



The burden of tracheal stenosis and tracheal diseases health-care costs in the 21st century

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Tracheal stenosis is a benign acquired iatrogenic disease. It may follow prolonged orotracheal intubation and tracheostomy, and individuals will often experience dyspnea, stridor, phonation ablation, dysphonia and dysphagia (1-3). Despite improvements in technology such as low cuff pressure and percutaneous dilation tracheostomy (PDT) approaches, tracheal stenosis continues to be a major burden (4). Studies have suggested that some degree of stenosis develops in up to 20% to 30% of patients with tracheostomy, and 1% to 7% of patients develop symptoms with the need for invasive procedures (4,5). This results in frequent visits to emergency department (ED), increased health-care costs and reduced health-related quality of life for the patients.

A recent study (5) analyzed a cross-sectional analysis of U.S. ED visits, hospital discharges, and readmissions using the 2013 National Emergency Department Sample, 2013 National Inpatient Sample, and 2013 Nationwide Readmission Database for patients with tracheal stenosis due to tracheostomies. Furthermore, patients that were readmitted within the same calendar year with tracheal stenosis due to the tracheostomy cannula were also queried. There were an estimated 6,156 ED visits; 4,920 hospital discharges; and 2,316 readmissions for tracheal stenosis due to tracheostomies in 2013. Among 71,446 tracheostomies, 739 (1.05%) were readmitted with tracheal stenosis after the initial admission. Tracheal stenosis due to tracheostomy represented 28.0% of all tracheostomy complication-related ED visits. The median ED charges were US\$1,682 (IQR, \$932–2,920). The median length of stay was 8 days (IQR, 4–19 days). The median total charges for the inpatient stay

was US\$66,416 (IQR, \$29,770–182,779). The in-hospital mortality was 3.2% (95% CI, 2.4–4.3%). Among the new tracheostomy patients who were readmitted with tracheal stenosis, the median length of stay was 36 days (IQR, 23–66 days). The median inpatient charges were \$390,187 (IQR, \$239,943–\$659,784), and the in-hospital mortality was 22.8% (95% CI, 18.0–28.6%).

Spataro *et al.* (6) performed a prospective single-center analysis to evaluate tracheostomy inpatient and outpatient complication rates, determine the 30-day all-cause and tracheostomy-related readmission rates and to assess patient and procedural risk factors associated with complications and readmissions. Of the 100 patients included, 47% experienced an inpatient tracheostomy-related complication. Thirty-five percent experienced some harm, defined as Clavien-Dindo grade II or higher; and 13% experienced severe harm (grade III or higher). Fifteen percent experienced an outpatient complication, and 33% were readmitted to the hospital for any cause within 30 days of discharge. Of the 29 patients readmitted to the hospital, 11 (38% of all readmissions) were due to tracheostomy-specific causes. The overall 30-day all-cause hospital readmission rate was 33% and the tracheostomy-specific readmission rate was 13%. There was one tracheostomy-related death.

Moreover, the costs associated with tracheal injuries are also overwhelming. Bhatti and colleagues (7) performed a cost-analysis using the AHRQ 2006 National Inpatient Sample, and compared patients with tracheal injury coded during the medical or surgical stay for length of stay (LOS) and mean hospital cost with diagnosis-related matched

controls. A total of 3,232 discharge records met criteria for tracheal injury from within the index hospital stay. Average LOS for patients with tracheal injury (6.3 days) exceeded LOS in the uncomplicated sample (5.2 days) by 1.1 days. The average hospital cost was US\$ 1888 higher with tracheal injury [\$10,375 (CI, \$9,762–10,988) *vs.* \$8,487 (CI, \$8,266–8,669)]. LOS for procedures treating prior tracheal injury averaged 4.7 days and cost an average of \$11,025 per discharge.

We can conclude that tracheal injuries, stenosis and tracheostomies are devastating conditions. They have high morbidity, mortality and are extremely costly to the health-care system.

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