Tracheostomy Management; Clinical Guideline 2017.

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Executive Summary

- It is the position of IASLT that working in the field of tracheostomy is within the scope of practice of Speech and Language Therapists (SLTs).

- SLTs working in a range of settings (from acute hospital to community clinics) may possess skills and competencies in working with tracheostomy. However, at all times SLTs should ensure that they are practising within their competency level and where required, in conjunction with an experienced practitioner who can guide them. Further training is recommended to achieve competency in this area of practice.

- This guideline aims to provide current best practice and evidence in the area of tracheostomy management, however does not provide a 'how to' approach. In some aspects, there is divided opinion amongst experts in the literature and there is a limited amount of research available.

- SLTs play an essential role in the management of communication difficulties and dysphagia, input into the decannulation pathway and education in the area of tracheostomy.

- A multidisciplinary team (MDT) approach provides optimal care for patients with a tracheostomy. The SLT is an integral member of the team and should work collaboratively. The roles and responsibilities of the MDT members will be governed by the employing facility.

- IASLT supports an evidence based practice approach to assessment and management in the area of tracheostomy.

- IASLT encourages SLTs working with tracheostomy to commit to continuing professional development, seek support and supervision as required, and maintain and update their knowledge and skills

- SLTs should adhere to the guidelines of their employing body, local and national laws and regulations and work within their scope of practice.

- Research on tracheostomy management should be incorporated into general departmental quality assurance, clinical audit and quality improvement programmes.

- This guideline does not address patients with a laryngectomy.

1.0 Introduction

Research conducted by Susan Downes in 2012 (funded by St Vincent's University Hospital) via an online survey, on clinical consistency in tracheostomy management in Ireland indicated that while tracheostomy management was an established part of SLTs' caseloads, there was wide variation in clinical practice. Many SLTs reported managing people with tracheostomies without completing formal competency training. The SLTs who responded to the survey were varied in their understanding and perception of the SLT's role in tracheostomy management. The Tracheostomy Network members were concerned regarding these findings and identified the need for a national guideline on tracheostomy management. IASLT was approached to begin the process.

A working group was commissioned by IASLT tasked with developing Tracheostomy Management; Clinical Guidelines. This resulting document is largely based on two original documents, Tracheostomy Management, Speech Pathology Australia, 2013 and Tracheostomy Competencies, Royal College of Speech and Language Therapists, 2014. Adaptations and additions have been made to reflect the Irish context and these changes were agreed with both SPA and RCSLT prior to publication.

To facilitate the development of this document the following processes were implemented:

- Consultation with the profession via:
  - IASLT
  - Dysphagia Special Interest Group (SIG)
  - Adult Communication SIG
  - Speech and Language Therapy Managers Group
  - The Tracheostomy Network

- Review of available literature including research and relevant international material

- Consultation with IASLT Council

2.0 Overview & Purpose

The Tracheostomy Management Clinical Guideline is intended to provide information about the speech and language therapy management of the neonate, child and adult with a tracheostomy. This guideline is not intended to provide a 'how to' manual, but rather a guideline of tracheostomy specific information and management principles based on current evidence and consensus. It is recognised that the management of the patient with a tracheostomy should be a multidisciplinary approach; however this clinical guideline specifically focuses on the role of the SLT, with reference to multidisciplinary team members as appropriate.

The role of the SLT and subsequent management and intervention will vary according to the clinical setting, patient needs and age. It is recognised that there are areas of controversy within the profession in the management of the patient with a tracheostomy. These will be discussed in this document.

This guideline should be read in conjunction with IASLT Code of Professional Conduct and Ethics (2015), IASLT Scope of Practice (2016) and IASLT Standards of Practice for Speech and Language Therapists on the Management of Dysphagia (2012) and IASLT Standards of Practice for Speech and Language Therapists on the Management of Feeding, Eating, Drinking and Swallowing Disorders: Working with Neonates and Babies (2013).

3.0 Background

3.1 Definition

The terms 'tracheostomy' and 'tracheotomy' are often used interchangeably in the literature and in practice, but they have two slightly different meanings (Mitchell et al., 2012). A 'tracheotomy' refers to the surgical procedure that creates an opening between the trachea and the midline skin surface of the neck. 'Tracheostomy' refers to the opening created by the tracheotomy procedure. A tracheostomy can be performed percutaneously or surgically and the choice of insertion method is a medical decision. A tracheostomy tube is then inserted into the opening, and the tube occupies approximately two-thirds of the tracheal lumen.

Indicators for a tracheostomy tube include:

- maintenance of an airway (e.g. reduced level of consciousness, upper airway obstruction, intubation difficulties)
- to protect the airway from gross aspiration (swallowing impairment)
- removal of tracheal secretions (e.g. excessive secretions/poor cough)
- to wean from ventilation
- long-term mechanical ventilation

(Groves & Durbin Jnr, 2007; Intensive Care Society Standards, 2008)

In the paediatric population, the most frequent indications are upper airway obstruction (Davis, 2006; Leung & Berkowitz, 2005; Tantinikorn, et al, 2003; Zenk et al., 2009; Al Samri et al 2010). Access to the lower airway for long term ventilation and pulmonary care is also a leading indication (Kraft et al. (2011); Al-Samri et al (2010). Other indications include neurological deficit, craniofacial anomaly, cardiopulmonary insufficiency, neuromuscular indication, bilateral vocal cord paralysis, and subglottic stenosis (Davis, 2006; Kraft et al., 2011; Leung & Berkowitz, 2005; Tantinikorn et al., 2003; Zenk et al., 2009 Al-Samri et al 2010; Wood et al 2012). These medical conditions can be congenital or acquired.

The majority of the patients tracheotomised in the intensive care unit (ICU) will have been intubated with an endotracheal tube (ETT) prior to the tracheostomy. An endotracheal tube is a tube that passes into the mouth or nose, through the pharynx and between the vocal cords into the trachea in order to provide an artificial airway to connect to mechanical ventilation. Complications can occur with both the ETT and tracheostomy (Refer to Section 15.5.1).

Benefits of a tracheostomy tube over an ETT include improved patient comfort and reduced need for sedation (Blot et al., 2008; Bosel et al., 2013; Krishnan, Elliot, &

Mallick, 2005; Nieszkowska et al., 2005), potential for eating, speaking, and mobilizing, reduced harm to the laryngeal structures (Tadie et al., 2010), and faster weaning from ventilation (Griffiths, Barber, Morgan, & Young, 2005; Holevar et al., 2009; Krishnan et al., 2005).

3.2 Patient Groups

SLTs manage patients with a tracheostomy across the continuum of care (i.e. neonatal and acute care, rehabilitation, extended care facilities, and community settings including home or residential care facilities) and age groups. Patients with a tracheostomy are seen across a wide range of diagnostic groups and medical areas.

Diagnostic categories for patients with a tracheostomy include, but are not limited to:

1. Neurological Conditions, including:
• Stroke • Acquired/traumatic brain injury • Progressive neurological condition • Encephalitis/meningitis • Tumour • Congenital neuromuscular disease • Cranial nerve damage • Neonatal maturation conditions (e.g. Central hypoventilation syndrome)
2. Surgical Conditions, including:
• Head and neck cancer • Neurosurgery • Spinal cord injury • Craniofacial abnormalities • Cardiothoracic/thoracic surgery/injuries/anomalies • Laryngotracheal anomalies (e.g. tracheal and subglottic stenosis, bilateral vocal cord paralysis, laryngomalacia, tracheomalacia) • Burns • Trauma • General surgical patients with complications/medical comorbidities • Tracheosophageal anomalies (e.g. tracheosophageal fistula) • Craniofacial anomalies and syndromes (e.g. Pierre-Robin sequence, Crouzon's, Opitz-Frias, Goldenhaar, Treacher-Collins)

• Laryngeal or pharyngeal neoplasms in children (e.g. haemangioma)
3. Medical Conditions, including:
• Pneumonia • Radiation therapy to the head and neck • Anaphylaxis • Complex patients with multiple medical comorbidities • Extended ICU admission and associated critical care pathologies (myopathy/polyneuropathies/psychosis)
4. Respiratory Conditions
• Bronchopulmonary dysplasia (BPD) • Chronic neonatal lung disease (CNLD) • Acute respiratory infections • Acute/chronic obstructive airway disease (COPD/COAD) • Obstructive sleep apnoea

3.3 The Tracheostomy Pathway

A tracheostomy may be inserted as an emergency procedure (e.g. to secure an airway following trauma), electively as part of planned surgery (e.g. head and neck surgery) or following intubation (e.g. ICU). The final goal is decannulation (removal of the tracheostomy tube) in the majority of cases once the tracheostomy is no longer indicated and timely, safe decannulation is a priority (Refer to 14.0).

Management of the patient with a tracheostomy is preferably overseen by a multidisciplinary team (Refer to 7.3) including Speech and Language Therapy (Refer to 6.0).

Speech and Language Therapy involvement in tracheostomy management may include:

- Assisting the patient to tolerate successful periods of cuff deflation and saliva management
- Establishing/re-establishing verbal communication (e.g. finger occlusion or speaking valve)
- Establishing other forms of communication
- Conducting swallow assessments to re-establish oral intake
- Providing dysphagia rehabilitation
- Providing input into the decannulation decision

All of these steps may progress easily and quickly with no complications, or may require high level problem solving and an extended period of time. The order in which these areas are addressed will depend on the individual patient.

3.4 Paediatrics

Infants with congenital conditions who require a tracheostomy will also generally have had a protracted time on endotracheal ventilation (either orally or transnasally) associated with preterm birth and bronchopulmonary dysplasia, or respiratory distress syndrome with failure to wean from ventilation (Torres 2014). Infants receiving immediate tracheostomy usually have craniofacial syndromes or airway obstruction. Children can also present with acquired conditions which necessitate tracheostomy insertion e.g. progressive neurological conditions, acquired brain injury or other traumas.

The insertion of the tracheostomy tube in the paediatric population is more technically complicated than adults due to the smaller, more pliable trachea and size of the operating field. Paediatric tracheostomy also has higher mortality, morbidity and complication rates than in adults (Parilla, Scaran, Guidi, Galli, & Paludetti, 2007). The death rate however for children having a tracheostomy performed in Paediatric Intensive Care Unit (PICU) is not significantly higher than for children admitted to PICU who do not undergo tracheostomy (Wood et al 2012).

Developmental feeding and communication assessment and treatment need to be considered.

4.0 Incidence & Prevalence

Estimates of the incidence and prevalence of tracheostomy vary widely in the literature. The varied methodologies used in different studies appear to have an impact on the rates reported.

Ireland:

The table below shows the Hospital Inpatient Enquiries (HIPE) figures for Ireland sourced from HPO for 2012-2015. HIPE does not distinguish between adults and paediatrics.

Tracheostomy	2012	2013	2014	2015	2016
Percutaneous tracheostomy	391	394	386	449	434
Open tracheostomy – temporary	388	390	352	317	337
Open tracheostomy - permanent	52	54	38	57	53
Total	**831**	**838**	**776**	**823**	**824**

Figure X: Number of tracheostomies performed annually in Ireland

The majority of these tracheostomies are placed while the patient is in a critical care setting.

Worldwide:

Adults

Speech Pathology Australia (SPA) reported that each year more than 7000 people receive a tracheostomy in Australia and New Zealand (SPA, 2014). Incidence rates within large tertiary hospitals in Australia for adult populations indicate that 4-10% of adults admitted to intensive care units receive a tracheostomy, or a range of 102-202 tracheostomies performed per year in an ICU (Choate, Barbetti, & Currey, 2009; Freeman-Sanderson, Togher, Phipps, & Elkins, 2011; Tobin & Santamaria, 2008). It is common practice for the majority of adults to be decannulated prior to hospital discharge (Choate et al., 2009; Freeman-Sanderson et al., 2011; Tobin & Santamaria, 2008).

Data from a Scottish record base over the period of 1996 to 2005 indicated an increase in the incidence of tracheostomy from 9.96 to 19.29 per 100,000 of Scotland's adult population (NHS Quality Improvement Scotland, 2007).

Paediatrics

Tracheostomies are predominantly performed in children and infants under the age of two and usually for long term rather than short term airway management (Abraham, 2003). There is often a second peak age occurring in adolescents of 15-18 years of age, with approximately 80% associated with trauma (Carr, 2007). Generally the number of tracheostomies in males outnumber females by a ratio of 2:1 (Alladi, Rao, Das, Charles, & D'Cruz, 2004).

One UK study looking at characteristics of children undergoing tracheostomy in PICUs indicated that in a sample of 1613 children from the period 2005-2009, 45.8% were age < 1 year, 24.2% were age 1-4 years, 13.9% were age 5-10 years, 13.1% were age 11-15 years and 3% were age 16 years (Wood et al 2012). Diagnostic groups included respiratory 48%, cardiovascular 13.7%, neurological 9.4%, trauma 4.6%, musculoskeletal 4.1%, gastrointestinal 3.8%, oncology 3.5%, infection 2.7%, multisystem 2.2%, body wall cavities 1.5%, endocrine/metabolic 1.1%, other 4.2% (Wood et al 2012). The male to female ratio was 57.8:42.2.

Scotland has reported prevalence rates of 2.47 tracheostomies performed per 100,000 in children aged 0-12 years, and 1.55 per 100,000 in those aged 13-17 years (NHS Quality Improvement Scotland, 2008).

5.0 Advances & Developments in Tracheostomy Care

There have been a number of changes and advances in tracheostomy management. As a consequence of the increasing number of patients with a tracheostomy, the role of the SLT has increased and expanded. Changes that have occurred include:

- Establishment of Global Tracheostomy Collaborative in 2014 (www.globaltracheostomycollaborative.com), with the aim of all members of the multidisciplinary team (including Physicians, Nurses, Respiratory therapists, SLTs, Physiotherapists and patients) working together to disseminate best practices and improve outcomes around tracheostomy care.
- Advanced medical technology resulting in increased survival of the critically ill patient.
- Increased tracheostomy insertion with (1) the introduction of the percutaneous technique (Krishnan et al., 2005), and (2) early tracheostomy associated with reduced mechanical ventilation and ICU length of stay (Griffiths et al., 2005).
- Increased pressure for ICU beds with subsequent drive for earlier ward transfer resulting in more patients with a tracheostomy being dispersed throughout the acute and sub-acute facilities (Green & Edmonds, 2004; Paul, 2010).
- Increased consumer involvement in health care and decision-making.
- Increased understanding of the psychological impact of lack of communication in early stages of recovery (Donnelly & Wiechula, 2006; Magnus & Turkington, 2006; Sherlock, Wilson, & Exley, 2009).
- Increased recognition of the benefits of a multidisciplinary team (MDT) approach including a 'dedicated' MDT to monitor and review the patients from the critical care setting to the ward (Cameron et al., 2009; Cetto et al., 2011; de Mestral et al., 2011; Tobin & Santamaria, 2008).
- Greater variety of tracheostomy tubes, some of which either enable communication (e.g. above cuff suctioning tubes) or are specifically designed to assist communication (e.g. The Blom Tracheostomy Tube System ™, Talking Tracheostomy Tubes™). These advances have allowed greater involvement from the SLT regarding tube choice for some patients.
- Increased use of Fibreoptic Endoscopic Evaluation of Swallowing (FEES) and its innovative potential with the tracheostomised patient, including the ventilated patient (Hales, Drinnan, & Wilson, 2008).
- Extended scope of practice for the SLT such as tracheal suctioning.

6.0 Role of the Speech & Language Therapist

6.1 Overview

Speech and Language Therapy involvement should occur as part of a multidisciplinary team. The complex interrelationships between respiration, swallowing and communication dictate that experienced SLTs play an integral role in managing patients with a tracheostomy.

The role of the SLT in tracheostomy management will also be determined by the policies and procedures of the employing organisation. Professional roles, responsibilities, and boundaries at the organisational level should be defined and adhered to. Within the multidisciplinary team, the SLT should work within their scope of practice but understand the role and important aspects of care from other disciplines. For example, stoma care and humidification must be understood and problems in these areas identified by all team members but remain the domain of nursing and physiotherapy. The SLT must also be aware of possible risks and complications inherent in tracheostomy management and needs to adhere to the policies and procedures of the organisation.

Reasons for Referral of patients with a tracheostomy to Speech and Language Therapy may include:

1. Assessment of:
• Saliva management • Readiness for cuff deflation towards decannulation • Communication status and options (e.g. speaking valve, communication board) • Swallowing function for oral intake
2. Implementation of:
• Non-nutritive oral stimulation programmes • Developmental feeding and communication therapy

The SLT may play a number of roles in the area of tracheostomy management including direct patient management, and/or as a consultant, educator, researcher or patient advocate.

Assessment and Intervention

In conjunction with the multidisciplinary team, patient management may include:

- Choice of the appropriate tracheostomy tube in relation to voice and secretion management issues

- Assessment and management of saliva/secretions
- Assessment and management of trans-tracheal pressure
- Cuff management including cuff pressure management
- Timing and progression of cuff deflation
- Discussion with physiotherapist/nurse re: cough and airway clearance
- Use of above cuff suctioning
- Use of tracheal suctioning (extended scope of practice)
- Assessment of swallowing function, recommendations for oral intake and implementation of strategies to ensure safe and effective swallowing
- Swallowing rehabilitation for saliva and/or oral intake
- Assessment and management of vocal fold function and phonation (in conjunction with ENT)
- Screening of upper airway patency (in conjunction with ENT)
- Establishing voice using finger occlusion in the presence of a deflated cuff or cuffless tube
- Introduction and use of speaking valves in the presence of a deflated cuff or cuffless tube
- Involvement in the selection of the appropriate tracheostomy weaning pathway
- Assessment and management of communication, including voice, speech, language, Augmentative and Alternative Communication (AAC), communication strategies, parent-child interaction and infant cues
- Use of above cuff voicing or other specialised talking tracheostomy tubes
- Contributing to decannulation decision making
- Contributing to discharge planning for patients with long term tracheostomy
- Assisting with trouble shooting for the patient and direction to appropriate profession as required
- Patient and family education re: tracheostomy tubes and management
- Patient advocacy

Education and Counselling

The SLT has an integral role with education and counselling of patients and/or carers, prior to and/or post insertion of the tracheostomy tube. Topics covered will vary according to the patients' medical status, the patients' type and degree of impairment, whether the tracheostomy is short or long term, current stage along the continuum of tracheostomy management, organisational policies and procedures, the recognised role of the SLT within the facility, the skill level of the SLT, and the roles and skills of other

team members. Education should include the use of visual information such as diagrams, and can include anatomical models (e.g. Tracheostomy Observation Model/T.O.M.™) or samples of tracheostomy tubes to aid understanding. Education of other health professionals is also within the role of Speech and Language Therapy.

6.2 Scope of Practice

It is the position of IASLT that management of patients with a tracheostomy is within the scope of practice of SLTs. However, additional and specialist training is required. It is not a competency expected of new graduate SLTs. The scope of practice of an SLT in tracheostomy management will also be determined by the policies and procedures of the employing organisation and the professional guidelines of IASLT.

Prerequisite Skills

The SLT will demonstrate competency in dysphagia and communication disorders, the latter to include selection and management of AAC, prior to managing patients with a tracheostomy. The therapist will also demonstrate an understanding of the relevant aspects of the diagnostic groups/medical disorders e.g. neurological disorders, respiratory disorders, voice disorders.

It is essential that tracheostomy competency, as defined by the professional body, be obtained before the SLT *independently* manages patients with a tracheostomy or if competency is not achieved adequate support should be provided (Refer to 15.3).

Ventilator Dependent Patients

It is the position of IASLT that it is within the scope of practice of SLTs to be part of the team that manages patients who have a tracheostomy and are ventilated. This area requires additional elements of competency (Refer to 15.3).

Paediatrics

The paediatric population has unique needs and requires the SLT to be equipped with the appropriate advanced knowledge and skills to manage this population. Additional to the pre-requisite skills mentioned above, competency training in paediatric dysphagia and management of infants/children in the neonatal intensive care, special care and paediatric ICU is required. IASLT recognises that it is within the scope of practice of SLTs to be part of the team that manages paediatric patients with a tracheostomy.

Extended Scope of Practice

Some organisations have supported SLTs to perform roles relating to tracheostomy management which are considered extended scope by Speech and Language Therapy (e.g. independent tracheal suctioning). In these instances, SLTs are strongly advised to seek formal approval, on-going training and support and legal advice from their employing body.

7.0 Service Delivery

7.1 Overview

SLTs may see a variety of clients across a broad spectrum:

Populations	Settings	Services Delivered

• Neonate/infant
• Paediatric
• Adult
	• Hospital (Paediatric and Adult)
	  ○ NICU/PICU and Special Care Nursery
	  ○ Intensive Care Unit
	  ○ Specialised weaning unit
	  ○ Acute wards
	  ○ Rehabilitation
	  ○ Palliative care
	  ○ Outpatient
	• Home based
	• Residential care
	• Schools
	• Workplace
		• Assessment
		• Diagnosis
		• Intervention
		• Discharge planning or transfer of care
		• Education

Consideration in service delivery should be given to issues such as:

- Patient and carers' needs
- Level of expertise of the treating SLT
- Speciality skills of other team members
- Facilities/resources available
- Policies and procedures of the organisation
- Relevant IASLT Guidelines and documents

7.2 Service Delivery Options

Models of service delivery include but are not limited to:

- Individual or group
- Specialist clinics
- Consultation
- Multidisciplinary, interdisciplinary, and transdisciplinary team management
- Family/client centred care
- Advocacy
- Education and training of client, carer, families and health professionals
- Resource development and provision

7.3 Multidisciplinary Tracheostomy Teams

There is a growing recognition that tracheostomy care crosses many professional boundaries and no single discipline or service is adequately equipped to manage the needs of this complex, challenging patient group. Optimal management can be provided by a team of tracheostomy experts of which the SLT is a core member (McGrath and Wallace, 2014). Each member should practise within their professional scope of practice but also should understand the important aspects of care provided by other disciplines. In situations where a formal tracheostomy team is not in place, the SLT must seek to manage the patient in conjunction with a team.

A growing body of literature has reported on the use of a 'dedicated tracheostomy team' as an ideal model for tracheostomy care (Cameron et al., 2009; Cetto et al., 2011; de Mestral et al., 2011; Hunt & McGowan, 2005; Norwood, Spiers, Bailiss, & Sayers, 2004; O Brien et al., 2012; Pandian, Miller, Marek, & Adam, 2012; Parker et al., 2010; Tobin & Santamaria, 2008). A recent systematic review concluded that tracheostomy teams have been shown to reduce the length of time to decannulation, reduce length of stay, increase use of speaking valves, reduce adverse events, and have associated cost savings (Speed & Harding, 2012). Other studies have also reported the benefits of tracheostomy teams for special populations including Traumatic Brain Injury (Le Blanc et al., 2010) and paediatric populations (Torre et al., 2011). Speech Pathology Australia estimated that the highest level of evidence for the presence of a dedicated tracheostomy team was Level 3.

The members of the "teams" in each of the studies to date have been site specific and vary in terms of the discipline that leads the team and who participates in the team. However, typical core members of a team specific for tracheostomy management may include the medical consultant and non-consultant hospital doctors, nurse, physiotherapist, and SLT. Extended team members that may be involved include, but are not limited to, Ear Nose and Throat specialist, intensivist, respiratory physician and a member of the clinical engineering/biomedical engineering/medical physics and craniofacial specialists. Ideally and increasingly these teams offer interdisciplinary education where all team members understand the roles and basics of tracheostomy care within all disciplines.

For the individual who has a long-term tracheostomy and Speech and Language Therapy input is in the client's home, residential care, school or workplace, there may be less access to all members of the MDT. The SLT should liaise with the individual's medical team /general practitioner and other relevant staff.

7.4 Support Groups

7.4.1 Patient Support Groups

Tracheostomy/ventilation support groups may exist for individuals and families. This can take the form of 'in person' or 'on line' support groups (Refer to Appendix A). Support groups aim to provide education, support and a network for people with tracheostomies and their families. The support groups can be facilitated within the health facilities, or they can be instigated and managed by patients with tracheostomies or their family. SLTs may be involved with initiating and facilitating support groups for individuals with a tracheostomy and their family/carers.

In Ireland currently for paediatrics there is no active tracheostomy parent support group (December 2016). However there is an active Facebook page (closed group). Similarly, there is no national adult support network specific to tracheostomy. Patients may receive support via other groups, such as diagnosis specific groups etc. The SLT should be aware of support groups available and how they can be accessed.

7.4.2 Healthcare Provider Support Groups

A variety of groups have been established for health professionals managing patients with a tracheostomy. Some are specifically for SLTs and others are multidisciplinary. The groups vary with regard to whether tracheostomy is the main focus or one of many topics that form the terms of reference of the group. These include tracheostomy interest groups and evidence based practice groups (Refer to Appendix A).

Multidisciplinary Team Key Statements	**Highest Level of Evidence**
Multidisciplinary team management is recommended for the individual with a tracheostomy.	Level III

See Appendix 1 for further information re evidence levels

8.0 Tracheostomy Tubes

8.1 Types of Tubes

There are a variety of types and features of tracheostomy tubes available to suit the clinical needs of the individual with a tracheostomy. Often, each setting has particular brands of tubes that they are more familiar with and regularly use.
Tubes can vary in a number of ways and possess different features including:

Single/Double Cannula:	Double cannula tubes are designed to be used with an inner cannula to facilitate cleaning of the tube which aims to reduce the risk of the tube obstructing with secretions. However, the inner cannula will reduce the lumen of the tracheostomy tube and the impact on respiratory work may need to be considered. It is recommended that settings have a policy regarding inner cannula use and care. Single cannula tubes have no inner tube and are mainly used in paediatric settings.
Cuffed/Cuffless	A cuffed tube has a cuff that is positioned circumferentially around the distal end of the outer surface of the tracheostomy tube within the trachea that inflates like a balloon. It can be filled with air, water or foam. The purpose of the cuff is to create a seal for ventilation or to minimise the risk of leak of aspirated saliva. With an inflated cuff, lung air is unable to reach the larynx as it travels in and out of the tracheostomy, and thus voicing is not possible. The cuffless tube is designed for people not requiring ventilation (exception being some individuals with long-term ventilation e.g. cervical spinal cord injury) and those at low risk of saliva aspiration (Refer to 10.0).
Fenestrated	This is a double cannula tube that has a hole or number of holes cut out (window or fenestration) on the superior surface of the outer cannula at the angle of the tube. The inner cannula can be fenestrated or non-fenestrated which when the fenestrated inner cannula is in situ, allows air to flow up through the tube to the larynx to facilitate voicing. This is usually in conjunction with a cuffless tube or a deflated cuff. It is generally not recommended for people with copious secretions or aspiration risk. There is low level evidence to suggest that fenestrated tubes should be used with caution and for specific reasons only, due to the potential risk of abrasion and granulation formation if poorly positioned (Siddharth&Mazzarella, 1985).
Above-Cuff Line	This tube has an extra suction line that runs along the outside shaft of the tube and ends just above the cuff. This allows for removal of secretions that may be pooled above the cuff, or allows for

	application of air to travel up to the larynx for voicing for the person requiring an inflated cuff (Refer to 11.3.2).
Mini-Tracheostomy	The mini-tracheostomy tube is a much narrower tube than the standard tracheostomy tube. It is used for suctioning purposes, not as an artificial airway. It is cuffless and is not suitable for a person with saliva aspiration or those requiring ventilation.
Tube Material & Shape	Tubes can be made of a variety of materials each with their own benefits, including plastic (polyvinyl chloride, silicone and silastic) and metal (silver or stainless steel). Generally, the initial tube inserted will be plastic. Tubes can also vary with their angle or curve to improve the fit of the tube in the trachea.
Tube Size/Diameter	Tube size will be determined by the medical team based on endoscopic assessment. Each brand of tube varies in diameter sizing, and will have its own sizing chart, so it is important to be aware of these differences if changing between different brands. (See Appendix B for size charts of commonly used tubes). Infants under one year of age usually require neonatal sized tubes, while those older have paediatric-sized tubes.
Tube Length	The length of the tube can be a standard length (most commonly), an adjustable length, or can be of a specified extended length, as required by the individual. The medical team performing the tracheotomy will determine the required length of the tube.
Other Specialised Communication Tubes	A variety of 'communication' tracheostomy tubes are also available, including inner cannula with integrated speaking valves, speaking tubes with inner cannula with other valving. The Blom Tracheostomy Tube System can be used with patients who are unable to tolerate cuff deflation.

8.2 Speech and Language Therapy Role in Advocacy for Tube Choice

Tube selection should take into account size, shape, as well as the functional needs of the individual, including communication (Mitchell et al., 2012). Final tube selection is the decision of the medical team inserting the tube. There are particular tracheostomy tubes that may facilitate swallowing and communication with features such as fenestration, above cuff suction lines, talking tracheostomy tubes, or the Blom Tracheostomy Tube System, and the SLT can advocate for these particular tracheostomy tubes. It is therefore essential for the SLT to be familiar with the variety

of tracheostomy tubes available and understand the advantages and disadvantages of the tubes.

In paediatrics, the SLT may suggest tube sizes with respect to the amount of leak available to use speaking valves (Tweedie et al 2007). This may also occur for adults, in discussion with the medical team, but for tube change rather than initial tube placement.

9.0 Ventilation Overview

Mechanical Ventilation is used in a variety of situations where patients have compromised respiratory function. It can be provided in two ways:

1. **Invasive Ventilation**: Where the ventilation is delivered to the patient via an endotracheal/nasotracheal or tracheostomy tube directly into the airways. Modes include assist control (AC), pressure regulated volume control (PRVC), synchronized intermittent mandatory ventilation (SIMV), intermittent mandatory ventilation (IMV), Pressure Support Ventilation (PSV), Continuous Positive Airway Pressure (CPAP). (Kirpalani & Huang 2009, Dikeman and Kazandjian 2003).

2. **Non-Invasive Ventilation**: Where the ventilation is delivered to the patient by methods such as a face mask, hood or mouth piece e.g. CPAP or Bilevel Positive Airway Pressure (BIPAP), or less commonly iron lung /rocking bed.

The ventilation settings are controlled by intensivists, anaesthetists or respiratory physicians, depending on local policies and guidelines. The ventilator can control and deliver breaths to the patient depending on the settings recommended by the clinicians and the needs of the patient. Breath volume and breath pressure variables are controlled by the clinicians depending on the status of the patient. For example, the ventilator may need to deliver and control all the breaths to the patient at a particular pressure e.g. patient in a coma or the patient may assist the ventilator with some spontaneous breathing themselves. There is generally a progression of dependence on the ventilator from full ventilator control of breathing to full patient control of breathing with pressure assistance from the ventilator. The patient can be fully dependent on the ventilator or can require intermittent ventilation with periods of unaided breathing e.g. off ventilator during the day but require full ventilation when sleeping.

Those who require mechanical ventilation fall into two main groups:

1. Acute care patients managed in intensive care units or special weaning units
2. Individuals on long-term mechanical ventilation managed in the hospital or community setting including home and residential care.

Both groups have very different needs and goals. In general, acutely unwell patients who are ventilated will be less stable and will require greater caution when treatment interventions are considered. Some interventions to improve communication and swallowing in this group have the potential to cause inadequate ventilation, cardio/respiratory instability and death. It is essential that the SLT must work always as part of the MDT and fully liaise with the lead medical team for that patient. It is essential that local policies state who is responsible for establishing and changing

ventilator settings. It is not considered within an SLT's scope of practise to make adjustments to ventilators. Adequate ventilation for the patient is always the priority during any session.

Strong communication amongst team members must occur in order that the goals of intervention are clearly understood by all. During any given intervention it is important for the team to discuss who will be responsible for which aspects of the session. It is always wise to establish the experience level of each team member prior to sessions in which ventilation adjustments are indicated (See section 15.3 for further discussion of skills required when working with ventilated patients).

For the ventilator dependent patient in the community, clear procedures are usually set in place and training of family members and carers should be provided in relation to manipulation of the ventilator as required under the guidance of the lead medical team.

10.0 Cuff Management

10.1 Overview

When the cuff is inflated on a cuffed tracheostomy tube, the larynx is separated from the lungs.

The cuff has two primary purposes;

1. To provide a closed circuit for the person on mechanical ventilation.
2. To minimize the risk of aspirated secretions from entering the lungs.

However it should be highlighted that an inflated cuff does not completely safeguard against leak of aspirated material as secretions pooled on top of the inflated cuff can leak around the cuff into the airway (Coffman et al 2008; Dikeman et al 2003; Hess 2005; Winklmaier et al 2006). There is also a risk of increased bacteria in secretions that are pooled on top of the cuff (Dikeman & Kazandjian 2003) which can leak around the cuff into the airway, thus introducing pathogens into the airway.The cuff can be filled with air, water or foam. Cuff inflation seals off the upper airway therefore preventing the patient from voicing. It may also impact on the patient's ability to swallow. Cuff management involves the entire multidisciplinary team and thorough communication between all members is essential to ensure safe practice and to determine professional roles.

10.2 Assessment and Progression of Cuff Deflation

Saliva Management:

The assessment of an individual's ability to tolerate cuff deflation and swallow their saliva is usually the first step toward decannulation and in most facilities, this is done at the request of the medical team. There is no information in the literature to clarify which MDT member is responsible for this but the SLT's scope of practice and skill base with dysphagia indicates a role for saliva swallowing management. The SLT may be involved prior to or at the time of the initial cuff deflation, in order to determine the individual's ability to swallow saliva. Intervention to improve saliva management may need to be considered to facilitate the cuff deflation process. The swallow frequency and integrity, amount and type of secretions, suctioning frequency, ability to cough, ability to protect the airway are some of the features the SLT should take into consideration when determining the individual's ability to swallow saliva. Tracheostomy tubes which allow above cuff secretions to be removed prior to cuff deflation (e.g. Portex ™ Suctionaid™, Shiley Evac™) aid in decreasing the individual's reactivity and intolerance of cuff deflation. Also, they provide insight into whether saliva is pooling above the cuff and potentially being aspirated.

Cuff Deflation Trials

Recommendations around the frequency and duration of cuff deflation may be made by the SLT in conjunction with the specialist members of the MDT and should be determined on an individual basis and guided by local policies and procedures (Dikeman & Kazandjian 2003). There is no evidence to support or negate a standardised cuff deflation protocol. It may be that the cuff remains deflated after initial assessment or there may be a regime where there are set periods each day in which the cuff is deflated, with gradual increments until full deflation is achieved. However, there is a general consensus that at least 24 hours of cuff deflation should be tolerated prior to decannulation (Braine & Sweby 2006; Thompson-Ward et al. 1999). Some individuals may never be suitable to undertake cuff deflation trials and will need to have the cuff inflated permanently. Others may progress promptly to a continuously deflated cuff but may need the tracheostomy tube for airway patency. In that situation, upon medical request, the tube may be changed to a cuffless tube. Foam filled cuffs are unable to be deflated and therefore are not suitable for cuff deflation trials or speaking valve/spigoting.

10.3 Cuff Pressure

Monitoring cuff pressure is necessary to ensure the cuff is not under or over inflated and this is generally performed by nursing staff. If the cuff is under-inflated, there is a greater risk of the aspirated material entering the lower airway, or inadequate ventilation when mechanically ventilated. Over inflation may result in tracheal complications due to the excessive pressure on the tracheal wall such as ulceration of the mucosa, stenosis, tracheoesophageal fistula, and trachea-innominate fistula. To prevent damage to the tracheal mucosa, the pressure exerted by the cuff onto the tracheal wall should not exceed the tracheal capillary pressure (Dikeman & Kazandjian, 2003; Hess, 2005). The advent of high-volume low-pressure cuffs has minimised, but not removed this risk. There is great variability in the literature regarding the 'safe pressure' for an inflated cuff. Safe pressures suggested in the literature include 15-25cmH2O (11-18 mmHg) (McHardy & Chung, 1999; Russell & Matta, 2004; Somri, Fradis, Malatskev, Vaida, & Gaitini, 2002); 20-40cm H2O (15-30 mmHg) (Conway & Mackie, 2004) and 27-34cm H2O (20-25 mmHg) (Heffner & Hess2001), but Dikeman and Kazandjian (2003) suggest that a set cuff pressure may not be suitable in every situation, and features such as ventilation or position may impact on the pressure required. Much of the literature recommends the use of a cuff pressure manometer to confirm cuff pressure (Dikeman & Kazandjian, 2003; Heffner & Hess, 2001; Russell & Matta, 2004); however Morris, Zoumalan, Roccaforte, and Amin (2007) suggest this as just one part of an overall cuff management protocol.

Cuff pressure measurement does not however determine if a cuff seal against the tracheal wall has been achieved. Methods to inflate a cuff and determine if a seal has been achieved include minimal occlusive volume and minimal cuff leak technique. Squeezing the pilot balloon is not an appropriate method to check for cuff seal adequacy (Fernandez, Blanch, Mancebo, Bonsoms, & Artigas, 1990). The SLT should adhere to the organisational policies and procedures regarding cuff management including methods to inflate the cuff, checks for adequacy of a cuff seal, and cuff pressure measurement methods and amounts.

10.4 Suspected Cuff Leak and the Role of the Speech and Language Therapist

Signs of a cuff leak may include inadequate ventilation or increased suction/secretions. If a cuff leak is evident, then discussion with the team should be initiated (i.e. problem-solving, monitoring, decision-making regarding need for tracheostomy change). Management of a cuff leak is not within the scope of practice of a SLT, however, the SLT can contribute information to the MDT, but the ultimate management decision lies with the lead medical clinician.

10.5 Issues Specific to the Ventilated Population

Initial cuff deflation trials in an acute patient who is invasively ventilated must be approached with caution and approved by the treating medical team. Suitability for cuff deflation may differ depending on whether the patient is acutely ventilated or long-term ventilated (e.g. cervical spinal cord injury, congenital paediatric conditions). The role of the SLT within the MDT with the patient on mechanical ventilation needs to be clearly established in the particular facility. The initial session with the SLT should always occur with a medical officer, nurse or physiotherapist (Hixon & Hoit, 2005) and the independence of the SLT for subsequent sessions will be guided by the MDT and facility. When the cuff is deflated a leak is imposed in the ventilator circuit and adjustments to the ventilator may be required to maintain adequate ventilation due to escape of air through the upper airway. The SLT should conduct a thorough assessment of the individual's ability to manage oral secretions prior to and post cuff deflation; however, this role may vary depending on the facility. The MDT and patient can usually advise if cuff deflation is well tolerated and if any ventilator adjustments are required when the cuff is deflated.

10.6 Paediatric Considerations with Cuffs

Older children may have cuffed tubes, particularly adolescents, depending on the presenting aetiology. However, younger children usually have cuffless tubes due to the pliability (delicacy) of the trachea and larynx, predisposing them to complications from the cuff. Additionally, the size of the structures of the larynx and vocal folds relative to the tracheal and pharyngeal space acts as a natural cuff. If a younger child has a leak, usually a larger diameter tube will be inserted, taking up more of the tracheal space, in preference to using a cuffed tube. However, cuffed tubes may be used in younger children who require high-pressure ventilation or those requiring nocturnal ventilation (Eber & Oberwaldner, 2006), or those who cannot maintain adequate ventilation with a cuffless tube.

11.0 Communication

11.1 Overview

It is the role of the SLT to identify communication disorders and devise a tailored therapy and management plan for each individual with a tracheostomy. The ability to voice and/or communicate can be impacted upon either by the presence of the tracheostomy or by the condition necessitating tracheostomy insertion. A tracheostomy redirects airflow away from the vocal folds, impacting on voice quality or preventing voice. Dysphonia may be present due to the underlying conditions, damage from intubation/s, disuse atrophy and complications such as formation of granulation tissue (Nixon, Ramsay, & Mackenzie, 2010) and referral to an ENT specialist may be necessary.

Six strategies have been described to facilitate effective communication with individuals with a tracheostomy including:

1. Establishing a communication-friendly environment
2. Assessing functional skills
3. Anticipating the individual's needs
4. Facilitating lip-reading,
5. AAC
6. Educating the person with a tracheostomy, family and staff about communication strategies (Grossbach, Stranberg, & Chan, 2011).

An inability to communicate effectively may place the individual at risk medically (Hemsley et al., 2001) and can cause anxiety, frustration and fear (Patak et al., 2006). Foster (2010) and Donnelly and Wiechula (2006) reported that individuals with a tracheostomy placed a high value on the necessity of communication and this was central to the individual experience.

In children, the development of speech language and communication skills can be delayed and significantly disrupted by the presence of a tracheostomy tube and/or ventilator. A developmental approach must be taken focusing on acquisition of skills along the developmental continuum from early pre-verbal skills to full communication. In Ireland, a formalised sign system, Lámh, for which training is required, is often used as the primary means of communication for children with tracheostomies who are developing language.

11.2 Assessment

Thorough assessment of the individual's ability to communicate is required in order to determine the nature and extent of the impairment, to formulate an appropriate therapy and management plan, and to determine the unmet needs for communication to

allow participation with communication partners and the environment (Beukelman & Mirenda, 2005). This may require involvement with the MDT (e.g. Occupational Therapist, Physiotherapist or Teacher). If assessment reveals the potential to communicate verbally, then further assessment for voicing options such as digital occlusion, speaking valve, or specialised tracheostomy tubes should be considered. Assessment for use of an electrolarynx could also be considered, where laryngeal function is insufficient to produce functional voice.

11.3 Intervention

11.3.1 Speaking Valves or Digital Occlusion for Communication

It is possible to restore voice in many people with a tracheostomy who are free of laryngeal or pharyngeal dysfunction by digitally occluding the tube or using a speaking valve (Dikeman & Kazandjian, 2003; Hess, 2005) when the cuff is deflated or in the presence of a cuffless tube. Digital occlusion can be used as an airway patency screen for suitability for a speaking valve (Dikeman & Kazandjian, 2003; Hess, 2005), or the primary method to allow voicing. The speaking valve was initially developed for voicing/communication and is a recognised means of enabling verbal communication for the person with a tracheostomy (Dikeman & Kazandjian, 2003; Hess, 2005).

The speaking valve is a small device with a one-way valve that is placed on the hub of a tracheostomy tube only when the cuff is deflated or with a cuffless tube. The valve opens on inhalation to allow the inspiratory breath, but closes on exhalation. This allows the exhaled air to be re-directed up to the vocal cords, to provide the opportunity for voicing. Digital occlusion follows the same principles. Speaking valves are available in a variety of brands and differ in size, shape, design, valve resistance, and compatibility with tracheostomy and respiratory equipment. They may be either bias open or bias closed, referring to the resting position of the diaphragm on the valve. The bias open design may result in incomplete closure during exhalation, resulting in unwanted expiratory flow through the valve, thereby limiting airflow through the upper airway and potentially compromising the ability to voice (Zajac, Fornataro-Clerici, & Roop, 1999). Specific brands and models of speaking valves can also be utilised with mechanical ventilation. Early intervention with ventilated patients can facilitate an earlier return to phonation and oral communication (Freeman-Sanderson et al, 2016)

Reference should be made to the specifications and information provided by individual speaking valve manufacturers, and the SLT should be aware of the indications and contraindications for use (Dikeman & Kazandjian, 2003; Hess, 2005). Some of the contraindications include: inability to deflate the cuff, foam-filled cuff,

severe medical instability, upper airway obstruction, and thick, copious secretions. The tube needs to be adequately sized to allow space around the tracheostomy tube for lung air to travel up around the tube to the larynx. If the individual does not tolerate digital occlusion or the speaking valve, then the clinician may need to consider a referral to an ENT specialist or other medical specialty for airway patency assessment. Making recommendations for assessment and use of speaking valves is within the scope of Speech and Language Therapy practice, provided medical consent is obtained.

11.3.2 Above cuff Voicing Tubes

There are a number of tracheostomy tubes that follow a particular principle in design that can be used for communication. The tube resembles a conventional tracheostomy tube, however as an additional feature, contains an external line that joins to an internal line running along the shaft of the tracheostomy tube and opening in the trachea just above the tracheostomy tube cuff. This tube is designed for individuals who cannot tolerate cuff deflation due to ventilator dependence or risk of aspiration (Dikeman & Kazandjian, 2003). Some of these tubes have been designed for the purpose of voicing, and thus allow air to be administered via the external line and the air travels upwards to the larynx to facilitate voicing with an inflated cuff. Other tubes with this feature have been designed for the purpose of removal of secretions that have pooled above the cuff. However, due to the design, these tubes can be used for both purposes of secretion removal or voicing facilitation.

Determining if a person is suitable for an above cuff access tracheostomy tube for communication should be a multidisciplinary decision but can be advocated by the SLT, but one should be aware of the indications and limitations (Dikeman & Kazandjian, 2003). A number of studies have examined the voice quality and methods to optimise the voice quality with the above cuff tubes designed specifically for communication, with the voice being reported as different to normal voice and harsh (Leder, 1990; Leder & Astrachan, 1989; Leder & Traquina, 1989; Sparker, Robbins, Nevlud, Watkins, & Jahrsdoerfer, 1987). Several limitations to the use of this type of tube include increased tube changes, poor voice quality, difficulties with the air flow via the air-port and increased practice and training to be able to produce voice (Hess, 2005).

There has been no research specifically in the use of above cuff tubes designed for secretion removal (e.g. Portex Blue Line Ultra Suctionaid™) and their use for voicing. However Husain, Gatward, and Harris (2011) in a letter to the editor of the American Journal of Respiration and Critical Care Medicine noted the potential for

airway injury and drying with the insufflation of non-humidified air directly into the larynx and also the potential to increase the risk of ventilator acquired pneumonia (VAP) if the subglottic secretions are not fully aspirated before insufflating air. There are strict recommendations guiding when this type of tube can be used for voicing post insertion due to the risk of subcutaneous emphysema therefore discussion with the medical team prior to use is essential.

Despite some of the limitations noted, this type of tube should still be considered as a voicing option for the individual who is unable to tolerate a deflated cuff.

11.3.3 AAC

It is essential for SLTs working with individuals with a tracheostomy to consider AAC (IASLT, 2016). AAC options to consider include non-electronic options (e.g. gesture, mouthing, head movement, symbol, picture, alphabet and word boards, writing, visual scanning) and high technology electronic options (e.g. computer technologies and speech generating devices, electrolarynx) (Batty, 2009 & Grossbach et al., 2011).

11.4 Issues Specific to the Ventilated Population

Early intervention for communication in acute patients on mechanical ventilation, who are otherwise stable, is deemed appropriate where safe and medical clearance has been obtained (Hoit, Banzettt, & Brown, 2006), but requires caution, team work and advanced training.

11.4.1 Oral Communication - Inflated Cuff

When the tracheostomy cuff cannot be deflated, options for oral communication include:

1. Above cuff voicing tubes which allow suctioning of above cuff secretions and voicing in the presence of an inflated cuff (Refer to 11.3.2)
2. The Blom Tracheostomy Tube System

The Blom Tracheostomy Tube System has a design significantly different to the conventional tracheostomy tube to enable speech via a cuffed tracheostomy tube. For ventilated patients, the Blom speech cannula is inserted into a fenestrated cuffed outer cannula. Inspired air flows from the ventilator to the lungs, but is redirected by the speech cannula on exhalation through the fenestration above the inflated tracheostomy cuff. For the non-ventilated patient, the Blom low profile valve is inserted whilst the cuff remains inflated. As per mechanical ventilation, all expired air exits through the

vocal cords for speech. Successful and audible speech has been reported (Kunduk et al., 2010; Leder et al., 2012). More evidence is needed on the use of this newer device, particularly on the individual's perceptions and potential for use.

11.4.2 Oral Communication – Deflated Cuff

When the tracheostomy cuff can be deflated, ventilator supported speech options include:

1. Leak speech with ventilator adjustments
2. Speaking Valve suitable for in line use with the ventilator, such as Passy Muir speaking valve (PMV/PMSV)

Individuals deemed appropriate for either of these methods need careful discussion and decision making from the entire MDT, but particularly the medical team. It is essential for the SLT working in this area to understand the normal speech breathing cycle in order to manage the differences in the ventilated speech cycle (Hoit et al., 2006). Tracheal pressure is rarely as constant during ventilated supported speech as it is during normal speech breathing (Hixon & Hoit, 2005; Hoit, Banzett, Lohmeier, Hixon, & Brown, 2003). The initial work in the area of speech and ventilation was with long term ventilated patients with neuromuscular weakness (Hoit & Banzett, 1997; Hoit, Shea, & Banzett, 1994; Hoit et al., 2003; Prigent, 2003).

The aim of the team is to maximise speech production whilst maintaining adequate ventilation. Cuff deflation imposes a leak in the ventilator system which can compromise ventilation. During the initial cuff deflation assessment the treating medical doctor or in some centres the physiotherapist or nurse establishes ventilator settings that provide adequate ventilation. The SLT assesses speech under those settings and makes further recommendations for adjustments which may optimise speech.

The clinical decision of using leak speech (i.e. deflated cuff) with ventilator adjustments or a PMSV in line with the ventilator is related to clinician familiarity and comfort of the user. Leak speech with no ventilator adjustments, whereby speech is generally during the inspiratory phase, may be characterised by long pauses, short phrases, and variable loudness and quality (McBean, Ward, Murdoch, Cahill, Solley, Geraghty, & Hukins, 2009). However, ventilator adjustments can help overcome the speech problems associated with leak speech (Dikeman & Kazandjian, 2003; Hoit et al., 1994, 2003, 2006; McBean et al., 2009; Prigent, 2003; Tippet, 2001).

Ventilator adjustments that improve leak speech include increasing the Positive End Expiratory Pressure (PEEP) and inspiratory time. McBean et al. (2009) and Hoit et al. (2006) reported that using these adjustments resulted in speech that is as good as speech using the PMSV in line with the ventilator. In general 8-10cm of PEEP is enough to improve the volume and phrase duration. High PEEP (15cmH2O) has been shown to replicate speech produced with a PMSV in line (Hoit et al., 2003). Some ventilators can be programmed to have cuff up and cuff down ventilator settings. These ventilator settings make it simple for nursing staff to change between settings to allow leak speech without changing the ventilator circuit. Any changes in the ventilator setting have to be approved by the medical team and will depend on the medical and ventilatory status of the individual. When using a PMSV in line, other ventilator setting modifications may need to be made, and this is to be discussed with the medical team.

11.5 Issues Specific to the Paediatric Population

11.5.1 General Communication Issues

Children with tracheostomy tubes are at risk for speech and language delay due to the presence of the tube itself, the underlying impairment or condition (e.g. genetic syndromes with cognitive impairment as part of the phenotype, neurological impairment), high risk of coexisting chronic middle ear problems, lengthy hospitalisations and periods of poor health, and inadequate muscle strength due to conditions such as chronic lung disease, neuromuscular disorders or spinal cord injuries (Eber & Oberwaldner, 2006).

Factors affecting speech and language development in neurologically normal children with tracheostomy tubes include age at time of intubation, and duration of tracheostomy until decannulation (Jiang & Morrison, 2003). More negative impact (lower speech and language scores/ages) was found in children who received their tracheostomy when they were less than 12 months of age or prelinguistic period, than children who had tracheostomy tube insertion in the linguistic period (having had some experience with vocalisations and oral communication). Decannulation by 15 months of age gave a good outcome (Jiang & Morrison, 2003). One study found that children who were decannulated during the prelinguistic period had speech and language function commensurate to their intellectual function (Simon, Fowler, & Handler, 1983).

Every effort should be made to assess and support the early development of communication including parent-child interaction, teaching carers to read and respond contingently to infant cues, provide opportunities for oral exploration (toys and oral sensorimotor programs), support use of manual signing systems (Lámh for children),

and AAC where appropriate. Communication assessment and management for linguistic and literate children and adolescents follow similar principles as described for adults.

11.5.2 Speaking Valve Use

Use of speaking valves is advocated where possible in young infants and children who meet anatomical criteria and other indicators (Davis, 2006; Eber & Oberwaldner, 2006; Sherman et al., 2000) and may ameliorate some of the effects of presence of the tube on communication development. One study reported immediately improved vocalisations following speaking valve placement including audible crying, non-specific vocalisations, word approximations, single words and short phrases dependent upon age (Hull, Dumas, Crowley, & Kharasch, 2005). There are a number of different speaking valves available.

PMSV tolerance was found in 83% in a study of 29 children considered eligible for a speaking valve trial and success was characterized by oxygen saturation at =88%, no changes in colour, heart rate or respiratory rate, no increase in respiratory effort above baseline, and minimal to no agitation (Engleman & Turnage-Carrier, 1997). Tolerance criteria would need to be discussed with the medical team. Although some children are considered anatomically suitable for the valve, they appear to not tolerate it. Brigger and Hartnick (2009) consider that this is due to elevated transtracheal pressures, and have described a method to modify the PMSV by drilling a 1/16 inch hole in the plastic housing distal to the valve membrane. They have found improved tolerance of the PMSV following this modification. They also described a method to determine transtracheal pressure and advocate that this is performed for all children who fail the PMSV evaluation. They suggest that children with transtracheal pressures of ≤10 cm H2O use the standard PMSV, and a modified (drilled) PMSV is trialled for children with pressures >10 cm H2O. A more recent study by Buckland et al (2012) replicated this for a case series of 10 children with encouraging results. Buswell et al (2016) report a series of 42 children who used adapted speaking valves, with 24% of their caseload requiring a valve adaptation in order to achieve phonation and who tolerated the adapted valves very well. Caution has been expressed that adapting valves in this way may invalidate the warranty of the valve if modified and this should be discussed with the treating medical team.

As for adults, PMSVs can be used successfully in-line for ventilator assisted children (Engelman & Turnage-Carrier, 1997; Hull et al., 2005; Passy, Baydur,

Prentice, & Darnell-Neal, 1993). However, assessment for this needs to be conducted in the Paediatric ICU or Transitional Care Unit (TCU) with nursing and/or medical assistance and/or clinical engineering/bioengineering assistance as it may require extra attachments to bring the PMSV in-line with the ventilator.

Communication Key Statements	**Highest Level of Evidence as per SPA**
The speaking valve should be trialled with adults as a communication option if nil contra-indications	Level IV
Leak speech or in-line speaking valve should be considered with individuals who are ventilated if medically stable and multidisciplinary team in agreement, and no contra-indications	Level III
A specialty tracheostomy tube for voicing should be considered if cuff deflation during mechanical ventilation is not possible and prolonged ventilation is anticipated	Level III
Children should be assessed for suitability for use of a speaking valve to support verbal communication, if medically stable and suitable anatomical structure/airway patency	Level IV
In the event of failure of PMSV attempts with children, assessment of transtracheal pressure should be performed and consideration for drilling PMSV be undertaken by the multidisciplinary team	Level IV
Assessment of communication (including parent-child interaction, infant cues, verbal, gestural, and AAC) should be conducted as soon as practicable, and individualised management plan determined to reduce the effects of the presence and duration of the tracheostomy tube on communication development in infants and young children	Level IV

See Appendix 1 for further information re evidence levels

12.0 Swallowing

12.1 Overview

The person with a tracheostomy may or may not have dysphagia (Dikeman & Kazandjian, 2003; Russell & Matta, 2004) and oral intake may or may not be appropriate. Therefore, the assessment of swallowing is indicated to determine the presence of dysphagia, and to guide the SLT in establishing the most appropriate management/rehabilitation plan for food/fluid and saliva. Liaison with the MDT and medical clearance is essential.

Swallowing dysfunction in the individual with a tracheostomy is multifactorial. They may have medical conditions that could predispose them to dysphagia and dysphagia may be present prior to placement of the tracheostomy or as the medical condition progresses. Presence of a tracheostomy tube, cuff status, occlusion status, and mechanical ventilation has been discussed in the literature as potential contributors to dysphagia (Refer to 12.2.3 and 12.2.4). The SLT should have an understanding of the clinical considerations typical for all individuals with dysphagia such as age (Baskin, Panagopoulos, Parks, & Kormisar, 2005; Leder, 2002), acute and chronic illnesses, cognitive status, nutrition, respiratory status and care setting.

The person with a tracheostomy is more likely to have come from a more severe illness background necessitating ventilation and tracheostomy. Factors such as critical illness myopathy and polyneuropathy, prolonged effects of neuromuscular blocking agents, deconditioning due to muscle disuse, and sepsis can negatively affect the neuromuscular function of the whole body (Bolton, 2005) including that of the oropharynx and larynx. Impact of an ETT prior to the tracheostomy should also be taken into consideration.

12.2 Assessment

There is no universally accepted protocol or set of considerations that SLTs rely on when evaluating dysphagia in individuals with a tracheostomy other than those typically adopted when conducting dysphagia assessments for individuals without a tracheostomy. Dikeman and Kazandjian (2003) and Russell and Matta (2004) outline steps to consider when assessing the person with a tracheostomy. SLTs may have input into the development, implementation and evaluation of facility specific protocols for Dysphagia management in the area of tracheostomy. Readiness for swallowing evaluation will be determined by the individual's medical condition, level of alertness, clinical progress, respiratory recovery/status and age. Information required from the MDT to determine suitability for assessment may include: cough strength, cough response to suctioning, suctioning frequency, type and colour of secretions, level of alertness and positioning. More recently an online survey of MD teams working with tracheostomy in the UK revealed practice variability and a lack of consistency in relation to swallow screening assessments in this population (Ginnelly et al 2016).

Liaison with an ENT may be beneficial, however in most cases, ENT assessment of the anatomical structures is not performed routinely unless specifically indicated.

Assessment of the individuals' ability to swallow saliva must also be conducted in order to plan effective therapy and to progress cuff deflations. An oromotor assessment includes assessment of the oromusculature function, dentition, saliva control in the oral stage, oral hygiene and the presence of primitive reflexes (Hales, 2004). Cuff deflation will further evaluate saliva swallowing and secretion management. Cuff status or use of a speaking valve may impact on swallow function, but the evidence is inconclusive of which is the most ideal for swallowing (Refer to 12.2.4 and 12.3.2). For these reasons assessment should be performed in conditions suitable for the individual to determine the optimal swallowing condition. The frequency of swallowing assessment will largely depend on the individual's condition and needs and rate of change. Consideration should also be given to the care setting, staffing and equipment resources, access to instrumental swallowing evaluation, supervision for oral feeding as well as staff knowledge, skills and training as these will vary across the continuum of care and will impact upon speech therapy assessment and management.

12.2.1 Clinical Assessment

While instrumental evaluation of swallowing function is considered ideal in providing the most accurate assessment of swallowing function for oral intake (Ding & Logemann, 2005), a clinical swallowing evaluation may be the primary and only form of assessment for a large number of people with a tracheostomy (Ward, Jones, Solley, & Cornwell, 2007; Ward, Morgan, McGowan, Spurgin, & Solley, 2012). Adjuncts to the clinical swallow evaluation may include use of pulse oximetry and cervical auscultation.

12.2.2 Blue Dye

The Evans Blue Dye Test (EBDT) is a procedure where a small amount of blue dye (methylene blue or blue food colouring) is added to saliva and secretions from the tracheostomy tube are monitored for evidence of aspiration. The Modified Evans Blue Dye Test (MEBDT) is an extension of this whereby food or fluid is coloured.

Issues discussed in the literature regarding the Blue Dye Test (BDT) relate to safety of blue colouring and assessment validity. Safety concerns relate to reports of systemic absorption of large quantities of blue dye in enteral feed in patients with sepsis (USA Food and Drug Administration [FDA], 2003) where death has occurred. The FDA states that although these reports are not evidence of a causal relationship between

the deaths and administration of blue dye, they are indicative of the need for care when giving patients blue colouring. Cross contamination has also been raised as a concern and single use vials are recommended (File, Tan, Thomson, Stephens, & Thompson, 1995).

Validity has been examined in a number of papers comparing blue dye in a clinical bedside assessment with instrumental swallow evaluation, with mixed findings regarding sensitivity and specificity (Belafsky, Blumenfeld, LePage, & Nahrstedt., 2003; Brady, Hildner, & Hutchins, 1999; Peruzzi, Logemann, Currie, & Moen, 2001). Evidence suggests that blue dye may detect moderate to large amounts of aspiration but has not been demonstrated to reliably detect trace aspiration (Dikeman & Kazandjian, 2003; Swigert, 2003).

There is no standardised protocol regarding quantity of blue dye required to stain the saliva/food/fluid (Belafsky et al., 2003; Dikeman & Kazandjian, 2003; Donzelli, Brady, Wesling, & Craney, 2001; Hales, 2004; Metheny et al., 2002; O'Neill-Pirozzi, Lisiecki, Momose, Connors, & Milliner, 2003). Due to safety concerns, Swigert (2003) concluded that the amount used should be kept to a minimum and only used with specific individuals where it is medically indicated. The literature is inconclusive in relation to MEBDT diagnostic accuracy. A recent systematic review (Bechet et al 2016). looking at diagnostic accuracy indicated discrepancies and lack of consistency in MEBDT protocols which lead to high variability in relation to amount of blue dye used and nature of blue dye used. This was also reflected in results of a survey of Irish SLTs (Greene & Murphy 2016). It does appear that the MEBDT is useful for establishing baseline information and for tracking progress if the MEBDT is positive (Bechet et al 2016).

Clinicians should understand the safety and validity issues, adhere to the policies and procedures of the employing body, use the type of colouring supported by the facility, and seek medical clearance for any use of any coloured food dye (local variability to policies may apply). Allergy and intolerance status to food colouring should be ascertained prior to the use of food dyes. The timing of suctioning post this procedure is determined on patient needs and local guidelines should be applied.

12.2.3 Impact of Intubation/Tracheostomy Tube on Swallowing

Impact of oral endo-tracheal intubation on swallowing: Many patients with a tracheostomy in the hospital setting have had an oral ET tube in the period leading up to tracheostomy insertion. The ETT has its own set of complications which should be taken into consideration (Conlan & Kopec 2000) (Refer to Section 15.5.1.) A significant body of evidence is emerging which reports risks of dysphagia associated

with intubation and ventilation (Kwok et al 2013, Bordon et al 2011). Studies specifically identify a high incidence of dysphagia in patients who are ventilated for 2 days or more (Kwok et al 2013). Skoretz et al (2014) reported that the prevalence of dysphagia in patients with more than 48 hours intubation rose from 6 to 67 %. Daly et al (2016) identified stroke, and days of ventilation as the most significant predictors of dysphagia in the cardiac population. Degree of trauma and age are significant variables in trauma patients (Kwok et al 2013, Bordon et al 2011).

Impact of tracheostomy on swallowing: Early literature cites a positive predictive relationship between the presence of a tracheostomy and dysphagia (Bonanno 1971, Feldman et al 1966, Nash 1988). Shaker et al reported that the duration of vocal cord closure is shorter with a tracheostomy. However, a significant body of literature refutes the suggestion that the tracheostomy causes increased risk of dysphagia and aspiration (Donzelli et al 2005, Kang et al 2012, Leder & Ross 2000 & 2010, Sharma et al 2007). Terk et al 2007 reported that hyolaryngeal excursion was not affected by the presence of a tracheostomy tube. Kang et al (2012) reported that laryngeal elevation, pharyngeal constriction and oesophageal opening are unlikely to be impacted by the presence of a tracheostomy. Further research is needed in this area.

It is also important to consider the negative impact a tracheostomy has on taste and smell as this may contribute to motivation for and enjoyment of oral intake once re-introduced (Lichtman et al 1995, Dikeman and Kazandjian 2003).

Overall the emerging body of evidence would appear to indicate that dysphagia leading to aspiration in the tracheostomised population is most likely due to pre-existing comorbidities or other medical factors surrounding the individual such as the severity of the illness, the exposure to drugs, critical illness, respiratory failure, medical comorbidities, age and the initial reason for tracheostomy insertion (Carlos et al., 2011; Romero et al., 2010; Terk, Leder, & Burell, 2007).

12.2.4 Impact of Cuff Status on Swallowing

The literature is mixed as to whether cuff status has an impact on swallowing, and there has been no consensus reached as to the ideal situation. Cuff status may not alter the risk of aspiration (Suiter, McCullough, & Powell, 2003). Ding and Logemann (2005) hypothesised silent aspiration with an inflated tracheostomy cuff was due to desensitisation of the larynx and pharynx leading to decreased awareness of aspiration and diminished cough reflex. An inflated cuff will prevent generation of a cough reflex making it difficult to clear aspirated material from the upper airway, and a deflated cuff will also impact on cough strength (Suiter & Leder, 2007). However, McGowan,

Gleeson, Smith, Hirsch, and Shuldham (2007) found that some individuals who had the cuff inflated due to mechanical ventilation requirements were able to commence oral trials after FEES determined no evidence of aspiration. Other studies have also reported safe swallowing with an inflated cuff (Goldsmith, 2000; Suiter et al., 2003). If the cuff is to remain inflated, there may need to be consideration for momentary deflation during the assessment to assess for evidence of aspiration (Dikeman & Kazandjian, 2003).

Other mechanisms of swallowing including hyoid bone movement and laryngeal excursion have been found not to be affected by tracheostomy tube cuff status during normal swallowing (Leder et al., 2005; Terk et al., 2007). Due to the literature being divided, oral intake should be considered and assessed with an inflated or deflated cuff depending on the needs and medical condition of the individual. The individual who is unable to have the cuff deflated for medical or respiratory reasons could indicate a more fragile or volatile status, so suitability for a swallow assessment may need further consideration and discussion with the primary medical team.

12.2.5 Use of Objective Instrumentation

Most authors advocate the use of instrumental evaluation of swallowing for individuals with a tracheostomy and dysphagia (Brady et al., 2006; Hales, Drinnan, & Wilson, 2008; Leder & Suiter, 2013; O'Neil et al., 2003; Rigui, 2007). Safety of oral intake can be determined under varied conditions such as cuff status, speaking valve/occlusion and compensatory or rehabilitation techniques. The Videofluoroscopy Swallowing Study (VFSS) and FEES assessments are the two most widely used instrumental techniques for objective evaluation of swallowing and both have been applied to individuals with a tracheostomy. Silent aspiration has been reported in the literature for individuals with a tracheostomy (Hales et al., 2008; Leder, 2002) and thus instrumental swallowing assessment can assist with providing further information.

Each instrumental evaluation method has its advantages and disadvantages and both provide valuable information that cannot be obtained with clinical swallowing evaluation alone, but they require technical skill in application and interpretation. However, access to both of these procedures can be limited due to availability, transport/mobility issues and associated costs. Also, not all individuals with a tracheostomy will be suitable for these methods of evaluation and both procedures have contra-indications. Refer to the IASLT Standards of Practice for Speech and Language Therapists on the Management of Feeding, Eating, Drinking and Swallowing Disorders (2012).

FEES allows direct visualisation of the pharynx and larynx (Hales et al., 2008; Leder, 2002) which is of particular benefit when determining saliva management i.e. the presence of secretions, type and ability to clear (Leder & Sasaki, 2001). Visual confirmation of pooled secretions can be evaluated and is highly predictive of aspiration of food and liquid (Donzelli, Brady, Wesling, & Craney, 2003; Murray, Langmore, Ginsberg, & Dostie, 1996) and penetrated secretions significantly linked to aspiration of oral intake (Hales et al., 2008). The latter study also suggested other FEES observations that may be useful in the decannulation pathway (Refer to 14.3.3). The portability of FEES makes it more accessible and can be performed at the bedside, which is of benefit for the more critically ill patient; however, one must consider that FEES is an invasive procedure. Leder and Sasaki (2001) suggest a FEES protocol for the individual with a tracheostomy. There is also an opportunity to grossly evaluate sensation by extending the procedure to include sensory threshold testing (Fibreoptic Endoscopic Evaluation of Sensory Testing-FEEST).

For the person with a tracheostomy who can be mobilised, VFSS is a widely used instrumental tool for the assessment and management of oral intake (Martin-Harris, Logemann, McMahon, Schleicher, & Sandidge, 2000). Internationally, other instrumental techniques for evaluation of swallowing include manometry, manofluorography, multichannel intraluminal impedance testing, ultrasonography, electromyography, and scintigraphy. However, these techniques are not widely available in clinical settings in Ireland and there are currently limitations with regards to their standardisation, reliability and validity.

12.3 Intervention

12.3.1 Dysphagia Rehabilitation

Once dysphagia and the aetiology have been identified and medical clearance sought, a rehabilitation program should be planned (Dikeman & Kazandjian, 2003).The dysphagia and potential aspiration may be demonstrated with oral intake and/or saliva. If failure to progress to cuff deflations and decannulation is related to saliva aspiration, then expert opinion suggests that the person requires dysphagia rehabilitation to assist with the saliva swallow.

Interventions for dysphagia have been outlined in the IASLT Standards of Practice for Speech and Language Therapists on the Management of Feeding, Eating, Drinking and Swallowing Disorders (2012) and Standards of Practice for Speech and Language Therapists on the Management of Feeding, Eating, Drinking and Swallowing Disorders: Working with Neonates and Babies (2013). These interventions can be also

considered when planning rehabilitation for the individual with a tracheostomy with a dysphagia for food/fluid and/or saliva.

Due to the nature of the condition that necessitated the tracheostomy, it may be that the individual may be unable to actively participate in the rehabilitation program (e.g. traumatic brain injury), and passive treatment techniques may need to be considered such as taste, tactile and/or thermal stimulation (Pelletier & Dhanaraj, 2006; Pelletier & Lawless, 2003; Steele & Miller, 2010). Much of the literature in the taste/thermal stimulation pertains to findings in animals or with healthy adults (Steele & Miller, 2010) or to swallowing of a bolus rather than saliva (Pelletier & Dhanaraj, 2006; Pelletier & Lawless, 2003).

When planning rehabilitation, the clinician should consider any contraindications either due to the tracheostomy being in situ or those associated with this critically ill population. The effort and coordination required to perform some techniques (e.g. effortful swallow, supraglottic swallow, super supraglottic swallow or laryngeal closing exercises) may cause excessive stress in weaker patients (Dikeman & Kazandjian, 2003). Suiter et al. (2012) in a discussion on the ASHA website suggested that some postural changes may be associated with risks for individuals with a tracheostomy. For example a chin tuck may risk tracheostomy tube dislodgement or a Shaker manoeuvre may result in accidental decannulation, fistula or ulcerations. There is no research evidence to contradict this, so expert opinion suggests caution when using particular manoeuvres. Cuff status and speaking valve use during therapy will depend on the needs and status of the individual (Refer to Sections 12.2.4 & 12.3.2).

Overall, therapy conducted by SLTs may reduce dysphagia but further investigations are required to investigate which components of swallow therapy are most effective (Geeganage, Beavan, Ellender, & Bath, 2012).

12.3.2 Speaking Valves or Occlusion for Swallowing

Some authors suggest that using a speaking valve may improve swallowing ability by improving pharyngeal sensation and normalising pharyngeal pressure (Dettlebach, Gross, Mahlmann, & Eibling, 1995) and restoring the post-swallow protective expiration of air into the upper airway (Prigent et al., 2012). A number of earlier studies suggest that the use of a speaking valve can reduce aspiration (Dettlebach et al., 1995; Eibling & Gross, 1996; Elpern, Okonek, Bacon, Gerstung, & Skrzynski, 2000; Gross, Mahlmann, & Grayhack, 2003; Stachler, Hamlet, Choi, & Fleming, 1996; Suiter et al., 2003). Some studies have suggested that subglottic airway pressure is impacted upon by the presence of a tracheostomy tube (Eibling & Gross, 1996; Suiter

et al., 2003) and thus postulated that via the use of a speaking valve, subglottic airway pressures are restored and thus swallowing is facilitated.
However, Hull, Dumas, Crowley, and Kharasch (2005) and Leder (1999) reported no change in swallowing ability with or without a speaking valve, indicating that by restoring subglottic pressure, the swallow was not always facilitated.

A few studies have looked at the impact of occlusion on swallowing rather than speaking valve, and found that occlusion status did not affect the swallow ability (Donzelli, Brady, Wesling, & Theisen, 2006; Leder et al., 1996; Leder, Joe, Hill, & Traube, 2001). Ledl & Ulrich (2016) reported that occlusion facilitated voluntary clearance of laryngeal residue and led to an improvement in penetration /aspiration scores (although patients were only assessed with puree consistencies)

Even though the literature is mixed as to the benefit of occlusion or speaking valve on swallowing, other benefits have been suggested due to the partial restoration of normalised physiology, including improved olfaction and taste, improved ability to cough and clear secretions, and restored sensation (Dikeman & Kazandjian, 2003; Lichtman et al., 1995; Shikani & Dietrich- Burns 2012). These may in turn benefit the swallow and thus should be assessed on an individual basis.

12.4.1 Communication Issues Specific to the Ventilated Population

Communication for mechanically ventilated patients can be very challenging. Patient' must rely on mouthing, gesture, writing and communication boards to convey their message. This restricts the patient' ability to effectively communicate, which can be a very frustrating experience (Foster 2010). A study by Sutt et al (2015) reported that in-line speaking valves have the potential to improve the quality of life of the ventilated patient by facilitating communication and swallowing capacity. They found that the use of in-line speaking valves increased the time where verbal communication was possible, did not negatively affect the duration of mechanical ventilation or cause any adverse events. It was later reported by Sutt and Fraser (2015) that time to return of verbal communication has increased 3-fold in their ICU since the introduction of an in-line speaking valve.

12.4.2 Swallowing Issues Specific to the Ventilated Population

Those individuals who require ventilation have greater respiratory compromise than those who are non-ventilated and thus have increased medical fragility. Sutt and Fraser (2015) found that there was no change in time to return to oral intake between 2 groups of patients. The first group did not have an in-line speaking valve in place for

eating and drinking and the second group did. They noted improvement in verbalisation was not associated with any deterioration of ventilatory or respiratory outcomes.

Leder (2002) suggested a difference in the incidence and type of aspiration between those individuals with a tracheostomy requiring long term mechanical ventilation compared to acutely ill patients with a tracheostomy requiring short term mechanical ventilation. The same swallowing considerations must be assessed and managed in the person who is ventilated as in the person who is spontaneously breathing. The SLT must establish the underlying cause of any swallowing impairment and assess if the individual can protect his/her airway from oral secretions. The individual who is ventilated should be medically stable, and be able to manage oral secretions prior to consideration of oral intake (Tippet, 2000). However, this may vary depending on the reason for ventilation and whether there is an underlying swallowing impairment.

Oral intake must be assessed cautiously. Instrumental swallowing assessment should be considered in the person on mechanical ventilation if suitable. FEES, in particular, may be the more appropriate study in this instance, as it can be performed at the bedside and the anatomy and secretion management can be visualised. Cuff status and use of a speaking valve will need to be considered on an individual basis.Tippet (1991, 2000) reported that aspiration in people who are fully ventilated with a deflated cuff may be reduced because the ventilator exhaled breath provides additional expiratory support to assist in clearing the upper airway.

12.5 Feeding and Swallowing Issues Specific to the Paediatric Population

Little data is available regarding the specific effects of the presence of a tracheostomy tube on swallowing function in infants and young children. The presence of one or more co morbidities as previously described may have an additional impact on the feeding and swallowing process and development of same. The larynx is usually positioned higher and posteriorly in infants with limited range of hyoid elevation and anterior movement. Thus, the presence of a tracheostomy tube in infants may offer little effect on hyoid elevation, but have more impact on factors such as subglottal pressure and swallow-respiratory timing. Common swallowing difficulties experienced by children with tracheostomy include delayed swallow with associated laryngeal penetration oral phase deficits, pharyngeal phase deficits including delayed or absent swallow nasopharyngeal backflow laryngeal penetration and aspiration and oesophageal phase (Abraham & Wolf, 2000).This reflects the combined effect of

having the tracheostomy tube in situ, in conjunction with dysphagia associated with the underlying medical conditions.

An added complication in this population may be feeding tube dependency which can contribute to aversive feeding experiences and development of negative associations with feeding and swallowing due to experiencing gastroesophageal reflux, vomiting and discomfort often associated with tube feeding (Silverman et al 2013; Ishizaki et al 2013; Kindermann et al 2008; Mason et al 2005). Expert opinion suggests children's feeding and swallowing skills should be evaluated as soon as medical clearance is obtained. Non-nutritive oral sensorimotor programs, 'mealtime' routines, tube feeding regimens mimicking normal mealtimes if tolerated, and messy play, etc, should be incorporated into the daily routines of children who need to remain nil by mouth with long term tube feeding. This will support normalisation and development of oral sensorimotor skills, and ameliorate the effects of oral suctioning and invasive procedures in preparation for future oral feeding. Instrumental evaluations, more commonly VFSS and, less commonly in very young infants, FEES, should be used as indicated to assess swallowing and determine appropriate recommendations in children.

Similar to adults, speaking valves could be used to support swallowing during oral feeding if tolerated, and the earlier they can be introduced the better.

Swallowing Key Statements	Highest Level of Evidence as per SPA
Dysphagia in individuals with a tracheostomy is a complex issue resulting from medical co-morbidities necessitating tracheostomy placement rather than the presence of the tracheostomy tube itself.	Level III
A clinical swallowing evaluation by a SLT should be considered for the adult with a tracheostomy at risk of dysphagia.	GPP-C
There is a risk of silent aspiration in individuals with a tracheostomy.	Level III
The speaking valve should be considered during the swallowing assessment if clinically indicated.	Level III
The blue dye test could be considered as an adjunct in the swallow assessment of an individual with a tracheostomy for screening for greater than trace aspiration, if medically suitable.	Level IV
Instrumental evaluation of swallowing should be utilised if possible, in individuals with a tracheostomy who are considered at risk for dysphagia.	Level III
Children should be given a clinical feeding evaluation, supported by instrumental studies (VFSS, FEES) to determine safety for oral intake as soon as medically indicated and an appropriate management plan determined	Level IV

See Appendix 1 for further information re evidence levels

13.0 Suctioning

13.1 Overview

The role of suctioning for SLTs is evolving with differential practices within the profession. Some settings have supported SLTs to perform roles outside of the generally recognised scope of practice such as tracheal suctioning. Suctioning is a procedure used to remove substances from the trachea, pharynx, nose or mouth either through a natural orifice (nose or mouth) or artificial tubing (ETT, tracheostomy tube, nasal or oral airway) (Overend et al., 2009). Training is required and local guidelines should be adhered to.

13.2 Oral Suctioning

Oral suctioning is an important component of comprehensive oral care and reduces the risk of aspiration pneumonia in individuals with a tracheostomy (Sole, Penoyer, Bennett, Bertrand, & Talbert, 2011). Information in the literature about the frequency of performing oral suctioning is minimal and oral suctioning is considered "ongoing monitoring" rather than a part of the suctioning process (Sole et al., 2003). Oral suctioning is within the scope of practice for SLTs. The clinician is advised to adhere to the policies and procedures at the organisational level.

13.3 Above Cuff Line Suctioning

Above cuff line suctioning is within the scope of practice for SLTs and allows for secretions to be removed from above the cuff from specialised tracheostomy tubes. This is performed by attaching a syringe or suction apparatus to the above cuff line suction port which enables removal of subglottic secretions in order to reduce the risk of leak of aspirated material down around the cuff. This has been shown to reduce the risk of developing aspiration pneumonia (Overend et al., 2009). Whether the above cuff secretions are removed via a syringe or suctioning will be guided by the facility. There is however minimal information in the literature on policies and procedures for above cuff line suctioning for SLTs.

13.4 Tracheal Suctioning

Traditionally, professions such as physiotherapists, respiratory therapists, nurses and physicians perform tracheal suctioning to promote secretion clearance and airway patency. In the home setting, individuals with the tracheostomy and/or parents/families/carers may be trained in this procedure, usually by nursing staff or physiotherapists, prior to discharge. Nasopharyngeal, pharyngeal and tracheal suctioning are considered extended scope of practice for SLTs, and those intending to

engage in this practice must undergo appropriate training. Current research indicates SLTs participating in tracheal suctioning are doing so after undertaking formal suctioning competency training programs within their settings (Ward et al., 2007; Ward et al., 2012; Downes 2012) and it is an emerging practice for SLTs. There is little in the literature to suggest exclusive capability of specific professionals in performing tracheal suctioning. The provision of adequate education to ensure competency is of foremost importance.

Acquiring competence in tracheal suctioning requires an in depth understanding in specific areas (Moore, 2003). Undertaking tracheal suctioning can be hazardous with significant side-effects which the clinician should be aware of (Day, Farnell, & Wilson-Barnett, 2002). The National Tracheostomy Safety Project has produced an e-learning package, developed in partnership with the UK Department of Heath's e-Learning for Healthcare project and the Royal College of Anaesthetist's e-Learning in Anaesthesia Project, which demonstrates tracheal suctioning methods. Suctioning guidelines are setting dependent and it is important that the SLT undertake tracheal suctioning only with the support and completion of a certified competency training package within their organisation.

Suctioning Key Statements	**Highest Level of Evidence as per SPA**
Tracheal suctioning is extended scope of practice for SLTs and it is not appropriate for SLTs to perform this task unless further competency training is undertaken	GPP-C

See Appendix 1 for further information re: evidence levels

14.0 Decannulation

14.1 Overview

Decannulation refers to the removal of the tracheostomy tube. Evidence regarding clinical indications for and procedural steps towards decannulation is limited. Criteria and processes are often population and institution dependent and may be influenced by traditional practices (Engels, Bagshaw, Meier, & Brindley, 2008). A systematic approach is preferable to ad-hoc weaning and decannulation, however in light of the many variables that can influence patient outcomes; management approaches should allow flexibility to address the needs of each individual (Braine &Sweby, 2006; Doerksen, Ladyshewsky, &Stansfield, 1994; Yu, 2010). Tracheostomy presence has associated risks, complications and psychosocial impact on the individual therefore timely removal is the goal; yet premature decannulation particularly in borderline patients can have severe consequences (Chadda et al., 2002; Gao et al., 2008). While the decision-making process may be multidisciplinary, the end decision to decannulate should be made and documented by medical staff, and is typically performed by nursing or medical staff. The physical act of removing or changing a tracheostomy tube is not within SLT's scope of practice.

Decannulation processes can vary according to the clinical site and setting in which the SLT operates. The clinician should be aware of the rationale for and impact of decannulation pathways and must ensure familiarity with their relevant organisational policies and procedures.

14.2 Decannulation Criteria

In the absence of research evidence, expert opinion and clinical consensus regarding decannulation criteria are often reported (Mitchell et al., 2012; Stelfox et al., 2008). There is some agreement within disciplines (Mitchell et al., 2012), however across the multiple specialist groups involved in tracheostomy management there is no consensus regarding indications or criteria for decannulation (Marchese, Corrado, Scala, Corrao, &Ambrosino, 2010; Veelo et al., 2008).

The following areas may be considered prior to decannulation; some are essential, but not all may be necessary:

- Resolution of initial need for tracheostomy
- Liberation from mechanical ventilation
- Airway patency
- Medical stability
- Respiratory stability

- Effective cough for airway clearance
- Airway protection from gross aspiration
- Controlled secretions (oral and pulmonary)
- Oxygenation
- No imminent surgery requiring endotracheal airway management
- Adequate level of consciousness
- Ability to tolerate tracheostomy occlusion
- One-way decannulation (i.e. palliation)

14.3 Decannulation Procedures

Cuff deflation is an initial step in the decannulation pathway to which additional procedures may then be applied. There is little agreement regarding selection, timing, and application of these procedures across clinical areas and disciplines. Decannulation processes reported in the literature are primarily expert opinions, descriptions, decision-making flowcharts and protocols specific to patient populations and clinical settings. Only one study compares two protocols: (1) an occlusion protocol (i.e. capping/spigoting/corking) requiring tube downsizing prior to decannulation, and (2) 24-48 hours of cuff deflation followed by decannulation (provided tracheal access was no longer required) (Thompson-Ward et al., 1999). In this study, patients following the cuff deflation only pathway achieved decannulation sooner and underwent fewer tube changes, with associated cost savings and no difference in adverse events. It is important to note however that this research was based on retrospective cohort comparison data and therefore more rigorous RCT evidence is needed to validate any specific decannulation pathway.

14.3.1 Prolonged Occlusion

Processes facilitating tracheostomy occlusion (e.g. downsizing, cuffless tube, fenestrated tube) have historically been utilised to disable the functions of the tracheostomy while in situ and "test" the individual's airway patency, airway clearance and airway protection prior to decannulation. Occluding a tracheostomy tube by placing a cap, spigot, cork or plug on the hub of the tracheostomy tube requires a person to breathe through reduced tracheal space as they inhale and exhale around the tube. Experimental testing of occluded tracheostomy tubes has shown increased airway resistance and potential for increased work of breathing, which may hinder progression

towards decannulation in borderline patients (Dellweg, Barchfield, Haidl, Appelhans, & Kohler, 2007; Hussey & Bishop, 1996).

Downsizing or changing to a cuffless tube may increase the tracheal space and thus may be considered to facilitate occlusion or speaking valve. However, by virtue of tracheostomy tube presence, the tracheal space for respiration is reduced. Changing to a fenestrated tube may allow increased airflow at a lower resistance compared to a standard tube as the air passes through and around the tube during occlusion (Hussey & Bishop, 1996). However, this is only effective if the fenestration sits correctly within open tracheal space. Siddharth and Mazzarella (1985) reported on 4 cases of tracheal granulation potentially related to the use of a fenestrated tube. They suggested that if the fenestration is incorrectly situated and adjacent to tracheal tissue the fenestration cannot be utilised for airflow and the risk of granulation is increased.

Tolerance of tracheostomy occlusion may indicate readiness for decannulation but is not necessarily influential in decision making (Stelfox et al., 2008). Recommendation for prolonged tracheostomy occlusion is a medical decision and does not fit within speech and language therapy scope of practice. However, there may be specific challenging cases whereby the SLT may consider high level discussion with the medical team.

14.3.2 Speaking Valve in the Decannulation Pathway

Improved comfort is reported when comparing speaking valve use to complete occlusion in individuals with long-term tracheostomies (Le, Aten, Chian, & Light, 1993). Speaking valves have been discussed for communication and swallowing (Refer to 11.3.1 & 12.3.2). The impact of speaking valve use on decannulation decision-making has not been well examined. Tolerance of a speaking valve is not a valid test of airway patency as information is provided on the passage of air on exhalation only (Johnson, Campbell, &Rabkin, 2009). Dynamic respiratory changes observed under normal bi-directional breathing conditions (e.g. tracheomalacia) may therefore not be identified.

14.3.3 Objective and Instrumental Evaluation

Consensus and expert opinion supports that a tracheostomy is no longer required when airway clearance, airway patency, and gross airway protection are

demonstrated (Christopher, 2005; O'Connor & White, 2010; Stelfox et al., 2008). Evaluation of these criteria is largely subjective and there is considerable variation in approach. Few objective measures of cough strength, airway resistance and airway pressure exist that are practical and applicable across patient populations (Bach & Saporito, 1996; Chan et al., 2010; Gao et al., 2008; Johnson et al., 2009), although cough peak flow of >160L/min in alert cooperative patients has been shown to be conducive to decannulation (Bach &Saporito, 1996).

Incidence of obstructive airway lesions has been reported as high as 67% in people with tracheostomies (Law, Barnhart, Rowlett, de la Rocha, & Lowenberg, 1993) therefore instrumental assessment of airway patency via bronchoscopy or fibreoptic endoscopic evaluation may be useful. However, not all identified airway lesions result in a clinical airway obstruction (Law et al., 1993; Raghuraman, Rajan, Marzouk, Mullhi, & Smith, 2005; Sue & Susanto, 2003). Hales et al. (2008) reported that FEES identified previously unknown clinical findings primarily relating to laryngeal function in 44% of individuals, which may influence decision making regarding airway patency and suitability for decannulation.

Other processes that may be utilised in the decannulation pathway include sleep study, bronchoscopy, digital occlusion, and mini-tracheostomy.

14.4 Decannulation Issues Specific to the Paediatric Population

Whilst the literature is limited in this area there appears to be a general consensus between centres regarding decannulation (Kubba et al 2004, Waddell et al 1997, Bakul et al 1999, Kontzoglou et al 2006). All children being considered for a trial of decannulation undergo a Microlaryngobronchoscopy (MLB) to assess their airway status. The typical decannulation process often takes the form of two methods which are outlined below:

Method 1: Decannulation in Theatre	Used for an infant or child who has a small tracheostomy tube in place when downsizing of the tube is not possible, or when a capped tracheostomy tube would occlude too much of the infant's airway and they would fail the downsizing and capping method.An MLB is performed, if the child or infant is deemed suitable for decannulation whilst under general anaesthetic the tracheostomy tube is removed in theatre and then the child's respiratory function is monitored closely over the following hours/days.

Method 2: Downsizing and Capping	The tracheostomy tube is downsized to a smaller tube on day 1. On day 2 if the child has shown no signs of respiratory distress their tracheostomy tube is capped. A polysomnography study is performed on the second night (Mukherjee et al 1999). On day 3 if the results of the polysomnography study are satisfactory the tracheostomy tube is removed

'Decannulation panic' is a phenomenon reported in children whereby decannulation fails despite an endoscopically confirmed patent airway with no obvious pulmonary or neurological abnormality (Black, Baldwin, & Johns, 1984). This may be due to reduced pulmonary function, particularly if the tube has been inserted due to an underlying pulmonary issue or diagnoses associated with respiratory muscle fatigue (e.g. respiratory distress syndrome, acute pulmonary oedema). Pulmonary function testing is recommended for this group (Aubier, 1989; Mallory et al., 1985).

14.5 Post Decannulation

SLTs should be aware of organisational policies and procedures regarding:

- Management post decannulation (e.g. stoma dressings, post decannulation observations)
- Signs of poor tolerance of decannulation (e.g. increased respiratory effort, use of accessory muscles, diaphoresis, distress, stridor)
- Complications post decannulation (e.g. poor stoma healing, bleeding)
- Failed decannulation (e.g. recannulation, resuscitation status)
- Emergency notification procedures and contacts

14.6 Failure to Decannulate

In some instances, the initial decannulation may be unsuccessful, but a subsequent attempt may be successful. A 2-5% decannulation failure rate has been reported as acceptable amongst physicians and respiratory therapists (Stelfox et al., 2008). Further assessment, for example, by an ENT may be necessary, and in some instances intervention may be required to facilitate decannulation (e.g. surgery, stenting).

14.6.1 Long-term Tracheostomy

Not all individuals with a tracheostomy are successfully decannulated and they may remain tracheostomised for the long-term. Reasons for this may include, but are not limited to, upper airway compromise, need for invasive mechanical ventilation, access to chest secretions, aspiration and decisions regarding palliative management (Russell &Matta, 2004). Medical advances and technology have facilitated the transition of individuals with a tracheostomyfrom the acute hospital setting to the home/residential setting and thus to the workplace and school environment.

An MDT approach is essential for discharge planning and ongoing management due to the complexities of individuals with a tracheostomy. The degree of SLT involvement with depend on the clinical needs of the patient. Coordinated liaison between the discharging facility and the community team is essential. Early discharge planning, appropriate destination selection, patient/carer training and education, support networks, equipment provision planning, planned tube changes and scheduled follow-up appointments are essential (Barnett, 2005; Bowers & Scase, 2007; Joseph, 2011; Lewarski, 2005; Montagnino & Mauricio, 2004; Vanker et al., 2013) and self-care and independence encouraged as goals (Russell &Matta, 2004). The tracheostomised and ventilated individual in the home requires advanced specialist management from a coordinated MDT. The degree of SLT involvement will fluctuate as the individual's needs change and progress throughout their clinical course.

If dysphagia for saliva/oral intake and communication management is ongoing, then the SLT involvement should continue as clinically indicated. When the person is discharged from the acute/rehabilitation setting to home or the residential setting, the SLT should provide all the necessary information to the individual, family/carer, receiving SLT and other health professionals involved with ongoing liaison as required. Workplace and school environment may also need to be included in the education/information provision and ongoing support. Children, in particular, will require a high level of supervision and care due to the hazards, and depending on age, significant ongoing Speech and Language Therapy for communication development.

The SLT working in community services may have less exposure to individuals with a tracheostomy, due to the small numbers of people with tracheostomies living in the community. They are advised to work within their scope of practice, skill base and clinical experience and should access support and assistance from more experienced clinicians as required.

Decannulation Key Statements	Highest Level of Evidence as per SPA
24-48 hours cuff deflation and tolerance of saliva where tracheal access is no longer required is recommended as one of the criteria for decannulation.	Level III
If an occlusion pathway is followed in the decannulation pathway, the tracheostomy tube is best to be downsized and cuffless however this is not within the scope of practice of the SLT.	Level III
If an occlusion pathway is followed in the decannulation pathway, a correctly positioned fenestrated tube could be considered, however this is not Speech and Language Therapy scope of practice.	Level IV
An incorrectly positioned fenestration increases the risk of granulation.	Level IV

See Appendix 1 for further information re: evidence levels

15.1 Referral Process

The referral process to a Speech and Language Therapy service is site specific but is expected to be clearly defined and documented (as per organisational policy).

15.2 Documentation

The documentation should also be in accordance with the policies of the employing body. It is the professional responsibility of the SLT to be aware of the employing body's policy on confidentiality and access to records.

Specific documentation for individuals with a tracheostomy should include:

- Reason for the tracheostomy and method and date of insertion
- Type and size of tracheostomy tube
- Period of intubation prior to tracheostomy and reasons for failed extubation(s)
- Date of tracheostomy tube changes
- Cuff status prior to and post Speech and Language Therapy session
- Communication options including AAC, speaking valve, specialised communication tubes
- Communication and cognitive function
- Swallowing function
- Management changes and rationale for changes
- Outcome of therapeutic intervention e.g. aspiration of food/fluid trialled, non-tolerance of speaking valve
- Acknowledgement of ENT/airway patency assessment
- Pre and post decannulation entries

15.3 Competency

The SLT and the employer must take responsibility to ensure there are systems in place to formalise the development of knowledge, skills and competency in line with organisational policies and procedures. Competency achieved in one facility will not necessarily be transferable to another facility.

To date there has been no formalised national competency programme in the area of tracheostomy management for SLTs in Ireland; a number of facilities both nationally and internationally have, or are establishing in-house competency programmes (Ward et al., 2008; Ward et al., 2012). Ward et al. (2012) reported that by having a formal tracheostomy competency training program in place, clinicians

reported greater number of hours of supervision prior to independent patient management and they felt more knowledgeable on current evidence. The National Confidential Enquiry into Patient Outcome and Death (NCEPOD) in their 2014 report "On the Right Trach?" recommended early referral to Speech and Language Therapy with specific competencies in tracheostomy care for all patients post tracheostomy.

Basic skills and knowledge (SPA 2013)

Some of the skills and knowledge that may be considered as necessary for independent management may include, but are not exclusive to:

- SLT's role and role of the multidisciplinary team and ability to work cohesively within a team
- Indications for a tracheostomy
- Methods of tracheostomy insertion
- Types of tracheostomy tube designs, features and indications for use
- Anatomical and physiological changes following tracheostomy
- Impact of the tracheostomy tube and cuff status on swallowing and other physiology
- Complications of the tracheostomy tube
- Impact and complications of the ETT
- Oral suctioning and above cuff suctioning (for designated tubes)
- Communication options, indications, and risks including use of speaking valves and specialised communication tubes
- Assessment and management of saliva tolerance, cuff deflation management and cuff pressure management
- Assessment and management of swallowing impairment
- Understanding of the indications and limitations of blue dye
- Knowledge of when to refer to instrumental swallowing assessment
- Ability to recognise signs of respiratory fatigue, increased work of breathing, respiratory distress and respiratory failure
- Decannulation pathway/process at one's facility
- Emergency procedures and universal precautions for the facility
- Knowledge of suctioning and humidification procedures
- Knowledge of general stoma and tracheostomy care
- Knowledge of modes of oxygen delivery and familiarity with relevant equipment
- Knowledge of policies and procedures of the organisation and Speech and Language Therapy department including tracheostomy, infection control and emergency procedures

- Knowledge of relevant IASLT documents and guidelines

Clinicians who have had a number of years of specific experience and/or additional education/training in the management of individuals with a tracheostomy may be considered as having more specialist skills. Some of the extra skills required may include:

- Expertise and specialist skills with a variety of specialty diagnostic groups such as acute neurosurgery, head and neck surgery, burns, spinal, slow to recover neurological patients
- Knowledge and use of instrumental examination (e.g. FEES)
- Contribution to the development and maintenance of tracheostomy programs, competency programs, policies and/or procedures at a local, regional or national level
- Teaching and supervision specific to tracheostomy
- Development and facilitation of relevant research projects
- Extended scope of practice skills (e.g. tracheal suctioning)

Skills for managing ventilator assisted patients:

The skill set required for independent management of the ventilator dependent individual is recognised as more advanced and requires additional knowledge, training and skills over and above those required by clinicians managing non-ventilated individuals. Ward et al. (2012) reported that 75% of the SLTs surveyed in the United Kingdom felt confident in managing the non-ventilated tracheostomy patient, however less than 50% felt confident managing the ventilated patient.

Additional skills and knowledge for working with ventilator dependent individuals may include:

- Knowledge of diagnostic populations requiring mechanical ventilation
- Knowledge of the progression of medical conditions that may require increasing dependence on mechanical ventilation
- Knowledge of the evolution of respiratory failure in a variety of diagnostic populations (e.g. progressive neurological conditions, Chronic Obstructive Pulmonary Disease)
- Recognition of the medical complexity, fragility and volatility of patients requiring ventilator assistance
- Knowledge of methods of mechanical ventilation including both non-invasive and invasive

- Knowledge of modes of ventilation (Assist Control AC, Synchronized intermittent mandatory Ventilation SIMV, Continuous Positive Airway Pressure CPAP, Bi-level Positive Airway Pressure BiPAP, Positive End Expiratory Pressure PEEP)
- Knowledge of volume versus pressure cycled ventilation
- Knowledge of ventilation components and measurements (e.g. tidal volume, respiratory rate, peak inspiratory pressure, variety of alarms, circuitry and tubing)
- Knowledge of specific types of ventilators used in one's workplace
- Knowledge of objective respiratory monitoring methods and norms including spirometry, pulse oximetry, capnography and arterial blood gas studies
- Knowledge of the protocols for weaning from mechanical ventilation at one's facility
- Knowledge of the potential impact that Speech and Language Therapy intervention may have on respiratory status and ventilation

The Royal College of Speech and Language Therapists has produced a comprehensive competency framework and an adapted format of this framework is included in this document. IASLT recommends use of the RCSLT amended framework for Irish therapists undertaking tracheostomy competency training (please see appendix C).

15.4 Leadership and Supervision

Senior and experienced clinicians have a role in leadership of less experienced clinicians. It is recommended that the new clinician to tracheostomy management undergo a supervision process when developing skills in this area. If there is no senior clinician in the workplace with tracheostomy experience, or no competency program in place, it will be necessary for the clinician to establish links with tertiary facilities or investigate formalised mentoring programs to obtain guidance and supervision in tracheostomy management and to develop the necessary skills. It is recommended that inexperienced clinicians do not consider managing patients with tracheostomies without being strongly linked to a mentor with considerable expertise and/or to a Speech and Language Therapy department with specialty in this particular area. It is also recommended that ongoing supervision and support will be required as case complexity increases.

15.5 Issues and Risk Management

The presence of a tracheostomy tube and the Speech and Language Therapy management of that individual carry risks for both parties. The individual with a tracheostomy often presents with complexities due to the significant medical condition necessitating the tracheostomy, medical fragility, and possible ventilation which may increase the risks.

The SLT should adhere to organisational policies and procedures, as well as local and national laws. By ensuring a sound training and competency process, risks should be minimised and the risk management pathway streamlined.

15.5.1 Complications of Endotracheal and Tracheostomy Tubes

The presence of an ETT or tracheostomy tube can be linked to a number of complications. Some of these may impact on the person's swallowing and voice, and thus the Speech and Language Therapy management. These include, but are not limited to:

Endotracheal Tube

Complications can occur to the individual as an immediate response to the insertion of the ETT or to the ongoing presence of the tube. Some of these include:

- Trauma to the mouth and pharynx
- Spinal cord injury
- Damage to the recurrent laryngeal nerve
- Subcutaneous emphysema
- Hypoxemia
- Rupture of the oesophagus
- Cardiac complications
- Laryngeal trauma (due to the position/movement of the tube on the vocal cords) – necrosis, granuloma, stenosis, laryngeal web, vocal cord impairment
- Tracheal trauma – tracheal stenosis

(Kaur & Heard, 2008)

Tracheostomy Tube

The insertion of the tracheostomy tube or the ongoing presence of the tube can result in complications. The complications can occur immediately, or can be intermediate or late complications. Controversy exists in the literature regarding the risks and complications of the surgical versus percutaneous insertion methods, but potential tracheostomy complications include, but are not limited to:

- Obstruction of the tracheal tube due to sputum plugging or tube mal-position
- Incorrect placement of the tube

- Accidental decannulation
- Pneumothorax
- Subcutaneous emphysema
- Haemorrhage during insertion, removal or at any time with a tracheostomy tube insitu. Significant bleeding can indicate a rare complication of tracheo-innominate fistula which can be fatal
- Suctioning trauma
- Oedema of laryngeal and tracheal structures
- Tracheostomy stoma infection or distortion
- Tracheitis
- Tracheal trauma – granuloma (at the stoma site), stenosis
- Pressure necrosis of the tracheal wall
- Tracheomalacia
- Suprastomal collapse
- Tracheoesophageal fistula
- Complications on re-cannulation (e.g. stoma collapse, loss of airway, risk of respiratory arrest)
- Risk of granulation with fenestration tubes

(Fikkers et al., 2004; Scalise et al., 2005; Seidman, Sinz, & Goldenberg, 2011; Zias et al., 2008)

Children have a high complication rate of up to 60%, associated with the presence of the tracheostomy tube, and mortality rate of 0.5-3% of tube related issues, predominantly due to accidental decannulation and blockage of the tube (Eber & Oberwaldner, 2006).

15.5.2 Risk Management in Speech and Language Therapy Service Provision

There are certain areas in the management of tracheostomy that can present specific risks to the person with the tube, which may be due to Speech and Language Therapy intervention or may impact on Speech and Language Therapy management. The clinician must be aware of these and there should be a risk management strategy in place to ensure patient safety. Risks management should be undertaken in conjunction with the tracheostomy multidisciplinary team. Risks include but are not limited to:

- Impact of cuff deflation or cuffless tubes with regards to saliva management and aspiration risk

- An inadequate or ineffective cough may limit the ability to clear oral and/or tracheal secretions from the airway which places the individual at risk of sputum retention/plugging
- Inadequate humidification can impact on the viscosity of the secretions leading to sputum retention/plugging
- Individuals are at risk of chest infections/pneumonia secondary to increased pulmonary secretions, inadequate clearance of secretions, and risk of saliva aspiration
- A single lumen tracheostomy tube has an increased risk of obstructing with secretions, particularly if humidification and suctioning care is compromised
- The potential impact of an inner cannula on respiratory work due to its narrowing of the tracheostomy tube lumen
- Contra-indications in the use of the speaking valve or prolonged occlusion (e.g. inflated cuff, upper airway obstruction, too large a tracheostomy tube, foam cuff, severe COPD, copious aspiration)
- The impact of a blocked tracheostomy tube
- Contra-indication of blue dye in specific populations
- Impact of cuff deflation, speaking valve and/or oral intake on mechanical ventilation

15.5.3 Infection Control

SLTs must adhere to the infection control policies of the organisation. Due to the nature of the tracheostomy there is the potential for increased exposure to bodily fluids, so strict policies must be followed, which may include the use of varied personal protective equipment (PPE), (e.g. goggles, gloves, gowns).

15.6 Policy Making

It is recommended that speech and language therapy services develop policies and protocols within the facility regarding tracheostomy management. This may involve policies specific to Speech and Language Therapy management and/or multidisciplinary policies and guidelines. To develop policies in this area, it would be expected that the clinician has specialist skills in the area of tracheostomy or be able to liaise with clinicians with expertise in the area.
It is particularly important that these policies cover such controversial areas as blue dye, decannulation practices, capping, and equipment provision.

15.7 Resources and Equipment

15.7.1 Equipment Required by Speech and Language Therapists

There are specific resources that an SLT working with individuals with a tracheostomy needs to have access to, to ensure safe and effective management. This includes, but is not limited to:

- Speaking valves
- Selection of AAC options
- iPad/AAC apps library
- Cuff pressure manometer
- Disposable syringes for cuff inflation/deflation, above cuff secretion removal
- Equipment for education and demonstration (eg. tubes, tracheostomy TOM demonstration model)
- Personal protective equipment (gloves, aprons, protective eyewear)

Depending on the employing body, these may be funded by the Speech and Language Therapy service or the organisation.

15.7.2 Equipment Required by Individuals with a Tracheostomy

In the acute hospital setting, all the necessary equipment for the patient with a tracheostomy will generally be provided by the organisation. However, funding for the trial and provision of electronic AAC will vary between facilities and counties, so this needs to be explored by the clinician. The SLT should be aware of organisational and national guidelines regarding provision and reimbursement of equipment for when a person with a tracheostomy is discharged to the community.

16.0 Education

16.1 Professional Development

SLTs should strive to continually update and extend their professional knowledge and skills through professional development activities and/or engaging the support of a mentor or supervisor (IASLT 2014). The SLT and the service have joint responsibility to identify the training and development needs of the clinician to effectively, efficiently and safely meet the needs of service users. Engagement in self-education activities is recommended including: accessing library services and resources; attending conferences, in-services, workshops, courses; using online information services; teleconferences; peer network meetings; involvement in special interest groups, IASLT CPD log.

16.2 Clinical Education

IASLT views student supervision as a professional responsibility and strongly encourages members of the profession to embrace the benefits of supervision (IASLT, 2014) As tracheostomy management is an area of practice requiring additional training, supervision with this group should be closely monitored and competency as a graduating student is not expected. Speech and Language Therapy students should be provided with opportunities to observe or participate in assessment/intervention with individuals with a tracheostomy where possible. The capacity for this will vary at different facilities.

16.3 Staff Education

It is in the scope of Speech and Language Therapy to educate staff in areas specific to Speech and Language Therapy. Target audiences may include medical staff, allied health staff, nurses, teachers, community staff, family/carers and others. Topics covered will vary according to the role of the SLT within the specific facility, type of facility and needs of the individual with the tracheostomy.

17.0 Research

17.1 Evidence Based Practice

As previously acknowledged, Speech and Language Therapy is a scientific and evidence based profession and SLTs have a responsibility to incorporate best available evidence from research and other sources into clinical practice. It is important for clinicians to keep themselves updated on literature and critically appraise ongoing research in the area of tracheostomy, and also other areas that may link in with tracheostomy management (e.g. dysphagia, FEES, videofluoroscopic examination of swallow, laryngectomy, AAC). Within the area of tracheostomy management, there are a number of controversial areas, which are discussed in this guideline. However, there are a number of issues regarding the literature for tracheostomy including: a limited amount of literature on the topic, low level evidence base, and the sample sizes are typically small. Thus, when searching for evidence, SLTs may find that little consensus exists in the literature or between experts in some areas to then determine best practice.

17.2 Research

Clinicians are encouraged to keep updated on and critically evaluate current literature, to then be able to identify gaps where research could be considered. There is a strong need for further research in the area of tracheostomy management. The role of the SLT has expanded, but only a small body of literature specific to Speech and Language Therapy practice exists. Assistance in conducting the research may be sought from associated academic/professional research units and/or universities. If a clinician is involved in research, it is important to abide by IASLT Code of Ethics (2006) and the research format should be consistent with the organisation's ethical procedures and/or guidelines. Reporting of the research both within and outside of the profession is also encouraged.

17.3 Outcome Measures

There is no published literature regarding outcome measures specific to tracheostomy and Speech and Language Therapy. There is literature that examines non-Speech and Language Therapy topics in the area of tracheostomy, such as comparing percutaneous and surgical insertion methods and timing of tracheostomy (i.e. early versus late), however there is nil pertaining to Speech and Language Therapy specific information.

18.0 Ethical Considerations

It is fundamental that SLTs observe the highest standards of integrity and ethical practice and abide to the Code of Professional Conduct and Ethics (IASLT, 2015). In many situations, the individual with a tracheostomy has progressed from being intubated and ventilated in a critical care environment to a tracheostomy. As a result, there are a number of ethical dilemmas that may arise and the clinician should be guided by the medical intervention plan, organisational policies and domestic, European and international laws as addressed by the Code of Professional Conduct and Ethics (IASLT, 2015).

There are a number of instances where the SLT is an integral member of the team and ethical decision making between the multidisciplinary team and individual/family/carer may be necessary. Examples of this include:

- Assessment of the cognitive and language ability and provision of communication options to determine the individual's ability to participate in and consent to or refuse treatment in conjunction with the medical team.

- Decision making around the individual with a significant dysphagia and non-tolerance of cuff deflation despite rehabilitation and the management options (e.g. long term tracheostomy, laryngectomy, one-way decannulation).

- Consideration of oral intake for quality of life for the individual who has a significant dysphagia and aspiration of oral intake (Palliative Care Competence Framework, 2014).

19.0 Legal Issues

19.1 Code of Ethics

SLTs should adhere to the IASLT Code of Professional Conduct and Ethics (2015) and to any codes, policy and procedures relevant to their employing body. All SLTs must also adhere to CORU's Code of Professional Conduct for Speech and Language Therapists.

19.2 Legislation

It is recommended SLTs be conversant with the national legislation that applies to the profession

19.3 Duty of Care/Consent

Members should refer to the IASLT Code of Professional Conduct and Ethics, 2015.

19.4 Service Guidelines

It is recommended that SLTs adhere to the approved guidelines of the employing body in terms of clinical and service management.

20.0 Future Directions

Medical advancement is increasing the survival rate of individuals with a tracheostomy, including very preterm infants, and tracheostomies are being performed more frequently. This, in combination with an ageing population, will potentially impact on the number of individuals with a tracheostomy and the role of the SLT. The role of the SLT within the multidisciplinary team for this population is now well recognised both at the individual level and at the level of 'dedicated setting multidisciplinary tracheostomy teams'.

However, a review of the literature reveals a small amount of research and generally low quality evidence base in the tracheostomy areas specific to Speech and Language Therapy, and the opinions are divided. This therefore makes it challenging for the practicing clinician to be fully informed by the evidence. There are areas that require the commencement of research and other areas that require further research. This would be beneficial for both the paediatric and adult areas and in both the non-ventilated and ventilated groups. Some of these areas include:

- Impact of the tracheostomy tube on swallowing
- Impact of cuff status on swallowing
- Impact of the speaking valve on swallowing
- Benefits of newer specialised communication tubes such as above cuff voicing tubes and the Blom Tracheostomy Tube System
- The relationship between fenestrated tubes and abrasion/granulation development
- Benefits of early saliva swallow rehabilitation for the acute patient for pre-cuff deflation suitability
- Use and suitability of a speaking valve as an airway patency screening/assessment tool
- Speech and language therapy and tracheal suctioning
- Further standardisation of the MBSImP (Modified Barium Swallow Impairment profile) (Martin-Harris et al., 2008) to include the tracheostomy population
- Impact of the timing of insertion and duration of tracheostomy on feeding and swallowing developmental outcomes in children.

As tracheostomy management requires additional specialised training, the skills and knowledge required to manage this area independently is therefore professional organisation guided. A consistent management pathway or competency program across the nation, with appropriate organisation modifications, should be considered to ensure a more standardised Speech and Language Therapy approach to the individual with a tracheostomy.

Methods of training and support to achieve competency are challenging with this population due to limited exposure in some settings, and rural and remote access. Simulation training is being utilised by a variety of professions (e.g. medicine, physiotherapy, podiatry, and nursing) and has been shown to be an effective teaching tool (Howard, Ross, Mitchell, & Nelson, 2010; Parker & Myrick, 2009; Wayne et al., 2010). It allows for 'no harm to the patient or clinician' in the simulated scenario, repetitive drills, and consistent training. Access to simulation training equipment is increasing internationally, eg Australia, and the use of simulation for tracheostomy management training for Speech and Language Therapists is being trialled within Australia currently (Ward, Baker, et al., 2012). Tracheal suctioning is an emerging area for Speech and Language Therapists as an extended scope of practice, and its progression should be facilitated and monitored as appropriate.

The National Tracheostomy Safety Project in the UK and The Global Tracheostomy Collaborative are two organisations aiming to improve consistency of tracheostomy care and safety internationally through collaboration with a variety of disciplines and stakeholders. Both of these organisations serve as useful resources for clinicians (see Appendix C)

21.0 Conclusions

IASLT recognises that management of the individual with a tracheostomy is within the scope of practice of the SLT and that competency based training in the workplace is recommended.

The individual with a tracheostomy is ideally managed by a multidisciplinary team and the Speech and Language Therapist is an integral member of that team and should work collaboratively within the team to ensure holistic care.

This clinical guideline aims to provide the best available evidence for provision of service to this challenging population. However, the evidence is mixed in a number of areas, and thus this document should be used as a guide, and the needs of the individual with a tracheostomy should be considered on an individual basis. There are a number of controversial areas within the area of tracheostomy management, and it is important that the clinician abide by the policies, protocols and role responsibilities within their organisation.

22.0 Appendices

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Appendix A: Evidence Based Recommendations

Speech and Language Therapy is a scientific and evidence-based profession. Speech and Language Therapists have a responsibility to incorporate best available evidence from research and other sources into clinical practice (Evidence-Based Practice in Speech Pathology, Speech Pathology Australia, 2010).

These guidelines have been developed to provide recommendations in the management of the patient with a tracheostomy according to the latest evidence in the literature.

The evidence to support these guidelines has been graded according to the National Health and Medical Research Council (NHMRC) guide. In 2009, the NHMRC developed a more extensive evidence hierarchy for classifying the literature, and this is outlined in the table below. When there has been minimal evidence in the literature, but the expert working party has reached consensus on the recommendations or clinical experience supports this statement, this has been given a grading of Good Practice Point-Clinical Opinion (GPP-C).

Table 1 NHMRC Levels of Evidence (2009)

Level	Intervention	Diagnostic accuracy	Prognosis	Aetiology	Screening intervention
I	A systematic review of level II studies	A systematic review of level II studies	A systematic review of level II studies	A systematic review of level II studies	A systematic review of level II studies
II	A randomised controlled trial	A study of test accuracy with: an independent, blinded comparison with a valid reference standard, among consecutive persons with a defined clinical presentation	A prospective cohort study	A prospective cohort study	A randomised controlled trial
III-1	A pseudorandomised controlled trial	A study of test accuracy with: an independent, blinded comparison with a valid reference standard, among non-consecutive persons with a defined clinical presentation	All or none	All or none	A pseudorandomised controlled trial
III-2	A comparative study with concurrent controls: -non-randomised experimental trials -cohort study	A comparison with reference standard that does not meet the criteria required for	Analysis of prognostic factors amongst persons in a single arm of a	A retrospective cohort study	A comparative study with concurrent controls: -non-randomised experimental trials -cohort study

	-case-control study -interrupted time series with a control group	Level II and III-1 evidence	randomised controlled trial		-case-control study
III-3	-Historical control study - Two or more single arm study -Interrupted time series without a parallel control group	Diagnostic case control study	A retrospective cohort study		A comparative study without concurrent controls: -Historical control study -Two or more single arm study
IV	Case series with either post-test or pre-test/post-test outcome	Study of diagnostic yield	Case series, or cohort study of persons at different stages of disease	A case control study A cross sectional study or case series	Case series

Tracheostomy Competency Framework (Amended for IASLT)

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Section 1 Introduction

The core competencies below reflect guiding principles in tracheostomy care to guide safe and best practice.

We have not repeated the core competencies in each specialist section. Please refer to the core tracheostomy competencies in conjunction with the specialist sections.

All the core competencies and skills will need to be tailor made in relation to your job description, client group and setting. This may include appropriate terminology for your client group. In the competencies below we have used the term *'where indicated'* to prompt you in this respect.

Where possible we have tried to group the contents but the groupings are not exhaustive.

You will need a tracheostomy mentor to guide you through this competency process. Depending on resources, this may be someone outside of your existing team. You may need to use local networks to identity a suitable person. For the competencies relating to communication, swallowing and SLT professional skills the tracheostomy mentor must be another Speech and Language Therapist working with patients with tracheostomies. For the more generic tracheostomy competencies the mentor may be another multidisciplinary team (MDT) member e.g. clinical nurse specialise or physiotherapist.

SLT suctioning is not covered within the scope of this document.

Pre-requisite core skills

Independent in the management of dysphagia and communication in non-tracheostomised patients within the same setting and client group as the tracheostomised patients.

Section 2 Core tracheostomy skills

Theoretical tracheostomy knowledge

Examples of methods of theoretical knowledge acquisition:

- Reading books, journals and trache company literature/websites (refer to reading list at end of this document)
- Discussion with reps/nurses/physios, anaesthetists, etc.
- Attendance at courses e.g. basic tracheostomy day
- Tutorial with tracheostomy mentor
- Reading local protocols
- Observing colleagues in MDT
- Case scenarios
- Visits to other hospitals
- External supervision
- Invite trainers to your department
- Reflective log

Examples of methods for practical skill acquisition

- Practice on models (Trache Tom)
- Observe on ward rounds/school visit/community clinic
- Carry out with patients

Note: There is no assumption made about the numbers of patients you have to see to achieve these competencies; this should be decided with your tracheostomy mentor in accordance with your needs, job requirements and clinical setting.

Theoretical knowledge required	Method of acquisition	Evidence of achievement	Date and sign
Anatomical/physiological			

1. Anatomical and physiological changes when a tracheostomy is *in situ*			
2. Physiological changes when tracheostomy tube is manipulated			
3. Impact of tracheostomy on voice production and airway			
4. Relevant literature regarding impact of tracheostomy tubes on speech and swallowing			
Rationale, method			
5. Reasons for requirement of tracheostomy tube			

Theoretical knowledge required	Method of acquisition	Evidence of achievement	Date and sign
6. Different methods for tracheostomy insertion and their risks and benefits			
7. Risks and benefits of tracheostomy			
Complications, impact			
8. Complications of tracheostomy (long and short term)			
9. Awareness of complications and impact of previous/ongoing airway management e.g. ventilation and intubation			
10. Knowledge of the signs of respiratory distress			
11. Identify potential emergency situations and how to respond appropriately			
12. Impact of tracheostomy on psychosocial functioning of patient e.g. on family and relationships, body image, community support, education, etc.			
Equipment			
13. Understand and describe a range of different tube types, from tubes used in standard practice to more specialised tubes, their function, rationale for use and contraindications			

14. Label accessories e.g. speaking valve/one way valve/HME/cap etc.			
15. Essential bedside equipment as per local policy			

Theoretical knowledge required	Method of acquisition	Evidence of achievement	Date and sign
Swallowing assessment			
16. Current literature on modified Evans dye testing and its limitations for aspiration detection			
17. Indications for oral and tracheal suctioning			
18. Understands the limitations of a clinical swallowing assessment in the presence of an inflated cuff			
19. Awareness of use and timing of different instrumental tools (e.g. Fibreoptic Endoscopic Evaluation of Swallowing (FEES), Videofluoroscopy (VFS) to assess laryngeal integrity for phonation, secretion management and swallow function			
20. Limitations of cervical auscultation (especially in cuff inflated patients)			
21. Knowledge of the value and limitations of pulse oximetry in tracheostomy management/swallowing assessment			
Cuff deflation, communication, speaking valves			

22. Cuff deflation - complications, safety and timing, impact on respiration function, secretion management and swallowing			
23. Impact of speaking valve/one-way valve on physiology of speech,			

Theoretical knowledge required	Method of acquisition	Evidence of achievement	Date and sign
swallow, respiratory workload			
24. Different types of speaking valves/one way valves, their function, limitations and impact on weaning			
25. Indications and contraindications for speaking valve/one-way valve use			
26. Understands the circumstances for feeding with an inflated cuff and SLT role in this, i.e. palliative/quality of life/patient choice			
Weaning			
27. Process and timing of weaning and decannulation including indications/contraindications			
28. Knowledge of medications and their impact on tracheostomy weaning			
29. Awareness of relevant patient co- morbidities and their potential impact on weaning			
30. The role of different tracheostomy tubes (e.g. fenestrated tubes) in the weaning process			
Roles and policies			
31. Role of SLT in tracheostomy management in specific setting			
32. Roles of other MDT members			

33. Knowledge of the implications of ear, nose and throat (ENT) findings on phonation, swallowing and weaning and likely interventions			

Theoretical knowledge required	Method of acquisition	Evidence of achievement	Date and sign
34. Awareness of outcomes measures related to tracheostomy management			
35. Local tracheostomy policies and national guidelines			
36. Local infection control policy pertaining to tracheostomies e.g. personal protective equipment, visors			

Core practical tracheostomy skills:

Skills required	Method of acquisition	Evidence of achievement	Date and sign
Rationale, method			
1. Identify reason from case history for tracheostomy insertion			
Complications, impact			
2. Recognises signs of respiratory distress and manages appropriately			
3. Recognises signs of cuff leak in an inflated cuff			

Skills required	Method of acquisition	Evidence of achievement	Date and sign
4. Able to describe impact of tracheostomy on communication and swallowing to patient and carers			
Equipment			
5. Identify type, size and cuff status of tracheostomy			
6. Able to remove, clean and reinsert inner tube according to local policy			
7. Able to use equipment e.g. cuff pressure manometer, pulse oximeter			
8. Able to give relevant information to patients about the tracheostomy tube			
9. Able to advise the MDT on selection of tubes			
Swallowing assessment			
10. Able to recognise aspiration signs in relation to a tracheostomy tube, e.g. identifying food/fluid stained secretions from trache on suctioning or stoma			
11. Able to recognise signs of aspiration around an inflated tracheostomy cuff			
12. Able to use blue dye as an adjunct to clinical bedside assessment of swallowing, acknowledging the significant limitations of the test			
13. Able to document clearly all aspects of tracheostomy assessment and management			

Skills required	Method of acquisition	Evidence of achievement	Date and sign
14. Provide dysphagia, communication and therapy recommendations appropriate to tracheostomised patients in the particular care setting			
Cuff deflation, communication, speaking valves			
15. Able to deflate cuff with simultaneous suction by an appropriately trained member of MDT			
16. Able to advise cuff deflation protocol as part of MDT			
17. Able to advise patient/family/MDT re effects of cuff deflation on voice and swallowing			
18. Able to finger occlude to assess voice			
19. Able to place speaking valve/one-way valve, and remove safely and appropriately			
20. Able to assess speaking valve/one- way valve tolerance, voice quality and trouble shoot any difficulties			
21. Able to re-inflate cuff and ensure that cuff pressure is checked in accordance with local policy			
Weaning			

22. Able to contribute SLT findings and their implications to team re: tracheostomy weaning and decannulation			
23. Able to adapt tracheostomy weaning advice according to plans for			

Skills required	Method of acquisition	Evidence of achievement	Date and sign
surgical/theatre interventions			
Training others			
24. Educates other MDT/family members and patient about the impact of tracheostomy on communication and swallowing and the appropriate use of one-way/speaking valve and Heat Moisture Exchange devices (HMEs)			
25. Able to advise on speaking valve/one way valve protocol as part of MDT and train other professionals as necessary			

Section 3 Attainment of competency

Once you have demonstrated these skills in theory, you need to demonstrate competency in the generalisation of knowledge, skills and decision making in relation to specific patient's assessments in your setting.

This can be done in a number of ways, but a suggested framework is as follows:

Practical application of knowledge

	Evidence	**Signature and date**
Observation, shadowing	Observe sessions and complete reflective log	
Take detailed case history	Completion of case history	
Assessment and management with assistance in decision making	Assessor to observe	
Decision making independently	Assessor to observe sessions	
Tracheostomy-related problem solving	Self appraisal Evidence of liaison in case notes Rarely requiring a second opinion	
Multiple tracheostomised patients on caseload	Same as above	
Training and presentation	Case presentation to rest of team	

Section 4 Maintenance of competencies

As per the whole of this document, there is no assumption made about the numbers of patients you need to see during a defined time period in order to maintain these competencies; this again should be decided with your tracheostomy mentor in accordance with your job requirements and clinical setting. Individual SLTs are responsible for maintaining their competency in this field through a commitment to CPD.

Section 5 Critical care tracheostomy competencies

Theoretical knowledge required	Method of Acquisition	Evidence of Achievement	Date and Sign
1 1.Knowledge of the different types and modes of ventilation, their benefits and complications			
2 Ability to understand the appropriacy of downsizing a tracheostomy tube or not i.e. to facilitate leak around tube vs. pt receiving adequate ventilation			
3 Understands when Passy Muir Valve (PMV) can be considered in patients who are ventilated			
4 Understands how a ventilator can be manipulated to optimise speech or to trouble-shoot non tolerance of PMV and to hypothesise causes			
5 Knowledge of relevant critical care roles and policies			
Skills Required	**Method of Acquisition**	**Evidence of Achievement**	**Date and Sign**
1 Identifies the current method and amount of ventilation and the ventilatory weaning status			

2	Able to recognise when assessment of a critical care patient is not indicated			
3	Able to recognise ventilator disconnection or failure alarms			
4	Demonstrates ability to place a			

	(PMV) in line with ventilator circuit, using the appropriate equipment				
5	Able to liaise closely with ICU team and communicate swallowing communication management plans clearly				
6	Influences local ICU tracheostomy policy				

Section 6 Head and neck competencies

These competencies only refer to head and neck knowledge with regard to tracheostomy management and do not encompass the competencies required for a whole head and neck caseload.

Theoretical knowledge required	**Method of acquisition**	**Evidence of achievement**	**Date and sign**
1. Understands the anatomical and functional changes between tracheostomy and laryngectomy (permanent stoma) patients			

2. Understands clinical requirement for tracheostomy, disease process, treatment intention (i.e. curative versus palliative) and predicted treatment trajectory			

Skills required	Method of acquisition	Evidence of achievement	Date and sign
1. Facilitates communication for laryngectomy patients with a tracheostomy tube *in situ*			
2. Able to differentially diagnose causes of dys/aphonia on phonation attempts with tracheostomy following surgery/radiotherapy, and proactively problem solve cause, considering appropriacy of decannulation attempts			
3. Knowledge of the appropriate use of tracheostomy tubes in complex laryngectomy/pharyngolaryngectomy in acute management during the healing process			
4. Awareness of scope of practice and when changing inner tube/deflating cuff is not appropriate due to disease process and bleeding risk			
5. Knowledge of local cancer network with reference to tracheostomy pathway for patients			
7. Form links with local cancer networks			

Section 7 Paediatric competencies

These competencies only refer to paediatric knowledge with regard to tracheostomy management and do not encompass the whole range of competencies required for working with a whole paediatric caseload.

Theoretical knowledge required	**Method of Acquisition**	**Evidence of Achievement**	**Date and sign**
1. Impact of developing anatomy and physiology in neonate/infant/child/adolescent			
2. Complications associated with long-term tracheostomy e.g. suprastomal collapse, granulation tissue			
3. Knowledge of current literature on the impact of long-term tracheostomy on communication development (including phonation)			
4. Knowledge of different modes of ventilation, benefits and complications			
5. Understands when PMV can be considered in patients who are ventilated			
6. Able to understand when downsizing a tracheostomy tube would be appropriate and when it would not i.e. to facilitate leak around tube vs. when patient needs to receive adequate ventilation			
7. Implications of changing airway pathology and impact on feeding and communication			

8. Role of extended MDT in community tracheostomy management and community support services e.g. respite			

care, educational staff			
9 . For paediatric head and neck caseload, understands the impact of treatment e.g. surgery, radiotherapy, on the timing and need for tracheostomy +/- risk of further treatment if that necessitates keeping the trache *in situ*			
10. Knowledge of health and safety implications of working with children with a tracheostomy in the community e.g. lone working, emergency procedures			
11. Awareness of children's potential behavioural response to having a tracheostomy and associated equipment			
12. Knowledge of tracheostomy support services e.g. Aid for Children with tracheostomies (ACT)			
Skills required	**Method of acquisition**	**Evidence of achievement**	**Date and sign**
1. Identifies the current type and amount of ventilation and the patients ventilatory weaning status			
2. Demonstrates ability to place a PMV in line with ventilator circuit, using the appropriate equipment			
3. Recognises potential for change in terms of child development and medical management in patients with long-term tracheostomy and appropriacy of timing of review			

4. Recognises the importance of MDT working in tracheostomy management and liaises with colleagues appropriately			

Section 8 Burns tracheostomy competencies

These competencies only refer to burns knowledge with regard to tracheostomy management and do not encompass the whole range of competencies required for working with a whole burns caseload.

Knowledge required	Methods of acquisition	Evidence of achievement	Date and sign
1. Knowledge of the risks of laryngeal trauma due to inhalation injury and subsequent impact on tracheostomy weaning, voice and swallowing			
2. Understands the effect of neck burns on the method of tracheostomy tube insertion, type of tube, stoma healing			
3. Understands the risks of dysphagia and patterns of recovery in burns patients e.g. delays to achieving oral feeding associated with tracheostomy/ventilation and facial burns			
4. Understands the effects of extent and type of burn injury on intubation and tracheostomy /ventilation requirements and swallowing			

5. Understands the effects of frequent theatre interventions on interruptions to tracheostomy weaning process or need for re-intubation for surgical debridement and skin grafting			

Practical skills required

Skills required	Method of acquisition	Evidence of achievement	Date and sign
1.Takes case history including presence of inhalation injury and intubation, extent/type of burn, tracheostomy/ventilation status			
2. Adapts swallowing and communications assessment to consider effects of neck burns on tracheostomy weaning (e.g. stoma leak, infection) and on ability to palpate swallow (e.g. dressings, pain) and detect aspiration			
3. Identifies bedside clinical signs of inhalation injury (e.g. dysphonia) following tracheostomy cuff deflation, speaking valve use or decannulation and refers appropriately to ENT			
4.Recognises laryngeal trauma due to inhalation injury on bedside swallowing assessment, refers for FEES and advises on impact on tracheostomy weaning			

Section 9 Community and/or long-term tracheostomy competencies

These competencies only refer to community/long-term knowledge with regard to tracheostomy management and do not encompass the range of competencies required for working with a whole community/long-term caseload.

Theoretical knowledge required	**Methods of acquisition**	**Evidence of achievement**	**Date and sign**
1. Understands complications associated with long-term tracheostomy			
2. Understands the role of the extended MDT in community tracheostomy management			
3. Knowledge of the local support available to patients in their own homes, nursing homes, rehab centres and children's centres			
4. Knowledge of local tracheostomy management protocols			
5. Knowledge of national/manufacturers tracheostomy equipment guidelines e.g. frequency of changes and required equipment within the home, nursing home or educational setting			
Skills required	**Methods of acquisition**	**Evidence of achievement**	**Date and sign**

1. Recognises inconsistencies in equipment use or tracheostomy care and alerts relevant professional with any concerns			

2. Recognises the importance of MDT working in community tracheostomy management and liaises with colleagues appropriately			
3. Recognises potential for change in patients with long-term tracheostomy and works with the MDT to facilitate weaning			

Section 10 References/reading lists

The following books and articles may guide your understanding of working with tracheostomy patients.

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Appendix C: Useful Resources

Useful Resources for Clinicians:
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Morris, L. & Afifi, M. (2010). Tracheostomies: The complete guide. Springer Publishing Company New York.
Tracheostomy Observation Model / T.O.M. ®
Global Tracheostomy Collaborative (GTC) www.globaltrach.org
National Tracheostomy Safety Project www.tracheostomy.org.uk
Tracheostomy Review and Management Service, Austin Health www.tracheostomyteam.org
www.passy–muir.com
St George's Healthcare NHS Trust. (2006) Guidelines for care of patients with tracheostomy tubes. www.stgeorges.nhs.uk/trachindex.asp
Patient & Carer Support Groups:
Aaron's Tracheostomy Page www.tracheostomy.com/
Healthcare Provider Support Groups:
National Tracheostomy Network (Contact details available from IASLT)

Appendix D: Abbreviations

AAC	Augmentative and Alternative Communication
AC	Assist Control
ASHA	American Speech – Language - Hearing Association
BDT	Blue Dye Test
BIPAP	Bilevel Positive Airway Pressure
BPD	Bronchopulmonary Dysplasia
CNLD	Chronic Neonatal Lung Disease
COAD	Chronic Obstructive Airway Disease
COPD	Chronic Obstructive Pulmonary Disease
CPAP	Continuous Positive Airway Pressure
EBDT	Evans Blue Dye Test
EC	European Community
EEA	European Economic Area
ENT	Ear Nose and Throat
ETT	Endotracheal tube
FDA	Food and Drug Administration
FEES	Fibreoptic Endoscopic Evaluation of Swallowing
FOF	Full Oral Feeders
GPP-C	Good Practice Point – Clinical Opinion
GTC	Global Trachestomy Collabrative
HIPE	Hospital Inpatient Enquiries
HPO	Healthcare Pricing Office
IASLT	Irish Association of Speech and Language Therapists
ICU	Intensive Care Unit
IMV	Intermittent Mandatory Ventilation
KSF	Knowledge and Skills Framework
LOS	Length Of Stay
MDT	Multidisciplinary Team
MEBDT	Modified Evans Blue Dye Test
MLB	Microlaryngobronchoscopy
MSC	Master of Science
NCEPOD	National Confidential Enquiry into Patient Outcomes and Death
NHMRC	National Health and Medical Research Council
NHS	National Health Service
PEEP	Positive End Expiratory Pressure
PICU	Paediatric Intensive Care Unit
PMV/PMSV	Passy Muir Speaking Value
PPE	Personal Protective Equipment
PRVC	Pressure Regulated Volume Control
PSV	Pressure Support Ventilation
RCSLT	Royal College of Speech and Language Therapists
RCT	Randomised Control Trial
SIMV	Synchronized Intermittent Mandatory Ventilation
SPA	Speech Pathology Australia
TBI	Traumatic Brain Injury

TCU	Transitional Care Unit
TOM	Tracheostomy Observation Model
TVD	Tracheostomy and Ventilator Dependant
UK	United Kingdom
USA	United States of America
VAP	Ventilated Acquired Pneumonia
VFSS	Videofluoroscopy Swallowing Study

Tracheostomy Tube Comparison Chart							
Shiley Sizes (mm) (inner cannula insitu)				Portex Blue Line Ultra Sizes (mm) (inner cannula insitu)			
Size	**ID**	**OD**	**Length**	**Size**	**ID**	**OD**	**Length**
4	5.0	9.4	65	7	5.5	10.5	70
6	6.4	10.8	76	8	6.5	11.9	75.5
8	7.6	12.2	81	9	7.5	13.3	81

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