

## Abstract

**Introduction:** Discharge location following pediatric tracheostomy is pertinent as it may impact access to postoperative care. Our aim is to evaluate discharge locations among pediatric tracheostomy patients (PTP) and identify associated demographic variables.

**Methods:** We used the 2016 and 2019 HCUP Kids' Inpatient Database for patients aged 0-17 years. ICD-10-PCS codes for PTP and HCUP data variables of interest were selected. Rao-Scott Chi-square tests were used for bivariate comparisons and multinomial generalized logistic regression models were used for odds ratios (OR).

**Results.** Patients aged 11-17, patients from large metropolitan areas, and patients of "Other" race have an increased odds of discharge to a short- or long-term care facility (all  $P < .001$ ). Weekend admissions, nonelective admissions, patients in Northeast hospitals, and patients at urban nonteaching hospitals are also more likely to be discharged to a short- or long-term care facility (all  $P < .001$ ). Mean and median total costs of admission were \$424,387 and \$243,479, respectively, with a median total charge of \$854,499.

**Conclusion.** Among pediatric tracheostomy patients, demographic factors that affect discharge disposition include age, community type, and race, and significant hospital factors include day and type of admission, geographic region, and hospital type. Hospitalizations are associated with high overall costs and charges to the patient, which are increasing over time.

## Introduction

- Pediatric tracheostomy is indicated in the management of **complex medical conditions** (airway obstruction, prolonged ventilation, etc.)<sup>1</sup>
- Tracheostomy patients require significant long-term care; adequate **postoperative management and caregiver education** are key<sup>2-4</sup>
- Discharge location is important, as it indicates the **level of resources and care** being provided to the patient and associated costs.
- Previous studies have established a relationship between tracheostomy, discharge location, and **social determinants of health (SDOH)**, including race, insurance status, and SES.<sup>5-10</sup>

### STUDY AIMS

1. Evaluate the breakdown of discharge locations among PTP and determine what percentage are discharged to home with self-care, home with HHC, STH, or SNF/ICF/Other.
2. Determine which SDOH influence discharge location
3. Examine national trends in post-tracheostomy discharge location based on region and community type

## Methods and Materials

- HCUP Kids' Inpatient Database (KID): 2016 and 2019
  - HCUP data elements selected for variables of interest
- **Inclusion criteria:**
  - Children <18 years of age
  - Tracheostomy during hospital admission (ICD-10-PCS codes)
- **Statistical analysis:**
  - **Bivariate comparisons:** Rao-Scott Chi-square tests
    - Bonferroni adjustment
  - **Odds ratios (OR):** Multinomial generalized logistic regression
    - Three discharge dispositions (home with HHC, STH, SNF/ICF/Other) vs. discharge home for self-care (reference)

## Results

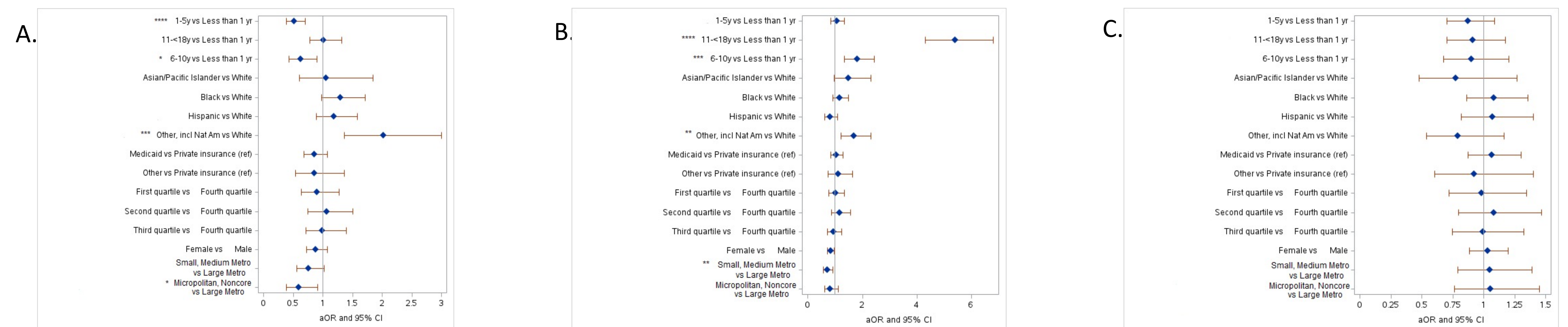
**Table 1. Tracheostomy discharge outcomes and demographics**

Factor	Wtd. Freq.	Percent (95% conf. limits)
<b>DISPOSITION*</b>		
Discharged to home or self-care	1566	40.2 (37.0,43.5)
Transfer: short-term hospital	436	11.2 (9.7,12.8)
Transfer: other type of facility (SNF/ICF/other)	865	22.2 (20.2,24.3)
Discharged home with Home health care (HHC)	729	18.7 (16.5,21)
Against medical advice (AMA)	Suppressed	Suppressed
Died in hospital	292	7.5 (6.8,8.2)
Discharged alive, destination unknown	Suppressed	Suppressed
<b>RACE/ETHNICITY</b>		
White	1554	43.6 (41.1,46.1)
Black	861	24.1 (22.1,26.2)
Hispanic	745	20.9 (18.6,23.2)
Asian/Pacific Islander	125	3.5 (2.9,4.1)
Native American	36	1.0 (0.6,1.4)
Other	244	6.9 (5.7,8.0)
<b>SEX</b>		
Male	2315	59.4 (58.1,60.8)
Female	1580	40.6 (39.2,41.9)
<b>AGE</b>		
Neonate	967	24.8 (23.4,26.2)
<1 yr	968	24.9 (23.4,26.4)
1-5y	663	17.0 (15.9,18.2)
6-10y	342	8.8 (8.0,9.6)
11-<18y	954	24.5 (23.0,26.0)
Age in years, mean (95% confidence limits)	3985	4.9 yrs (4.7, 5.1)
Age in years, median [25 <sup>th</sup> , 75 <sup>th</sup> quartile]	3985	1.0 yrs [0.1, 9.7]
<b>CHARGE, COST and LENGTH OF STAY</b>		
Total Charge, \$, median [25 <sup>th</sup> , 75 <sup>th</sup> quartile]	3800	\$854,499 [352860, 1942850]
Total Cost, inflation adjusted \$, mean (95% confidence limits)	3800	\$424,387 (399955, 448819)
Total Cost, inflation adjusted \$, median [25 <sup>th</sup> , 75 <sup>th</sup> quartile]	3800	\$243,479 [101078, 562245]
LOS, days, median [25 <sup>th</sup> , 75 <sup>th</sup> quartile]	3800	59.2 [27.0, 130.1]
<b>INCOME QUARTILE BASED ON ZIP</b>		
First quartile	1343	35.2 (33.0,37.4)
Second quartile	970	25.4 (23.8,27.0)
Third quartile	878	23.0 (21.6,24.3)
Fourth quartile	628	16.4 (14.6,18.2)

**Table 2. SDOH associations with discharge – bivariate analysis**

Factor	Discharge to home for self-care (N=2,269)	Transfer to short term hospital (N=649)	Transfer to other type of facility (N=1,270)	Discharge to Home Health Care (N=1,071)
<b>AGE</b>				
Neonate	23.8 (21.6,26.0) <sup>23</sup>	32.8 (28.8,36.8) <sup>13</sup>	13.4 (11.2,15.6) <sup>124</sup>	28.0 (24.8,31.2)
<1 yr	27.3 (25.0,29.6) <sup>3</sup>	28.9 (24.5,33.3) <sup>3</sup>	15.3 (13.1,17.6) <sup>124</sup>	27.4 (24.5,30.2)
1-5y	21.6 (19.5,23.8) <sup>23</sup>	12.2 (9.6,14.9) <sup>14</sup>	12.8 (11.2,14.4) <sup>14</sup>	18.9 (16.4,21.3)
6-10y	10.0 (8.7,11.3)	6.4 (4.4,8.3)	9.2 (7.5,10.8)	9.1 (7.4,10.9)
11-<18y	17.3 (15.5,19.0)	19.7 (16.3,23.1)	49.4 (45.6,53.1) <sup>124</sup>	16.5 (14.0,19.1)
<b>RACE</b>				
White (non-Hispanic)	44.8 (41.4, 48.2)	37.6 (33.1, 42.1)	43.4 (39.6, 47.2)	44.7 (40.7, 48)
Black (non-Hispanic)	22.5 (19.6, 25.4)	25.4 (21.3, 29.5)	25.2 (22.1, 28.3)	24.5 (21.0, 28)
Hispanic	22.2 (19.0, 25.5)	21.8 (18.0, 25.5)	17.5 (14.7, 20.3)	23.1 (18.9, 27)
Asian/Pacific Islander	3.5 (2.6, 4.3)	3.2 (1.7, 4.7)	4.4 (3.2, 5.6)	2.5 (1.5, 3.5)
Native American	1.1 (0.55, 1.7)	Suppressed	0.93 (0.33, 1.5)	Suppressed
Other	5.8 (4.4, 7.3)	10.9 (7.7, 14.1) <sup>14</sup>	8.5 (6.7, 10.4)	4.3 (2.9, 5.8)
<b>INDICATOR OF SEX</b>				
Male	57.6 (55.6, 59.6) <sup>3</sup>	60.3 (56.6, 64.1)	65.1 (62.3, 67.9) <sup>14</sup>	56.6 (53.7, 59)
Female	42.4 (40.4, 44.4)	39.7 (35.9, 43.4)	34.9 (32.1, 37.7)	43.4 (40.5, 46)
<b>PRIMARY EXPECTED PAYER</b>				
1: Medicare	Suppressed	Suppressed	Suppressed	Suppressed
2: Medicaid	59.3 (55.9, 62.8)	55.2 (50.5, 60.0)	56.8 (53.5, 60.1)	61.7 (58.4, 65)
3: Private Insurance	34.2 (31.1, 37.3)	38.9 (34.8, 42.9)	37.3 (34.2, 40.4)	33.3 (29.8, 36)
4: Self-pay	2.4 (1.3, 3.6)	Suppressed	1.3 (0.61, 1.9)	Suppressed
5: No Charge	Suppressed	Suppressed	Suppressed	Suppressed
6: Other	4.0 (2.8, 5.2)	4.8 (2.8, 6.8)	4.7 (3.0, 6.3)	4.2 (2.7, 5.6)
<b>MEDIAN H<sup>HH</sup>OLD INCOME NAT'L QUARTILE FOR PT ZIP CODE</b>				
1 <sup>st</sup> quartile (lowest income)	35.0 (32.0, 38.0)	31.9 (28.0, 35.8)	36.1 (32.9, 39.4)	35.7 (31.8, 39)
2 <sup>nd</sup> quartile	24.9 (22.7, 27.1)	25.6 (22.0, 29.3)	26.0 (23.3, 28.7)	26.1 (23.4, 28)
3 <sup>rd</sup> quartile	23.7 (21.7, 25.6)	23.9 (20.4, 27.5)	21.3 (19.0, 23.6)	23.4 (20.5, 26)

**Figure 1. Forest plot of adjusted odds ratios of transfer to A.) STH B.) SNF/ICF/Other C.) Home with HHC**



## Discussion

- 2020 Census data indicates that approximately 14.2% of the U.S. population identifies Black but **Black Americans account for 24.1%** of pediatric tracheostomies - **disproportionate burden**
- Rising **mean cost of hospitalization** (~\$500,000) at least partly due to inflation, represents **significant economic burden for families**
- **Bivariate analysis:** age, race, sex, primary expected payer, patient location, and hospital geographic region associated with discharge
- **Multivariable modeling:** **age, community type, and race/ethnicity** associated with discharge location
  - **Age:** likely related to mechanism of injury in children by age
  - **Community type:** greater availability of care facilities in large metropolitan areas

## Conclusions

- Among pediatric tracheostomy patients, demographic variables associated with discharge disposition include **age, community type, and race**, with older patients (11-17), patients from large metropolitan areas, and patients of "Other" race having an **increased odds of discharge to a STH or SNF/ICF/other facility**.
- Hospitalizations for pediatric tracheostomy are associated with high overall costs and charges to the patient, increasing over time, representing a **significant economic burden**.
- Multidisciplinary clinics for complex tracheostomy patients can help alleviate this economic burden
- Further characterization of race-based disparities is needed

## Contact

Diya Ramanathan, BA  
Case Western Reserve University School of Medicine  
8210 Chester Parkway, Cleveland, OH 44103  
dxr240@case.edu  
(262) 744-2240

## References

1. Singh A, Zubair A. Pediatric Tracheostomy. In: *StatPearls*. StatPearls Publishing; 2022.
2. Duncan BW, Howell LJ, deLorimer AA, Adzick NS, Harrison MR. Tracheostomy in children with emphasis on home care. *J Pediatr Surg*. 1992;27(4):432-435. doi:10.1016/0022-3468(92)90329-6
3. Hopkins C, Whetstone S, Foster T, Blaney S, Morrison G. The impact of paediatric tracheostomy on both patient and parent. *Int J Pediatr Otorhinolaryngol*. 2009;73(1):15-20. doi:10.1016/j.ijporl.2008.09.010
4. Kun SS, Davidson-Ward SL, Hulse LM, Keens TG. How much do primary care givers know about tracheostomy and home ventilator emergency care? *Pediatr Pulmonol*. 2010;45(3):270-274. doi:10.1002/ppul.21169
5. Spruce L. Back to Basics: Social Determinants of Health. *AORN J*. 2019;110(1):60-69. doi:10.1002/aorn.12722
6. Brown C, Shah GB, Mitchell RB, Lenes-Voit F, Johnson RF. The Incidence of Pediatric Tracheostomy and Its Association Among Black Children. *Otolaryngol Head Neck Surg*. 2021;164(1):206-211. doi:10.1177/014959820947016
7. Johnson RF, Brown CM, Beams DR, et al. Racial Influences on Pediatric Tracheostomy Outcomes. *Laryngoscope*. 2022;132(5):1118-1124. doi:10.1002/lary.29847
8. Bahethi R, Park C, Yang A, et al. Influence of Insurance Status and Demographic Factors on Outcomes Following Tracheostomy. *Laryngoscope*. 2021;131(7):1463-1467. doi:10.1002/lary.28967
9. Hulsebos IF, Collier ZJ, Spera LJ, et al. Burn Patient Insurance Status Influences Hospital Discharge Disposition and Utilization of Post-Discharge Outpatient Care. *J Burn Care Res*. Published online August 7, 2021;irab124. doi:10.1093/jbcr/irab124
10. Sacks GD, Hill C, Rogers SOJ. Insurance status and hospital discharge disposition after trauma: inequities in access to postacute care. *J Trauma*. 2011;71(4):1011-1015. doi:10.1097/TA.0b013e3182092c27