



RCSLT RESOURCE MANUAL FOR COMMISSIONING AND PLANNING SERVICES FOR SLCN

Dysphagia

Dysphagia

RCSLT Project

1. Key Points

1. Speech and language therapists have a unique HCPC recognised and registered role in identifying and managing oropharyngeal dysphagia associated with a broad range of developmental, neurological and head and neck disorders. The key role of the speech and language therapist in the assessment, differential diagnosis and management of dysphagia has been recognised in national and international guidelines of practice.
2. There is evidence that the appropriate identification and management of dysphagia by speech and language therapists reduces morbidity, mortality and improves quality of life.
3. Improved nutrition and hydration have an impact on physical and mental well-being.
4. Speech and language therapists should be integral members of services and multiagency teams supporting people with dysphagia, their families and carers, and informing the broader clinical management.
5. Children and adults with dysphagia may present in different ways and have varying symptoms and profiles of retained abilities. Services should be person-centred and provide a range of interventions which are culturally appropriate.
6. Instrumental investigations, such as videofluoroscopy and fibre-optic endoscopic evaluation (FEES) are used to visualise the anatomy and physiology of the swallowing mechanism by speech and language therapists. This can improve the accuracy of identifying the nature of dysphagia. These investigations enable the trial of techniques or modification of textures to minimise the risk of complications associated with dysphagia.
7. There is evidence that interventions, behavioural and other, used by speech and language therapists in the treatment of dysphagia are effective.
8. NICE has recommended that transcutaneous neuromuscular electrical stimulation for oropharyngeal dysphagia should only be used with special arrangements in ongoing research or for audit.
9. The speech and language therapist has a key role in assisting patients to make informed decisions when balancing the risks and benefits of treatment options.
10. Speech and language therapists have a key role in educating/training others in identifying, assessing and managing dysphagia.
11. Persons with long-term conditions, who have transient, intermittent, persistent or progressive dysphagia often remain at risk of the complications associated with dysphagia and require the speech and language therapist to monitor and review progress over time.
12. The appropriate management of dysphagia can reduce complications and length of stay in hospital
13. The specialist skills of the speech and language therapists working with people with dysphagia must be appropriate for the requirements of the job, tasks undertaken, and the supervision available.
13. Pathways of care for persons with dysphagia should integrate speech and language therapy and take account of the changing needs and focus of interventions as the condition alters or declines.

2. Topic –What is dysphagia?

Introduction

Dysphagia is the term used to describe a swallowing disorder usually resulting from a neurological or physical impairment of the oral, pharyngeal or oesophageal mechanisms. The normal swallow has 4 phases:

1. oral preparatory
2. oral
3. oropharyngeal
4. oesophageal

The first three of these together are termed the oropharyngeal phase. The 'normal' swallow needs the respiratory, oral, pharyngeal, laryngeal and oesophageal anatomical structures to function in synchrony, which is dependent upon the motor and sensory nervous system being intact. Disorders of swallowing are associated with increased likelihood of aspiration, chest infections and pneumonia. Dysphagia is associated with increased morbidity, mortality and reduced quality of life. Pneumonia is a common sequelae of dysphagia and is associated with higher costs of care (Katzan et al 2007).

Dysphagia can be a transient, persistent or deteriorating symptom according to the underlying pathology.

Epidemiology

The prevalence of dysphagia varies with the aetiology and age of the individual. It is difficult to ascertain the prevalence rate for some populations because of the way dysphagia is reported, often forming part of other health conditions for which the patient is being treated. See table 1

Table1: Incidence and Prevalence of Dysphagia

Client group	Incidence/Prevalence of condition	Incidence/Prevalence of dysphagia within condition
Stroke	200/100,000 per UK population each year affected by stroke (National Clinical Guidelines for Stroke 2012).	Studies report an incidence of dysphagia of between 40% and 78% (Martino 2005) Of those with initial dysphagia following stroke 76% will remain with a moderate to severe dysphagia and 15% profound (Mann et al 1999)

Progressive neurological disease	Dysphagia can be an initial symptom in a small number of people with progressive diseases such as Parkinson's disease, multiple sclerosis and motor neurone disease, but the majority will develop dysphagia with progression of the disease	200/100,000 UK population have dysphagia due to Parkinson's disease (Hartelius and Svensson 1994). More than 90% of those with motor neurone disease will develop dysphagia
Chronic Obstructive Pulmonary Disease		27% (McKinstry et al 2009)
Dementia		68% of those with dementia in homes for the aged have dysphagia (Steele 1997)
Adult Learning Disability		5.27% of all adults with a learning disability were referred for advice regarding dysphagia (Chadwick et 2003)
Nursing home residents		Between 50 and 75% of nursing home residents (O'Loughlin & Shanley 1998)
Acute hospitalised elderly		10% of acutely hospitalised elderly. (Lugger 1994)
Cerebral Palsy	Sucking (57%) and swallowing (38%) problems in the first 12 months of life were common, and 80% had been fed nonorally on at least one occasion.	99% of children with severe cerebral palsy have dysphagia (Calis et al 2008)

(S.Reilly, D.Skuse,
XPoblete 1996)

Duchenne
muscular
dystrophy

1 in 3,600 boys

Common with
progression of
disease(Archer et al
2013)

Disordered swallowing has been recognised as a significant problem following stroke as whilst stroke is the third most common cause of death and the most important cause of long-term disability most stroke-related deaths are due to medical complications of the stroke, rather than directly due to the neurological damage. Only 10% of stroke-related deaths are caused by neurological deficits, while 30% of post-stroke deaths are due to pneumonia (Heuschmann P., et al., 2004, Kwan et al 2008). In 67% of patients pneumonia manifests within 48hrs of admission (Hassan A., et al. 2006). It is almost invariably associated with swallowing problems. Clinical studies show evidence of dysphagia in over 70% of stroke patients (Martino R., et al 2005). In 75% of patients with early swallowing problems dysphagia will continue to be moderate to severe, and in 15% it will remain profound (Mann G., et al.1999). Preventing pneumonia with early and effective treatment of dysphagia could have a significant impact on survival, patient experience, functional recovery and costs.

Dysphagia is, also, now recognised as a symptom of concern in many other conditions such as COPD (McKinstry et al 2009), head and neck cancer (McCabe et al 2009), thermal burn injury (Ward et al 2001) and acquired brain injury (Ward et al 2007). A study of those having cervical discectomy and fusion indicated an incidence of dysphagia in 50.3% of patients (Frempong-Boadu et al, 2002). Dysphagia is commonly noted as a symptom in the frail elderly or with any impairment of oral structure, the respiratory or neurological system can cause dysphagia.

3. **What causes dysphagia?**

Oropharyngeal dysphagia can result from a number of factors. The causes may be:

- Neurological – including diseases/injuries or abnormalities of the central nervous system, anterior horn cell, peripheral nervous system and/or neuromuscular junction.
- Physical - related to head and neck impairments such as cancer and or surgery-e.g., glossectomy
- Respiratory disease e.g. COPD
- Psychological

In both children and adults dysphagia can present as acute or chronic, and within these categories, static or progressive in its presentation. It is frequently associated with the following disorders:

- Stroke
- Head/neck cancer
- Acquired Brain injury
- Brain or CNS Cancer
- Respiratory conditions (including COPD or post polio syndromes)
- Following cervical spinal surgery
- Progressive neurological diseases, including Multiple Sclerosis, Parkinson's Disease and Dementia
- Developmental disorder (carried on into adulthood)

(Crary & Groher, 2003)

The ability to swallow normally can be influenced by a number of factors which can include coordination and strength of the musculature, posture, bolus size, texture of bolus, disuse of swallow due to illness, ageing, cognition, respiratory, and cardiac problems.

4. How does Dysphagia affect individuals?

Impact of dysphagia

Difficulty with swallowing may have life threatening consequences and can lead to an impaired quality of life. This may be due to embarrassment and lack of enjoyment of food, which can have profound social consequences for both the person and members of the family. Aspiration of food, drink and saliva is frequently caused by oropharyngeal dysphagia and can lead to aspiration pneumonia (Marks & Rainbow, 2001).

Dysphagia can present in many ways, and the patient may demonstrate one or several of the following symptoms:

- Food spillage from lips
- Taking a long time to finish a meal
- Poor chewing ability
- Dry mouth
- Drooling
- Nasal regurgitation
- Food sticking in the throat
- Poor oral hygiene
- Coughing and choking
- Regurgitation
- Weight loss
- Repeated chest infections

Children

In children there are serious implications for both survival and brain development if nutrition is insufficient for developmental needs (Boyle 1991). There is increasing awareness of compromised swallowing in preterm babies. Respiratory disorders caused by aspiration can seriously affect the child's ability to survive or thrive. In addition, pressure on the caregiver to provide sufficient nutrition and intake for weight gain can cause anxiety and give rise to stress around feeding (Arvedson & Lefton-Greif, 1994). There is particular need to give support to families of children who are tube fed as it is important to develop systems to have a pleasant feeding/meal times to establish a good carer-child relationship (Sullivan 2005). Stressful feeding and meal times can impact on wellbeing, social interaction and lead to behavioural issues.

Adults

Pneumonia is a major cause of morbidity and mortality after stroke or head injury that can be associated with dysphagia. Sellars et al (2007) in a study of 412 patients determined the key characteristics that would predict patients at high risk for poststroke pneumonia. They concluded

that it was associated with, older age, dysarthria, severity of post stroke disability and an abnormal water swallow test.

Furthermore, aspiration pneumonia is a leading cause of death in nursing homes. It has been reported that between 35-85% of people are malnourished in longstay institutions such as nursing and residential homes. As well as being an alarming symptom, swallowing difficulties in the elderly lead to physical and psychosocial problems which reduce the quality of life. Tibbling & Gustafsson (1991) found that elderly patients with dysphagia had significantly more frequent chest pain, heartburn and regurgitation than those without dysphagia. Difficulty with swallowing also caused anxiety at mealtimes; either the individual not wanting to eat alone for fear of choking, or feeling embarrassed at their slow and unusual eating behaviour (Costa Bandeira et al, 2008). In elderly patients swallowing problems can confound existing problems such as diabetes and wound healing (Carrau and Murray, 1998). Guidelines produced by the Royal College of Physicians (2012) require the early diagnosis and effective management of dysphagia stating that it has been found to reduce the incidence of pneumonia and improve quality of care and outcomes.

There are cost implications associated with dysphagia. Length of stay in hospital is longer for those stroke patients with dysphagia compared with patients without dysphagia and patients with dysphagia were twice as likely to be discharged to a nursing home than those without. (Odderson et al 1995).

“When a person is unable to swallow, the ability to enjoy almost all other aspects of life is affected. Even minor, intermittent dysphagia can lead to psychological and social stresses. Episodes of choking can lead to a fear of eating that can lead to malnutrition and social withdrawal.”
(McCulloch et al, in Perlman and Schutze-Delrieu 1997)

5. What are the aims/objectives of speech and Language therapy interventions for dysphagia?

Speech and language therapists have a unique role for the assessment, diagnosis and management of oropharyngeal dysphagia. The aims and objectives of speech and language therapy interventions for dysphagia depend on the type and nature of the dysphagia, the underlying cause, and the needs and preferences of the individual. Considering the safety of the swallow, managing aspiration and preventing complications are of paramount concern. In children the aims and objectives will change as appropriate to the age as the child's anatomy and neurological abilities alter with growth and development (Logeman 1998).

The overall aims of the speech and language therapist working with an individual with dysphagia include:

- detailed and accurate assessment (there may be multiple assessments over time) leading to accurate diagnosis of dysphagia which may assist with the differential medical diagnosis.
- ensuring safety (reducing or preventing aspiration) with regards to swallowing function.
- balancing these factors with quality of life, taking into account the individual's preferences and beliefs.
- working with other members of the team, particularly dieticians, to optimise nutrition and hydration.
- stimulating improved swallowing with oral motor/sensory exercises, swallow techniques and positioning.

Assessment methods

Screening protocols

Screening of swallowing in order to determine the presence of dysphagia, using bedside screening protocols is often appropriately undertaken by nurses and doctors and other health care workers who may be trained by speech and language therapists.

A study by Hinchey et al (2005) examined the process of dysphagia screening procedures for persons following stroke and found that formal dysphagia screening was associated with a higher adherence rate, improved detection and decreased risk of pneumonia. They concluded that formal screening protocols should be offered to all stroke patients regardless of stroke severity.

The RCP guidelines for Stroke (2012) also recommend that patients with acute stroke should have their swallowing screened within 4 hours of admission to hospital, before being given any food, fluid or medication and should have an ongoing management plan for the provision of adequate hydration and nutrition.

A prospective study (Ickenstein, 2012) considered the possibility of predicting chronic dysphagia within seventy-two hours of an acute stroke. All patients admitted to a stroke unit were screened for swallowing problems by nursing staff within two hours. All patients demonstrating signs of aspiration completed a clinical swallowing exam performed by a speech therapist within twenty-four hours. The study found that signs of aspiration within seventy-two hours following an acute stroke can predict severe swallowing problems by day ninety.

Assessment

Speech and Language Therapists will take a full case history and conduct clinical and instrumental assessments along with bedside clinical examinations, and, if indicated, use more detailed formal assessments.

The SLT can use instrumental dysphagia assessments such as videofluoroscopy (dynamic x-ray) or fibre-optic endoscopic evaluation (FEES) to visualise some or all of the three swallow stages (FEES only visualises the pharyngeal phase). These examinations allow inspection of the anatomy and physiology of swallowing, the presence and/or cause of aspiration and the pooling of residue in order to aid diagnosis and to help identify strategies to improve the swallow efficiency and provide a benchmark for outcomes. These investigations will allow the SLT to determine the management of the appropriate eating/feeding regimes.

A literature review (Ramsey, Smithard, & Kalra, 2003) synthesised evidence from the international literature on the various assessment methods for early assessment of dysphagia in acute stroke patients and considered the advantages and disadvantages of the different methods. The most frequent method used to assess swallowing was the bedside swallow assessment. If further assessment was then indicated, videofluoroscopy was usually used. Bedside swallow tests are safe for patients and relatively easy and quick to perform. However, silent aspiration can be missed in bedside tests and reliability is variable. In terms of assessing swallow mechanics and testing the safety and efficiency of compensatory swallowing techniques these authors concluded that videofluoroscopy has advantages over bedside tests but they caution that the results are dependent on following operating procedures correctly, and the assessors being trained to

interpret the results. Additionally, many acute stroke patients recover from dysphagia within two to four weeks after a stroke; thus to subject patients to a complicated test may be unnecessary. The study concluded that, although bedside tests are a useful and practical early screening tool, they are not always accurate.

Fibreoptic endoscopic evaluation of swallowing (FEES) has been found to improve the accuracy of the detection of the presence of dysphagia, aspiration and the underlying causes of this. It is also used to evaluate methods of management by examining the impact of different head positions and dietary substances and the impact of these on improving swallow safety. It has been argued that this improves selection of appropriate treatment procedures. (McGowan et al 2007, Leder 1998, Ajemian et al 2001)

In recent years cervical auscultation has been adopted in many areas as an adjunct to the bedside / clinical assessment for dysphagia. Cervical auscultation is defined as 'the use of a listening device, typically a stethoscope in clinical practice, to assess the sounds of swallowing' (Leslie et al. 2007). Listeners interpret the sounds and make inferences about the efficiency of the swallow or cause of the impairment. There is no agreement on the origin and implication of the sounds heard when using this technique to assess swallowing (Zenner, Losinski, & Mills 1995; Stroud, Lawrie, & Wiles 2002) and the reliability of raters using this technique has been found to be poor (Stroud, Lawrie, & Wiles 2002). At present there is no robust evidence that cervical auscultation should be adopted in clinical practice for screening or diagnostic purposes (Leslie et al. 2007).

Pulse oximetry has also been suggested as an alternative to monitoring swallowing and detecting aspiration. Pulse oximetry is well tolerated as it requires little patient co-operation and is an inexpensive option to other instrumental assessments such as videoflouroscopy (Collins & Bakheit 1997). Using pulse oximetry to detect aspiration is based on the principle that reduced and oxygenated haemoglobin exhibit different absorption characteristics to red and infrared light emitted from a finger or ear probe (Murry & Carrau 2001). Pulse oximetry measures the frequency and severity of oxygen desaturation of arterial blood, which is recognised as a possible marker of aspiration.

Zaida et al (1995) suggested that desaturation as demonstrated by using pulse oximetry while drinking, was a possible clinical indicator of aspiration, as greater desaturation in patients with acute stroke were found than in controlled matched subjects. The study found that the degree of desaturation correlated with assessment of aspiration risk, however other studies have found no correlation between desaturation and aspiration (Sellars, Dunnet, & Carter 1998; Colodny N 2000). Wang et al. (2005) reported no significant association between the reduction in oxygen saturation and aspiration, identified simultaneously by videofluoroscopy, among 60 patients with dysphagia due to stroke and nasopharyngeal cancer.

Although pulse oximetry is a quick and non-invasive method to detect aspiration following stroke, its association with oxygen desaturation has been inconclusive. Generally, when compared with other instrumental assessments its performance has been poor.

Speech and language therapy interventions

Speech and language therapists (SLT's) will often provide education and training for those responsible for providing nutrition, hydration and mealtime support (family, professionals, and

relevant others) and maintain links with the multi-disciplinary team to ensure good communication. SLTs are pivotal in the team supporting long-term management of those with dysphagia associated with a long-term chronic or progressive condition. There is evidence that some individuals discharged with a percutaneous endoscopic gastrostomy (PEG) tube can have these removed once swallowing improves. The speech and language therapist has a role in monitoring change of swallowing over time. Appropriate insertion or removal of PEGs is associated with improved quality of life and reduced health and social care costs.

Management of dysphagia frequently requires environmental modifications, safe swallowing advice, appropriate dietary modification, and the application of swallowing strategies, which improve the efficiency of swallow function and reduce the risk of aspiration. See Box 1

Box 1--- Frequently used interventions

- Modify consistency of food.
- Modify consistency of fluids.
- Modify feeding strategies.
- Indirectly modify swallow techniques.
- Modifying the physiology of the swallow mechanism during swallowing.
- Modify posture.
- Improve oral hygiene
- Introduce strategies to increase confidence and reduce fear of choking
- Educating carers

(Crary & Groher, 2003. Costa-Bandeira et al, 2008. Rosenvinge & Starke, 2005)

Table 2: International Classification of Functioning (ICF) dimension and focus of speech and language therapy assessment

ICF dimension	Factors
Impairment	general motor skills structure vocal tract function respiratory status tracheostomy status cognitive levels level of alertness effect of medication oral hygiene oral sensitivity dental health
Activity	nutrition and hydration management of secretions dietary preferences current feeding pattern positioning posture bolus size altered food consistencies pacing and presentation of food and drink need to use special utensils coping strategies
Participation	environment mealtime interaction ability to participate in social meal times ability to eat in different locations cope in differing social settings
Well-being	effects of emotional state, mood and behaviour

6. What is the management for people with dysphagia?

As a core member of the multi disciplinary team, speech and language therapists will play a key role in contributing to the early diagnosis of individuals with dysphagia and identifying the specific level of impairment providing appropriate intervention and information for those individuals with dysphagia, their family and carers.

The role of the multi-disciplinary team working with those who have swallowing disorders include:

- Development of co-ordinated assessment protocols, joint goals and timely intervention
- Joint treatment plans with written documentation
- Multi-disciplinary audit of practice
- Agreed common approach to the involvement of patients/relatives/carers

Speech and language therapists are generally involved in environmental modifications, safe swallowing advice, appropriate dietary modification, and the application of swallowing strategies, which improve the efficiency of swallow function and reduce the risk of aspiration. They commonly provide advice and strategies to:

Many persons with dysphagia (particularly those with cognitive problems) may be unaware that they have a swallowing problem, thus carers have to take responsibility for following the recommendations of the speech and language therapist. Educating carers involved in the care of patients with dysphagia is essential in ensuring compliance with safety recommendations made by the speech and language therapist. Lack of information and appropriate supervision are common reasons for non-compliance with safe swallowing strategies. Studies have indicated

that the guidance given by speech and language therapists can greatly improve adherence to swallowing regimes (Rosenvinge & Starke, 2005).

There are time implications for the education and training that SLT's provide to other professionals and family members. Working as part of a multidisciplinary team necessitates taking on team roles such as attending care planning meetings.

Cultural diversity

Many individuals who have English as a second language, or are from a culture which have particular beliefs and customs associated with eating, will require specialist and sensitive consideration by the speech and language therapist. These individuals may have more difficulty in accessing services and co-operating fully in detailing their symptoms and participating in an assessment. An interpreter may be required to assist the SLT's assessment, to ensure it is both accurate and reliable and to facilitate understanding of therapy and implementation of treatment strategies. There is a time and cost implication when working with interpreters/co-workers, for example, in taking a case history, completing a full assessment in languages spoken by the individual (if appropriate) and their family. Timings of assessments and mealtimes need to be culturally sensitive, for example, not offering appointment times which coincide with religious observations (Communicating Quality 3, 2006).

7. What is the evidence for Speech and language therapy interventions in dysphagia?

Literature Synthesis

The focus of the interventional synthesis within this briefing is to provide a synopsis on the effectiveness of speech and language therapy interventions for dysphagia.

Methodology

The interventional synthesis is not intended to be a full systematic review within the area of dysphagia. However, it draws upon systematic review techniques to ensure that the synthesis is developed according to systematic, explicit and reproducible methods. The intention of the syntheses is to consolidate articles which represent some of the best research in the area of dysphagia. The initial synthesis was completed in early 2009, with the update completed in May-June 2013.

Literature searching

Firstly, search terms were selected within the project team drawing on the expertise of four speech language professionals. This involved listing all possible synonyms describing the condition or population (e.g. dysphagia or aphagia or swallowing disorders etc) and combining those with terms described speech and language therapy. For the update of the synthesis the intervention terms were broadened to ensure that relevant research on transcutaneous neuromuscular electrical stimulation (NMES). Terms were used in both free text and thesaurus searching. The following databases were used:

- ASSIA
- CINAHL
- The Cochrane Library (which includes the Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled trials, Database of Abstracts of Reviews of Effects, Health Technology Assessment Database and NHS Economic Evaluations Database).
- Linguistics and Language Behaviour Abstracts
- MEDLINE
- PsycInfo

All references retrieved from the literature searches were entered onto a Reference Manager Version 11 database using appropriate keywords.

The searches results were limited to English Language and to studies after 1998.

Selecting and obtaining relevant articles

Articles for inclusion were selected to illustrate the range of good quality evidence within each topic area. An initial screening of articles was undertaken by Anna Cantrell who adopted the following principles:

- Articles must be empirical research evaluating the effectiveness of a particular speech and language therapy intervention
- Only articles published in English language are included.
- In general, only the most current (1998-present) literature is included. However, exceptions were made to this if a particular article was felt to be important to include.
- Where possible higher level evidence was included (systematic reviews, randomised controlled trials). However, this research did not always exist necessitating the inclusion of lower levels of evidence i.e. case series, pilot studies and cohort studies. Additionally, effort was made to seek out literature that provided a range of perspectives on interventions for each topic area, i.e. both quantitative and qualitative research.

Following initial screening, the remaining articles were examined by Pam Enderby who has considerable speech and language therapy knowledge and experience.

Assessing the quality of relevant articles

Quality assessment involved using checklists as a guideline to give an indication of the overall quality of studies and identify the main errors within each study. For each interventional synthesis, the study designs are listed and the problems with each study design noted. Common errors within the studies are noted and *general observations* on study quality are made. The checklists used are one for quantitative and one for qualitative studies from the Alberta Heritage Foundation for Medical Research (2004). Additionally, when an identifiable study design was used, the appropriate Critical Appraisal Skills Programme checklist was selected. Where, studies met all quality indicators on the appropriate checklist, they were deemed excellent. Good studies generally had two to three faults identified by the quality checklists and average studies had more than three faults identified. 'Faults' depended on the study design being assessed. For example, in a randomised controlled trial, failure to explain the randomisation procedure or numbers lost to follow up during the trial could affect the robustness of the study outcomes and hence the quality of the study. For more information about faults in different study design, please look at the quality checklists used within these briefings.

Syntheses of the articles

The key points from each article were summarised including the objective of the study, the participants' characteristics, the methodology, the intervention, results and limitations. From this, articles were grouped into themes according to the type of intervention being investigated (e.g. swallowing therapy, diet modification). Results were summarised and drawn together within each particular theme and a summary paragraph provided at the end.

Studies

This synthesis draws together the evidence from thirty-six studies on patients with dysphagia or swallowing difficulties. The included studies were conducted in a variety of countries and healthcare settings. 7 of the studies were conducted in the UK, 5 in USA, 2 in Germany, Holland, Australia and Korea and 1 in Italy, France, Turkey, Japan and Thailand. Additionally, one of the studies recruited participants from 3 European countries; Sweden, Netherlands and

France. All of the studies were published in English, with the earliest being published in 1998. The studies investigated from six to 711 patients. The studies investigated different treatment options for dysphagia, methods for assessing dysphagia, the clinical progression of dysphagia within specific conditions, and the impact that dysphagia can have on an individual's quality of life. The literature described here is organised by intervention type. The different treatments covered in this synthesis can be broadly categorised as speech and language therapy interventions, diet modification and pharmacological interventions. The papers cover dysphagia occurring following surgery, stroke or traumatic brain injury and as a symptom of Parkinson's disease, Huntington's disease, Dementia and Cerebral Palsy. Two of the studies investigated the clinical progression of dysphagia in children, one with traumatic brain injury and the other following surgery for posterior tumour.

Study design

The synthesis includes studies with a range of study designs. There were 10 randomised controlled trials (RCTs), 3 clinical trials, 8 systematic reviews, 4 cohort studies, 2 literature reviews, 2 pilot studies, 2 prospective studies, 2 surveys 1 interventional study, 1 retrospective study and 1 case-series study. The quality of the eight systematic reviews was generally very good to excellent. The randomised controlled trials were of very good or good quality with their strength being in good statistical analysis of results and the consideration of confounding factors. Three of the RCTs were pilot studies that followed the RCT methodology well but only investigated very small sample sizes. Similarly the clinical trials and pilot studies had small numbers participating and in some self-selection to take part in the studies. The lack of randomisation in the clinical trials introduces the possibility of bias. The other studies were generally of average to good quality. The common problems with these studies were the use of small convenience samples, possible confounding factors, and no comparison group. One of the studies was a literature review which was of average quality due to limited information on methodology. Results from case studies have been included in this synthesis. However, it is important to be aware that they provide weaker evidence of effectiveness of interventions.

Caution should be applied if generalising results from small studies to the larger population of dysphagia patients.

Finally, it is worth noting that the findings from the non-UK papers need to be interpreted cautiously due to generalisability of findings to the UK population.

Synthesising pre-existing studies

A number of studies attempted to draw together the conclusions of studies investigating therapy for individuals with dysphagia.

An excellent Cochrane systematic review (Bath, Bath-Hextall, & Smithard, 1999) investigated the effectiveness of different interventions for dysphagia in acute stroke patients. The study identified six small RCTs. One of the included RCTs was a trial on the effectiveness of swallowing therapy. The review found that formal swallowing therapy did not significantly reduce dysphagia when compared with standard treatment. The, one trial on drug therapy found that drug therapy with nifedipine did not alter the frequency of dysphagia or end of trial case fatalities. This systematic review was recently updated (Geeganage, et al., 2012) to include studies up to February 2012. The review now includes studies on interventions for sub-acute and acute stroke patients. Eighteen studies on swallowing therapy are included in the update with the broad term swallowing therapy comprises acupuncture, behavioural interventions: swallowing exercises/therapy and dietary modification, drug therapy, NMES, PES, physical stimulation (thermal, tactile), TDCS and TMS. All of the techniques failed to demonstrate significant individual effects on functional outcome or case fatality although there is limited data for all of the techniques. Acupuncture and behavioural interventions significantly reduced dysphagia at the end of the trial. The one study on NMES found that there was insufficient evidence for the effectiveness of NMES for treating dysphagia. The update included one further study on drug therapy. The new study investigated an antibacterial oral gel in fifty-

eight dysphagic stroke patients. The gel was found to have no significant effect on the rates of chest infection or pneumonia. The update concluded that there was still insufficient data on the effects of drug therapy in stroke patients. The update additionally investigated nutritional support. The available evidence suggests that in the short-term survival might be better if feeding is started earlier and found that the limited evidence suggested a possible lower death rate with PEG compared to NGT feeding. The overall delivery of food seems to be improved by PEG feeding. Nutritional supplements only seem to be beneficial if patients are malnourished or possibly if they are at risk of becoming malnourished.

Foley, et al (2008) reviewed the evidence for different treatments of dysphagia in patients who had suffered a stroke. This good systematic review identified RCTs published from 1966 until August 2007. The review included 15 studies covering a broad range of therapies including texture-modified diets, general dysphagia therapy programmes, non-oral feeding, medications and physical and olfactory stimulation. Two of the RCTs investigated the effectiveness of general swallowing treatment programmes. Such programmes are recommended and administered by speech-language pathologists. The overall evidence suggested that swallowing treatment programmes are associated with a reduced risk of pneumonia during the acute stage of stroke. Four RCTs investigated the effectiveness of dietary texture modifications and/or alteration of fluid viscosity. Modifications in dietary textures are a common treatment for dysphagia however the evidence for their effectiveness is limited. Three RCTs investigated the outcomes of acute stroke treated with NG or PEG feeding. The results from these studies suggest that NG feeding is not associated with a higher risk of death when compared with PEG feeding as found previously. The review was limited to RCT evidence; however, the quality of the included trials was generally judged to be only fair.

A systematic review of behavioural treatments and approaches for oropharyngeal dysphagia was undertaken by Wheeler-Hegland et al (2009) following a search of 14 electronic databases they identified 17 studies meeting the inclusion criteria. Many of the studies (eight of the 17) investigated the procedure 'effortful swallow' three studies examined the Mendelsohn manoeuvre, chin tucked, and supraglottic swallows and a further two studies examined the value of head rotation. The authors also reviewed the impact of these procedures on those without dysphagia and were able to establish that some of these behavioural techniques did have an impact on swallowing physiology whereas others did not. These studies revealed changes to the swallow biomechanics which were often not originally targeted by the manoeuvres. The authors concluded that six of the seven interventions studied provided physiological evidence supporting the underlying hypothesis of the treatment strategy.

Speyer et al (2010) undertook a good quality synthesis of the international evidence up to 2008 on the effects of swallowing therapy for oropharyngeal dysphagia performed by speech and language therapists. The review included fifty-nine studies which generally demonstrated statistically significant positive effects. However, most of the studies had methodological problems and the review concluded that further research based on high-quality randomised controlled trials is required.

A good quality systematic review (Carnaby-Mann & Crary, 2007), including a meta-analysis, assessed the effects of NMES on swallowing rehabilitation. Seven studies were included in the review. The meta-analysis demonstrated a small significant positive effect size. However, the results need to be considered with caution due to the small number of studies in this area and methodological weaknesses.

Clark, et al (2009) synthesised the international evidence on the effects of NMES on swallowing and neural activation. Fourteen articles, published from 1960 to 2007, were included. Most of the studies were classified as exploratory research and many had significant limitations methodologically. The application of surface NMES to the neck had been investigated in most studies with promising findings. They reported that intramuscular NMES and surface NMES to the palate, faucial pillars and pharynx have only been investigated in phase I studies.

Burns and Miller (2011) synthesised the evidence on the effectiveness of neuromuscular electrical stimulation (NMES) in the treatment of pharyngeal dysphagia in a range of medical diagnoses. The review included fourteen studies which all indicated positive effects of NMES.

However, many of the included studies were small and would have benefited from more robust methodology including longer follow-up of patients. Furthermore, the differences between studies made it difficult to compare them. Important differences included frequency, length and intensity of treatment and outcome measures used. This review shared the conclusion of Carnaby-Mann and Crary (2007) and Clark et al (2009) that the quality and volume of the evidence was found to be insufficient to conclusively demonstrate the effectiveness of NMES, this conclusion was also drawn in the updated Cochrane systematic review (Geeganage, et al., 2012) which included studies published up to February 2012.

One literature review (Davies, 2003) investigated the evidence for the effectiveness of oromotor treatment for cerebral palsy in children. Effectiveness was considered in terms of four main outcomes: improvement in oromotor skill level, decrease in length of mealtimes, improved clearing from the pharynx and improvement in physical growth. No details were provided of the therapists providing the oromotor treatment. The review found limited evidence for oromotor treatment leading to improved clearing from the pharynx. Two well-designed controlled trials provided limited to moderate evidence for improvement of oromotor skills levels in the moderately eating-impaired group. The evidence from the controlled trials suggests that oromotor treatment does not lead to an increase in growth or to a decrease in mealtime duration. It appears that oromotor treatment can improve oromotor skill level but the evidence is unclear as to whether benefits actually generalise to functional gains during mealtimes.

Speech and Language Therapy Interventions

The speech and language therapy interventions were varied and covered direct and indirect swallowing therapy including behavioural interventions, diet modification, education and exercise.

A good RCT (Carnaby, Hankey, & Pizzi, 2006) conducted in Australia (included in Geeganage, et al., 2012) investigated the effect of a behavioural intervention at high and low intensity compared with usual care for patients with dysphagia following acute stroke. Usual care was prescribed by the attending physician. The standard low-intensity behavioural intervention consisted of swallowing compensatory strategies, mainly environmental modifications, safe swallowing advice, and appropriate dietary modification, under the direction of speech pathologists three times weekly for a month or duration of hospital stay. The standard high-intensity swallowing therapy consisted of direct swallowing exercises and appropriate dietary modification, under the direction of a speech pathologist every working day for a month or duration of hospital stay. In the usual care group 56% (57/102) survived at 6 months free of an abnormal diet compared with 67% (136/204) allocated standard swallowing therapy. Of the patients allocated high-intensity 70% survived free of abnormal diet at 6 months compared with 64% low-intensity and 56% usual care. Compared with usual care and low-intensity therapy, high-intensity therapy was associated with an increased proportion of patients who returned to a normal diet and recovered swallowing by 6 months. The results from the high-intensity and low intensity intervention were not markedly different, so it was not possible to determine whether there is a differential treatment effect or if the low-intensity behavioural intervention could be as effective as the high-intensity. The study results lend support to the potential value of behavioural swallowing interventions for patients with dysphagia after acute stroke to help them return to pre-stroke swallowing function and minimisation of dysphagia-related outcomes. The findings from this RCT indicate that swallowing therapy could be a useful intervention to manage dysphagia in patients who have suffered stroke.

A pilot RCT (Sullivan & Dangerfield, 2002), conducted in the UK, investigated the impact of direct and indirect speech language therapy on older patients who had suffered a stroke. The comparison group received direct speech and language therapy intervention three times a week and daily indirect-trained nurse management. The experimental group received indirect management via trained nursing staff responsible for their day-to-day management. The average time for the comparison group to achieve a functional swallow was 32 days, and for the experimental group 25 days. The results suggest the importance of a multidisciplinary team in dysphagia management and a possible important role for the speech and language therapist in training.

A small UK comparison study (Lucas & Rodgers 1998) compared the dysphagia management of stroke patients in two hospitals with differing speech and language therapists involvement in dysphagia services. At hospital A there was a speech and language therapy dysphagia service for in-patients while hospital B had an extra-contractual referral (ECR) for dysphagia assessment by speech and language therapists from another hospital. At hospital A there was better identification of dysphagia, more complete documentation of nutrition and hydration management, less risky dysphagia management and less perceived need for chest physiotherapy when compared with hospital B. The findings from this study provide additional support for the important role of speech and language therapists in dysphagia services.

A recent small study (Becker et al 2011) retrospectively assessed the effects of functional dysphagia therapy by speech-language therapists with or without PEG treatment. The therapy included functional training exercises of motor skills designed to improve the movement and co-ordination of the lips, jaw, tongue, velum, larynx and vocal folds combined with sensory enhancement techniques. For the analysis patients were divided into groups determined by if they were feed with a PEG. The patients had dysphagia caused by a variety of different medical conditions. A significant improvement was found in the non-PEG group on functional oral intake, diets generally improved from pasty (semisolid) to firm meals. The PEG groups patients also showed a significant improvement on functional oral intake with even the most severely disordered patients been able to take some food orally. Additionally, the earlier that patients with severe dysphagia had PEG treatment the more there actual daily oral intake improved.

A small case series (Gerek & Çiyiltepe, 2005), conducted in Turkey, investigated the wearing of a Castillo-Morales Device (CMD) and speech-language therapy to manage dysphagia in children with cerebral palsy. The children built up their wearing of the device until they were wearing it all day; they then continued to wear the device for a further 10-12 weeks. The children also received speech language therapy twice a week for 12 weeks. At completion of the speech language therapy the children were able to close their lips during the day, keep their tongue in their mouth and produce bilabial sounds. The results also showed improvements in saliva control, decreased risk of aspiration and higher consistency in food intake. After six months, five of the children were able to stop wearing the CMD; the other two children continued to wear it for another two months. The findings from this small study suggest that a CMD plus speech language therapy could be a useful intervention for managing dysphagia in children with cerebral palsy.

Diet Modification

A common practice in dysphagia management is making changes to the texture of a patient's diet. Four of the studies considered texture-modified diet. The findings from these studies were inconclusive. The most useful diet modification strategy appears to depend on the individual patients condition, support and preferences. Whilst modifications in dietary textures are a common treatment for dysphagia the evidence for their medical effectiveness is limited.

A good RCT (Robbins et al, 2008) conducted in America, compared the effectiveness of a chin-down posture and two consistencies (nectar or honey) of thickened liquids for frail elderly patients with dysphagia on the cumulative incidence of pneumonia after three months. Study participants were randomly assigned to drink nectar-thick or honey-thick liquids in a head-neutral position or to drink thin liquid in a chin-down posture. The three month cumulative incidence of pneumonia was lower for the chin-down posture group than in the thickened-liquid groups. The pneumonia incidence was lower in the nectar-thick group compared with in the honey-thick group. This study suggests that a chin-down posture can reduce the incidence of pneumonia more than thickened liquids although no definitive conclusions can be drawn. A further study to investigate the impact of drinking nectar thick liquids in a chin-down posture on the incidence of pneumonia might be useful.

A clinical trial (Logemann et al, 2008), conducted in America, investigated 711 patients with Dementia or Parkinson's Disease who aspirated on thin liquids. Patients received each of the three interventions in a randomly assigned order while being assessed videofluorographically. Patients in the three interventions drank a thin liquid in the chin-down posture, honey-thickened

liquids and nectar-thickened liquids. The study found that aspiration was eliminated most often with honey-thickened liquids, followed by nectar-thickened liquids and chin-down posture. For approximately half the patients investigated aspiration was stopped by one or more of the three interventions indicating the importance of assessing each of the interventions to ensure that the best prevention method is selected for each individual patient. The patients with most severe dementia benefited least from the interventions. Patients with Parkinson's Disease without dementia were also asked about their preference for each intervention. The most popular intervention was a chin-down posture followed closely by the nectar-thickened liquids. This study demonstrates that videofluorographic swallow assessment can help to determine the most appropriate short-term intervention to stop aspiration. It is important to also consider the preferences of each individual patient when determining their treatment plan. This study only considered the short-term outcome of these interventions and the longer-term impact could be beneficially assessed.

A small cohort study (Finestone et al, 2001), conducted in America, investigated whether stroke patients with dysphagia met their estimated fluid recommendations when receiving an oral or non-oral diet. The oral diet consisted of a thickened-fluid dysphagia diet and the non-oral diet was enteral feeding supplemented with intravenous fluids. The dysphagic stroke patients that received the oral diet did not meet their fluid requirements while patients receiving the non-oral diet did. The findings from this small cohort study suggest that initially providing patient with a non-oral diet may help them reach their fluid recommendations better than with the use of a thickened-fluid diet. A further large good quality study in this area could be beneficial.

A survey (Garcia, Chambers & Molander, 2005) of speech-language pathologists in America investigated their practice patterns in the use of thickened liquids for the management of patients with swallowing difficulties. The questions considered use of thickened liquids, information about thickening products and service delivery, patient perceptions, professionals responsible for producing thickened liquids and the training provided for this role. The internet survey was completed by 149 participants; 145 were speech-language pathologists. The speech-language pathologists primarily managed adult patients with dysphagia. The majority (84.8%) indicated that they thought thickening thin liquids was an effective intervention. Speech-language pathologists believed that nectar-thick consistencies were more effective than honey-like and spoon-like consistencies. The respondents perceived that their patients did not like thickened liquids. The institution where the speech-language pathologists worked had varied training provision for training in thickening liquids, with only a small number having structured training programmes. The results from this survey highlight the complex issues surrounding speech-language pathologists' use of thickened liquids. Further information could also be found by considering the other members of the multidisciplinary team involved in dysphagia management.

Behavioural treatments

Behavioural treatments for dysphagia were investigated in a good quality systematic review (Wheeler-Hegland et al 2009), discussed in **Synthesising pre-existing studies** section above, and a retrospective cohort study.

An early intervention (Takahata, et al 2011) for promotion of oral feeding was investigated in a retrospective cohort study conducted in Japan. The records of two hundred and nineteen patients with intracerebral hemorrhage were retrospectively analysed, ninety patients before the intervention was introduced and one hundred and twenty-nine after. The intervention comprised intensive oral care and early behavioural interventions. In the intervention group there was a significantly greater number of patients able to tolerate oral feeding compared with the control group. Data from this cohort study suggests that the early intervention can be implemented safely and justifies further examination in a randomised controlled trial.

Transcutaneous neuro-muscular electrical stimulation

Transcutaneous neuro-muscular electrical stimulation (NMES) involves the delivery of electrical current through externally placed electrodes, either in a submental position or on the neck, to

stimulate the peripheral nerves that innervate a muscle. With sufficient intensity, this stimulation creates an action potential that travels through the motor neuron and evokes a muscle contraction. Electrical stimulation is usually used in addition to conventional swallowing therapy. Although electrical stimulation is widely used in clinical practice in the United States, currently it is not used routinely in the UK as there is a lack of robust evidence to support its use. The latest literature review in the NICE guidelines provides information from 3 meta-analyses and 8 RCTs. We have also considered four systematic reviews, discussed in Synthesising pre-existing studies section above.

It is recommended that readers seek further detail from the NICE guidelines published in May 2014.

Whilst this treatment approach is of great interest and has some potential. NICE has recommended that transcutaneous neuromuscular electrical stimulation for oropharyngeal dysphagia should only be used with special arrangements in ongoing research or for audit. This means that clinicians undertaking the procedure should audit and review the clinical outcomes of all patients. Audit data should be reviewed at appropriate intervals and practice should be changed if the results suggest the need to do so.

To help clinicians audit and review clinical outcomes NICE has produced a clinical audit tool, which is for use at local discretion. It contains clinical audit criteria and a data collection form which can be used in its current form or amended to suit local preferences and should be completed for each patient.

Clinical audit tool: Implementing the NICE guidance on transcutaneous neuromuscular electrical stimulation for oropharyngeal dysphagia (IP490). Published: May 2014

Further advice and opinion from the Royal College of Speech and Language Therapists on NMES is available at http://www.rcslt.org/news/nes_statement

Pharmacological interventions

Two studies investigated the effectiveness of pharmacological interventions for managing dysphagia, a systematic review (Geeganage, et al., 2012), discussed in **Synthesising pre-existing studies** section detailed above and a pilot RCT which was included in the review. The pilot RCT (Perez et al. 1998) was conducted in the UK. The RCT investigated the effect of slow-release nifedipine on patients with persistent dysphagia following a stroke. By the end of the four weeks of treatment assessments showed that nine patients had improved their swallow, five in the treatment and four in the placebo group. Patients in the treatment group experienced significant improvements in their pharyngeal transit times and swallowing delay. The results from this small pilot RCT suggest that treatment with pharmacological agents such as nifedipine could have a role in the management of persistent, but not severe, dysphagia following stroke. The results are inconclusive and a further study in this area would be beneficial.

Feeding assistance

A small interventional study (Wright, Cotter, & Hickson, 2008) investigated the impact of one-to-one targeted feeding assistance by trained volunteers of elderly dysphagia patients. The group with targeted assistance had higher intakes of energy and protein from meals and supplements combined compared to the comparison group. The findings from this small study suggest that targeted feeding assistance by trained and adequately supervised volunteers can improve nutritional uptake in hospitalised elderly patients. These initial findings have important implications for ward resources; providing feeding assistance can take up a large amount of staff time and therefore may only be possible with an increase in staff or volunteers.

Pinnington, L. and Hegarty, J. (1999) used an ABA design to study 'consistent feeding practices' with 16 severely disabled children between the ages of seven and 17 years old. Statistically significant differences in components of oral-motor behaviour were found when a consistent method of food presentation was employed and significant improvements, which could not be attributed to maturation alone, were found between assessment periods.

Group therapy

Group therapy was investigated in one small UK study (Millichap, Lee, & Pring, 2005). The group therapy was part of a treatment programme that also included education, reassurance and the use of exercises to treat 14 clients with psychogenic dysphagia. The clients attended a group therapy session covering education about the physiology of swallowing, discussing causes of abnormal swallowing and allowed the group to describe and discuss their problems together. The clients' Glasgow and Edinburgh Throat Scale (GETS) scores improved indicating that the treatment helped them. However, the clients GETS scores also improved during the baseline phase so further research would be needed to determine whether the treatment actually had an effect or if clients benefit from the reassurance and general attention. While the evidence from this initial study is inconclusive, the treatment itself only took up a small amount of the speech and language therapist's time and the group therapy element enabled clients to meet others with similar symptoms. This study suggests that an approach including group therapy may be useful for treating clients with psychogenic dysphagia.

Educating carers

Many persons with dysphagia (particularly those with cognitive problems) may be unaware that they have a swallowing problem, thus carers have to take responsibility for following the recommendations of the speech and language therapist. Educating carers involved in the care of patients with dysphagia is essential in ensuring compliance with safety recommendations. Lack of information and appropriate supervision are common reasons for non-compliance with safe swallowing strategies. Studies have indicated that the guidance given by speech and language therapists can greatly improve adherence to swallowing regimes (Rosenvinge & Starke, 2005)

The need for education about dysphagia is noted in the literature (Colodny 2001, Ekberg *et al.* 2002, Hines *et al.* 2011, Kelly *et al.* 2011). Colodny (2001) identified three factors for the non-adherence of nurses and care assistants to dysphagia management recommendations: lack of knowledge, disagreement with the speech and language therapy recommendations and the nuisance factor.

In 2006, an Inter-Professional Dysphagia Competence Framework (Boaden *et al.* 2006) was launched to provide a consistent, UK wide approach to education. The Framework is recognised by relevant professional associations (UK-based) including the Royal College of Physicians; the Royal College of Nursing; the Royal College of Speech and Language Therapists and the British Dietetics Association. The Framework comprises five levels of competence ranging from awareness of the risks of dysphagia, through to Consultant Dysphagia Practitioner competence to undertake specialist investigations, manage complex cases and contribute to research. A range of training approaches aimed at gaining the knowledge and skills across the competency framework are commonly implemented by speech and language therapists including traditional lectures, workshops and e-learning packages.

There are time implications for the education and training that SLT's provide to other professionals and family members. Working as part of a multidisciplinary team necessitates taking on team roles such as attending care planning meetings etc, which also have time implications.

Quality of life

A survey (Farri, Accornero, & Burdese, 2007), conducted in Italy, assessed the quality of life of patients with dysphagia following surgery. 73 patients were surveyed on questions concerning their medical history, eating habits, personal feelings, information about dysphagia, and their health. Nearly half (40%) of the sample were under 60 years of age, still working and had busy social lives. Following operations which lead to their dysphagia, the patients became weaker, experienced lower self-esteem and limited their social relationships. Due to embarrassment, eating restrictions, needing help with feeding and a lack of interest in food, the patients no

longer found mealtimes pleasant or saw them as a social activity. To overcome their difficulties with swallowing, food consistencies had to be altered and strategies learnt to improve swallowing. Once patients were informed about dysphagia and strategies to tackle it by doctors and health care workers, their lives improved qualitatively. The patients that had received speech therapy rehabilitation all agreed that this had improved their quality of life as they were taught strategies that made swallowing easier. The survey demonstrates that dysphagia can have negative social and economic impacts on an individual's quality of life.

Conclusion

The different studies included in this synthesis demonstrate the varied conditions in which dysphagia is associated. Many different treatments are common clinical practice even though the evidence for them is limited. There is some evidence for swallowing therapy which is a common practice. Diet modification is another common practice, but the evidence supporting its effectiveness is at present limited. NMES is a new treatment with possible potential. The studies demonstrate the important role of speech and language therapists in the assessment and management of dysphagia and in administering interventions and training staff.

The significance of dysphagia has only relatively recently been appreciated. It has a marked impact on survival, general health and quality of life. There are a range of approaches to the assessment of dysphagia which is important given that aspiration can be easily overlooked. The most significant method of improving the lot of those with dysphagia is by detecting its presence, nature and severity through appropriate assessment. Without this appropriate interventions cannot be implemented and, conversely inappropriate interventions, which may be unpleasant and unnecessary may not be avoided.

Study	Country	Study Design	Subjects	Intervention
Baijens, L. W. J. et al 2012	Holland	Pilot study	20 patients, 10 with Parkinson's disease and 10 healthy controls.	Surface electrical stimulation.
(Bath, Bath-Hextall, & Smithard 1999)	Worldwide	Systematic review	Six small studies investigating patients with acute stroke and dysphagia diagnosed either clinically or using videofluoroscopy.	Four main types of interventions were reviewed: 1. The effect of the feeding route 2. The timing of feeding 3. The effect of nutritional and fluid supplementation 4. The effect of formal swallowing therapy
Becker, R. et al 2011	Germany	Retrospective study	222 patients with dysphagia, 117 with PEG feeding and 105 without.	Comparing the outcomes of functional dysphagia therapy with and without PEG feeding.
(Bilney, Morris, & Perry 2003)	Worldwide	Systematic review	42 people with Huntington's Disease from 2 papers. Subjects were over 18 years old.	Diet modification, intensive speech pathology intervention, adaptive eating equipment and modified body positioning.

Bulow, M. et al 2008	3 European countries: Sweden, Netherlands and France	RCT	25 stroke patients with dysphagia.	Neuromuscular Electrical Stimulation (NMES) was compared with traditional swallowing therapy.
Burns, M. I. and Miller, R. M. 2011	Worldwide	Systematic Review	Reviewed 14 studies of patients with pharyngeal dysphagia.	NMES
(Carnaby, Hankey, & Pizzi 2006)	Australia	RCT	306 patients with clinical dysphagia admitted to hospital with acute stroke.	Patients were randomised to receive usual care, a standard low-intensity intervention, three times a week for up to a month or a standard high-intensity intervention daily for up to a month.
Carnaby-Mann, G.D. and Crary, M. 2007	Worldwide	Systematic review including meta-analysis	Review included 7 studies of patients with dysphagia caused by a range of conditions.	NMES for swallowing.
Clark H. et al 2009	Worldwide	Systematic Review	14 articles on NMES to treat swallowing	NMES for swallowing.
(Davies 2003)	Worldwide	Literature review	Children with cerebral palsy. The number of subjects investigated in the eight included studies ranged from single subjects to larger studies with more than 30 subjects.	Oromotor treatment.
(Farri, Accornero, & Burdese 2007)	Italy	Survey	73 patients, age range 40-80 years, almost 40% under 60 years of age.	Survey assessing quality of life of patients with dysphagia following one of the following operations: ENT, maxillo-facial, neurological and presbiphagic.
(Finestone et al. 2001)	USA	Pilot cohort study	13 first stroke patients with dysphagia	Seven of the patients were started on non-oral feeding and six patients received oral dysphagia diets only.
(Foley et al.	Worldwide	Systematic review	Patients with dysphagia following	Any treatment for dysphagia post-

2008)			stroke. Mean age in all 15 included studies ranged from 67 to 86 years.	stroke including texture-modified diets, general dysphagia therapy programmes, non-oral feeding, medications and physical and olfactory stimulation.
Freed, M. L. et al 2001	Hawaii, USA	Clinical Trial	110 patients suffering with swallowing problems due to stroke.	Comparison of electrical stimulation and thermal-tactile stimulation. Treatment was for 1 hour daily for in-patients and three times a week for out-patients.
(Garcia, Chambers, & Molander 2005)	USA	Survey	Speech and language therapists involved in dysphagia management.	Considers use of thickened liquids in dysphagia management.
Geeganaige, C. et al 2012 (Update of Bath)	Worldwide	Systematic Review	18 studies of 967 acute and subacute stroke patients with dysphagia	RCTs investigated various forms of swallowing therapy.
(Gerek & Çiyiltepe 2005)	Turkey	Case series	Seven children with cerebral palsy. Age range 8-17 years. Three males and four females.	Dysphagia management including Castillo-Mo-roles Device, speech and language therapy and oral-motor range of motion exercises.
Heijnen, B. J. et al 2012	Holland	RCT	88 patients suffering from Parkinson's disease and dysphagia.	Comparison of NMES and traditional therapy.
Ickenstein, G.W. et al 2012	Germany	Prospective study	114 acute stroke patients assessed for problems with swallowing within 72 hours of stroke.	To assess if dysphagia can be predicted within 72 hours of stroke.
Lim, K-B et al 2009	Korea	RCT	36 stroke patients with dysphagia.	Neuromuscular electrical stimulation and thermal-tactile stimulation was compared with thermal-tactile stimulation treatment only.
(Logemann et al. 2008)	USA	Clinical trial	711 patients with dementia or Parkinson's Disease. Aged 50-95 years old. 79% male, 21%	Compares three interventions for aspiration of thin liquids. Interventions are

			female.	chin-down posture, nectar-thickened liquid and honey-thickened liquid.
(Lucas & Rodgers 1998)	UK	Clinical trial	114 patients who had experienced their first stroke. Median age of 75 years (range 44-104). 56% female, 44% male.	Compares dysphagia management in two hospitals with differing involvement of speech and language therapists.
(Marks et al. 2001)	UK	Pilot RCT	Parkinson's Disease patients with drooling & swallowing difficulties. 28 patients were recruited, 18 men & 10 women Average age 64.8 years and average duration of Parkinson's Disease was 15.7 years.	Patients were randomised to either a speech and language therapy intervention or botulinum toxin injections. Their results were compared with an age-matched comparison group.
(Millichamp, Lee, & Pring 2005)	UK	Cohort study	14 patients with psychogenic dysphagia (globus pharyngeus). Mean age 52.5 years, range 24-78 years. Ten male and four female.	Group treatment programme including education, the use of exercises and reassurance. Patients were to do exercises five times a day until follow-up eight weeks later.
(Morgan, Ward, & Murdoch 2004)	Australia	Cohort study	13 children with moderate to severe traumatic brain injury (TBI). Seven male and six female. Aged 4 years 1 month to 15 years old; mean age 7 years and 4 months.	To assess clinical progression and outcomes of dysphagia in children with TBI.
(Morgan et al. 2008)	UK	Prospective study	11 children who had had surgical removal of posterior fossa tumours (PFT). Aged 3 years 6 months to 13 years 5 months. Eight male and three female.	To document presence, severity and characteristics of dysphagia pre and post surgical removal of PFT.
Park, J-W. et al 2012	Korea	RCT	20 post-stroke dysphagia patients.	Effortful swallowing with infrahyoid motor electrical stimulation or effortful swallowing with infrahyoid sensory electrical stimulation. Sessions of both were for 20 minutes with total of 12

				sessions over 4 weeks.
(Perez et al. 1998)	UK	Pilot RCT	17 hospitalised patients with persistent dysphagia two weeks after stroke. Eight patients in nifedipine group had a mean age of 77.3 years; there were four men and four women. Nine patients in the placebo group had a mean age of 76.8 years; there were four men and five women.	Patients received slow-release nifedipine 30 mg orally or placebo for four weeks.
Permsiri vanich, W. et al 2009	Thailand	RCT	23 stroke patients with persistent dysphagia.	Comparison of NMES and rehabilitation swallowing therapy. Both were delivered in 60 minute sessions on week days for 4 weeks.
(Ramsey, Smithard, & Kalra 2003)	Worldwide	Literature review	Acute stroke patients.	Assessment of dysphagia and aspiration risk.
(Robbins et al. 2008)	USA	RCT	515 patients from 47 hospitals and 79 subacute care facilities. Aged 50 years or older with dementia or Parkinson's Disease who aspirated their liquids.	Patients either drank all liquids in a chin-down posture or drank nectar-thick or honey-thick liquids in a head-neutral position.
Speyer, R. et al 2009	Worldwide	Systematic Review	Reivew synthesised results from 59 studies of patients with dysphagia.	Therapy for dysphagia performed by speech and language therapists.
(Sullivan & Dangerfield 2002)	UK	Pilot RCT	20 patients in the acute stage of stroke recovery with dysphagia persisting for more than 48 hours. Aged 65 years and over.	Patients were assigned to either a comparison group receiving direct SLT intervention three times a week, in addition to daily indirect-trained nurse management, or an experimental group receiving indirect management via trained nursing staff.
Takahat	Japan	Retrospec	219 stroke patients.	Early intervention to

a, H. et al 2011		tive cohort study		promote oral feeding.
Verin, E. et al 2011	France	Pilot study	13 patients living at home with dysphagia.	Submental sensitive transcutaneous electrical stimulation (SSTES)
(Wright, Cotter, & Hickson 2008)	UK	Interventional study	46 elderly patients with dysphagia.	Patients received targeted feeding assistance from trained volunteers. Data from these patients was compared with previously collected data from dysphagic patients who had received no targeted feeding assistance.

References

Ajemian, M., Niruml, G., Anderson, M., Zirlen, D. and Kwasnik E. 2001. Routine fibre optic endoscopic evaluation of swallowing following prolonged incubation. *Archives of Surgery* **136**:434-437.

Arvedson, J. and Brodsky, L. 2002 *Pediatric swallowing and feeding: assessment and management*, pub. Singular Publishing Group San Diego, CA.

Arvedson, J., Lefton-Greif, M. 1998. *Paediatric Videofluoroscopic Swallow Studies: A Professional Manual with Caregiver Guidelines*.

Arvedson, J., Rogers, B., Buck, G., Smart, P., and Msall, M. 1994. Silent aspiration prominent in children with dysphagia. *International Journal of Paediatric Otorhinolaryngology*, **28**:173–181.

Carnaby-Mann, G.D. and Crary, M.A. (2007) Examining the evidence on neuromuscular electrical stimulation for swallowing: a meta-analysis. *Arch Otolaryngol Head Neck Surg* **133**:564-571.

Bath, P. M. W., Bath-Hextall, F. J., and Smithard, D. 1999. Interventions for dysphagia in acute stroke. *Cochrane Database of Systematic Reviews* **4**.

Baijens, L.W., Speyer, R., Passos, V.L., Pilz, W., Roodenburg, N., and Clav+®, P. 2012. The effect of surface electrical stimulation on swallowing in dysphagic Parkinson patients. *Dysphagia*, **27** (4):528-537.

Becker, R., Nieczaj, R., Egge, K., Moll, A., Meinhardt, M., and Schulz, R.J. 2011. Functional dysphagia therapy and PEG treatment in a clinical geriatric setting. *Dysphagia*, **26** (2):108-116.

Bilney, B., Morris, M. E., and Perry, A. 2003, Effectiveness of Physiotherapy, Occupational Therapy, and Speech Pathology for People with Huntington's Disease: A Systematic Review. *Neurorehabilitation & Neural Repair* **17** (1):12-24.

Blumenfeld, L., Hahn, Y., Lepage, A., Leonard, R., & Belafsky, P. C. 2006. Transcutaneous electrical stimulation versus traditional dysphagia therapy: A nonconcurrent cohort study. *Otolaryngology–Head and Neck Surgery*, **135** (5):754–757.

Boaden, E., Davies, S., Storey, L., Watkins, C. 2006. *Inter-professional Dysphagia Framework*, Available at: http://www.rcslt.org/members/publications/Framework_pdf.

Boyle, J. 1991. Motility of upper gastrointestinal tract in the fetus 86. and neonate. *Dysphagia*, **6**:203-208.

Bulow, M., Speyer, R., Baijens, L., Woisard, V. and Ekberg, O. 2008. Neuromuscular electrical stimulation (NMES) in stroke patients with oral and pharyngeal dysfunction. *Dysphagia*, **23**:302-309.

Burns, M., I and Miller, R. 2011. The effectiveness of neuromuscular electrical stimulation (NMES) in the treatment of pharyngeal dysphagia: a systematic review. *Journal of Medical Speech-Language Pathology*, **19** (1):13-24.

Calis, E., Veugelers, R., Sheppard, J., Tibboel, D., Evenhuis, H. and Penning, C. 2008. Dysphagia in children with severe generalized cerebral palsy and intellectual disability. *Developmental Medicine & Child Neurology*, **50** (8):625-630.

Carnaby, G., Hankey, G. J., and Pizzi, J. 2006. Behavioural interventions for dysphagia in acute stroke: a randomised controlled trial. *Lancet Neurology*, **5**:31-37.

Carnaby-Mann, G.D. and Crary, M.A. 2007. Examining the evidence on neuromuscular electrical stimulation for swallowing: a meta-analysis. *Arch Otolaryngol Head Neck Surg*, **133**:564-571.

Carrau R. and Murray T. 1998. (eds): *Comprehensive Management of Swallowing Disorders*. pub. Singular Publishing Group San Diego, CA.

Chadwick, D.D., Jolliffe, J. and Goldbart, J. 2003. Adherence to Eating and Drinking Guidelines for Adults with Intellectual Disabilities and Dysphagia, *American Journal on Mental Retardation*, **108** (3):202-211.

Clark, H., Lazarus, C., Arvedson, J., Schooling, T., & Frymark, T. (2009). Evidence-based systematic review: Effects of neuromuscular electrical stimulation on swallowing and neural activation. *American Journal of Speech-Language Pathology*, **18** (4):361-375.

Colodny, N. 2000. Comparison of dysphagics and nondysphagics on pulse oximetry during oral feeding. *Dysphagia*, **15**:68-73.

Colodny, N., 2001. Construction and Validation of the Mealtime and Dysphagia Questionnaire: An Instrument Designed to Assess Nursing Staff Reasons for Noncompliance with SLP Dysphagia and Feeding Recommendations. *Dysphagia*, **16** (4):263-271.

Collins, M.J. and Bakheit, A.M. 1997. Does pulse oximetry reliably detect aspiration in dysphagic stroke patients? *Stroke* **28** (9):1773-1775.

Costa Bandeira, A., Azevedo, E., Vartanian, J. G., Nishimoto, I., Kowalski, L. and Carrara-de Angelis, E., 2008. Quality of Life Related to Swallowing After Tongue Cancer Treatment. Anna Karinne, *Dysphagia*, **23** (2):183.

Crary, M. and Groher, M. 2003. *Introduction to Adult Swallowing Disorders*, pub: Butterworth-Heinemann.

Crary, M. & Groher, M. 2009. *Clinical Management in Adults and Children* Pub: Mosby.

Davies, F. 2003, Does the End Justify the Means? A Critique of Oromotor Treatment in Children with Cerebral Palsy. *Asia Pacific Journal of Speech, Language, and Hearing*, **8** (2):146-152.

Ekberg, O. et al., 2002. Social and psychological burden of dysphagia: its impact on diagnosis and treatment. *Dysphagia*, **17** (2):139-46.

Farri, A., Accornero, A., and Burdese, C. 2007. Social importance of dysphagia: its impact on diagnosis and therapy. *Acta Otorhinolaryngologica Italica*, **27** (2):83-86.

Finestone, H. M., Foley, N. C., Woodbury, M. G., and Greene-Finestone, L. 2001. Quantifying fluid intake in dysphagic stroke patients: a preliminary comparison of oral and nonoral strategies. *Archives of Physical Medicine & Rehabilitation* **82** (12):1744-1746.

Foley, N., Teasell, R., Salter, K., Kruger, E., and Martino, R. 2008, Dysphagia treatment post stroke: a systematic review of randomised controlled trials. *Age & Ageing* **37** (3):258-264.

Freed, M.L., Freed, L., Chatburn, R.L. and Christian, M. 2001. Electrical stimulation for swallowing disorders caused by stroke. *Respir Care*, **46** (5):466-474.

Frempong-Boadu, A., Houton, J.K., Osborn, B., Opulencia, J., Kells, L., Guida, D.G. and Roux, P. 2002. Swallowing and speech dysfunction in patients undergoing anterior cervical discectomy and fusion: a prospective, objective preoperative and post-operative assessment. *Journal of Spinal Disorders and Techniques* **15** (5):362-368.

Garcia, J. M., Chambers, E., and Molander, M. 2005. Thickened liquids: practice patterns of speech-language pathologists. *American Journal of Speech-Language Pathology*, **14** (1):4-13.

Geeganage, C., Beavan, J., Ellender, S., and Bath, P.M. 2012. Interventions for dysphagia and nutritional support in acute and subacute stroke. *Cochrane Database of Systematic Reviews*, **10**:CD000323.

Gerek, M. and Çiyiltepe, M. 2005. Dysphagia management of pediatric patients with cerebral palsy. *British Journal of Developmental Disabilities*, **51** part 1, no. 100:57-72.

Hartelius, L. and Svensson, P. 1994. Speech and swallowing symptoms associated with Parkinson's disease and multiple sclerosis: a survey. *Folia Phoniatrica*, **46** (1):9-17.

Heijnen, B.J., Speyer, R., Baijens, L.W., and Bogaardt, H.C. 2012. Neuromuscular electrical stimulation versus traditional therapy in patients with Parkinson's disease and oropharyngeal dysphagia: effects on quality of life. *Dysphagia*, **27** (3):336-345.

Hinchey, J. A., Shephard, T., Furie, K., Smith, D., Wang, D., Tonn, S. 2005. Formal Dysphagia Screening Protocols Prevent Pneumonia. *Stroke*, 2005, **36**:1972-1976.

Hines, S. et al., 2011. Identification and nursing management of dysphagia in individuals with acute neurological impairment (update). *International journal of evidence-based healthcare*, **9** (2):148-50.

Ickenstein, G.W., Hohlig, C., Prosiel, M., Koch, H., Dziewas, R., Bodechtel, U., Muller, R., Reichmann, H., and Riecker, A. 2012. Prediction of outcome in neurogenic oropharyngeal dysphagia within 72 hours of acute stroke. *Journal of Stroke & Cerebrovascular Diseases*, **21** (7):569-576

Jayasekeran, V., Singh, S., Tyrrell, P., Michou, E., Jefferson, S., Mistry, S., and Hamdy, S. 2010. Adjunctive functional pharyngeal electrical stimulation reverses swallowing disability after brain lesions. *Gastroenterology*, **138** (5):1737-1746.

Katzan, I. L., Dawson, N. V., Thomas, M. E., Votruba, M. E. and Cebul, R. D. 2007. The Cost of Pneumonia after Acute Stroke. *Neurology*, **68**:1938-1943.

Kelly, J., Wright, D. and Wood, J., 2011. Medicine administration errors in patients with dysphagia in secondary care: a multi-centre observational study. *Journal of advanced nursing*, **67** (12):2615-27.

Kiger, M., Brown, C. S., and Watkins, L. 2006. Dysphagia management: An analysis of patient outcomes using VitalStim therapy compared to traditional swallow therapy. *Dysphagia*, **21** (4):

Langdon, P. C., Lee, A. H. and Binns, C.W. 2007. Dysphagia in Acute Ischaemic Stroke: Severity, Recovery and Relationship to Stroke Subtype *Journal of Clinical Neuroscience*, **14**: 630-634.

Langmore, S., Terpenning, M., Schork, A., Chen, Y., Murray, J., Lopatin, D. and Loesche, W. 1998. Predictors of Aspiration Pneumonia: How important is Dysphagia? *Dysphagia*, **13**:69-81.

Leder, S. 1998. Serial fibre-optic endoscopic swallowing evaluations in the management of patients with dysphagia. *Archives of Physical Medicine and Rehabilitation*, **79**:1264-1269.

Leslie, P., Drinnan, M., Zammit-Maempel, I., Coyle, J., Ford, G., and Wilson, J. 2007. Cervical Auscultation synchronized with images from endoscopy swallow evaluations. *Dysphagia*, **22** (4): 290-298.

Lim, K.B., Lee, H.J., Lim, S.S. and Choi, Y.I. 2009. Neuromuscular electrical and thermal-tactile stimulation for dysphagia caused by stroke: a randomized controlled trial. *J Rehabil Med*, **41**:174-178.

Lin, P-H., Hsiao, T-Y., Chang, Y-C., Ting, L-L., Chen, W-S., Chen, S-C. and Wang, T-G. 2009. Effects of functional electrical stimulation on dysphagia caused by radiation therapy in patients with nasopharyngeal carcinoma. *Support Care Cancer*, **19**:91–99.

Logemann, J.A., Veis, S., and Colangelo, L. 1999. A screening procedure for oropharyngeal dysphagia. *Dysphagia*, **14**:44–51.

Logemann, J. 1998. *Evaluation and Treatment of Swallowing Disorders*. (rev.ed), Austin, TX, PRO-ED and St. Tammany Parish Schools Dysphagia Team.

Lucas, C. and Rodgers, H. 1998. Variation in the management of dysphagia after stroke: does SLT make a difference? *International Journal of Language & Communication Disorders*, **33** (Suppl):284-289.

Luggers, K. 1994. Predictors of feeding gastrostomy tube removal in stroke patients with dysphagia. *Journal of Stroke and Cerebrovascular Diseases*, **12** (4):169-174.

Mann, G. Hankey, G. and Cameron, D. 1999. Swallowing Function After Stroke Prognosis and Prognostic Factors at 6 Months. *Stroke*. **30**:744-748.

Marks, L., Turner, K., O'Sullivan, J., Deighton, B., and Lees, A. 2001. Drooling in Parkinson's disease: A novel speech and language therapy intervention. *International Journal of Language & Communication Disorders*, **36** (Suppl):282-287.

Marks, L. and Rainbow D. 2001. *Working with Dysphagia*. pub: Speechmark.

Martino, R., Foley, N., Bhogal, S., Diamant, N., Speechley, M. and Teasell, R. 2005. Dysphagia after stroke: Incidence, diagnosis, and pulmonary complications. *Stroke*. **36** (12):2756-2763.

Marks, L., Turner, K., O'Sullivan, J., Deighton, B., and Lees, A. 2001. Drooling in Parkinson's disease: A novel speech and language therapy intervention. *International Journal of Language & Communication Disorders*, **36** (Suppl):282-287.

McCabe, D., Ashford, J., Wheeler-Hegland, K., Frymark, T., Mullen, R., Musson, N., Hammond, C. and Schooling, T. 2009. *Journal of Rehabilitation Research and Development*, **46** (2):205-214.

McGowan, S., Gleeson, M., Smith, M., Hirsch, N. and Shuldham, C. 2007. A pilot study of fibre optic endoscopic evaluation of swallowing in patients with cuffed tracheostomies in neurologic intensive care. *Neurocritical Care*, **6**:90-93.

McKinstry, M., Tranter, M., and Sweeney, J. 2009. Outcomes of Dysphagia Intervention in a Pulmonary Rehabilitation Program. *Dysphagia*, pub online 18 July 2009.

Millichap, F., Lee, M., and Pring, T. 2005. A lump in the throat: should speech and language therapists treat globus pharyngeus? *Disability & Rehabilitation*, **27** (3): 124-130.

Morgan, A., Ward, E., and Murdoch, B. 2004. Clinical progression and outcome of dysphagia following paediatric traumatic brain injury: a prospective study. *Brain Injury*, **18** (4): 359-376.

Morgan, A. T., Sell, D., Ryan, M., Raynsford, E., and Hayward, R. 2008. Pre and post-surgical dysphagia outcome associated with posterior fossa tumour in children. *Journal of Neurooncology*, **87**:347-354.

Murry, T. and Carrau, R. 2001. *Clinical Manual of Swallowing Disorders* Singular Publishing Group, San Diego.

National Institute of Clinical Effectiveness. 2014. Transcutaneous neuromuscular electrical stimulation for oropharyngeal dysphagia

Odderson, R., Keaton, J. and McKenna, B. 1995. Swallowing Management in Patients on Acute Stroke Pathway: Quality Is Cost-Effective. *Archives of Physical Medicine and Rehabilitation*, **76** (12):1130-1113.

O'Loughlin, G. and Shanley, C. 1998. Swallowing Problems in the nursing home: a novel training response. *Dysphagia*, **13**:172-183.

Park, J.W., Kim, Y., Oh, J.C., and Lee, H.J. 2012. Effortful swallowing training combined with electrical stimulation in post-stroke Dysphagia: a randomized controlled study. *Dysphagia*, **27** (4):521-527.

Perlman, A.L. and Schulze Delrieu, K. 1997. *Deglutition and its Disorders*. Singular Publishing Group, San Diego Perlman, Schulze-Delrieu, Disorders

Perez, I., Smithard, D. G., Davies, H., and Kalra, L. 1998. Pharmacological treatment of dysphagia in stroke. *Dysphagia*, **13** (1):12-16.

Permsirivanich, W., Tipchatyotin, S., Wongchai, M. et al. 2009. Comparing the effects of rehabilitation swallowing therapy vs. neuromuscular electrical stimulation therapy among stroke patients with persistent pharyngeal dysphagia: a randomized controlled study. *J Med Assoc Thai*, **92**:259-265.

Pinnington, L. and Hegarty, J. (1999). Effects of consistent food presentation on efficiency of eating and nutritive value of food consumed by children with severe neurological impairment. *Dysphagia*, **14**:17-26.

Ramsey, D. J., Smithard, D. G., and Kalra, L. 2003. Early assessments of dysphagia and aspiration risk in acute stroke patients. *Stroke*, **34** (5):1252-1257.

Reilly, S., Skuse, D. and Poblete, X. 1996. Prevalence of feeding problems and oral motor dysfunction in children with cerebral palsy: A community survey. *The Journal of Pediatrics*, **129** (6):877-882.

Robbins, J., Gensler, G., Hind, J., Logemann, J. A., Lindblad, A. S., Brandt, D., Baum, H., Lilienfeld, D., Kosek, S., Lundy, D., Dikeman, K., Kazandjian, M., Gramigna, G. D., Garvey-

Toler, S. and Miller Gardner, P. J. 2008. Comparison of 2 interventions for liquid aspiration on pneumonia incidence: a randomized trial. *Annals of Internal Medicine*, **148** (7):509-518.

Rosenvinge, S. and Starke, I. 2005. Improving care for patients with dysphagia. *Age and Ageing*, **34** (6):587-593.

Royal College of Physicians Intercollegiate Stroke Working Party. 2008. *National clinical guidelines for stroke*, Royal College of Physicians.

Royal College of Speech and Language Therapists. 2003. *Communicating Quality 3*. RCSLT: London.

Royal College of Speech and Language Therapists. 2006. *Clinical Guidelines*. RCSLT: London.

Ryu, J. S., Kang, J. Y., Park, J. Y., Nam, S. Y., Choi, S. H., Roh, J. L. and Choi, K. H. 2008. The effect of electrical stimulation therapy on dysphagia following treatment for head and neck cancer. *Oral Oncology*, **45**:665-668.

Scottish Intercollegiate Guidelines Network. 2004. SIGN Executive Royal College of Physicians, <http://www.sign.ac.uk/guidelines/published/>

Sellars, C., Dunnet, C., and Carter, R. 1998. A preliminary comparison of videofluoroscopy of swallow and pulse oximetry in the identification of aspiration in dysphagic patients. *Dysphagia* **13**:82-86.

Sellars, C., Bowie, L., Bagg, J., Sweeney, P., Miller, H., Tilston, J., Langhorne, P. and Stott, D. J. 2007. Risk Factors Chest Infection in Acute Stroke. *Stroke*, **2007**:2284-2291.

Smithard, D.G., O'Neill, P.A., England, R.E., Park, C.L., Wyatt, R., Martin, D.F., Morris, J. 1997. The Natural History of Dysphagia Following a Stroke. *Dysphagia* **12**:188-193.

Speyer, R., Baijens, L., Heijnen, M., and Zwijnenberg, I. 2010. Effects of therapy in oropharyngeal dysphagia by speech and language therapists: a systematic review. *Dysphagia*, **25** (1):40-65.

Steele, C., Greenwood, C., Ens, I., Robertson, C. and Seidman-Carlson, C. 1997. Mealtime Difficulties in a Home for the Aged: Not Just *Dysphagia*. *Dysphagia*, **12**:43-50.

Stroud, A., Lawrie, B., and Wiles, C. 2002, Inter- and intra-rater reliability of cervical auscultation to detect aspiration in patients with dysphagia. *Clinical Rehabilitation*, **16**:640-645.

Sullivan, P. 2005. Gastrostomy tube feeding in children with cerebral palsy: a prospective, longitudinal study. *Developmental Medicine & Child Neurology*, **47**:77-85.

Sullivan, R. A. and Dangerfield, L. K. 2002, Research in practice: managing swallowing difficulties post stroke. *British Journal of Therapy & Rehabilitation*, **9** (4):133-137.

Takahata, H., Tsutsumi, K., Baba, H., Nagata, I., and Yonekura, M. 2011. Early intervention to promote oral feeding in patients with intracerebral hemorrhage: a retrospective cohort study. *BMC Neurology*, **11**:6.

Tibbling, L., Gustafsson, B. 1991. Dysphagia and its consequences in elderly people. *Dysphagia*, **6**:200-202.

Verin, E., Maltete, D., Ouahchi, Y., Marie, J.P., Hannequin, D., Massardier, E.G., and Leroi, A.M. 2011. Submental sensitive transcutaneous electrical stimulation (SSTES) at home in neurogenic oropharyngeal dysphagia: a pilot study. *Annals of Physical & Rehabilitation Medicine*, **54** (6): 366-375.

Wang, T.G., Chang, Y.C., Chen, S.Y., Hsiao, T.Y. 2005. Pulse oximetry does not reliably detect

aspiration on videofluoroscopic swallowing study. *Arch Phys Med Rehabil.* **86** (4):730-4.

Ward, E., Green, K., and Morton, A. 2007. Patterns and Predictors of Swallowing Resolution Following Adult Traumatic Brain Injury. *Journal of Head Trauma Rehabilitation.* **22** (3):184-191.

Ward, E., Uriate, M., Conroy, A., 2001. Duration of Dysphagic Symptoms And Swallowing Outcomes After Thermal Burn Injury. *Journal of Burn Care and Rehabilitation,* **22** (6):441-453.

Wheeler-Hegland, K., Ashford, J., Frymark, T., McCabe, D., Mullen, R., Musson, N., Hammond, C. and Schooling, T. 2009. Evidence-based Systematic Review: Oropharyngeal Dysphagia Behavioural Treatments. Part two: Impact of Dysphagia Treatment on Normal Swallowing Function. *Journal of Rehabilitation Research and Development,* **46** (2):185-194.

Wright, L., Cotter, D., and Hickson, M. 2008. The effectiveness of targeted feeding assistance to improve the nutritional intake of elderly dysphagic patients in hospital. *Journal of Human Nutrition & Dietetics,* **21** (6):555-562.

Xia, W., Zheng, C., Lei, Q., Tang, Z., Hua, Q., Zhang, Y., and Zhu, S. 2011. Treatment of post-stroke dysphagia by VitalStim therapy coupled with conventional swallowing training. *Journal of Huazhong University Science and Technology (Medical Sciences),* **31**:73-76.

Zaida, N. H., Smith, H. A., King, S. C., Park, C., O'Neill, P. A., and Connolly, M. J. 1995. Oxygen desaturation on swallowing as a potential marker of aspiration in acute stroke. *Age Ageing,* **24**: 267-270.

Zenner, P. M., Losinski, D. S. and Mills, R. H. 1995. Using cervical auscultation in the clinical dysphagia examination in long-term care. *Dysphagia,* **10**:27-31.