

Pediatric Difficult Airway Diagnoses Mapping to SNOMED CT Terminology

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Introduction: The Systematized Nomenclature of Medicine Clinical Terms (SNOMED CT) is a recognized standard of medical terminology around the world. SNOMED CT describes concepts in relationships to other concepts and in various hierarchies, classifying them in common disease categories. SNOMED CT allows for evolution by allowing multiple synonyms to be mapped to one unique concept. [1,2]

Pediatric anesthesiologists rely on patient history and physical exam to identify patients that may experience difficult airway management during anesthesia care. The Society for Pediatric Anesthesia's Pedi-R special interest group that maintains a multi-institution registry of patients with known difficult airways and associated conditions.[3] In this study, problems associated with difficult airways were mapped to existing SNOMED CT terms. We present the results of the SNOMED CT term mapping and number of patients with matching diagnoses as well as the incidence of difficult airway diagnoses in this cohort from a single institution cohort.

Methods: We retrieved the list of diagnoses associated with difficult airway from the REDCap database in use by the Society for Pediatric Anesthesia's Pedi-R Special Interest Group. Two authors (Galvez JA, and Cha YM) reviewed the diagnoses and matched them to existing SNOMED CT terms using the International Edition SNOMED CT Browser (4). We retrieved a de-identified dataset from the clinical data warehouse at The Children's Hospital of Philadelphia between January 1, 2016, and December 10, 2017, for patients with an active or resolved diagnosis matching the SNOMED CT terms compiled. My study satisfies the requirements of my institution or organization regarding the use of human subjects in scientific research. We reported patients with active or completed difficult airway problem, active or completed critical airway, history of general anesthesia, history of tracheostomy, or history of an endotracheal tube. Difficult airway is defined as known difficulty with intubation in the past or anticipated challenges in securing a stable airway. Critical airway is defined as a patient whose airway is unable to be ventilated due to anatomic or other abnormalities if an artificial airway is dislodged, tracheostomy less than 7 days, or airway stent in place.

Results: We matched 141 diagnoses with SNOMED CT codes, of which 52 codes were matched 710 patients in the clinical data warehouse during the study period. 25 diagnoses were linked with difficult airway in active or resolved state (Table 1). Tracheostomy rates ranged from 0-100%.

Discussion: The true incidence of difficult airway for the individual patient populations remains unknown. Mapping the conditions found in the Pedi-R database with a medical terminology standard such as SNOMED CT is one of the necessary steps to study these populations. Furthermore, a validated list of SNOMED CT terms can be organized into a hierarchical grouping of pediatric difficult airway syndromes. This grouping can be applied to population-based studies as well as clinical decision support applications in electronic health record systems around the world. The authors are continuing to work with SNOMED CT international and the Society for Pediatric Anesthesia to achieve this goal.

References:

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2. Wade, G., et al. (2008). "Assessing voids in SNOMED CT for pediatric concepts." AMIA Annu Symp Proc: 1164.
3. Fiadjoe, J. E., et al. (2016). "Airway management complications in children with difficult tracheal intubation from the Pediatric Difficult Intubation (PeDI) registry: a prospective cohort analysis." Lancet Respir Med 4(1): 37-48.
4. SNOMED CT International edition browser 20170731. <http://snomed.info/?perspective=full&conceptId1=404684003&edition=en-edition&release=v20170731&server=http://browser.ihtsdotools.org/api/v1/snomed&langRefset=900000000000509007>. Accessed December 1, 2017.

Table 1 – Prevalence of SNOMED CT difficult airway terms at The Children’s Hospital of Philadelphia

SNOMED CT	Patients (n)	Hx Anesthesia (%)	Difficult Airway		Critical Airway		Tracheostomy		Hx Endotracheal Tube (%)
			Active (%)	Resolved (%)	Active (%)	Resolved (%)	Active (%)	Resolved (%)	
Congenital web of larynx	1	100%	100%	100%	100%	0%	100%	0%	0%
Microstomia	1	100%	100%	0%	0%	0%	0%	0%	0%
Stenosis of trachea	36	86%	50%	11%	31%	55%	28%	50%	53%
Mucopolysaccharidosis type II	6	50%	50%	0%	0%	0%	0%	0%	0%
Anomaly of chromosome pair 18	2	50%	50%	0%	0%	0%	0%	0%	0%
Ring chromosome 18 syndrome	2	100%	50%	0%	0%	0%	0%	0%	0%

Supernumerary der(22)t(11;22) syndrome	2	100%	50%	0%	0%	0%	0%	0%	0%
Tracheal stenosis following tracheostomy	2	50%	50%	0%	0%	0%	0%	0%	0%
Treacher Collins syndrome	7	29%	29%	0%	14%	100%	29%	50%	14%
Goldenhar syndrome	20	60%	25%	20%	5%	100%	0%	0%	0%
Mucopolysaccharidosis type I-H	4	100%	25%	0%	0%	0%	0%	0%	0%
Robin sequence	47	57%	23%	46%	13%	50%	13%	33%	19%
Acrocephalosyndactyly type V	5	60%	20%	0%	0%	0%	0%	0%	0%
Coloboma, heart malformation, choanal atresia, retardation of growth and development, genital abnormalities, and ear malformations association	23	48%	17%	0%	4%	100%	26%	17%	17%
Complete trisomy 21 syndrome	6	83%	17%	0%	0%	0%	17%	0%	33%
Laryngeal web	8	63%	13%	100%	25%	100%	13%	100%	13%
Complete trisomy 18 syndrome	21	24%	10%	0%	5%	100%	5%	0%	19%
Vallecular cyst	11	82%	9%	0%	0%	0%	9%	100%	9%
Congenital cleft larynx	23	70%	9%	0%	4%	100%	9%	0%	0%
Klippel-Feil sequence	26	35%	8%	0%	0%	0%	0%	0%	0%
Beckwith-Wiedemann syndrome	81	30%	7%	67%	1%	100%	1%	0%	4%

Rubinstein-Taybi syndrome	15	53%	7%	100%	0%	0%	0%	0%	0%
DiGeorge sequence	31	71%	3%	100%	3%	100%	7%	0%	23%
Noonan's syndrome	50	44%	2%	0%	2%	100%	2%	0%	14%
Congenital hypothyroidism	131	25%	1%	0%	2%	100%	2%	0%	9%