A Computable Phenotype for Time Toxicity of Elective Tracheostomy

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Background:

Tracheostomy is a surgical procedure that involves making an incision on the anterior wall of the trachea to create a secure airway and improve ventilation.[1] The procedure is conducted for both emergent and elective clinical reasons on a wide variety of patient populations from neonates with airway obstruction to cervical spine trauma patients to adult intensive care unit patients needing prolonged mechanical ventilation. Treatment-related time toxicity is defined by Gupta et al. as days with physical healthcare system contact and is contrasted to days without physical healthcare system contact defined as home days.[2] Time toxicity is an important metric to provide to patients and their families, especially when the time toxicity from more intensive treatment options could exceed the potential survival benefit.[2] Time toxicity has become a significant concern among patients, providers, caregivers, and the healthcare system as the quantity of treatment is frequently discussed aside from the implications on the patient's quality of life.[3] Providing context to patients and caregivers regarding the time toxicity of the treatment options fosters shared decision-making and establishes informed treatment decisions with clearly defined expectations of care. The objective of this study was to develop a computable phenotype for patients receiving an elective tracheostomy to use in large-scale analysis of time toxicity compared to similar patients indicated for an elective tracheostomy but decided against receiving the procedure. A computable phenotype was first developed to capture all patients receiving a tracheostomy whether emergent or elective, and a subsequent phenotype was created to capture only the elective tracheostomy procedures among all tracheostomy patients captured in the first phenotype.

Methods:

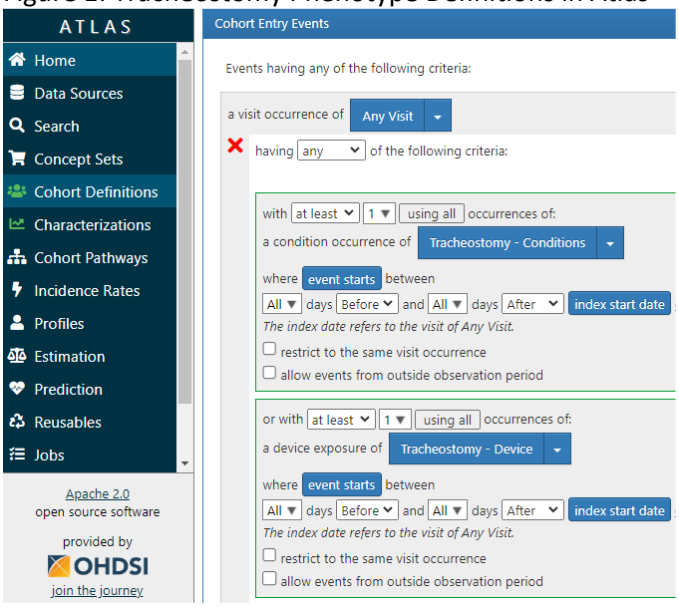
A series of cohort definitions were developed using standardized medical concept sets including, SNOMED-CT, RxNorm, Current Procedural Terminology (CPT), and LOINC. The refined concept sets and cohort definitions were applied to the Synpuf 5% dataset mapped to the OMOP Common Data Model (CDM) using the OHDSI ATLAS cohort discovery tool. The patients identified by the computable phenotypes were characterized by demographics, indication for tracheostomy, and other clinical characteristics.

Results:

Table 1: Tracheostomy Cohort Characterization

Cohort name	Visit Count	Avg	StdDev
Trach - Eval1	1640	1.757067	1.725914
Trach - Eval1	211	1.8	1.571611
Trach - Eval1	1433	1.75151	1.741591
Trach - Eval1	23	2.137931	2.054591

Figure 1: Tracheostomy Phenotype Definitions in Atlas



Conclusions:

Tracheostomy is utilized in a variety of medical specialties and performed on patients of all ages from neonates to the elderly. The procedure can have a significant impact on a patient's quality of life. It is critical for physicians to be able to provide contextual information to patients and caregivers regarding time toxicity of elective tracheostomy to aid in shared decision-making regarding treatment plans.[3] In this study, a series of computable cohort definitions with level 4 data sophistication were tested for utility in a future federated network study across disparate systems. The development and testing of these computable phenotypes for tracheostomy allows for large-scale quantification of time toxicity related to elective tracheostomy across a distributed network of clinical databases. As researchers' ability to analyze observational data progresses it is imperative that computable phenotypes such as the one validated in this project are developed to provide scalable evidence.

References:

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