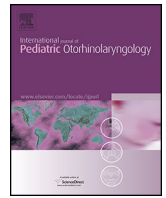




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The Global Tracheostomy Collaborative: one institution's experience with a new quality improvement initiative



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ABSTRACT

Objective: Given the low frequency of adverse events after tracheostomy, individual institutions struggle to collect outcome data to generate effective quality improvement protocols. The Global Tracheostomy Collaborative (GTC) is a multi-institutional, multi-disciplinary organization that utilizes a prospective database to collect data on patients undergoing tracheostomy. We describe our institution's preliminary experience with this collaborative. It was hypothesized that entry into the database would be non-burdensome and could be easily and accurately initiated by skilled specialists at the time of tracheostomy placement and completed at time of patient discharge.

Methods: Demographic, diagnostic, and outcome data on children undergoing tracheostomy at our institution from January 2013 to June 2015 were entered into the GTC database, a database collected and managed by REDCap (Research Electronic Data Capture). All data entry was performed by pediatric otolaryngology fellows and all post-operative updates were completed by a skilled tracheostomy nurse. Tracked outcomes included accidental decannulation, failed decannulation, tracheostomy tube obstruction, bleeding/tracheoinnominate fistula, and tracheocutaneous fistula.

Results: Data from 79 patients undergoing tracheostomy at our institution were recorded. Database entry was straightforward and entry of patient demographic information, medical comorbidities, surgical indications, and date of tracheostomy placement was completed in less than 5 min per patient. The most common indication for surgery was facilitation of ventilation in 65 patients (82.3%). Average time from admission to tracheostomy was 62.6 days (range 0–246). Stomal breakdown was seen in 1 patient. A total of 72 patients were tracked to hospital discharge with 53 patients surviving (88.3%). No mortalities were tracheostomy-related.

Conclusion: The Global Tracheostomy Collaborative is a multi-institutional, multi-disciplinary collaborative that collects data on patients undergoing tracheostomy. Our experience proves proof of concept of entering demographics and outcome data into the GTC database in a manner that was both accurate and not burdensome to those participating in data entry. In our tertiary care, pediatric academic medical center, tracheostomy continues to be a safe procedure with no major tracheostomy-related morbidities occurring in this patient population involvement with the GTC has shown opportunities for improvement in communication and coordination with other tracheostomy-related disciplines.

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1. Introduction

Tracheostomy is a straightforward surgical procedure; however, there is need for complex and labor intensive post-operative

care. Patients undergoing tracheostomy are medically complex; care of the tracheostomy itself is often only one part of a very detailed medical care plan carried out by a multi-disciplinary team. Adverse events related to tracheostomy are relatively uncommon, and individual institutions may not have sufficient case numbers to generate meaningful data regarding safety events and ways to improve patient outcomes. Multi-institutional, collaborative databases can be powerful tools in such cases, and have been used in other specialties such as thoracic surgery, pathology, and neurosurgery to identify and improve outcomes [1–3].

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The Global Tracheostomy Collaborative (GTC) was formed in 2014 with the objective to improve the care and safety of tracheostomy patients. The collaborative consists of a multi-disciplinary group of providers, patients, and families working to delineate and disseminate best practices surrounding tracheostomy care [4]. This is accomplished in part by utilizing a prospective multi-institutional database to gather data on patients undergoing tracheostomy. There has been legitimate concern from hospitals about the burden of participating and reporting data into such collaboratives and what the benefit of such participation is for the hospitals. Furthermore, in order for a database to be useful, data entry must be accurate and complete. We describe our institution's early experience in the Global Tracheostomy Collaborative. It was our hypothesis that data entry would be performed by skilled providers in a way that was both accurate and minimally time-intensive.

2. Methods

The GTC uses a prospective database to collect and manage data using REDCap electronic data capture tools hosted at each host institution. REDCap (Research Electronic Data Capture) is a secure, web-based application designed to support data capture for research studies, providing 1) an intuitive interface for validated data entry; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for importing data from external sources [5].

The database is focused on the hospital admission during which tracheostomy was performed, and includes fields for all pertinent demographic information, reason for hospitalization, comorbidities, and indication for tracheostomy. Outcome data include fields for complications such as tracheostomy tube obstruction, accidental decannulation, tracheostomy bleeding, stomal breakdown, and need for revision (Table 1).

Data on children undergoing tracheostomy at Children's National Medical Center in Washington, DC from 1 January 2013 to 30 June 2015 were recorded into the GTC database. Demographic data, comorbidities, and indication for tracheostomy were entered by the pediatric otolaryngology fellow as part of the standard post-operative documentation. The tracheostomy nurse, who gathered data on daily rounds of all tracheostomy patients, completed the fields for complications and discharge disposition at or shortly after time of patient discharge. While the focus of the GTC is on prospectively entered data, information from January

2013 to June 2014 was entered retrospectively as part of an institutional quality improvement project.

The tracheostomy procedure was performed in a similar fashion amongst all providers with stay sutures affixed to the patient's chest wall and the tracheostomy tube was secured with a soft collar. One provider performed stomal maturation as part of the procedure. All patients were sedated for 5–7 days postoperatively until the otolaryngology service performed first tracheostomy tube change. During the period prior to this tracheostomy tube change, the patient was evaluated daily by the otolaryngology service to ensure no wounds were forming and to confirm that the tracheostomy tube was securely in place.

3. Results

Total data entry time for each patient was less than 5 min. Specialized team members designated to perform data entry deemed the extra time needed to input the clinical information into the database negligible. With respect to our institutional data: between January 2013 and June 2015, data from 79 patients with age range 2 weeks to 18 years undergoing tracheostomy were recorded into the GTC database. The most common primary indication for admission in this subset of patients was a diagnosis of the respiratory system (22 patients, 27.8%) (Table 2). Medical comorbidities were common in this patient population. Respiratory comorbidities were found in 43 patients (54.4%), cardiac comorbidities in 25 patients (31.6%), and neurological comorbidities in 23 patients (29.1%).

The most common primary indication for tracheostomy placement was respiratory failure/facilitation of ventilation in 65 patients (82.3%). Chronic aspiration and upper airway obstruction (including obstructive sleep apnea) were the primary indication in eight (10.1%) and six (7.6%) of patients, respectively. Average time from date of admission to date of tracheostomy was 62.6 days (range 0–246 days).

With respect to adverse events, there were no accidental decannulations, failed recannulations, tracheostomy tube obstructions, bleeding/tracheoinnominate fistulas, or tracheocutaneous fistulas in this patient population. One patient had minor wound breakdown on the inferior aspect of the tracheostomy stoma.

At the time of data analysis, seven patients were still actively hospitalized. A total of 53 of the patients who were not actively hospitalized survived until hospital discharge (88.3%) (Table 3). Of these patients, 23 (43.4%) were discharged to a rehabilitation hospital, 17 (32.1%) went home, three were transferred to another acute care hospital (5.7%), and four (7.5%) were transferred to a long-term care facility. Final disposition was unknown in six patients (12.8%). Seven patients (8.8%) died prior to hospital

Table 1
Data entered into GTC database.

Patient demographics
Admission information
Date
Primary reason for admission
Comorbid conditions
Tracheostomy information
Date
Primary reason for tracheostomy
Need for mechanical ventilation
Discharge date and disposition
Decannulated prior to discharge?
Death prior to discharge?
Adverse events
Accidental decannulation
Failed decannulation
Tube obstruction
Speaking valve placed with inflated cuff?
Bleeding
Tracheoesophageal fistula
Tracheocutaneous fistula
Other

Table 2
Primary indication for admission in patients undergoing tracheostomy.

Diagnosis category	Patients (%)	Associated diagnoses
Respiratory	22 (27.8)	Chronic lung disease, subglottic stenosis, aspiration, respiratory failure, obstructive sleep apnea
Neonatal/prematurity	14 (17.7)	Prematurity, intrauterine growth restriction
Neurological	12 (15.2)	Hydrocephalus, seizures
cardiovascular	10 (12.7)	Aortic coarctation, tetralogy of Fallot, truncus arteriosus, ASD/VSD, hypoplastic left heart
Hematological/oncologic	6 (7.6)	Leukemia, lymphoma, solid neoplasm
trauma	4 (5.1)	Non-accidental trauma, motor vehicle accident
Vascular malformation	1 (1.3)	Lymphatic malformation
Other/unknown	10 (12.7)	

Table 3
Discharge disposition of children undergoing tracheostomy.

Discharge location	n (%)
Rehabilitation hospital	23 (43.4)
Home	17 (32.1)
Long-term care facility	4 (7.5)
Acute care hospital	3 (5.7)
Died	7 (8.8)
Unknown	6 (12.8)

discharge, however, none of the patients died directly from tracheostomy-related complications.

4. Discussion

While tracheostomy as a procedure is technically straightforward, the post-operative care of patients with tracheostomies is relatively challenging. Safe and effective care for a new tracheostomy requires intensive monitoring and care from a variety of providers including multiple medical specialties, nursing, and respiratory therapists. Furthermore, patients undergoing tracheostomy often carry multiple medical comorbidities and require care from multiple specialties and ancillary services [6]. This medical complexity has been associated with a high incidence of post-operative mortality, albeit mostly from non-tracheostomy-related events [7]. Despite their rarity, adverse events specifically attributed to tracheostomies do occur, and efforts to reduce these events are warranted [8].

One method for providing a means for analysis of rare entities is via the multi-institutional, collaborative database. Perhaps the most established and well known of these databases is that by the Society of Thoracic Surgeons (STS), first described in 1989 [1]. Since its inception, the STS database has led to a multitude of studies that have permitted the assessment of provider performance, determined appropriateness of procedures and interventions, led to the development of new guidelines and prompted new quality improvement endeavors [9]. Data maintained in this database have been assessed for accuracy of entry and have been highly validated [10,11]. Similarly, recent creation of a pathology errors database supported by the Agency for Healthcare Research and Quality (AHRQ) and the National Neurosurgery Quality and Outcomes Database (N²QOD) have marked the early stages of utilization of collaborative databases in healthcare quality endeavors [2,3].

The GTC aims to improve outcomes in tracheostomy care. One of the key drivers in achieving that goal is the development of best practices, and standardization of care. Prospectively collecting outcome data on a large scale via an international, multi-institutional database will eventually allow for benchmarks to be set, and novel targets for quality improvement initiatives to be identified. This will help to define and refine tracheostomy care best practices. At time of writing, there are over 30 member institutions in the GTC, and over 600 entries into the database. These numbers are growing significantly as more institutions join and begin entering data.

Of course, in order for a database to be worthwhile, data entry must be accurate, complete and not burdensome. At our institution, we found the time and effort required for data entry was minimal. Furthermore, limiting entry to fellows and a specialized tracheostomy nurse ensured the accuracy of data. A

tangential benefit of using the GTC database has been more frequent communication and closer collaboration between our otolaryngology team and our tracheostomy nurse. As with all studies, analysis of our institutional data has its limitations. Data entered retrospectively between January 2013 and June 2014 risk recall bias and the perpetuation of inaccuracies in the patient chart. While this may be true, the fact that data entry was performed by fellow-level providers minimized this risk. Furthermore, the small patient population captured in this time period limits the ability to make large conclusions about outcomes of tracheostomy at our institution alone. This only further supports the need for multi-institutional collaborations for procedures and conditions that are relatively rare.

The GTC as a quality improvement collaborative is larger than simply using the database. We have utilized access to the experience and institutional protocols and staff training materials from other members to initiate the development of a multi-disciplinary tracheostomy care clinic as well as overhaul the approach to the inpatient care of our patients with trachs.

Our early data have confirmed the findings supported by other studies that tracheostomy-related complications are rare, and that post-tracheostomy mortality is rarely directly due to tracheostomy-related complications [7,8]. We have also shown that respiratory failure is overwhelmingly the most common indication for tracheostomy at our institution, an evolving trend that highlights the growing overall medical complexity of patients undergoing this procedure [12].

As the use of this collaborative database grows, tracheostomy care best practices can be refined and disseminated, and new targets for quality improvement may be identified. Future plans for the GTC database include expanding data collection to include secondary admissions (admissions of patients with pre-existing tracheostomies), and introducing an optional expanded database capable of capturing a wide variety of trach-related information, which can be tailored to each member institution's interests and needs.

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