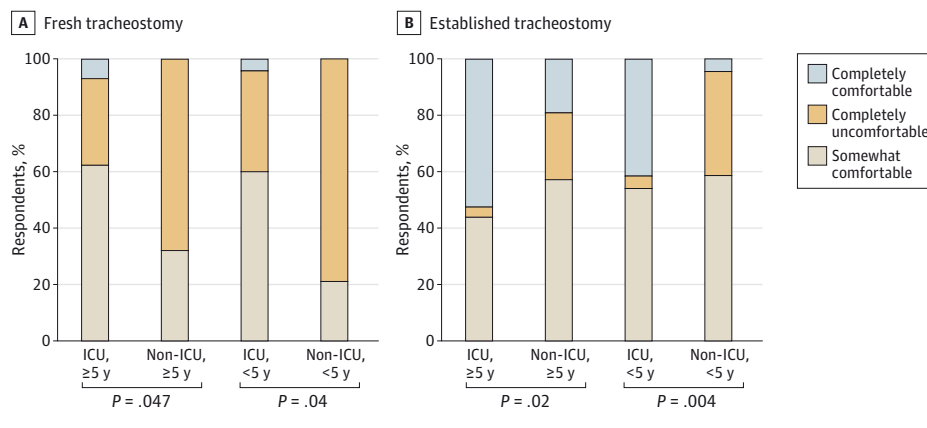
### Nurse Comfort With Accidental Decannulation of Fresh Tracheostomy

**Figure 2A** depicts nurses' comfort level in managing a fresh tracheostomy with accidental decannulation. Whereas 59 of 128 nurses (46%) felt completely comfortable with established tracheostomy changes, only 5 of 119 nurses (4%) felt completely comfortable managing accidental decannulation of a fresh tracheostomy ( $P < .001$ ). In general, ICU nurses felt more comfortable handling this scenario than non-ICU nurses (27 of 83 ICU nurses [33%] reported feeling "completely uncomfortable" vs 34 of 46 non-ICU nurses [74%];  $P = .03$ ). In contrast to the established tracheostomy scenario, length of practice was inconsequential in the level of comfort present, when all the nurses within a particular unit were compared with each other (**Figure 2**).

### Nurse Comfort With Accidental Decannulation of Established Tracheostomy

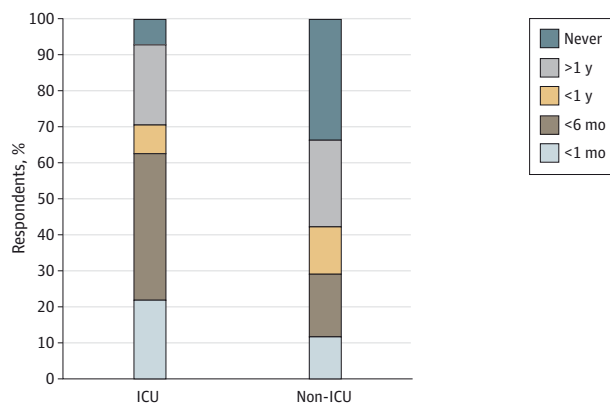
**Figure 2B** depicts nurses' comfort level in managing an accidental decannulation in patients with a well-formed tract. Respondents had a moderate comfort level with this situation, with 45 of 126 nurses (36%) reporting complete comfort with managing the situation (vs 5 of 118 [4%] for a fresh tracheostomy). Similar to the pattern observed with routine care in established tracheostomies, comfort varied by practice location (40 of 81 [49%] for ICU vs 5 of 45 [11%] for non-ICU;  $P < .001$ ) and experience (34 of 79 [43%] for  $\geq 5$  years vs 11 of 48 [23%] for nurses with  $< 5$  years' experience;  $P = .03$ ). However, whereas years of experience did not demonstrate a meaningful difference in ICU nurses, less experienced non-ICU nurses reported disproportionate discomfort with managing accidental decannulations (5 of 21 [24%] non-ICU nurses with  $\geq 5$  years of experience were completely uncomfortable compared with 9 of 24 [38%] non-ICU nurses with  $< 5$  years' experience;  $P = .03$ ).

Figure 2. Nurses' Comfort With Accidental Decannulation of Fresh and Established Tracheostomy Tubes



Intensive care unit (ICU) nurses reported significantly higher comfort levels compared with their non-ICU colleagues in managing accidental decannulations ( $P = .049$  for fresh tracheostomy,  $P = .03$  for established tracheostomy). Among non-ICU nurses, there was a statistically significant relationship between experience and comfort handling accidental decannulations ( $P = .03$ ).

Figure 3. Nurse Interval Since Last Tracheostomy Tube Change Performed, by Location of Practice



Intensive care unit (ICU) nurses reported less time since they last performed a tracheostomy change compared with non-ICU nurses (58 of 82 [71%] vs 19 of 46 [41%] within the past year). Whereas only 6 ICU nurses (7%) reported never having changed a tracheostomy, 15 non-ICU nurses (33%) had never completed a tracheostomy change.

### Nurse Comfort With Teaching Tracheostomy Changes and General Care

The majority of nurses reported feeling either “completely comfortable” or “somewhat comfortable” with teaching tracheostomy care and tracheostomy changes. Again, location was a significant factor, as more ICU than non-ICU nurses felt comfortable teaching general tracheostomy care (79 of 83 [95%] vs 36 of 46 [78%];  $P = .050$ ) and tracheostomy changes (74 of 83 [89%] vs 27 of 46 [59%];  $P < .001$ ).

### Time of Last Tracheostomy Tube Change Performed

Overall, 77 of 127 nurses (61%) reported that they had completed a tracheostomy change within the past year. Predictably, this percentage was higher in the ICU nurses (58 of 82 [71%] vs 19 of 46 [41%];  $P = .001$ ). Fifteen non-ICU nurses (33%) reported that they had never performed a tracheostomy change compared with only 6 ICU nurses (7%) (4 of whom were early-career nurses) (Figure 3).

Free-text comment boxes were provided with each series of questions. Many comments alluded to a lack of consistency in nurse-to-nurse teaching of tracheostomy tube care. Specific nursing concerns raised included infrequent exposure to patients with tracheostomy, the lack of formalized nursing education on the topic, and uncertainty regarding the latest policies and practices.

### Family Survey

For the parental survey, 38 children were identified to have tracheostomy tube placement during the review period. Nineteen families responded to the parental satisfaction survey (50% response rate). Overall satisfaction was high, although variability in instruction method was significant (Figure 4). The results revealed that 16 of 17 (94%) felt either “prepared” or “very prepared” at the time of discharge, and either “agreed” or “strongly agreed” that their teaching nurse and/or therapist and members of the surgical team were available for their questions throughout their child’s hospitalization. Sixteen of 18 (89%) reported that the length of time provided to learn tracheostomy tube care was either just right or slightly in excess; 2 (11%) reported having “slightly” too little time. The educational DVD and binder provided were judged “moderately helpful” to “very helpful” by 8 of 10 (80%) and 17 of 17 (100%) families, respectively, who received the resources. Twelve of 18 (67%) reported that the information about tracheostomy tube care was provided in a way that they could “easily understand,” and the remaining 6 (33%) reported that they “understood, but it took some time to grasp”; none reported that it was “confusing.”

Four of 18 respondents (22%) felt neutral or disagreed that the tracheostomy care instructions given by health care personnel were highly consistent. This concern was further reflected in comments provided by nursing staff regarding lack of up-to-date clinical practice guidelines for tracheostomy care, as well as conflicting information based on their particular preceptor. An important concern was that 2 of 17 respondents (12%) indicated that the family did not know whom they should contact with tracheostomy tube care concerns.

## Discussion

### Effect of Work Location on Exposure to Tracheostomy Care

Nurses working in an ICU setting were significantly more comfortable handling accidental decannulations of both fresh and established tracheostomies. This finding may be attributable to differences in training for ICU vs non-ICU nurses, specifically institutional protocol requiring the first tracheostomy change to occur in the ICU setting. Intensive care unit nurses are thus familiar with tracheostomy procedures and have exposure to tracheostomy care significantly more often than their non-ICU colleagues (Figure 4). Intensive care unit nurses manage acute and emergent health care issues (tracheostomy included) on a more regular basis, inherently leading to a higher comfort level with patients who often have medically complex conditions.

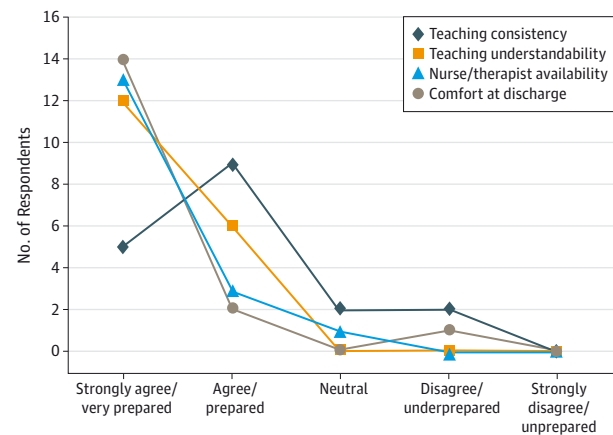
It is important to note that comfort may not reflect competency, and vice versa.<sup>8</sup> A systematic literature review of physician competence in self-assessments compared with expert rater observations found that physicians did not accurately self-assess in the majority of studies.<sup>9</sup> Similar incongruities are found in comparable nursing competency assessments, with poor performers tending to overestimate abilities while high performers underestimate theirs.<sup>10</sup>

### Experience of at Least 5 Years Helps Increase Comfort With Routine Nonemergent Tracheostomy Care

Early-career nurses (<5 years' experience) felt more uncomfortable with routine tracheostomy changes compared with their more seasoned counterparts (Figure 1). Early-career, non-ICU nurses were extremely uncomfortable with accidental decannulations, regardless of whether it is a fresh or established tracheostomy (Figure 2). The cumulative contributions that experience and practice location afford are understandable. Tracheostomies are considered a "high-risk, low-incidence" condition on many units. This patient population needs specialized nursing care, and they may present to a wide variety of floors rather than being limited to the ICU.<sup>11</sup> Thus, these nurses may infrequently care for individuals with tracheostomies and may not be well versed in the nuances of tracheostomy care.

The higher levels of comfort reported by late-career nurses may be attributable to cumulative exposure to tracheostomy care over their career.<sup>12,13</sup> Nursing free-text comments indicated that repeated exposure to patients with tracheostomies in different situations helped develop appropriate skills and confidence in ability. It is interesting to note that although ICU nurses manage tracheostomy care more frequently, both ICU and non-ICU nurses who have more than 5 years' experience report similar comfort levels. This increased comfort level reported by veteran nurses may also be attributable to developed mechanisms that help manage the anxiety and stress of handling challenging situations.<sup>14</sup> Additionally, our study found that no early-career ICU nurses (<5 years) felt completely uncomfortable with established tracheostomy changes. This finding may reflect an incomplete understanding of the challenges and morbidity that may arise with tracheostomy care.<sup>15,16</sup>

Figure 4. Parental Ratings of Tracheostomy Teaching



Teaching inconsistency was the primary area of concern cited in parental education. Almost all parents indicated satisfaction regarding inpatient nurse and/or therapist availability, overall quality of teaching/understandability, and their comfort at discharge to care for their child with a tracheostomy. However, teaching consistency was identified as a potential arena for improvement.

### Future Considerations in Resource Allocation and Multidisciplinary Approaches

The challenges faced by both early-career and experienced nurses can be ameliorated through the use of multidisciplinary teams that use a tracheostomy clinical nurse. Collaboration in a team setting enables experienced clinicians to guide early-career nurses through both the technical and emotional challenges that may arise during routine and emergent tracheostomy care.<sup>15,17</sup> Establishing one person to serve as an expert tracheostomy clinical nurse also reduces the variation of training that clinicians may receive.

Limitations of this study include those applicable to any data gathered through survey mechanisms, including high likelihood of selection bias, in which those who have experienced catastrophes are more likely to respond; recall bias, in which respondents either overestimate or underestimate the number of times that they have encountered specific complications; and the fact that the data are unverifiable. Our response rate was 16%, and perhaps extending the enrollment period would have garnered a more robust response rate. However, our results resemble findings from other self-reported tracheostomy comfort data with higher response rates that demonstrate substantial variation in comfort level across health care personnel.<sup>18</sup> Finally, the survey tool used was not validated, and this could be limiting. Previous work, however, has noted the paucity of validated instruments for evaluating tracheostomy care.<sup>19</sup>

## Conclusions

Comfort with tracheostomies and associated emergencies varied as a function of nursing experience, both in duration and work in the ICU setting.<sup>17</sup> Parental comfort with tracheostomy care is high, but some concern exists for the lack of con-



sistent instruction provided. Educational efforts for nurses and parents caring for children with tracheostomies should be standardized and serial. Ongoing efforts can include in-services, direct patient observation, and simulated exercises.

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**Study concept and design:** Pritchett, Brown.

**Acquisition, analysis, or interpretation of data:** All authors.

**Drafting of the manuscript:** Pritchett, Ray, Brenner, Brown.

**Critical revision of the manuscript for important intellectual content:** Foster Rietz, Ray, Brenner, Brown.

**Statistical analysis:** Pritchett, Foster Rietz, Ray, Brenner.

**Administrative, technical, or material support:** Pritchett, Ray, Brown.

**Study supervision:** Brenner, Brown.

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