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Changes in Multidisciplinary Tracheostomy Team Practice Over Time

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Abstract

Aim

Increasing numbers of tracheostomy patients are discharged from the Intensive Care Unit (ICU) to general hospital wards. There is evidence that a Multidisciplinary Tracheostomy Team (MTT) can have a positive impact on the care of tracheostomy patients discharged from the ICU. We compared tracheostomy management and patient outcome in two time periods, at the start of our MTT practice in 2009-2011 and again in 2017.

Methods

In a retrospective audit, we compared tracheostomy management and patient outcome in 117 patients who had a tracheostomy in 2009-2011 with 81 patients who had a tracheostomy in 2017.

Results

The duration of tracheostomy cannulation was significantly shorter (21 vs 31 days, p=0.0005) in 2017 compared to 2009-2011. A Mini-Trach was used after tracheostomy decannulation in 56 of the 81 (69%) tracheostomy patients in 2017.

Conclusions

The continued development of our MTT service over 8 years was associated with a significantly shorter duration of tracheostomy cannulation and the introduction of Mini-Trach use after tracheostomy decannulation. These results support the importance of maintaining an active MTT service to manage tracheostomy patients after discharge from the ICU.

Introduction

The number of critically ill patients who require a tracheostomy to assist in weaning from mechanical ventilation has increased.[1,2] There are numerous reports comparing outcomes in tracheostomy patients discharged from the ICU before and after the establishment of a MTT.[3-8] The MTT provides a key role in weaning from mechanical ventilation, cuff management and down-sizing of the tracheostomy tube, restoration of speech and safe swallowing and eventual tracheostomy decannulation. In addition, the MTT provides tracheostomy related education for ward-based staff, the patient and their family.[9] The aim of this study was to compare changes in tracheostomy management and patient outcome since the establishment of our MTT in 2009-2011 and again in 2017.

Methods

This study was conducted in the Mater Misericordiae University Hospital in Dublin, Ireland. Medical and surgical patients who had a tracheostomy performed during their ICU course in 2009-2011 and 2017 were included in the study. Medical patients included Respiratory Medicine, Cardiology, Nephrology, Neurology, Gastroenterology, Infectious Disease, Endocrinology and Haematology patients. Surgical patients included Cardiothoracic, General, Vascular, Orthopaedic and Plastic Surgery patients. Patients with a cervical spinal cord injury who required a tracheostomy and patients having a permanent tracheostomy were not included in this study.[10] Ethical approval for the study was obtained from the Mater Hospital Institutional Review Board.

Demographic data and details of tracheostomy management were retrieved from the Critical Care electronic patient record (ICIP, Philips Healthcare). Tracheostomy placement was by percutaneous dilatational technique or by open surgical technique. Details of tracheostomy management were recorded by the MTT since its formation in March 2009 for all patients discharged from the ICU with a tracheostomy or Mini-Trach (Portex, Smiths Medical) in place. The team is composed of a Critical Care Consultant, a Critical Care Advanced Nurse Practitioner and a Speech and Language Therapist. All patients with a tracheostomy or Mini-Trach in place who were discharged from the ICU to a hospital ward were followed weekly or more frequently by the MTT. Tracheostomy patients requiring minimal ventilatory assistance but with an effective cough were identified as a cohort who might be safely managed with a Mini-Trach after tracheostomy decannulation. The tracheostomy was removed over a guidewire and a Mini-Trach advanced over the guidewire through the tracheostomy stoma. The Mini-Trach was retained securely in place by a tracheostomy tie and a non-adhesive foam dressing was inserted between the stoma and the Mini-Trach.

Data was collected for 24 months for the first time period (2009-2011) and for 12 months for the later time period (2017). Mini-Trach tubes were not used during the earlier study period but were placed during the later time period as part of the progression towards complete decannulation.[11] Patients who had a Mini-Trach alone without prior tracheostomy placement were not included in this study.

Normally distributed data (patient's age) were compared with Student's t-test. Categorical data (proportion of ICU patients with tracheostomy, mode of tracheostomy, gender, in-hospital death) were compared using Fisher's exact test. APACHE score, duration of tracheostomy, ICU and hospital length of stay were not normally distributed and were compared using the Mann-Whitney U test. A p value of < 0.05 for each test was defined as statistically significant. Data were analysed in Prism 8.4 (GraphPad LLC).

Results

One hundred and seventeen of the 2,129 patients admitted to the ICU between March 2009 and February 2011 had a tracheostomy performed and were included in the study. Between January and December 2017, 81 of the 1,081 patients admitted to the ICU had a tracheostomy performed and were included in the study. The demographic data in both study periods are shown in Table 1. Although there was an increase (6% vs 8%, p=0.03) in tracheostomy use in 2017, the patient's age, gender and APACHE score on ICU admission were similar in both time periods (Table 1).

Table 1. Demographic data.

	2009-2011	**2017**	
Patients admitted to ICU	**n = 2,129**	**n = 1,081**	**p value**
Patients with T - no. (%)	117 (6)	81 (8)	0.03
Mean Age (± SD) yr	60 ± 17	58 ± 16	0.53
Male gender - no. (%)	67 (57)	57 (70)	0.07
Median APACHE score (range)	21 (14-27)	19 (14-23)	0.16

ICU: Intensive Care Unit; T: tracheostomy; SD: standard deviation;
APACHE: Acute Physiology and Chronic Health Evaluation

The median duration of tracheostomy cannulation was shorter (21 vs 31 days, p=0.0005) in 2017 compared to 2009-2011 (Table 2). The proportion of patients who had a percutaneous dilatational tracheostomy (PDT) compared to open surgical tracheostomy was higher (96% vs 83%, p=0.003) in 2017 than in 2009-2011. There was no difference in the median time from ICU admission to tracheostomy insertion or the number of patients discharged from the ICU within 7 days of tracheostomy insertion between the two study periods. There was no significant difference in the hospital length of stay (LOS) for tracheostomy patients during both time periods (Table 2).

Table 2. Tracheostomy Management and Patient Outcome data.

Tracheostomy Patients	2009-2011 n = 117	2017 n = 81	p value
PDT - no. (%)	97 (83)	78 (96)	0.003
Median days ICU admit to T (range)	9 (6-15)	8 (5-12)	0.14
ICU D/C within 7days of T - no. (%)	49 (42)	29 (36)	0.46
Median Duration of T (range) days	31 (20-59)	21 (13-35)	0.0005
Median ICU LOS (range) days	16 (11-29)	21 (14-31)	0.03
Median Hospital LOS (range) days	74 (44-120)	67 (38-105)	0.14
Deaths - no. (%)	43 (37)	24 (30)	0.36

PDT: percutaneous dilatational tracheostomy; ICU: Intensive Care Unit;
T: tracheostomy; D/C: discharge; LOS: length of stay

Fifty-five of the 81 patients in 2017 were discharged from the ICU with a tracheostomy in place. A Mini-Trach was used after tracheostomy decannulation in 56 patients, 12 of whom were still in the ICU when their tracheostomy was replaced by a Mini-Trach. Forty-six Mini-Trach patients (82%) were successfully decannulated (Table 3). Twenty-four patients died in 2017, 16 with a tracheostomy in situ (13 in ICU, 3 in hospital ward), 6 with a Mini-Trach in situ (1 in ICU, 5 in hospital ward) and 2 patients who had been decannulated (Table 2, 3).

Table 3. Mini-Trach after Tracheostomy data (2017).

Patients with T – no.	81
Patients died prior to decannulation – no.	16
Patients with MT after T (total) – no. (%)	56/81 (69)
Patients with MT after T (exclude deaths)* – no. (%)	56/65 (86)
Discharge from ICU with MT – no. (%)	12 (21)
Median Duration of T prior to MT (range) days	21 (13-36)
Median Duration of MT after T (range) days	8 (5-19)
Median Duration of MT plus T (range) days	33 (19-48)
MT patients decannulated – no. (%)	46 (82)
Deaths in MT patient – no. (%)	6 (11)

T: tracheostomy; MT: Mini-Trach; ICU: Intensive Care Unit;
*excluding tracheostomy patients who died prior to decannulation

In 2017, 12 of the 81 tracheostomy patients required re-admission to ICU during their hospital course. Six of these patients had their tracheostomy still in place at the time of ICU re-admission. Of these, 3 patients died, 1 patient was transferred to another hospital and 2 patients survived to be discharged home. Four of the 6 Mini-Trach patients who required re-admission to ICU had their tracheostomy re-fashioned. The outcome in these 4 patients included one death and 3 patients surviving to be discharged home. Of the two remaining MT patients re-admitted to ICU, one died, and one patient was transferred to another hospital.

Discussion

We compared tracheostomy management and patient outcome in two time periods (2009-2011 and 2017) in a university-affiliated adult hospital. The MTT was established in our hospital in March 2009 to help manage the growing number of tracheostomy patients being discharged from the ICU to general hospital wards. There have been several reports of fewer tracheostomy-related complications and shorter duration of tracheostomy cannulation or hospital LOS when outcomes before and after the establishment of tracheostomy review teams have been compared.[3-8] After the first 8 years of our MTT practice, we report a reduced duration of tracheostomy cannulation and the introduction of Mini-Trach use after tracheostomy decannulation.

The proportion of PDT's compared to open surgical tracheostomy increased significantly (83% vs 96%, p=0.003) between the two study periods and similar trends have been noted by others.[12] We found that there was a highly significant (31 vs 21 days, p=0.0005) reduction in the duration of tracheostomy cannulation between the two time periods. The regular weekly patient follow-up by the MTT and the use of a Mini-Trach after tracheostomy removal are likely to be associated with the shorter duration of tracheostomy cannulation in 2017. A median duration of tracheostomy cannulation of 16 days was reported in 3,443 adult patients from the Global Tracheostomy Collaborative quality improvement database.[13] Although the duration of tracheostomy cannulation is influenced by multiple factors, these recent Global Tracheostomy Collaborative data suggest we may be able to target some further reduction in tracheostomy time for our patients, leaving aside the question of whether a short-duration tracheostomy could have been avoided altogether.

The MTT made regular assessments of tracheostomy patients who were weaning from mechanical ventilation to identify patients who might benefit from a Mini-Trach after tracheostomy decannulation. Although a Mini-Trach can only accommodate a 10Fr suction catheter, the use of a Mini-Trach to assist in the management of sputum retention in thoracic surgery patients has been reported.[14] Potential advantages of Mini-Trach use after tracheostomy decannulation include improved voice and patient satisfaction, restoration of normal humidification of inspired air and the maintenance of relatively non-invasive access to the airway for tracheal suctioning. The Mini-Trach cannula extends further into the trachea than a tracheostomy, decreasing the risk of inadvertent decannulation. The consequences of a Mini-Trach decannulation are likely to be less threatening for the patient than an un-planned tracheostomy decannulation, particularly out-of-hours.

In 2017, a Mini-Trach was used after tracheostomy decannulation for a median of 8 days in 56 of 81 (69%) patients or 56 of 65 (86%) patients if we exclude patients who died prior to tracheostomy decannulation (Table 3). This is a higher incidence of Mini-Trach use after tracheostomy decannulation than reported previously.[11] The low number of Mini-Trach patients (4 out of 56 patients) who required re-admission to ICU and re-fashioning of their tracheostomy in our study was reassuring. Our normal MTT practice is to retain the Mini-Trach in place until the patient successfully clears their tracheal secretions and has made progress with their physical rehabilitation.

We report a prolonged hospital LOS (67-74 days) for tracheostomy patients during both study periods. In similar studies, the median hospital LOS in tracheostomy patients ranges from 20 to 40 days and is influenced by many factors including the range of step-down facilities available for tracheostomy patients.[3,4,8,13] The hospital LOS reported in the present study and others emphasises the importance of having a high-quality and durable MTT service to provide consistent follow-up in these patients and assist with planning and expediting their complete decannulation.

We found that 36-42% of patients were discharged from the ICU within 7 days after tracheostomy insertion during both study periods. Similarly, 30% of PDT patients in the NCEPOD study were discharged from the ICU within 7 days of tracheostomy insertion.[1] The key role of the multidisciplinary team in coordinating the care of tracheostomy patients after discharge from the ICU was also highlighted by this report.[1]

The ICU LOS in our study (16-21 days) was longer than the 11 days reported in a mixed medical and surgical tracheostomy patient cohort with similar age, gender and APACHE score to our patients.[3] However, Tobin et al., reported that 40% of their annual 1,100 – 1,200 admission were cardiac surgery patients and the median LOS in their ICU was only 1 day.[3] One possible beneficial effect of the longer ICU LOS in our study was that more patients had their tracheostomy replaced by a Mini-Trach prior to discharge from the ICU. In 2017, 12 patients were discharged from the ICU after their tracheostomy had been changed to a Mini-Trach. This may be potentially safer than our earlier practice of sending all our patients to ward level care with a tracheostomy still in place and warrants further study.

We found no difference in hospital mortality (30-37%) for tracheostomy patients during both study periods (Table 2). The 30-day mortality after early or late tracheostomy placement was 31-32% in the TracMan trial.[15] Although the incidence of tracheostomy related complications has increased with the greater number of tracheostomies being performed, the patients' age, severity of the underlying illness and number of comorbidities contribute to the increased mortality.[16] A five-fold increase in mortality in tracheostomy patients with 4 or more comorbidities and a 55% one-year mortality for tracheostomy patients over 65 years of age have been recently reported.[13,17] Our results and the results of similar studies confirm that the requirement for a tracheostomy in critically ill patients is associated with a prolonged ICU and hospital LOS and with a high in-hospital mortality rate.

The limitations of our single centre retrospective study include the broad range of indications for tracheostomy and the standard recognised difficulties of safely accommodating tracheostomy patients outside the ICU setting. We have used broad metrics, such as ICU and hospital LOS and duration of tracheostomy cannulation to monitor tracheostomy management as these have been used by previous authors and facilitate comparison of our results with published data.

In conclusion, in a study comparing tracheostomy management and patient outcome since the establishment of our MTT service in 2009 and again in 2017, we found a significantly increased use of tracheostomy and the percutaneous dilatational tracheostomy technique. We report a highly significant reduction in the duration of tracheostomy cannulation between the two study periods. The use of a Mini-Trach following tracheostomy decannulation has been introduced into our more recent practice. The potential role of a Mini-Trach after tracheostomy decannulation appears promising and requires further study.

Declaration of Conflicts of Interest:
The author's report no conflicts of interest.

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