NEW ZEALAND SPEECH-LANGUAGE THERAPY CLINICAL PRACTICE GUIDELINE ON VIDEOFLUOROSCOPIC STUDY OF SWALLOWING (VFSS)

Anna Miles

Andrea Benoit, Melissa Keesing, Helen McLauchlan, Esther Ong, Helen Rigby, Margaret Sargent, Leanne Whitteker, Jodi White and Philippa Williams

April 2011

Endorsed by

The New Zealand Speech-language Therapists' Association (NZSTA)

The Royal Australian and New Zealand College of Radiologists

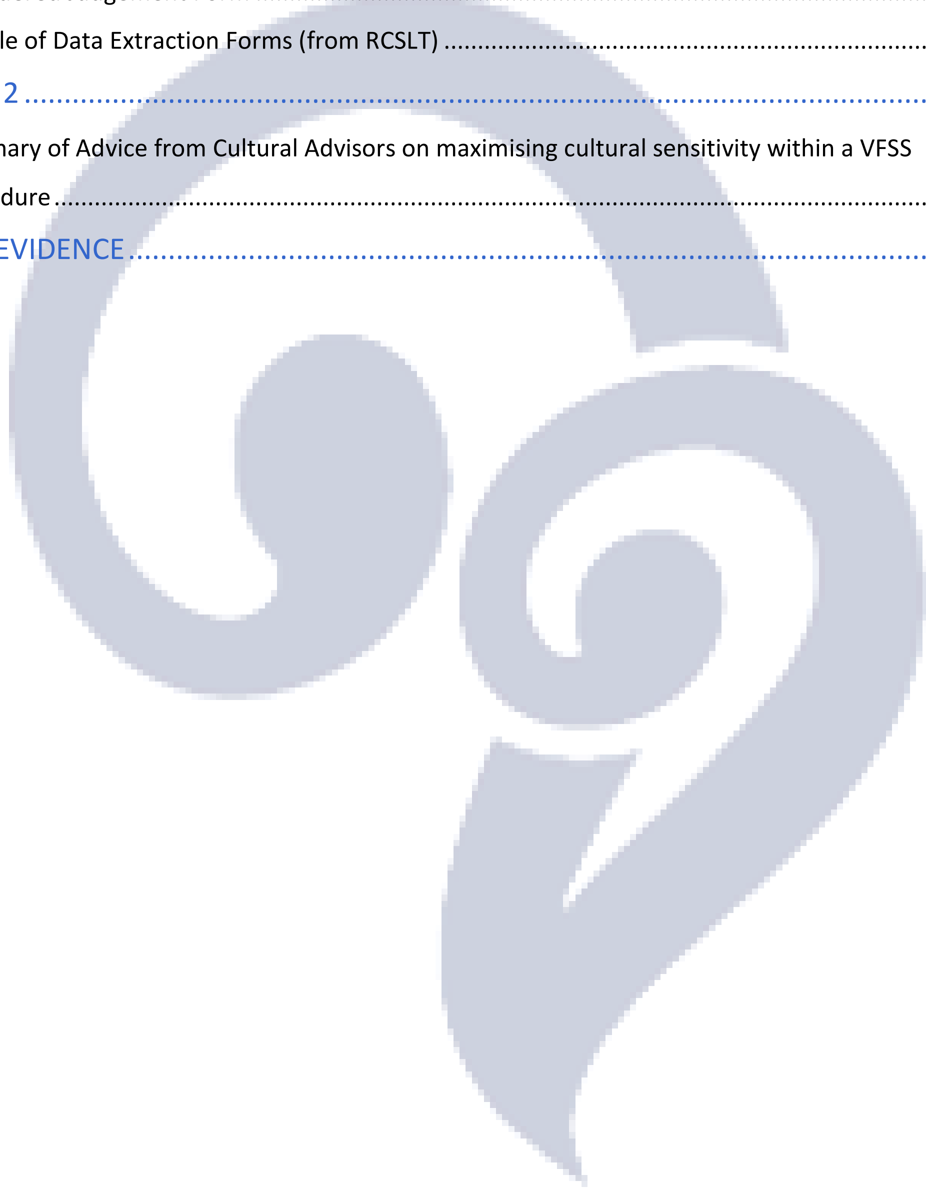
New Zealand Speech-language Therapists' Association

Te Kāhui Kaiwhakatikatika Reo Kōrero o Aotearoa

CONTENTS

CONTENTS ... 2
INTRODUCTION ... 4
Scope of the Guideline ... 4
Purpose of the Guideline ... 4
Definition ... 4
Context and Use ... 5
Population ... 5
Endorsements ... 5
Acknowledgements ... 5
Working Group Members ... 6
Consultation Group ... 6
METHODOLOGY ... 7
Working Group ... 7
Recruitment of Consultation Group ... 7
Literature Search ... 7
Appraisal of the Evidence ... 7
The Unique New Zealand Context ... 8
GUIDELINE SUMMARY ... 9
RECOMMENDATIONS ... 10
Indications for using VFSS ... 10
Contraindications for VFSS ... 12
Use of VFSS in comparison to other investigations such as Flexible endoscopic evaluation of swallowing (FEES) ... 12
SLT Competency ... 13
Protocol ... 15
Radiation Safety ... 15
Team Members and roles ... 16
Recording ... 18
Education to patient and whānau ... 19
Assessment ... 19
Preparation of Food and Fluids with Contrast Agents ... 20
Barium Safety ... 21
Termination of Procedure ... 21
Positioning of Patient ... 22
Delivery of trials ... 23
Interpretation of the VFSS ... 24

IMPLEMENTATION PLAN 25
TEACHING SUPPLEMENTS 25
REVIEW PLAN 25
APPENDIX 1 26
INTERPRETATION OF THE GRADING STRUCTURE 26
Levels of Evidence 26
Grading of Recommendations 26
Considered Judgement Form 27
Sample of Data Extraction Forms (from RCSLT) 31
APPENDIX 2 32
Summary of Advice from Cultural Advisors on maximising cultural sensitivity within a VFSS Procedure 32
TABLE OF EVIDENCE 33



INTRODUCTION

Scope of the Guideline

In 2009, the National SLT Health Leaders' Group identified the need for a New Zealand clinical guideline for speech-language therapists (SLTs) working with videofluoroscopic study of swallowing (VFSS), also known as modified barium swallow (MBS).

It was acknowledged that VFSS is a proven valid tool and is clinically important. Instrumental assessment of dysphagia is vital given the limitations of the clinical swallowing/feeding evaluation. VFSS is the most readily available instrumental assessment tool for SLTs in New Zealand. Unfortunately, despite its 'gold standard' status, there is an inconsistency in practice across New Zealand, and internationally, and there is a discrepancy between international policy statements, current literature and actual practice.

This guideline aims to be relevant to the assessment of both children and adults and to support practice across the breadth of services of New Zealand (i.e. rural and urban, community and hospital-based). It aims to source evidence internationally but to be specific to the New Zealand context.

Purpose of the Guideline

The aim of this clinical guideline is to support consistent speech-language therapy practice through explicit evidence-based statements. This guideline is aimed at managers and clinicians and may be used to support clinical decision-making and service delivery decision-making. Where evidence is not available, expert opinion and professional consensus have been included.

This guideline is written for speech-language therapists and has been produced using multidisciplinary literature and with multidisciplinary consultation. It may be used as part of a multidisciplinary document at a local level.

Definition

A VFSS should be distinguished from a barium swallow procedure. A VFSS is a medical imaging procedure performed by a radiologist and/or speech-language therapist with focus on the anatomy and physiology of the oral, pharyngeal, laryngeal and upper oesophageal parameters of swallowing. A variety of foods, fluids and compensatory strategies are usually trialed. In comparison, a barium swallow is a medical imaging procedure used to examine the upper gastrointestinal tract focusing on the oesophagus and stomach. This is performed by a radiologist to identify oesophageal abnormalities such as motility issues or structural abnormalities and often requires larger volumes of liquids to be ingested.

Context and Use

This guideline has been written with the unique New Zealand population and health service in mind in order to allow clinicians and managers to easily apply evidence to practice. The guideline must always be used within the context of local governance. Statements must be interpreted with clinical judgement on a case-by-case basis.

Population

Dysphagia can occur at any stage of life and may have many causes. Speech-language therapists working in the area of dysphagia engage with many patient groups with the aim of habilitating, maintaining and rehabilitating swallowing. In the paediatric sector, SLTs work with children with congenital, acute and/or chronic conditions which include but are not limited to TBI, cerebral palsy, prematurity/chronic lung disease, Down Syndrome, complex congenital heart disease and intracranial tumours. In the adult sector, SLTs work with patients with acute, chronic and progressive conditions which include but are not limited to stroke, progressive neurological conditions (Parkinson's disease, Motor Neurone disease, Multiple Sclerosis, Huntington's disease), cognitive impairment (dementia, intellectual disability) and head and neck cancer. SLTs work across many settings including acute hospitals, rehabilitation centres, residential facilities, schools and community-based or home-based services. VFSS is deemed an appropriate instrumental assessment tool with all population groups in all settings.

Endorsements

The New Zealand Speech-language Therapists' Association (NZSTA)
The Royal Australian and New Zealand College of Radiologists

Acknowledgements

Thank you to the National SLT Health Leaders' Group for initiating this project and for agreeing to take responsibility for implementing and reviewing it. We would like to thank the New Zealand Guideline Group (NZGG) for their resources and support in producing this guideline and for use of the NZGG grading of recommendations system. Thank you to the Royal College of Speech and Language Therapists (RCSLT) for permission to use RCSLT Clinical Guidelines 2005 critical appraisal forms and levels of evidence process. Due to the extensive work done by NZGG and RCSLT this guideline was made achievable. Thank you to all the speech-language therapists who were involved in developing this guideline and to the New Zealand Speech-language Therapists' Association (NZSTA) for their support and encouragement. Thank you specifically to Clare McCann, Professional Standards, NZSTA and Kerrie Gallagher, Māori and Cultural Development, NZSTA for their significant contributions. Thank you to the consultation group for reading drafts and providing expert advice. Many thanks to Fran Clements at the University of Auckland Medical School Library for her support in literature searching.

Anna Miles, Project Leader

Working Group Members

Project Lead: Anna Miles – *Senior Tutor, Speech Science, The University of Auckland*

Andrea Benoit – Professional Leader, Speech-Language Therapy, *Waitemata DHB*

Melissa Keesing – Speech-Language Therapist- paediatric dysphagia, *Auckland DHB*

Helen McLauchlan – Professional Leader, Speech-Language Therapy, *Counties Manukau DHB*

Esther Ong – Speech-Language Therapist- ENT/ORL, *Auckland DHB*

Helen Rigby – Professional Leader, Speech-Language Therapy, *Capital and Coast DHB*

Margaret Sargent – Clinical Specialist, Speech-Language Therapist, Community Stroke Team, *Canterbury DHB*

Leanne Whitteker – Speech-Language Therapist, Stroke Unit, *Canterbury DHB*

Jodi White – Speech-Language Therapist, *Midcentral DHB*

Philippa Williams – Clinical Director, Speech Science, *The University of Auckland*

Consultation Group

Beverley VanZyl - *Speech-Language Therapy Manager- Rural and Remote, Northland DHB*

Bianca Gordon - *Senior Tutor- paediatric dysphagia, Speech Science, The University of Auckland*

Clare McCann PhD - *Professional Standards, The New Zealand Speech-language Therapists' Association (NZSTA)*

Dr David Vokes - *Consultant ORL, Auckland DHB*

Diane Brown - *Team Leader, Medical Radiation Technician, Starship Hospital, Auckland DHB*

Dr Glyn Thomas - *Consultant Radiologist, Palmerston North Hospital, Midcentral DHB*

Dr Jacob Twiss - *Consultant Paediatric Respiratory Medicine, Starship Hospital, Auckland DHB*

Ian Kaihe-Wetting - *TIP Facilitator, Te Kaahui Oro (Māori Health Services), Counties Manukau DHB*

Kerrie Gallagher – *Māori and Cultural Development, The New Zealand Speech-language Therapists' Association (NZSTA)*

Dr Jacqueline Allen - *Consultant ORL, North Shore Hospital; Senior Lecturer, Department of Surgery, The University of Auckland*

Jenni Palmer - *Unit Charge Medical Radiation Technician, Angiography/Fluoroscopy, Capital and Coast DHB*

Karla Rika-Heke - *Te Kaahui Ora Nurse Educator, Counties Manukau DHB*

Maggie-lee Huckabee PhD – *Senior Lecturer, University of Canterbury, Christchurch; The Van der Veer Institute for Parkinson's and Brain Research, Christchurch*

Dr Richard Annand – *Consultant Radiologist, Christchurch Radiology Group*

Dr Russell Metcalf - *Paediatric Radiologist, Starship Hospital, Auckland DHB*

This clinical guideline was developed in consultation and discussion with the above listed clinicians. The working group members contributed to the project on the basis of their work context. The working group as a whole was considered to be representative of the range of contexts in which speech-language therapists' work.

METHODOLOGY

Working Group

A working group was established from volunteers through the National SLT Health Leaders' Group. Members varied in locality, service and experience. The group worked through email and teleconferences as well as locality-based small working parties for evidence appraisal.

Recruitment of Consultation Group

A range of specialists within the speech-language therapy profession and within relevant associated professions was asked to form a consultation group. The aim was to gain advice on draft guidelines from experienced professionals who worked with VFSS across the variety of different client groups (e.g. paediatric and adults, radiologists, medical radiation technologists (MRTs)) as well as across the variety of contexts of New Zealand (e.g. rural, community-based).

Literature Search

A structured review of the literature was carried out. The working group devised a list of clinical questions and these were turned into key words for the database search. Search databases included Medline, Embase, Cochrane, Scopus, CINAHL as well as searches on various websites and smaller databases e.g. Speechbite, Google scholar, NHS Evidence (NICE) and relevant national and international professional association sites e.g. Ministry of Health NZ, American Speech-Language-Hearing Association (ASHA). Key textbooks were read to gauge expert opinion/professional consensus on specific areas of the guideline and hand searching through reference lists and bibliographies of relevant reviews and research was carried out.

Appraisal of the Evidence

Literature was read and appraised by the working group and their speech-language therapy colleagues. This guideline aligns its appraisal of evidence with the New Zealand Guideline Group (NZGG) and the Royal College of Speech Language Therapists (RCSLT). The Health Service Assessment Cooperation (HSAC) recommendations of high quality, regularly used grading tools were taken into account (Ali 2009).

With permission from the RCSLT, each paper was critically appraised using one of seven data extraction forms depending on its methological design; analytic cohort/one sample longitudinal, case control/case series, cross-sectional/survey, randomised controlled trial, single subject, systematic review and meta-analysis and qualitative. These checklists (see appendix) taken from the RCSLT Clinical Guidelines were based on work carried out by the Scottish Intercollegiate Guidelines Network (SIGN) and the Royal College of Nursing, UK.

Each paper was given an evidence level based on the critical appraisal. These levels of evidence were taken from the RCSLT Guidelines (based on *AHCPR 1992*) and range from Ia-IV (see appendix).
Recommendations were assessed using the NZGG considered judgment forms (see appendix) and graded based on the volume of evidence, consistency, applicability and clinical impact. A grade was allocated for each recommendation following the NZGG grading of recommendations (see appendix);

A *The recommendation is supported by good evidence.*

B *The recommendation is supported by fair evidence.*

C *The recommendation is supported by expert opinion only and/or limited evidence.*

I *No recommendation can be made because the evidence is insufficient. Evidence is lacking, of poor quality or conflicting and the balance of benefits and harms cannot be determined.*

✓ *Recommended good practice based on the clinical experience of the guideline development group and where guidance is needed.*

As always, interpretation of grading of literature must be taken cautiously. A low grading means that there has not been a large amount of research in that particular area of practice NOT that the recommendation is a poor one.

The Unique New Zealand Context

NZ Population Data from 2006 Census:

- European largest major ethnic group 67.6%
- Māori 14.6%
- Asian 9.2%
- Pacific peoples 6.9%
- Middle Eastern, Latin American and African 0.9%

Statistics New Zealand (Tatauranga Aotearoa) www.stats.govt.nz/census/2006CensusHomePage

It was deemed important to address the unique cultural context of New Zealand in the guideline and the guideline group wanted to reflect its commitment to a Treaty of Waitangi/Te Tiriti o Waitangi relationship with Māori. Māori and Pacific Island consultation occurred throughout guideline development. Key literature on culturally sensitive practice in health was appraised and incorporated into the recommendations. Māori and Pacific Island Advisors were asked to observe a VFSS procedure in a New Zealand District Health Board and provide advice on providing a culturally sensitive service (see appendix). This advice was incorporated into the recommendations.

In today's dysphagia practice, we need to expand our definition of culture to include not only patients who are ethnically diverse, but also to consider socioeconomic status and those who may belong to a religious group, follow a specific lifestyle or even eat specific foods. All of these factors may influence the patient's view of disability, of western medical treatment, the roles of family members and of clinicians, the different gender roles, and the ways in which we show respect (Riquelme, 2004).

GUIDELINE SUMMARY

Recommendation	Strongly recommended with Good Evidence	Recommended with Fair Evidence	Recommended Expert Opinion but little research in the area
VFSS is a clinically valid assessment tool	✓		
A clinical swallowing/feeding evaluation should occur prior to the VFSS			✓
SLTs should receive ongoing training in using VFSS	✓		
SLTs should ensure they have good knowledge of normal swallowing physiology	✓		
SLTs should be aware of the principles of cultural safety			✓
SLTs should receive radiation safety training	✓		
A staff member of radiology must be present to work the fluoroscopy equipment	✓		
A radiologist must be present or available to review recordings of the procedure			✓
SLTs are not qualified to make medical diagnosis or identify structural deviations	✓		
SLTs should have access to high quality images and slow motion playback	✓		
Voice recording and a counter timer are recommended			✓
SLTs should take responsibility for educating patients and their family/whānau			✓
SLTs should follow a standardised procedure with standardised use of contrast agents		✓	
SLTs should avoid aspiration of high density barium where possible	✓		
SLTs should use clinical judgment on the termination of the procedure		✓	
All efforts should be made to simulate normal feeding positions within the procedure		✓	
Patients should be viewed in lateral and anterior-posterior projection as appropriate			✓
The oesophageal stage should be viewed where appropriate			✓
Consistencies and delivery modes should be selected based on specific patient needs		✓	
Compensatory strategies should be trialled within the procedure		✓	
Many rehabilitative approaches should not be recommended without objective assessment such as VFSS		✓	
A locally agreed objective VFSS tool should be used for interpretation	✓		
A comprehensive report should be written. An additional radiologist report should be written (if present)			✓

The full guideline can be accessed through The New Zealand Speech-language Therapists' Association (NZSTA) website at www.speechtherapy.org.nz.

RECOMMENDATIONS

A *The recommendation is supported by good evidence.*

B *The recommendation is supported by fair evidence.*

C *The recommendation is supported by expert opinion only and/or limited evidence.*

I *No recommendation can be made because the evidence is insufficient.*

✓ *Recommended good practice.*

Indications for using VFSS

VFSS is useful clinically for a variety of population groups in both acute and non-acute settings. **A**

VFSS is considered a gold standard assessment of swallowing due to its proven validity. Examples of population groups who can benefit from VFSS include acquired neurological disorders, benign and malignant head and neck conditions, tracheostomised and/or ventilated patients, respiratory conditions, spinal injuries, burns and trauma, developmental and congenital conditions (RCSLT 2007). The sensitivity and specificity of the 'bedside' clinical swallowing evaluation (for identifying patients who aspirate) has been found to be poor. Therefore, the use of instrumental assessments such as VFSS is a vital part of speech-language therapy practice.

Evidence:

Hiorns & Ryan (2006) Evidence level IV
Leonard & Kendall (2008) Evidence level IV
Logemann (1998) Evidence level IV
Logemann et al (2008) Evidence level IIa
Mari et al (1997) Evidence level III
Martin-Harris et al (2000) Evidence level III
Mason (1993) Evidence level IV
Ott et al (1996) Evidence level III
RCSLT (2007) Evidence level IV
Smithard et al (1998) Evidence level III
Splaingard et al (1988) Evidence level III
Stroudley & Walsh (1991) Evidence level IIb
Tippett (2000) Evidence level IV
Zerilli et al (1989) Evidence level III

VFSS is considered useful for investigation of the following:

- To confirm and/or differentially diagnose dysphagia including normal and abnormal swallowing physiology and airway protection during swallowing **A**
- To enhance nutritional adequacy and safety through compensatory strategies and diet modification **A**
- To monitor change in a patient already known to have dysphagia **C**
- To support an inconclusive clinical swallowing/feeding evaluation (e.g. due to cognitive or communication difficulties or where the clinical condition does not match the clinical swallowing/feeding evaluation) **C**

- To determine appropriate rehabilitative strategies **A**
- To support decisions regarding quality of life (e.g. choices about alternative feeding methods) **C**
- To provide objective information for patient, family and multidisciplinary team (MDT) about swallowing function. **C**

Evidence:

Arvedson & Lefton-Greif (1998) Evidence level IV
Baylow et al (2009) Evidence level IIa
Bisch et al (1994) Evidence level III
Daniels & Huckabee (2008) Evidence level IV
De Matteo et al (2005) Evidence level III
Huckabee & Pelletier (1999) Evidence level IV
Leonard & Kendall (2008) Evidence level IV
Logemann et al (1994) Evidence level IIb
Logemann et al (1995) Evidence level III
Logemann & Kahrilas (1990) Evidence level III
Martin-Harris et al (2000) Evidence level III
Pikus et al (2003) Evidence level III
Shaker et al (2002) Evidence level Ib

VFSS is useful in identifying aspiration risk in patients with dysphagia. **A**

Rationale:

Studies have shown good intra and inter-rater reliability for SLTs identifying aspiration using VFSS.

Evidence:

Langmore et al (2003) Evidence level III
Mari (1997) Evidence level III
Martin-Harris et al (2000) Evidence level III
Ott et al (1996) Evidence level III
Rugiu (2007) Evidence level IV
Singh et al (2009) Evidence level III

A clinical swallowing/feeding evaluation must occur prior to a VFSS and the detailed results of this must be available to the team performing and analysing the VFSS.

This should include:

- case history from patient, family, MDT
- medical history
- speech and voice assessment
- oral motor examination
- observation of eating and drinking/feeding. **C**

Evidence:

Arvedson & Lefton-Greif (1998) Evidence level IV
Daggett et al (2006) Evidence level III
Daniels & Huckabee (2008) Evidence level IV
Leonard &Kendall (2008) Evidence level IV
O'Donoghue & Bagnall (1999) Evidence level IV
Rugiu 2007 Evidence level IV

Contraindications for VFSS

A VFSS is not considered appropriate for the following:

Medically unstable, drowsy or agitated patients
Patients who are unable to be positioned safely
Patients with allergies to barium/contrast
Patients without a clear rationale for assessment or where management is unlikely to change as a result of the VFSS

An SLT should have a clear reason for a referral for VFSS and be prepared for the management decisions as a result of the procedure (SPA 2005). **C**

Use of VFSS in comparison to other investigations such as Flexible endoscopic evaluation of swallowing (FEES)

The decision to complement a clinical/feeding swallowing evaluation with an instrumental investigation such as a VFSS should be made with considered judgement of the advantages and disadvantages of the instrumental options available in the workplace **B**

Rationale:

Many researchers have investigated the merits of one instrumental dysphagia assessment tool over another. There is evidence that both VFSS and FEES provide good sensitivity and specificity when assessing swallow physiology and aspiration risk. VFSS and FEES have different clinical and practical merits (see ASHA, 2004) and where other tools are available, the assessment tool should be chosen based on the specific case (e.g. mobility, risk with radiation exposure) and specific clinical question (e.g. aspiration risk, pharyngeal mobility, UES opening). It should be noted that VFSS and FEES are complementary and not exclusive tools.

Evidence:

Allen et al (2010) Evidence level III
Arvedson & Lefton-Greif (1998) Evidence level IV
ASHA (2004) Evidence level IV
Aviv (2000) Evidence level Ib
Butler et al (2009a) Evidence level III
Butleret al (2009b) Evidence level III
Chih-Hsiu et al (1997) Evidence level III
Hiorns et al (2006) Evidence level IV
Langmore et al (2003) Evidence level III
Langmore et al (1991) Evidence level III
Leder 1998 Evidence level III
Martin-Harris et al (2007) Evidence level III
Singh et al (2009) Evidence level III
Teasell et al (1999) Evidence level III
Wu et al (1997) Evidence level II

SLT Competency

All SLTs using VFSS should maintain competency through continuous professional development to maximise the accuracy of their interpretations including peer review/group interpretation sessions. **A**

Rationale:

Researchers have discovered highly variable and often poor intra and inter-rater reliability for VFSS analysis and interpretation. There are some clear correlations between level of experience and training and improved intra/inter-rater reliability and accuracy. Group discussion is believed to help with intra/inter-rater consensus and therefore accessing opportunities for peer review and mentoring is recommended. In Nightingale & Mackay (2009), education/training not only improved accuracy of interpretation but also led to improvements in service delivery/protocol development.

Evidence:

ASHA (2002) Evidence level IV
Becker et al (2005) Evidence level III
CASLPO (2008) Evidence level IV
Gibson et al (1995) Evidence level III
Kuhlmeier et al (1998) Evidence level III
Logemann et al (2000) Evidence level IIb
McCullough et al (2001) Evidence level III
Nightingale & Mackay (2009) Evidence level III
RCSLT (2007) Evidence level IV
Scott et al (1998) Evidence level III
SPA (2005) Evidence level IV
Stoeckli et al (2003) Evidence level III
Wilcox et al (1996) Evidence level III

SLTs need a good understanding of normal infant/adult swallowing and normal ageing swallowing in order to accurately identify abnormality. This includes an understanding of the effects of bolus volume, viscosity, nasogastric tube presence and verbal cueing on presentation. **A**

Rationale:

Studies show a great range of swallowing physiology amongst the normal population. There is now good normative data for the young adult and older adult in the literature although normative data for the paediatric population are less documented. SLTs need to have a good understanding of, for example, the normal range of hyoid movement, the normal range of position of bolus at point of swallow initiation and the normal range of vallecular residue in an older adult. There are studies that also give good normative data for the effects of bolus size and viscosity on the duration of different components of a swallow. Daniels and colleagues (2007) found that verbal cueing affected swallow physiology in their healthy older cohort and this should be considered during the VFSS. Nasogastric tubes have been shown to change swallow dynamics in normal and stroke patients and this should therefore be taken into account. There is emerging evidence of the effects of sensory variations (hot versus cold), taste and carbonation, and these may also need to be considered during assessment.

Evidence:

Allen et al (2010) Evidence level III

Arvedson & Lefton-Greif (1998) Evidence level IV

Butler et al (2009) Evidence level III

Butler et al (2009) Evidence level III

Daggett et al (2006) Evidence level III

Daniels et al (2007) Evidence level IIb

Hiorns et al (2006) Evidence level IV

Huggins et al (1999) Evidence level III

Lazarus et al (1993) Evidence level IIa

Leonard &Kendall (2008) Evidence level IV

Logemann et al (1998) Evidence level IIb

Martin-Harris et al (2007) Evidence level III

Miura et al (2009) Evidence level III

Wang et al (2006) Evidence level III

SLTs must be aware of the unique relationship with Maori and the fundamental principles of cultural safety for a cross section of cultures represented within New Zealand. This includes Asian and Pacific Island cultures.

SLTs must be responsible for the use of these principles within the radiology suite. **C**

Although no single clinician can be expected to have a complete knowledge of all the different cultures in his or her geographic area, each should actively demonstrate willingness to access information needed to provide a culturally competent service. **C**

Rationale:

Consideration must be given to providing New Zealand specific training for SLTs on Treaty of Waitangi/Te Tiriti o Waitangi and cultural awareness particularly given our internationally trained workforce. Significantly relevant for SLTs are protocols for: engagement, the importance of relationship building, disengagement, acknowledgement and inclusion of relevant beliefs, values and potential role of whānau and other support people (including, but not restricted to Māori support staff and interpreters). When working with people with dysphagia in particular, SLTs should have an awareness of beliefs and customs around food since this will assist them with the provision of appropriate assessment and management (Manna et al, 2003). It is the responsibility of the SLT to incorporate a holistic approach to health and ensure food is prepared, stored and served in accordance with relevant cultural beliefs and practices of each patient.

Evidence:

Davis-McFarland, E. (2008) Evidence level IV

Dikeman & Riquelme (2002) Evidence level IV

Manna et al (2003) Evidence level III

Riquelme, L.F. (2004) Evidence level IV

Riquelme, L.F. (2007) Evidence level IV

Protocol

Radiation Safety

All SLTs participating in VFSS should gain and maintain knowledge of radiation safety practices for themselves and their patients within the workplace. **A** *

All SLTs conducting VFSS should wear lead aprons and thyroid shields. Radiation monitoring badges should be worn if required by the institution. Lead gloves and glasses should be worn if close proximity to the patient is needed for feeding **A** *

All SLTs should understand the implications of prolonged radiation and minimise patient exposure through carefully considered liquid/food/strategy selection. **A** *

Rationale:

VFSS, as currently conducted, has proved to be **low risk** in terms of effective dose of radiation both to the speech-language therapist and the patient. This has been found irrespective of age, the aetiology of dysphagia or screening of pharynx alone versus pharynx and oesophagus. Screening time must be recorded and reviewed by the Principal Licencee on a regular basis. The legal responsibility for monitoring/controlling radiation doses lies with the radiologist (or MRT in his/her absence), including the right to control who is present in the x-ray room (Ministry of Health- NRL C5). The Ministry of Health Radiation Protection Act (1965) states that a shared monitoring badge approach is adequate for low dose personnel but that it is not acceptable to perform procedures without a monitoring badge.

Researchers have found a linear relationship between the effective dose of radiation and the screening time. Documented screening time ranges from 18 seconds to 8 minutes 17 seconds (497 seconds). The VFSS procedure allows for longer screening time with lower effective dose levels in comparison with a barium swallow procedure. Internationally, there are no specific dose references recommended for VFSS but SLTs should be guided by the Ministry of Health Code of Safe Practice (in accordance with their radiologists and MRTs). SLTs have a responsibility to follow the ALARA (as low as reasonably achievable) principles (Strauss 2006) alongside radiology personnel. This means SLTs have a responsibility to minimise radiation exposure time through i) ensuring there is a clear rationale/plan for the study, ii) directing the MRT to areas of specific interest e.g. oesophagus in the anterior/posterior plane and iii) directing the MRT about when to continue versus halt screening e.g. during chewing to avoid unnecessary radiation.

Studies that have addressed speech-language therapy education and awareness of radiation risks and safe practices recommend education and knowledge of radiation safety practices should be provided at a university level and then maintained through formal education sessions/packages in the workplace by both SLTs and radiology departments.

Evidence:

Chan et al (2002) Evidence Level III
Chau & Kung (2009) Evidence Level III
Cohen (2009) Evidence Level IIb
Crawley et al (2004) Evidence Level III
Hayes et al (2009) Evidence Level III
Jones (2003) Evidence Level IV
Ministry of Health (2010) Evidence Level IV
Ministry of Health (1965) Evidence Level IV
Moro & Cazzani (2006) Evidence Level III
Strauss & Kaste (2006) Evidence level IV
Warren-Forward et al (2008) Evidence Level III
Weir et al (2007) Evidence level III
Wright et al (1998) Evidence Level IIb
Zammit-Maempel et al (2007) Evidence Level IIa

** This recommendation has been given a Grade A due to its significant clinical impact and applicability as a New Zealand policy statement.*

Team Members and roles

The VFSS procedure and analysis should be a multidisciplinary activity with clear roles and responsibilities for those professionals involved. This is especially important with a complex patient (e.g. presence of a tracheostomy where the responsibilities for suctioning and the ventilator adjustments must be clear prior to the procedure). **C**

An NRL licensed staff member of radiology must be present to work the equipment (radiographer or medical radiation technologist (MRT)). An SLT is not qualified to use radiology equipment. **A ***

It is considered best practice internationally for a radiologist to be present during the VFSS procedure. Where an SLT is leading the procedure, the SLT should have appropriate access to a radiologist or medical support and have permission from the employing authority. **C**

Rationale:

A VFSS requires the skills of different professionals in order to be performed safely and to maximise its benefits. Essential team members are: a medical radiation technologist (MRT), a speech-language therapist (SLT), a radiologist (present or access to) and a nurse (present or access to). Other team members may include a physiotherapist, whānau, relevant cultural support, an interpreter, a therapy assistant, a specialist medical practitioner (e.g. intensivist, ENT/ORL surgeon).

Evidence:

ASHA (2004) Evidence level IV
CASLPO (2008) Evidence level IV
Medicare (2008) Evidence level IV
SPA (2005) Evidence level IV
RCSLT (2007) Evidence level IV

** This recommendation has been given a Grade A due to its significant clinical impact and applicability as a New Zealand policy statement.*

SLTs are not qualified to make a medical diagnosis or identify structural deviations. The SLT should refer all oesophageal abnormalities and anatomical abnormalities to a medical practitioner immediately if there is not one present in the procedure. **A ***

Where a patient is medically complex (e.g., ventilator dependant or spinal injury), a medical practitioner should attend the procedure. **C**

Where oesophageal abnormalities and anatomical abnormalities are suspected, a medical practitioner should attend the procedure. **C**

SLTs should have the knowledge and skills to recognise anatomical abnormalities and "recognize patient signs and symptoms that may be associated with cervical-esophageal and esophageal phase dysphagia" (ASHA 2004) and know when to refer to a radiologist if one is not present.

Evidence:

ASHA (2004) Evidence level IV
ASHA (2008) Evidence level IV
CASLPO (2008) Evidence level IV
Hiorns et al (2006) Evidence level IV
Medicare (2008) Evidence level IV
RCSLT (2007) Evidence level IV
SPA (2005) Evidence level IV
Ward & Morgan (2009) Evidence level IV

** This recommendation has been given a Grade A due to its significant clinical impact and applicability as a New Zealand policy statement.*

Recording

SLTs should have access to high quality images to maximise the accuracy of their interpretations. **A**

The procedure must be recorded to allow for slow motion playback. **A**

Voice recording is recommended to record presence of coughing/throat clearing and need for external prompting. **C**

A counter timer is strongly recommended to ascertain meaningful timing measures of swallowing. **C**

Rationale:

SLTs should consult with radiological personnel to ensure that the recording is sufficient to capture adequate information. This includes use of a high-resolution videofluoroscopic recording medium, views of oral cavity, pharynx, larynx, and upper oesophageus, and an adequate temporal resolution.

The availability of slow motion playback and a good quality image is important for reliability. Where clinicians are able to enhance the images and improve contrast/brightness, intra/inter-rater reliability has been shown to be greater (e.g. access to a Kay Swallowing Workstation (KayPentax). (Hind et al 2009)

Evidence:

ASHA (2002) Evidence level IV
CASLPO (2008) Evidence level IV
Daniels & Huckabee (2009) Evidence level IV
Hind et al (2009) Evidence level Ib
Hiorns et al (2006) Evidence level IV
Leonard & Kendall (2008) Evidence level IV
Logemann (1998) Evidence level IV
RCSLT (2007) Evidence level IV
SPA (2005) Evidence level IV
Weir et al (2007) Evidence level III

Education to patient and whānau

SLTs must gain informed consent and take responsibility for working with patients and their whānau by educating them on the procedure and its purpose. **C**

Rationale:

Literature supports the relevance of sensitivity around 'how' information is provided to patients and their whānau both in relation to consenting to the procedure and the feedback of results. Information methods need to be flexible, innovative and relevant to the individual situation. SLTs should provide an opportunity and an environment where the patient can invite/include whānau or others who support them. In many cultures the importance of the whānau as a collective must be acknowledged. By including whānau and other support people a broader and clearer understanding of the procedure and its purpose can be achieved. This may also reduce any anxiety for the patient and support a higher level of participation.

Evidence:

Manna et al (2003) Evidence level III

Assessment

Assessment should include;

Oral parameters at rest and during swallowing of a variety of consistencies
Oral transit parameters including calculating transit timings
Pharyngeal parameters at rest and during swallowing of a variety of consistencies
Laryngeal Parameters including a penetration-aspiration measure
Crico-oesophageal parameters
Oesophageal parameters

Huckabee (unpublished) New Zealand Index for the Multidisciplinary Evaluation of Swallowing (NZIMES) **C**

SLTs must use an objective VFSS tool to maximise the accuracy of their interpretations. **A**

The VFSS procedure should assess structures at rest as well as swallowing physiology and coordination. Objective measures are recommended such as hyolaryngeal elevation, pharyngeal transit timing measures and maximal pharyngoesophageal segment (PES) opening measures. Many researchers have provided guidance to clinicians in the objective measurement of temporal and spatial aspects of swallowing as viewed on VFSS (for a detailed guide see Leonard & Kendall, 2008).

Large studies have shown that with training, clinicians gain a high accuracy for judging presence/absence of aspiration when using a penetration-aspiration scale (even compared with 'expert' judges). Without objective measures, the reliability of other parameters of oro-pharyngeal swallow has been shown to be poor. There is higher inter/intra-rater reliability for numerical variables (e.g. number of swallows, transit time) than for functional variables and a higher reliability when a standardised tool is used e.g. Penetration-Aspiration Scale (Rosenbek 1998) or MBSImp (Martin-Harris 2008). In order for maximum benefit and information to be gained from the radiation exposure to patients, a VFSS tool such as the NZIMES (Huckabee) must be used.

Effects of cognition, respiration and fatigue should also be observed.

Evidence:

Arvedson & Lefton-Grief (1998) Evidence level IV
Daniels & Huckabee (2008) Evidence level IV
Hind et al (2009) Evidence level Ib
Huckabee (unpublished) Evidence level IV
Jones (2003) Evidence level IV
Kellen et al (2010) Evidence level III
Leonard & Kendall (2008) Evidence level IV
Leonard et al (2011) Evidence level III
Logemann (1998) Evidence level IV
Martin-Harris et al (2008) Evidence level III
O-Donoghue & Bagnall (1999) Evidence level IV
Park et al (2009) Evidence level IIb
Palmer et al (1993) Evidence level III
Perlman et al (1995) Evidence level IIb
Rosenbek et al (1996) Evidence level III

Preparation of Food and Fluids with Contrast Agents

Departments should follow a standardised use of contrast agents and materials to aid consistency when reviewing tapes or comparing to follow-up studies (i.e. the product and mixture of product with food/fluid).

Caution should be taken in making recommendations about diet modification based on the response to barium altered materials as the addition of barium changes consistency, taste and viscosity. **B**

Rationale:

Chicero et al (2000) found a poor correlation between mealtime fluids and VFSS fluids. VFSS fluids were more viscous, more dense and showed higher yield stress values than their mealtime counterparts. They concluded that clinicians should create recipes such that adding barium to fluids is more objective. Fink and Ross (2009) found marked differences in patients' responses to various 'thin liquid' barium solutions on the market.

Evidence:

Chicero, et al (2000) Evidence level IIa
Dantas et al (1989) Evidence level III
Fink & Ross (2009) Evidence level III
Groher et al (2006) Evidence level III
Hiorns et al (2006) Evidence level IV
Logemann et al (1995) Evidence level III
Mason 1993 Evidence level IV
Nightingale & Mackay (2007) Evidence level III
Power et al (2006) Evidence level IV
RCSLT (2007) Evidence level IV
SPA (2005) Evidence level IV

Barium Safety

SLTs should use low density barium in suspension where possible and avoid patients aspirating high density barium. **A**

Rationale:

The literature suggests that high and low density barium in suspension are commonly used during VFSS procedures. Gross aspiration of high density barium and gastrografin should be avoided. If high levels of aspiration are anticipated then use of water-soluble non-ionic contrast should be used. SLTs should understand the differences between different contrasts.

Evidence:

Gray et al (1989) Evidence Level III
Katsanoulas et al (2007) Evidence Level III
Pracy et al (1993) Evidence Level III
Rasley et al (1993) Evidence level Ib

Termination of Procedure

SLTs should use clinical judgement on the density and quantity of aspirated material and the physical condition of the patient when considering continuation versus termination of the procedure. **B**

SLTs should use clinical judgement on the density and quantity of aspirated material and the physical condition of the patient when considering the need for treatment of the aspiration (i.e. nursing, medical, physiotherapy intervention). **B**

Rationale:

Complications depend on the density and quantity of aspirated material and the physical condition of the patient. A degree of aspiration may be necessary in order to gain a clear assessment of swallow physiology. SLTs must judge the balance between adequate information and challenge of the patient's swallowing versus medical risk. Where possible medical advice should be obtained before continuing a procedure after aspiration has occurred. Where significant aspiration occurs or the patient's physical condition deteriorates, the procedure must be terminated and early treatment and follow-up based on clinical judgement is recommended e.g. contacting a medical professional, nurse or physiotherapist.

Evidence:

Gray et al (1989) Evidence Level III
Katsanoulas et al (2007) Evidence Level III
Pracy et al (1993) Evidence Level III

Positioning of Patient

All efforts should be made to ensure the patient's positioning simulates their normal feeding position. This should include the ability to use the patient's own wheelchair or a specifically designed chair for radiology. In the spinal population, this may entail feeding lying down. **B**

Evidence:

Arvedson & Lefton-Greif (1998) Evidence level IV
Cox & Petty (1999) Evidence level III
Hiorns et al (2006) Evidence level IV
Ott & Pikna (1993) Evidence level IV
O'Donoghue & Bagnall (1999) Evidence level IV
Ward & Morgan (2009) Evidence level IV

SLTs should view the patient swallowing in lateral and anterior-posterior projection where appropriate. Where external bracing is present, slight angling (15-30 °) may be necessary. **C**

The oesophageal stage should be viewed in addition to the oro-pharygneal stage where appropriate. **C**

Rationale:
The lateral plane will identify small degrees of aspiration more than an anterior-posterior plane and should therefore be performed first. The anterior-posterior plane will identify asymmetry in swallow physiology and may allow visualisation of vocal cord movement.

Oesophageal difficulties are common in many aetiologies (e.g. ageing swallow, stroke). Almost one third of patients with oesphageal abnormalities will localise their symptoms in the neck. Oesophageal screening should be considered in all patients, particularly where the pharyngeal findings do not explain the complaints. If the SLT feels the findings are inconsistent with the clinical history, they should endeavour to ensure oesophageal phase studies are included. The additional radiation time will be at the discretion of the radiologist or MRT present. Screening from oral through to oesophagus on the same bolus trial is not recommended.

Evidence:

Arvedson & Lefton-Greif (2007) Evidence level IV
ASHA (2008) Evidence level IV
Daniels & Huckabee (2008) Evidence level IV
Hiorns et al (2006) Evidence level IV
Leonard & Kendall (2008) Evidence level IV
Logemann (1998) Evidence level IV
Nightingale (2009) Evidence level III
Weir et al (2007) Evidence level III

Delivery of trials

> Consistencies and delivery modes (e.g. via spoon, cup, bottle) selected for the study should be based on specific patient needs. **B**

Rationale:

Studies have shown that presenting a variety of consistencies and delivery modes leads to an increased chance of identifying a safe diet consistency or method of presentation. Consistencies are managed differently from each other and it is therefore important to try a variety of consistencies to identify the swallowing physiological abnormalities. Some experts suggest small quantities of thin fluids (10-15ml) should begin the procedure as this limits the amount of potential aspiration and pharyngeal residue. It is recommended that one view more than one swallow for each consistency in order to make accurate interpretations. This is because the first swallow may not be representative of general swallowing functioning. The decision to continue trials should be led by the patient's response to each consistency and the SLT's knowledge of the patient's response during the clinical swallowing/feeding evaluation. Thickened fluids should be considered as a compensatory strategy not a standard administration. Eating/drinking should be made as natural as possible including self-feeding wherever possible.

Diet options of specific relevance or difficulty to a patient, should be brought into the procedure (e.g. rice, medication). The relationship with food can have a specific cultural relevance and etiquette. SLTs must ensure they are aware of any potential cultural or religious beliefs and practices towards food (type of food, how it is prepared, how it is presented and how it is offered). Many cultures will not refuse food out of respect for the host and this needs to be considered in relation to VFSS as it may later cause conflict around any future recommendations. It is recommended that SLTs consider inviting whānau to bring appropriate food to the procedure. It is recommended that SLTs offer the opportunity of karakia (a blessing/prayer) prior to consumption of food.

Evidence:

Daniels & Huckabee (2008) Evidence level IV
Hiorns et al (2006) Evidence level IV
Kuhlmeier et al (2001) Evidence Level IIb
Logemann (1998) Evidence level IV
Manna et al (2003) Evidence level III
Newman et al (2001) Evidence level III

> SLTs should trial compensatory strategies during the VFSS to assess their efficacy. **B**

Rationale:

Trialling a compensatory strategy during the VFSS procedure allows the SLT to assess its efficacy and safety. A clinical swallowing/feeding evaluation has been found to be unreliable for assessing if a compensatory strategy has reduced aspiration risk e.g. chin tuck. It may be useful to teach a strategy prior to the assessment e.g. supraglottic swallow. Strategies may include postural changes (e.g. chin tuck and head rotation), manoeuvres (e.g. supraglottic swallow), bolus modifications (e.g. consistency changes) and volume changes or sensory enhancement (e.g. flavour, texture or temperature changes).

Evidence:

Arvedson & Lefton-Greif (1998) Evidence level IV
Baylow et al (2009) Evidence level IIa
Bisch e al (1994) Evidence level III
Bulow et al (1999) Evidence level IIa
Bulow et al (2001) Evidence level IIa
Logemann et al (1994) Evidence level IIb
Logemann et al (1995) Evidence level III
Shanahan et al (1993) Evidence level IIa

Many rehabilitative approaches should not be commenced without identification of swallowing physiology through objective assessment such as VFSS. **B**

Rationale:

Studies have shown that exercises intended to strengthen the muscles of deglutition, may have unexpected consequences resulting in no improvement in swallowing and even harm. Using VFSS to ensure the impairments are correctly diagnosed, reduces the risk of causing harm and ensures beneficence of the rehabilitative approach.

Evidence:

Bulow et al (1999) Evidence level IIa
Bulow et al (2001) Evidence level IIa
Daniels & Huckabee (2008) Evidence level IV
Garcia et al (2004) Evidence level III
Ludlow et al (2007) Evidence level IIa
Steele (2006) Evidence level IV

Interpretation of the VFSS

Written documentation should describe:

- the symptoms observed including details of any aspiration that occurred
- the hypothesised swallow physiology
- a severity rating
- the hypothesised prognosis
- safety of oral intake and compensatory strategy recommendations
- recommendations for dysphagia rehabilitation
- recommendations for referrals to other professionals (e.g. ENT)
- recommendations for SLT follow-up assessment e.g. by clinical evaluation or repeat VFSS. **C**

Reports should be written in a timely manner and be easily accessible to relevant multidisciplinary members. If a radiologist is directly involved, they should also provide a radiological report on the study.

Evidence:

ASHA (2004) Evidence level IV
Logemann (1998) Evidence level IV
Huckabee & Pelletier (1999) Evidence level IV
SPA (2005) Evidence level I

IMPLEMENTATION PLAN

The working group have planned the following implementation strategies:

- National Audit of current practice in relation to guideline recommendations
- Article in the NZSTA Communication Matters
- Publication on the NZSTA website
- Communications with The Royal Australian and New Zealand College of Radiologists and New Zealand Institute of Medical Radiation Technology
- Dissemination of electronic versions to all SLT team leaders nationally at MOH, MOE & ACC.
- Publicity through DHB/GSE communication systems e.g. local newsletters.
- Dissemination to all DHBs for input onto intranet sites
- Electronic copies to academic centres; University of Canterbury, The University of Auckland, Massey University

TEACHING SUPPLEMENTS

Teaching supplements are being produced to support specific competency recommendations in the guideline. They aim to provide speech-language therapists with basic knowledge in selected specialist areas of dysphagia management within the New Zealand context that may not be easily assessible to all SLTs within their work place e.g. radiation training for the SLT, oesophageal screening for the SLT.

REVIEW PLAN

This working group recommends that the guideline be reviewed five (5) years after publication. The working group will take responsibility for this review. It is recommended that the review include:

- A further comprehensive literature search
- An update of recommendations in line with new evidence
- Follow-up National Audit at 18 months post-Guideline launch regarding implementation of recommendations i.e. which recommendations are being used consistently across the country.
- Consultation with National SLT Leaders' Group re: implementation of guideline
- Consultation with clinicians regarding impact of guideline on clinical practice
- Feedback through focus groups regarding specific sections of the guideline that directly impact on our specific patient groups e.g. education and consent. This may include feedback from Stroke groups, Parkinson's Disease groups.

APPENDIX 1

INTERPRETATION OF THE GRADING STRUCTURE

It is vital to recognize that the grade does not relate to the importance of the recommendation but to the methodological strength of the supporting evidence, using the grading system below.

Levels of Evidence

Ia	Evidence obtained from meta-analysis of randomised controlled trials
Ib	Evidence obtained from at least one randomised controlled trial
IIa	Evidence obtained from at least one well-designed controlled trial without randomisation
IIb	Evidence obtained from at least one other type of well-designed quasi-experimental study
III	Evidence obtained from well-designed non-experimental descriptive studies, such as comparative studies, correlation studies and case-control studies
IV	Evidence obtained from expert committee reports or opinions and/or clinical experience of respected authorities

(Evidence level taken from RCSLT Clinical Guidelines, based on AHCPR 1992)

Grading of Recommendations

A The recommendation (course of action) is supported by good evidence

The evidence consists of results from studies of strong design for answering the question addressed.

B The recommendation (course of action) is supported by fair evidence

The evidence consists of results from studies of strong design for answering the question addressed but there is some uncertainty attached to the conclusion either because of inconsistencies among the results from the studies or because of minor flaws; or the evidence consists of results from weaker study designs for the question addressed but the results have been confirmed in separate studies and are reasonably consistent. There is fair evidence that the benefits of the course of action being proposed outweigh the harms.

C The recommendation (course of action) is supported by expert opinion only

For some outcomes, trials or studies cannot be or have not been performed and practice is informed only by expert opinion.

I No recommendation can be made because the evidence is insufficient

Evidence for a course of action is lacking, of poor quality or conflicting and the balance of benefits and harms cannot be determined.

Considered Judgement Form

Key question:	**Evidence table ref:**
1. Volume of evidence *Comment here on any issues concerning the quantity of evidence available on this topic and its methodological quality.*	
2. Consistency *Comment here on the degree of consistency demonstrated by the available evidence. Where there are conflicting results, indicate how the group formed a judgment as to the overall direction of the evidence*	
3. Applicability *Comment here on the extent to which the evidence is directly applicable in the New Zealand setting. Comment here on how reasonable it is to generalise from the results of the studies used as evidence to the target population for this guideline.*	
4. Clinical impact *Comment here on the potential clinical impact that the intervention in question might have e.g. size of patient population; magnitude of effect; relative benefit over other management options; resource implications; balance of risk and benefit.*	

5. Other factors *Indicate here any other factors that you took into account when assessing the evidence base*	
6. Evidence statement *Summarise the development group's synthesis of the evidence relating to this key question, taking all the above factors into account, and indicate the evidence level which applies.*	**Evidence level**
7. Recommendation *What recommendation(s) does the guideline development group draw from this evidence? Please indicate the grade of recommendation(s) and any dissenting opinion within the group.*	**Grade of recommendation**

Sample of Data Extraction Forms (from RCSLT)

CASE CONTROL / CASE SERIES CHECKLIST FORM

STUDY IDENTIFICATION	
Author	
Title	
Reference	Year of publication
Checklist completed by	

Section 1 OBJECTIVE	
Evaluation criteria	**How well is this criterion addressed? Use the notation as outlined in the key at the end of the form.**
1.1 Does the study address an appropriate and clearly focused question?	
Selection of subjects	
1.2 Are the cases and controls taken from the same source population?	
1.3 Are the same exclusion criteria used for both cases and controls?	
1.4 What percentage of each group (cases and controls) participated in the study?	
1.5 Is there any comparison of participants and non-participants to establish their similarities or differences?	
Assessment	
1.6 Are cases clearly defined and differentiated from controls?	
1.7 Is it clearly established that controls are non-cases?	
1.8 Is there evidence that the method of assessment was comparable between cases and controls?	
Confounding	
1.9 Are the main potential confounders considered and assessed appropriately?	
Statistical analysis	
1.10 Are the same data processing methods used for cases and controls?	

Speechmark P This page may be photocopied for instructional use only. *RCSLT Clinical Guidelines* © RCSLT 2005

1.11	Is the method of statistical analysis appropriate?	
1.12	Is any measure of precision given?	
1.13	Is a measure of goodness of fit of any multivariate model given?	
1.14	Has a correction been made for multiple statistical testing (where appropriate)?	
	Causal Relationships	
1.15	Is there positive evidence of a causal relationship?	
Section 2	**SAMPLE**	
2.1	How well was the study carried out to minimise the risk of bias or confounding, and to establish a causal relationship between intervention and effect? (Code ++, + or –)	
2.2	Taking into account clinical considerations and your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the factor(s) investigated in this study?	
2.3	Are the results of this study directly applicable to the client group targeted by this study?	
Section 3	**DESCRIPTION OF THE STUDY**	
3.1	What intervention/approaches or prognostic factors are considered?	
3.2	What outcomes are considered?	
3.3	What are the characteristics of the study population? (eg, age, sex)	
3.4	What are the characteristics of the study setting?	

Speechmark P This page may be photocopied for instructional use only. *RCSLT Clinical Guidelines* © RCSLT 2005

Section 4 GENERAL NOTES & COMMENTS

List specific reservations (if any)

Do you agree with the author's conclusions? Yes ☐ No ☐

Is the paper to be included as evidence? Yes ☐ No ☐

KEY FOR 'How well is this criterion addressed?'

Section 1

- Well covered
- Adequately addressed
- Poorly addressed
- Not addressed
- Not reported
- Not applicable

Section 2

++ **All** or **most** of the criteria have been fulfilled.
Where they have not been fulfilled the conclusions of the study or review are thought *very unlikely* to alter.

+ **Some** of the criteria have been fulfilled.
Those criteria that have not been fulfilled or not adequately described are thought *unlikely* to alter the conclusions.

– **Few** or **no** criteria fulfilled.
The conclusions of the study are though *likely or very likely* to alter.

Speechmark P This page may be photocopied for instructional use only. *RCSLT Clinical Guidelines* © RCSLT 2005

Appendix 2

Summary of Advice from Cultural Advisors on maximising cultural sensitivity within a VFSS

Procedure

The following advice was gained from a variety of cultural advisors who observed radiology procedures and reviewed the guideline document. This advice is aimed at supporting speech-language therapists to maximise the cultural responsiveness and sensitivity of their services within Radiology.

Whānau

- Value and acknowledge the role and/or participation of whānau and other support people. Provide an opportunity for patient to invite or include others. In many cultures the importance of the family/whānau as a collective must be acknowledged. Including whānau and other support people can contribute to a broader and clearer understanding of the procedure and its purpose. This may also reduce any anxiety for patient and support a higher level of participation with recommendations.

Information

- If relevant cultural support services are available, inform patient and/or whānau of these services as early as possible. If patient and/or whānau consent, provide an opportunity for these services to be involved.
- Information methods need to be flexible, innovative and relevant to the individual patient and the service they are accessing.

Food

- Demonstrate an awareness and openness of diverse beliefs and customs around food as this will assist with the provision of appropriate assessment and management.
- Consider: the type of food, how it is prepared, how it is presented and how it is offered
- Invite family/whānau to bring appropriate food to the procedure or check with patients and their whānau about the appropriateness of your food options.
- Ensure food is prepared, stored and served in accordance with the relevant cultural beliefs and practices of each patient.
- Offer the opportunity of karakia (a blessing/prayer) prior to consumption of food.

Thank you to the following cultural advisors at Counties Manukau DHB for giving time to observing VFSS/MBS procedures and viewing the Guideline drafts and providing valuable advice to our profession. Thank you also to the NZSTA for their valuable contribution.

Ian Kaihe-Wetting -	TIP Facilitator, Te Kaahui Oro (Māori Health Services), Counties Manukau DHB
Karla Rika-Heke -	Te Kaahui Ora Nurse Educator, Counties Manukau DHB
Kerrie Gallagher -	Māori and Cultural Development, The New Zealand Speech-language Therapists' Association (NZSTA)

TABLE OF EVIDENCE

Reference	Design	Sample	Objective of Study	Conclusion	Level
Allen, J.E., White, C.J., Leonard, R.J., & Belafsky, P.C. (2010) Prevalence of Penetration and Aspiration on Videofluoroscopy in normal individuals without Dysphagia. *Otol Head Neck Surg*.,142: 208-213.	Cross sectional	149 participants VFSS	To determine the prevalence of penetration and aspiration on videofluoroscopic swallow studies (VFSS) in normal individuals without dysphagia.	Aspiration on VFSS is not a normal finding. Penetration is present in 11.4 percent of normal adults and is more common with a liquid bolus.	III
American College of Radiology. ACR practice guideline for the performance of the modified barium swallow in adults. (2001). Retrieved from: http://www.acr.org/SecondaryMainMenuCategories/quality_safety/guidelines/dx/gastro/modified_barium_swallow.aspx	Practice Standards	-	Support safe, consistent practice	Good summary of roles of MDT	IV
American Speech-Language-Hearing Association (2002) Clinical Indicators for Instrumental assessment of dysphagia (guidelines). *ASHA Desk Ref*; 4: 231-239.	Practice Standards	-	Support safe, consistent practice	Detailed policy	IV
American Speech-Language-Hearing Association (2008) Esophageal Dysphagia: Diagnosis and Treatment Options; collated articles from ASHA Special Interest Division Newsletters. ASHA.	Series of newsletter articles collated into a self-study publication	-	Continual Education	Detailed information on oesophageal dysphagia symptoms and treatment	IV
American Speech-Language-Hearing Association (2004) Guidelines for Speech-Language Pathologists Performing Videofluoroscopic Swallowing Studies. *ASHA.*	Practice Standards	-	Support safe, consistent practice	Detailed policy	IV
Arvedson, J.C., & Lefton-Greif, M.A. (1998) Pediatric Videofluoroscopic Swallow Studies. *Communication Skill builders.*	Textbook	-	-	VFSS in the paediatric population	IV
Aviv, J.E. (2000) Prospective, randomised outcome study of endoscopy vs. modified barium swallow in patients with dysphagia. *Laryngoscope, 100*: 563-574.	Randomised clinical trial	126 outpatients. 78MBS exams and 61 FEEST exams	An initial investigation into whether FEEST or VFSS/MBS is superior as diagnostic test.	Outcome measure: pneumonia incidence Both exams have advantages and disadvantages but outcomes are comparable.	Ib
Baylow, H.E., Goldfarb, R., Taveira, C.H. & Steinberg, R.S. (2009) Accuracy of Clinical Judgement of the Chin-Down Posture for Dysphagia During the Clinical/Bedside Assessment as Corroborated by Videofluoroscopy in Adults with Acute Stroke. *Dysphagia, 24*:423-433.	Clinical trial without randomization	15 participants following acute strokes	To examine the sensitivity and specificity of the accuracy of using the chin-down posture during the clinical assessment	Clinical/bedside assessment is not adequate to determine the effect of the chin-down posture on aspiration.	IIa
Becker, S., McLeroy, K., & Carpenter, M. (2005) Reliability of Observations from Modified Barium Swallow Studies. *Journal of Medical Speech-Language Pathology, June:* 97–108.	Reliability study	10 certified SLTs with experience of over 50 MBS	To assess inter- and intra-judge reliability.	Intra-judge reliability relatively strong. Inter-judge reliability stronger for observations with bolus presence but not for structural judgements.	III

Reference	Design	Sample	Objective of Study	Conclusion	Level
Bisch, E. M., Logemann, J. A., Rademaker, A. W., Kahrilas, P. J., & Lazarus, C. L. (1994) Pharyngeal effects of bolus volume, viscosity, and temperature in patients with dysphagia resulting from neurologic impairment and in normal subjects. *Journal of Speech and Hearing Research, 37:* 1041-1059.	Comparative study	28 participants; 10 mild dysphagia (acute stroke), 10 normal 8 moderate-severe (neurological disorder other than stroke)	To determine the effects of volume, viscosity and temperature on the pharyngeal stage of swallowing	There were differences in how stroke patients' and normal subjects' swallowing responded to some bolus volumes and viscosities.	III
Bulow, M., Olsson, R., & Ekberg, O. (1999) Videomanometric Analysis of Supraglottic Swallow, Effortful Swallow, and Chin Tuck in Healthy Volunteers. *Dysphagia, 14:* 67-72.	Clinical trial without randomization	8 healthy volunteers	To determine the effect of different swallowing techniques on videographic and manometric variables	Chin tuck significantly reduces pharyngeal contraction in healthy volunteers, therefore, may be contraindicated in patients with already decreased pharyngeal contraction	IIa
Bulow, M., Olsson, R., & Ekberg, O. (2001) Videomanometric Analysis of Supraglottic Swallow, Effortful Swallow, and Chin Tuck in Patients with Pharyngeal Dysfunction. *Dysphagia, 16*: 190-195.	Clinical Trial without randomization	8 patients with pharyngeal dysfunction	To determine the effect of different swallowing techniques in participants with pharyngeal dysfunction	Chin tuck, effortful swallow and supraglottic swallow did not reduce the number of penetration events.	IIa
Butler, S.G., Stuart, A., & Kemp, S. (2009) Flexible endoscopic evaluation of swallowing in healthy young and older adults. *Ann Otol Rhinol Laryngol*.,118: 99-106.	Case Series	23 young adults 21 older adults	To determine normal swallowing features as assessed by endoscopy/manometry. Study effects of age, gender, bolus size, bolus condition (milk vs water)	Endoscopic data on normal swallowing physiology were generated. This will serve as a landmark for clinicians and researchers in interpretation of dysphagia.	III
Butler, S.G., Stuart, A., Markley, L., & Rees, C. (2009) Penetration and aspiration in healthy older adults as assessed during endoscopic evaluation of swallowing. *Ann Otol Rhinol Laryngol., 118:*190-198.	Cross-sectional study	20 older adults (560 swallows analysed)	To determine the incidence of penetration/ aspiration in normal adults (FEES)	A number of normal subjects penetrate or aspirate. Significantly more aspiration on thin fluids than puree and solids	III
Chan, C.B., Chan, L.K., & Lam, H.S. (2002) Scattered Radiation Level During Videofluoroscopy for Swallowing Study. *Clinical Radiology, 57:* 614-616.	Cross-sectional study	17 adult patients	To investigate scattered radiation level during VFSS	Estimated scattered radiation dose well within limits	III
Chau, K.H.T., & Kung, C.M.A. (2009) Patient Dose During videofluoroscopy Swallowing Studies in a Hong Kong Public Hospital. *Dysphagia, 24 (4):* 387-390.	Cross-sectional study	398 participants (all age ranges)	Measurement of Dose Area Product (DAP) values and fluoroscopic time for VFSS exams.	DAP figures were comparable to similar published literature. There is no known national dose reference for VFSS (Hong Kong) but recommended national doses for barium meal and swallow exam are 11 and 14 Gy cm2.	III
Chicero, J., Jackson, O., Halley, P., & Murdoch, B. (2000) Rheological differences between mealtime and videofluoroscopy fluids. *Dysphagia, 15*: 188-200.	Clinical Trial without randomization	10 major metropolitan hospitals. Each hospitals had to provide 200ml samples	To determine whether there is a perceived subjective difference between mealtime fluids and VFS fluids.	Conclusion: poor correlation between mealtime fluids and VFS over all parameters.	IIa

Reference	Design	Sample	Objective of Study	Conclusion	Level
Wu, C-H., Hsiao, T-Y., Chen, J-C., Chang, Y-C., & Lee, S-Y.(1997) Evaluation of Swallowing Safety With Fiberoptic Endoscope: Comparison With Videofluoroscopic Technique.*The Laryngoscope, 107(5):* 396-401.	Comparative study	28 participants?	To assess validity of FEES compared with VFSS	Validity of FEES	III
Cohen, M.D. (2009) Can we use pulsed fluoroscopy to decrease the radiation dose during videofluoroscopic feeding studies in children? *Clinical Radiology, 64:* 70-73.	Cross-sectional study	10 children aged 1 month to 2yrs nine months	To investigate the possibility of reducing the radiation dose during VFSS below the current 30 frames/s (continuous fluoroscopy)	The pharyngeal phase of swallowing is too quick for pulse fluoroscopy and may be missed. Decreasing fluoroscopic pulse rates may result in non-detection of supraglottic penetration of barium liquid and is therefore not recommended.	IIb
College of Audiologists and Speech-Language Pathologists of Ontario (CASLPO). (2008) Practice Standards and Guidelines for Speech Language Pahtology Practice in the area of Dysphagia. Retrieved from: http://www.caslpo.com/Portals/0/ppg/Dysphagia_PSG.pdf	Practice Standards	-	Support safe, consistent practice	Detailed Guideline	IV
Cox, M.S., & Petty, J. (1999) A videofluoroscopy chair for the evaluation of dysphagia with patients with severe neuromuscular disease. *Arch Phys Med Rehabil., 72:* 157-9.	Case Series	2 participants	To determine the use and practicality of Rehab Tech Video Fluoro Chair	Useful for severely physically impaired group	III
Crawley, M.T., Savage, P., & Oakley, F. (2004) Patient and Operator Dose During Fluoroscopic Examination of Swallow Mechanism. *The British Journal of Radiology, 77:* 654-656.	Case Series	21 patients with oral/pharyngeal dysphagia from spinal or neurological condition	Used to estimate effective dose to patient to provide measures of radiation risk Dose to operators (SLT and Radiologist) measured to estimate annual exposure	Median DAP for patients 3.5 $Gy.cm^2$ (3.1-5.2), effective dose 0.85 mSv (0.76-1.3) Median screen time 3.7 minutes Low associated risk mainly of cancer induction of around 1 in 16 000 Organ receiving greatest dose was thyroid (13.9mSv) Total operator dose (for all 21 studies) less than 0.3mSv for whole body (under lead apron- 0.5 mSv equivalent dose eyes, 0.9mSv equivalents dose extremities) Average for 50 patients per year would be less than 0.6 mSv whole body, 1mSv eyes and 1.8 extremities against corresponding legal dose limits of 20mSv, 150mSv and 500mSv National Radiological Protection Board quote median DAP value of 6.6-8.3 $Gy.cm^2$ for standard barium swallow of 104 seconds, approximately twice the median for VFSS with less study time.	III

Reference	Design	Sample	Objective of Study	Conclusion	Level
Daggett, A., Logemann, J., Rademaker, A., & Pauloski, B. (2006) Laryngeal penetration during deglutition in normal subjects of various ages. *Dysphagia*, 21: 270-4.	Cross-sectional study	98 normal subjects	To study the frequency of penetration of liquid, paste and masticated materials into the airway during VFSS	Results showed that penetrations were significantly more frequent after age 50 and thick viscosities penetrated only in subjects age 50 and over. For persons under 50, 7.4% of swallows exhibited penetration, while for people age 50 and over, 16.8% of swallows showed penetration. Significantly more penetration occurred on larger liquid boluses.	III
Daniels, S.K. & Huckabee, M.L. (2008) Dysphagia After Stroke. *Plural Publishing Ltd.*	Textbook	-	-	Overview of the literature on dysphagia after stroke assessment and treatment	IV
Daniels, S., Schroeder, M., DeGeorge, P., Corey, D., & Ronsenbek, J. (2007) Effects of verbal cue on bolus flow during swallowing. *American Journal of speech-language pathology, 16*: 140-147.	Cross-sectional study	12 healthy older adults	To assess whether bolus timing and bolus direction are affected by verbal cues in healthy adults. 5mls used.	Verbal cue: effect on oral transit time.	IIb
Dantas, R.O., Dodds, W.J., Massey, B.T., & Kern, M.K. (1989) The effect of high- vs low- density barium preparations on the quantitative features of swallowing. *American Journal of Roentgenology,* 153: 1191-1195.	Cross-sectional study	9 healthy control subjects	To compare the effects of high-density and low-density preparations. Concurrent VFSS and manometric studies.	Density as well as viscosity of the barium preparation has an influence on bolus transit time and on UES opening.	III
Davis-McFarland, E. (2008). Family and cultural issues in a school swallowing and feeding program. *Language, Speech, and Hearing Services in Schools, 39 (2):* 199-213.	Descriptive/Expert opinion	1 case study included	To present a rationale for SLT to provide culturally competent evaluation, diagnostic and intervention services for children with oral motor, swallowing and feeding disorders in school settings.	Culturally competent SLT practice strengthens clinical skills and effectiveness, optimizing opportunities for success in working with children and families in the school setting.	IV
DeMatteo, C., Matovich, D., & Hjartarson, A. (2005) Comparison of clinical and videofluoroscopic evaluation of children with feeding and swallowing difficulties *Developmental Medicine and Child Neurology, 47 (3): 149-157.*	Comparative study	75 participants	1. Evaluate the accuracy of CFE compared with VFSS in the detection of penetration and aspiration in children 0-15y. 2. Assess the relationship between therapists' confidence ratings in making judgments about the presence or absence of penetration and aspiration and the accuracy of their evaluation as confirmed by VFSS. 3. To identify clinical predictors of penetration and aspiration during CFE of children with feeding and swallowing difficulties.	CFE with experienced clinicians can detect aspiration and penetration of fluids in children of varied ages and diagnoses, but it is not accurate with solids.	III

Reference	Design	Sample	Objective of Study	Conclusion	Level
Dikeman, K.J., & Riquelme, L.F. (2002). Food for thought: Ethnocultural concerns in dysphagia management. Newsletter of the ASHA Special Interest Division 13: Perspectives on Swallowing and Swallowing Disorders. *Dysphagia, 11 (3):* 31-35.	Review	-	To bring up issues relating to dysphagia and cultural sensitivity/safety for discussion	Cultural sensitivity and safety are very important for SLPs working in dysphagia.	IV
Fink, T.A., & Ross, J.B. (2009) Are We Testing a True Thin Liquid? *Dysphagia, 24*:285–289.	Case series	40 patients with variety of aetiologies including those without likely dysphagia risk	VFSS investigation comparing swallowing of Ultrathin liquid vs Varibar Thin Liquid. Clinical question was "is our thin liquid used in a VFSS reliable for real life thin liquids"?	Fifty percent of patients aspirated on the Ultrathin liquid but not on the Varibar Thin liquid in at least one condition	III
Garcia, J.M., Hakel, M., & Lazarus, C. (2004) Unexpected consequence of effortful swallowing: case study report. *Journal of Medical Speech-Language Pathology, 12 (2):* 59-66.	Case study	1 male, adolescent with cranial nerve damage	Investigate/explain unexpected nasal regurgitation as a result of effortful swallow	Swallowing manoeuvres can have unexpected consequences, thus VFSS is necessary to determine effects of such manoeuvres on swallowing physiology.	III
Gibson, E., Phyland, D., & Marchner, I. (1995) Rater Reliability of the Modified Barium Swallow. *Australian Journal of Communication Disorders,* 23: 54-60.	Reliability study	8 subjects; 20 swallows 4 SLT raters with between 40-200 VFS experiences.	Comparison of inter and intra rater reliability for 6 defined variables (defined by researchers)	High inter and intra rater reliability for numerical variables (e.g. transit time) 'good' agreement on aspiration 'poor' agreement on residue	III
Gray, C., Sivaloganathan, S., & Simpkin, K.C. (1989) Aspiration of high-density barium contrast medium causing acute pulmonary inflammation- Report of two fatal cases in elderly women with disordered swallowing. *Clinical Radiology, 40:* 397-400.	Case Study	2 elderly women (74 and 85) who died following aspiration of barium sulphate during barium meal/swallow	Case study of aspiration of high density barium sulphate preparation (250%) resulting in death.	The aspiration of high density barium should be avoided. If there is a chance of aspiration a low density preparation (50% or non-ionic low osmolar contrast medium should be considered. If aspiration of high density preparation occurs, the study should be terminated and appropriate treatment implemented.	III
Groher, M.E., Crary, M.A., Carnaby, G., Vickers, Z., & Aguilar, C. (2006) The Impact of Rheologically Controlled Materials on the identification of airway compromise on the clinical & videofluoroscopic swallowing examinations *Dysphagia,* 21 (4): 218-225.	Comparative study	22 participants	To determine the difference between a bedside evaluation and VFSS when the materials are identically matched	Vital to match consistencies in VFSS with bedside	III
Hayes, A., Alspaugh, J.M., Bartlet, D., Campion, M.B., Eng, J., Gayler, B.W., Henkel, S.E., Jones, B., Lingaraj, A., Mahesh, M., Rostkowski, M., Smith, C.P., & Haynos, J. (2009) Radiation Safety for the Speech-Language Pathologist. *Dysphagia, 24 (3): 274-9.*	Qualitative Study	6 SLTs conducting 130 VFSS exams in an acute-care setting over a 2 month period	To measure radiation exposure to SLTs in a clinical setting and to provide practical recommendations to keep radiation exposure as low as possible	Average VFSS time was 165secs; average radiation exposure was 0.0015 mGy per day, which extrapolates to 0.55 mGy per year. The authors concluded this exposure was quite low. Pharynx plus oesophagus studies took greater screening time and resulted in greater exposure but still well within acceptable limits.	III

Reference	Design	Sample	Objective of Study	Conclusion	Level
				Recommendations made to reduce radiation exposure to SLTs included distance from the source of radiation and shielding. Also education and knowledge of radiation patterns and safe practices.	
Hind, J.A., Gensler, G., Brandt, D.K., Miller Gardner, P.J., Blumenthal, L., Gramigna, G.D., Kosek, S., Lundy, D., McGarvey-Toler, S., Rockafellow, S., Sullivan, P.A., Villa, M., Gill, G.D., Lindblad, A.S., Logemann, J.A., & Robins, J. (2009) Comparison of Trained Clinician Ratings with Expert Ratings of Aspiration on Videofuoroscopic Images from a Randomised Clinical Trial. *Dysphagia,* 24 (2); 211-217.	Clinical Trial as part of a large multi-site clinical trial	669 patients 76 clinicians 10,200 swallows	To examine the accuracy of judgements of aspiration of SLPs vs expert judges using Pen/Asp scale. Clinicians were given 2 day intensive training	Found high accuracy for SLPs using the scale compared with expert judges Recommendations: extensive training for SLP and image enhancement.	Ib
Hiorns, M.P., & Ryan, M.M. (2006) Current practice in paediatric videofluoroscopy. *Pediatric Radiology, 36:* 911-919.	Practice review	-	Reviews the scope and limitations of the examination, explores the current techniques and illustrates some of the main findings.	-	IV
Huckabee, M.L. (unpublished) New Zealand Index for the Multidisciplinary Evaluation of Swallowing (NZIMES). *University of Canterbury/ The Van der Veer Institute for Parkinson's and Brain Research, Christchurch, New Zealand.*	Assessment Tool	-	A tool for analysing and reporting VFSS procedures	-	IV
Huckabee, M.L., & Pelletier, C.A. (1999) Management of Adult Neurogenic Dysphagia. *Singular Publishing Group.*	Textbook	-		Detailed evidence-based review	IV
Huggins, P.S., Tuomi, S.K., & Young, C. (1999) Effects of Nasogastric tubes on young normal swallow mechanism. *Dysphagia, 14*: 157-161.	Case Series	10 normal subjects with nasogastric tubes - MBS	To investigate the effects of wide bore and fine bore NGTs on the swallow of normal people	Large bore tubes significantly affected durational measures with similar results for small bore tubes	III
Jones, B. (ed) (2003) Normal and Abnormal Swallowing: imaging in diagnosis and therapy. 2nd Ed. *Springer- Verlag New York Inc.*	Textbook	-	-	Detail of VFSS procedure including radiation Normal and abnormal swallowing physiology	IV
Katsanoulas, C., Passakiotou, M., Moulodi, E., Georgopoulou, V., & Gritsi-Gerogianni, N. (2007) Severe Barium Sulphate aspiration: a report of two cases and review of the literature. *Signa Vitae, 2 (1):* 25-28.	Case Report and Literature Review	2 patients who developed acute respiratory failure requiring mechanical ventilation following aspiration of large amounts of barium during upper GI radiographic contrast study (1 deceased)	Case study of aspiration of barium. Aspiration of barium sulphate is not expected to cause severe lung injury due to its relatively non-irritant manner Review of reported mortality and treatment	Complications depend on density and quantity of aspirated material, and the physical condition of the patient. Early treatment and follow up are important to prevent progression towards fibrosis. Treatment is based on clinical judgement Acute inflammation and death due to aspiration of high or low preparations of barium sulphate have been reported. Mortality rate associated with massive aspiration is approximately 30% (> with co-morbidities)	III

Reference	Design	Sample	Objective of Study	Conclusion	Level
Kellen, P.M., Becker, D.L., Reinhardt, J.M., & Van Daele, D.J. (2010) Computer-Assisted Assessment of Hyoid Bone Motion from Videofluoroscopic Swallow Studies. *Dysphagia, 25 (4): 298-306.*	Case series	9 cases from 3 subjects	To demonstrate use of a computerised system of hyoid range of motion measurement	High correlations with manually defined hyoid trajectories. Computerised system can provide fast, easy, objective assessment using VFSS image sequences	III
Kuhlmeier, K. V., Palmer, J. B., & Rosenberg, D. (2001). Effect of liquid bolus consistency and delivery method on aspiration and pharyngeal retention in dysphagia patients. *Dysphagia, 16:* 119-122.	Quasi-experimental study	190 patients with dysphagia	To determine if aspiration rates varied for thin, thick, and pudding consistencies. Also to determine whether aspiration rates were influenced by mode of bolus presentation	• Using thin, thick and pudding consistencies and varying delivery with spoon and cup during MBS can increase the chances of identifying a consistency and mode of presentation the patient can use without aspirating • MBS procedure should include bolus presentation via spoon and cup. • Different consistencies should be used to determine aspiration as it can become more evident with a different consistency	IIb
Kuhlemeier, K.V., Yates, P., & Palmer, J. (1998) Intra- and Interrater Variation in the Evaluation of Videofluorographic Swallowing Studies. *Dysphagia, 13*:142-147.	Reliability study	9 raters – 4 physicians and 5 SLPs. Viewed 20 patients' VFSS who were selected by severity to match the typical caseload.	To determine intra- and inter-rater variation between clinicians evaluating VFSS	Inter- and intra-rater reliability did not differ greatly Reliability was greatest for detecting aspiration. It was adequate for evaluating oral stage, LP and pharyngeal retention. Reliability was poor for judging functional components of the swallow (e.g. Timing of the swallow)	III
Langmore, S.E. (2003) Evaluation of oropharyngeal dysphagia: which diagnostic tool is superior? *Laryngology and bronchoesophagology, 11(6)*: 485-489.	Literature review	37 Studies reviewed	Examine efficacy of VFSS/MBS vs FEES	Both VFSS/MBS can be used to manage dysphagia successfully. The view obtained from each tool is different. VFSS/MBS is better for examining UES problems while FEES is better at identifying aspiration.	III
Langmore, S.E, Schatz, K., & Olsen, N. (1991) Endoscopic and Videofluoroscopic Evaluations of Swallowing and Aspiration. Ann Otol Rhinol Larnygol., 100: 678-681.	Comparative study	21 subjects	To evaluate the accuracy of FEES compared with VFSS for identifying aspiration	FEES is a valid, valuable tool. Some specific patients and conditions lend themselves to this procedure rather than VFSS	III
Lazarus, C., Logemann, J., Rademaker, A.W., Kahrilas, P.J., Pajak, T., Lazar, R., & Halper, A. (1993) Effects of bolus volume, viscosity and repeated swallows in non stroke subjects and stroke patients. Arch *Phys Med rehabil., 74:* 1066-70.	Clinical Trial	20 participants; 10 post-CVA 10 age matched non-CVA.	Effects of volume, viscosity and repeated swallowing.	Volume effects (1ml, 3ml, 5ml) CVA: shorter pharyngeal delays as bolus volume increased. ↓ Duration BOT to PPW as volume ↑	IIa

Reference	Design	Sample	Objective of Study	Conclusion	Level
				CVA and Normal: ↑laryngeal closure time and CP opening as bolus size ↑ Viscosity effects (liquid vs paste). Normal: longer mean CP opening and lower mean pharyngeal swallow efficiency on paste than liquid. CVA: nil differences in CP and pharyngeal swallow. CVA and normal patients: ↑BOT to PPW on paste than liquid Repeated swallows/ learning effects: No statistically significant effects were found in normals and CVA.	
Leder, S.B., Sasaki, C.T., & Burrell, M.I. (1998) Fibreoptic Endoscopic Evaluation of Dysphagia to Identify Silent Aspiration. *Dysphagia,* 13:19–21.	Case Series	400 subjects	To assess validity of FEES compared with VFSS	Validity of FEES	III
Leonard, R., Rees, C.J., Belafsky, P., & Allen, J. (2011) Fluoroscopic Surrogate for Pharyngeal Strength: The Pharyngeal Constriction Ratio (PCR). *Dysphagia, 26 (1): 13-17.*	Case Series	25 subjects	To evaluate the correlation between pharyngeal constriction ratio (PCR) during VFSS with manometric pharyngeal strength	Results suggest utility of the objective VFSS measure for pharyngeal strength when manometry is not available	III
Leonard, R., & Kendall, K. Dysphagia Assessment and treatment planning – A team approach. 2nd Ed. *Plural Pub, San Diego, 2008.*	Textbook	-	-	Particularly Ch 8, 14-17	IV
Logemann, J.E. (1998) Evaluation & Treatment of Swallowing Disorders. *Pro-ed.*	Textbook	-		Detailed review of literature and current practice in paediatrics and adults	IV
Logemann, J.A., Gensler, G., Robbins, J., Lindblad A.S., Brandt, D,. Hind, J.A., Kosek, S., Dikeman, K., Kazandijian, M., Gramigna,G.D., Lundy, D., McGarvey-Toler, S., & Gardner, P.J.M. (2008) A Randomized Study of Three Interventions for Aspiration of Thin Liquids in Patients With Dementia or Parkinson's Disease. *Journal of Speech, Language, and Hearing Research, 51 (1):* 173-183.	Randomised Clinical Trial	711 participants	To determine which treatment eliminates aspiration	Identifies best short term intervention to prevent aspiration of thin liquid in patients with dementia and/or PD	IIa
Logemann, J.A., & Kahliras, P.J. (1990) Re-learning to swallow after stroke- application of manoeuvres & biofeedback: A case study. *Neurology, 40:* 1136-1138.	Case Study	1 patient with medullary stroke (monitored until 45 months post stroke)		Using repeat VFSSs allowed ability to monitor change in people with chronic dysphagia receiving therapy	III

Reference	Design	Sample	Objective of Study	Conclusion	Level
Logemann, J.A., Lazarus, C., Keeley, Sanchez, A., & Rademaker, A.W. (2000) Effectiveness of 4hrs of Education in Interpretation of Radiographic Studies. *Dysphagia, 15:* 180-183.	Quasi-experimental study	39 Clinicians enrolled on a course at a state conference	To review the outcome of 4hrs of training on therapists' interpretation skills	There was a significant ↓ in incorrect answers. Amount of previous experience affected the amount of improvement (i.e. less room for improvement in experienced clinicians).	IIb
Logemann, J. A., Pauloski, B. R., Colangelo, L., Lazarus, C., Fukiu, M., & Kahrilas, P. (1995) Effects of a sour bolus on oropharyngeal swallowing measures in patients with neurogenic dysphagia. *Journal of Speech and Hearing Research, 38:* 556-563.	Quasi-experimental study	19 people with dysphagia post stroke 8 people with dysphagia from other neurological aetiologies e.g. Parkinson's Disease	Effects of sour bolus on pharyngeal swallow	Significant improvement in oral onset time, sign reduction in pharynx swallow delay, reduction in aspiration	IIb
Logemann, J. A., Rademaker, A. W., Pauloski, B. R., & Kahrilas, P. J. (1994) Effects of postural change on aspiration in head and neck surgical patients. *Otolaryngology Head and Neck Surgery, 4:* 222-227.	Quasi-experimental study	32 patients with dysphagia following head and neck diagnosis	To define effects of postural change on liquid aspiration using VFSS	Showed importance of introducing postural techniques during the VFSS to facilitate safe feeding	IIb
Logemann, J. A., Rademaker, A. W., Pauloski, B. R., Ohmae, Y., & Kahrilas, P.J. (1998) Normal Swallowing Physiology as viewed by videofluoroscopy and videoendoscopy. *Folia Phoniatrica et Logopaedica,* 500: 311-319.	Comparative study	8 adults 12 swallows each	To examine normal swallowing with VFSS and endoscopy	For laryngeal events before and after the swallow, endoscopy is useful. For pharyngeal anatomy and presence of food/fluid in the pharynx, either endoscopy or VFSS is useful. For pharyngeal physiology during swallow, VFSS is a better procedure.	III
Ludlow, C.L., Humbert, I., Saxon, K., Poletto, C., Sonies, B., & Crujido, L. (2007) Effects of Surface Electrical Stimulation Both at Rest and During Swallowing in Chronic Pharyngeal Dysphagia. *Dysphagia, 22:* 1-10.	Quasi-experimental study	10 people with chronic stable pharyngeal dysphagia	To examine the effect of surface electrical stimulation on the hyoid bone/larynx, and on the incidence of aspiration during stimulation at low sensory levels and maximum tolerated motor levels	Electrical stimulation can interfere with hyolaryngeal elevation required for airway penetration. Therefore, the baseline ability to raise the hyolaryngeal complex must be determined prior to the use of electrical stimulation in therapy.	IIa
Manna, A., Wurtzburg S.J., Huckabee, M.L., & Blake, T.K. (2003) Cultural Issues Influencing Dysphagia management practices in New Zealand Maori Population: A Descriptive Study. *New Zealand Journal of Speech- Language Therapy, 58:* 35-46.	Qualitative	15 Semi-structured interviews. (5 Māori patients who had experienced dysphagia 5 Health Professionals 6 Kaumatua)	Health professionals should have some understanding of their patients' cultures in order to provide the most appropriate treatment.	Māori health and beliefs surrounding food and its consumption should be considered by speech–language therapists who want to assist members of this population with effective dysphagia management practices. Recommendations are provided.	III
Mari, F., Matei, M., Ceravolo, M.G., Pisani, A., Montesi, A., & Provinciali, L. (1997) Predictive value of clinical indices in detecting aspiration in patients with neurological disorders. *Journal of Neurology, Neurosurgery & Psychiatry, 63(4):* 456-60.	Case Series	93 consecutive patients	(1) To evaluate the predictive value of a detailed clinical screening of aspiration in patients with neurological diseases, both with and without	The association of two clinical items (such as history of cough on swallowing and 3oz test positivity) provides a useful screening tool, the cost benefit	ĪII

Reference	Design	Sample	Objective of Study	Conclusion	Level
			symptoms of dysphagia taking videofluoroscopy as the gold standard; (2) to assess the existence of risk factors for silent aspiration, measuring the cost-benefit ratio of radiological examination.	ratio of which seems very competitive in comparison with videofluoroscopy in aspiration risk evaluation.	
Martin-Harris, B., Brodsky, M.B., Michel, Y.B., Brodsky, M.B., Michel, Y., Lee, F.S., & Walters, B. (2007) Delayed Initiation of Pharyngeal Swallow: Normal Variability in Adult Swallows. J Speech Lang Hear Res, 50(3): 585-94.	Cross Sectional	82 Normal Ageing	To identify measure of swallow initiation and compare it to age and the PA scale.	Beware of normal variation in swallow initiation points especially in aging population. Delay swallow rarely the only feature of dysphagia.	III
Martin-Harris, B., Brodsky, M. B., Michel, Y., O'Castell, D., Schleicher, M., Sandidge, J., Maxwell, R., & Blair, J.(2008). MBS MeasurementTool for Swallow Impairment – MBSImp: Establishing a Standard. *Dysphagia, 23*: 392-405.	Cross-sectional	300 participants	Benefits of standardisation of MBS	Standardised training, protocols, contrast materials and measurements should improve reliability of MBS studies.	III
Martin-Harris, B., Logemann, J., McMahon, S., Scheicher, M., & Sandridge, J. (2000) Clinical utility of the Modified barium Swallow. *Dysphagia, 15:* 136-141.	Case Series	608 participants	Support use of MBS	90% of MBS show abnormality 82% show change in outcome measures	III
Mason, M.F. (1993) Speech Pathology for Tracheostomized & Ventilator Dependant patients. *Voicing Inc.*	Textbook	-		Review of use of VFSS with patients with tracheostomies.	IV
Mathers-Schmidt, B., & Kurlinski, M. (2003) Dysphagia Evaluation Practices: Inconsistencies in Clinical Assessment and Instrumental Examination Decision-Making. *Dysphagia, 18*:114-125.	Qualitative Survey	72 returned surveys	Components of clinical exam, consistency of clinical exam practices, consistency of clinical decision making.	There is considerable clinician variability both in conducting clinical examinations and in making clinical decision. This finding is consistent with other studies.	III
McCullough, G.H., Wertz, R. T., Rosenbek, J.C., Mills, R.H., Webb, W.G., & Ross, K.B. (2001). Inter- and Intrajudge Reliability for Videofluoroscopic Swallowing Evaluation Measures. *Dysphagia, 16:*110-118.	Reliability study	3 SLPs with their CCCs and >300 hrs assessment and treatment of dysphagia and >200 hours experience with VFS. Viewed 20 patients' VFSS – all had a stroke.	To determine the inter- and intra-judge reliability of VFS interpretation	Good intra-judge reliability (sample of only 1 clinician), but unacceptable inter-judge reliability across all measures.	III
Medicare (2009) Medicare Benefit Policy Manual- Therapy Policies, Part B Outpatient CR 3648, 15 (220 & 230). Retrieved from: http://www.cms.gov/manuals/Downloads/bp102c15.pdf	Practice Standards	-	Support safe, consistent practice	Detailed policy	IV
Ministry of Health (1965) The Radiation Protection Act. Retrieved from: http://www.nrl.moh.govt.nz/regulatory/c16.pdf	Practice Standards		NZ Legislation of Radiation Use		IV
Ministry of Health (2010) Code of Safe Practice For The Use of x-rays in medical diagnosis: NRL C5; Version 1.3. Retrieved from: http://www.nrl.moh.govt.nz/regulatory/c12.pdf	Practice Standards			Sets out requirements and recommendations for radiation safety associated with the use of x--rays for medical diagnosis and for research on humans.	IV

Reference	Design	Sample	Objective of Study	Conclusion	Level
Miura, Y., Morita, Y., Koizumi, H., & Shingai, T. (2009) Effects of Taste Solutions, Carbonation, and Cold Stimulus on the Power Frequency Content of Swallowing Submental Surface Electromyography. *Chemical Senses,* 34: 325-331.	Quasi-experimental study	5 taste solutions 20 healthy volunteers	To explore the effects of 5 taste solutions on the power frequency content of sEMG.	Taste, carbonation and cold stimuli have qualitatively different influences on the power frequency content of swallowing sEMG.	III
Moro, L., & Cazzani, C. (2006) Dynamic Swallowing Study and Radiation Dose to Patients. *La Radiologia Medica (Torino), 111 (1*): 123-9.	Case series	22 patients aged 29-84 years acute or chronic pathological neurological conditions	To define the optimal radiological procedure for VFSS and calculate the effective and organ dose to the patient and provide a measure of the radiation risk associated with the procedure.	The optimal radiological VFSS procedure involving the lowest dose per patient while producing adequate diagnostic information was defined using kerma-area product (KAP) measurements. The KAP measurements confirmed that VFSS provides useful diagnostic and treatment planning information in swallowing disorders with a low associated radiological risk.	III
Newman, L.A., Cleveland, R.H., Blickman, J.G., Hillman, R.E., & Jaramillo, D. (1991) Videofluoroscopic Analysis of the Infant Swallow Investigative *Radiology, 26 (10):* 853-920.	Case series	23 participants	Understanding normal infant swallow	VFSS provides an objective and systematic method for analyzing the infant swallowing mechanism	III
Newman, L.A., Keckley, C., Peterson, M.C., & Hamner, A. (2001) Swallowing function and medical diagnoses in infants suspected of Dysphagia. *Paediatrics, 108 (6):* e106.	Case Series	43 infants videos	To review the swallow physiology of infants referred for VFSS	Silent aspiration is common. Most infants did not demonstrate abnormalities in the first few swallows but deteriorated as they continued to feed.	III
Nightingale, J., & Mackay, B. (2009) An analysis in changes in practice introduced during an education programme for practitioner-led swallow investigations. *Radiography, 15:* 63-69.	Quasi-experimental study	24 practitioners (SLTs and Radiographers)	To analyse any change in practice after an education programme	Between 4-19 practice changes were made post training-service improvements, communication, protocols and quality assurance	III
O'Donoghue, S., & Bagnall, A. (1999) Videofluoroscopiv evaluation in the assessment of swallowing disorders in paediatric & adult populations. *Folia Phoniatr Logop.,* 51: 158-171.	Review	-	To review the literature on use of VFSS and evaluate the applicability of protocols to the paediatric population.	Dysphagia specialists should achieve greater consistency in VFSS.	IV
Ott, D.J., Hodge, R.G., Pikna, L.A., Chen, M.Y.M., & Gelfand, D.W. (1996) Modified barium swallow: clinical & radiographic correlation & relation to feeding recommendations. *Dysphagia, 11 (3):* 187-190.	Comparative study	148 patients	Clinical and VFSS correlated to determine agreement and relationship to feeding recommendations	Combined clinical and radiographic examinations correlated well, but clinical evaluation alone was limited by failure to evaluate the pharynx in many patients. The swallowing severity correlated well with final feeding recommendations.	III
Ott, D.J., & Pikna, L.A. (1993) Clinical & Videofluoroscopic Examination of Swallowing Disorders- Review Article. *American Journal Roentgenology 161*, 507-513.	Review	-	Summary of literature of Dysphagia Practice	Good information on barium materials.	IV

Reference	Design	Sample	Objective of Study	Conclusion	Level
Palmer, J., Kuhlemeier, K., & Tippett, D. (1993) A protocol for the VFS study. *Dysphagia, 8*: 209-214.	Case Series	More than 350 (neurological) patients over 30-month period.	Testing was standardised by development of a sequence of liquid and solid foods	Table for the procedure provided. Takes 4-10mins.	III
Park, T., Kim, Y., Ko, D., & McCullough, G. (2009) Initiation & Duration of Laryngeal Closure during the pharyngeal swallow in post-stroke patients. *Dysphagia, 25 (3): 177-182.*	Case Series	10 stroke patients who aspirate 10 stroke patient who do not aspirate 10 normal controls	To measure initiation of laryngeal closure (ILC) and laryngeal closure duration (LCD) through objective temporal measurements from VFSS recordings	Both delayed ILC and reduced LCD were associated with post-stroke aspiration. Delayed ILC is a significant indicator of overall risk of aspiration.	IIb
Perlmann, A.L., VanDaele, D.J., & Otterbacher, M.S. (1995) Quantiative Assessment of Hyoid Bone Displacement from Video Images during swallowing. *Journal of Speech and Hearing Research,* 38: 579-585.	Case Series	20 males 10 normal 10 reduced hyoid movement	To validate a quantitative method for clinically assessing hyoid bone movement during VFSS	Significant different anterior and superior movement measurement between normal and impaired group. Simple to perform. Could be used for other structural measurements.	IIb
Pikus, L., Levine, M.S., Yang, Y-X., Rubesin, S.E., Katzka, D.A., Laufer, I., & Gefter, W.B. (2003) Videofluoroscopic Studies of Swallowing Dysfunction and the Relative Risk of Pneumonia. *American Journal of Roentgenology,* 180; 1613-1616.	Case Series-retrospective study of notes	381 patients	Compare results of penetration/aspiration on VFSS with pneumonia rates over 6 months	Severity of penetration/aspiration directly proportional to rates of pneumonia.	III
Power, M., Laasch, H., & Kasthuri, R. (2006) Videofluoroscopic assessment of dysphagia: A questionnaire survey of protocols, roles and responsibilities of radiology and speech and language therapy personnel. *Radiography, 12:* 26-30.	Qualitative survey	73 SLTs 40 Radiologists	Identify: • Ax protocols • Food materials • Use of therapeutic interventions • Data analysis • Reporting • Training • Radiation protection	VFSS is carried out infrequently and protocols vary widely. Intra and inter-disciplinary training and supervision are minimal. More work is needed to develop standard guidelines to improve quality of exam and its reproducibility.	IV
Pracy, J.P.M., Montgomery, P.Q., & Reading, N. (1993) Acute pneumonitis caused by low density barium sulphate aspiration. *Journal of Laryngology and Otology, 107*: 347-348.	Case Study	Case of chemical pneumonitis following the aspiration of low density (100%) barium sulphate suspension	To illustrate the risks/problems associated with the aspiration of a relatively non-irritant contrast medium	Previous studies have been based on low density barium suspensions (50%) and therefore thought to be harmless, whereas higher density solutions (250%) appeared to provoke a more intense pneumonitis. This study concludes that even lower density solutions (100%) may also cause significant morbidities. Precautions should be taken to avoid aspiration whatever the density and patients at known risk may benefit from the use of a water soluble non-ionic contrast medium.	III
Rasley, A., Logeman, J., Kahrilas, P., & Rademaker, A.W. (1993) Prevention of barium aspiration during videofluoroscopic swallowing	Randomised Clinical Trial	165 patients - variable causes of	Investigate the frequency of whether changes in posture can eliminate	Postural changes (techniques) eliminated aspiration for at least one	Ib

Reference	Design	Sample	Objective of Study	Conclusion	Level
studies. *American Journal Roentgenology, 160*: 1005-1009.		dysphagia From neurological to anatomical (head and neck, Zenkers)	aspiration in patients with oro-pharyngeal dysphagia.	bolus volume in 77% of subjects. 23 % with techniques had no effect on the frequency or amount of aspiration.	
Riquelme, L.F. (2004). Cultural Competence in Dysphagia. *The ASHA Leader*. Retrieved from: http://www.asha.org/Publications/leader/2004/040413/f040413b3.htm	Qualitative	-	Need to define culture more broadly in order to provide best clinical services possible.	Recommended strategies provided.	IV
Riquelme, L.F. (2007). The role of cultural competence in providing services to persons with dysphagia. Topics in Geriatric *Rehabilitation, 23 (3):* 228-239.	Qualitative	-	To investigate the role of cultural competence in dysphagia	Importance of cultural knowledge and sensitivity in working with food in different cultures.	IV
Rosenbek, J.C., Robbins, J., Roecker, E.V., Coyle, J.L., & Woods, J.L. (1996) A penetration-aspiration scale. *Dysphagia, 11*: 93-98.	Reliability study	75 swallows	Identify reliability of use of Rosenbek Pen-Asp Scale	Acceptable intra and inter-reliability found.	III
Royal College Speech Language Therapists (2007) VFSS in Adults: The role of SLTs. Policy Statement.	Practice Standards	-	Support safe, consistent practice	Clear scope of practice.	IV
Rugiu, M.G. (2007). Role of videofluroscopy in evaluation of neurologic dysphagia. *Acta Otorhinolaryngologica Italica, 27:* 307-316.	Review	-	To analyse the technical procedure of VFSS and the principle indications in the study of neurologic dysphagia to reveal the advantages and disadvantages of the investigation.	It should always be preceded by careful and overall clinical evaluation of the patient.	IV
Scott, A., Perry, A., & Bench, J. (1998). A Study of interrater Reliability when Using Videofluoroscopy as an Assessment of Swallowing. *Dysphagia, 13*: 223-227.	Reliability Study	9 SLPs – 2 very experienced; 5 moderately and 2 minimal experience in the area of VFSS	To clarify the process of interpreting VFSS and to define the areas of inconsistency and potential misinterpretation.	Higher agreement for semi-solids than for liquids. Highest level of agreement occurred after group discussion.	III
Shaker, R., Easterling, C., Kern, M., Nitschke, T., Massey, B., Daniels, S., Grande, B., Kazandjian, M., & Dikeman, K. (2002) Rehabilitation of Swallowing by Exercise in Tube-Fed Patients With Pharyngeal Dysphagia Secondary to abnormal ues opening. *Gastroenterology, 122:* 1314-1321.	Randomised Clinical Trial	27 patients	Evaluated effect of head lift exercise on restoration of swallowing caused by abnormal UES opening	The proposed suprahyoid muscle strengthening exercise programme is effective in restoring oral feeding in some patients with deglutitive failure because of abnormal UES opening.	Ib
Shanahan, T.K., Logemann, J.A., Rademaker, A.W., Pauloski, B.R., & Kahrilas, P.J. (1993) Chin-down posture effect on aspiration in dysphagic patients. *Archives of Phys. Med. & Rehab, 74(7*): 736-739.	Clinical Trial without randomization	30 participants with dysphagia from neurological impairment	Determine effectiveness of chin-down posture in eliminating aspiration.	Chin-down posture is not effective in eliminating aspiration in all cases of neurological dysphagia.	IIa
Singh, V., Berry, S., Brockbank, M.J., Frost, R., Tyler, S.E., & Owens, D. (2009) Investigation of aspiration: milk nasendoscopy versus videofluoroscopy. *Eur Arch Otorhinolaryngol., 266:* 543-545.	Case Series-retrospective notes review	100 sets of clinical notes reviewed	Aim to review the correlation between milk nasendoscopy and VFSS/MBS in the detection of aspiration among patients with clinically diagnosed neurological dysphagia.	Milk nasendoscopy was able to detect post swallow aspiration more than VFSS/MBS with no significant difference in pre-swallow phase while VFSS/MBS better at detecting aspiration during the swallow.	III

Reference	Design	Sample	Objective of Study	Conclusion	Level
Smithard, D., O'Neill, P., Park, C., England, R., Renwick, D., Wyatt, R., Morris, J., & Martin, D.F. (1998). Can bedside assessment reliably exclude aspiration following acute stroke? *Age Ageing, 27*, 99-106.	Comparative study	94 patients	Blinded study comparing VFSS and bedside clinical swallowing evaluation	Bedside clinical swallowing evaluation lacks sensitivity a screening tool for detecting aspiration in acute stroke	III
Splaingard, M., Hutchins, B., Sulton, L., & Chaudhuri, G. (1988). Aspiration in rehabilitation patients: videofluoroscopy vs bedside clinical assessment. . *Archives of Physical Medicine and Rehabilitation, 68*(8), 637-640.	Comparative study	107 inpatients	Blinded study comparing VFSS & bedside clinical swallowing evaluation	Bedside clinical swallowing evaluation under-estimates aspiration.	III
Speech Pathology Australia (2005) Dysphagia: Modified Barium Swallow, Position Paper.	Practice Standards	-	Support safe, consistent practice	Clear scope of practice. Very detailed protocol.	IV
Steele, C.M. (2006) Primum Non Nocere- The Potential for Harm in Dysphagia Intervention. *ASHA Swallowing and Swallowing Disorders,* 19-23.	Expert Opinion	-	-	There is potential for swallowing interventions to result in unintended negative outcomes. Instrumental evaluation is important in determining appropriateness and safety of intervention.	IV
Stoeckli, S.J., Huisman, T.A.G.M., Burkhardt, A., Seifert, G.M., & Martin-Harris, B.J.W. (2003) Interrater Reliability of Videofluroscopic Swallow Evaluation. *Dysphagia, 18* (1): 53-57.	Reliability study	9 independent raters of the VFSSs of 51 consecutive dysphagic patients	To assess the inter-observer reliability of videofluroscopy for swallow evaluation.	Only aspiration is evaluated with high reliability by videofluoroscopy, whereas the reliability of all other parameters of oropharyngeal swallow is poor	III
Strauss, K.J., & Kaste, S.C. (2006) The ALARA (as low as reasonably achievable) concept in pediatric interventional and fluoroscopic imaging: striving to keep radiation doses as low as possible during fluoroscopy of pediatric patients—a white paper executive summary. *Pediatric Radiology, 36 (Suppl 2):* 110-112.	Practice Standards	-	Support safe, consistent practice	Recommendations to keep radiation doses as low as possible in paediatrics.	IV
Stroudley, J., & Walsh, M. (1991) Radiological assessment of dysphagia in Parkinson's disease. *The British Journal of Radiology, 64;* 890-893.	Case Series	24 patients	Evaluate swallowing abnormalities in Parkinson's Disease	Abnormalities detailed and common. VFSS is an appropriate method of investigation.	IIb
Teasell, R.W., McRae, M., Heitzner, J., Bhardwaj, A., & Finestone, H. (1999) Frequency of Videofluoroscopic Modified Barium Swallow Studies and Pneumonia in Stroke Rehabiitation Patients: A comparative Study. *Arch PhysMed Rehabil., 80; 294-298.*	Comparative Study	1024 participants	Is increased use of MBS associated with reduced aspiration?	Increased use of MBS after initial 15 days post stroke was not associated with decreased aspiration pneumonia with stroke patients.	III
Tippett, D.C. (2000) Tracheostomy & Ventilator Dependency. *Thieme.*	Textbook	-		VFSS are feasible for medically stable tracheostomised patients. MDT- outline responsibilities e.g. suctioning	IV
Wang, T.G., Wu, M.C., Chang, Y.C., Hsiao, T.Y., & Lien, I.N. (2006) The effect of nasogastric tubes on the swallow function of persons with dysphagia following stroke. *Arch Phys Med Rehabil., 87;* 1270-1273.	Case Series	22 participants	To investigate the effects of wide bore and fine bore NGTs on the swallow of person following stroke	Presence of large bore tubes increased bolus flow timing, but this was not significant	III

Reference	Design	Sample	Objective of Study	Conclusion	Level
Ward, E., & Morgan, A. (2009) Dysphagia post trauma. Clinical Dysphagia Series. *Plural Publishing.*	Textbook	-	-	Must be guided by physician re: stability. View is different with bracing Radiologist presence Use patient's usual meal position Own seating where possible	IV
Warren-Forward, B., Mathisen, S., Best, P., Boxsell, J., Finlay, A., Heaseman, D., Hodis, C., Morgan, A., & Nixon, J. (2008) Knowledge and Practice of Radiation Protection While Performing Videofluoroscopic Swallowing Studies. *Dysphagia, 23*:371-377.	Qualitative Study	Questionnaire responses from 69 SLPs in Australia	To assess the level of current knowledge and practice of radiation protection among SLPs performing VFSS in Australia	Participants had some general knowledge of radiation protection but no formal teaching. They were uncertain of the specifics of radiation protection (e.g.: sensitive organs, minimum distance). Protective apron, shields and radiation badges worn to differing degrees. Recommendation that education on radiation protection and safety be provided at a university level. For practising SLPs there should be formal education and an increased emphasis on the application of radiation protection. SLPs should also always wear lead aprons, thyroid shields and radiation monitoring badges.	III
Weir, K.A., McMahon, S.M., Long, G., & Bunch, J.A. (2007) Radiation doses to children during modified barium swallow studies. *Pediatric Radiology, 37*: 283-290.	Case series	90 participants	Documenting radiation doses in VFSSs	Screening times, DAP, effective dose and child and procedural factors associated with higher effective doses are presented for children undergoing MBS studies.	III
Wilcox, F., Liss, J.M., & Siegel, G.M. (1996) Interjudge Agreement in Videofluroscopic Studies of Swallowing *Journal of Speech & Hearing Research, 39*:144-152.	Reliability study	10 SLTs	To examine agreement among SLTs	The level of inter-judge agreement for videofluoroscopic evaluations is not encouragingly high.	III
Wright, R.E.R., Boyd, C.S., & Workman, A. (1998) Radiation Doses to Patients during Pharyngeal Videofluoroscopy. *Dysphagia, 13:* 113-115.	Case Series	23 adult patients aged 28-95 years (mean 65) weight 50-90kg (mean 64)	Measurement of Dose Area Product (DAP) values and fluoroscopic time for VFSS exams. To establish effective dose to patient during VTF (VFSS) and compare radiation exposure with other common radiological procedures	There is a linear relationship between DAP and screening time. The effective dose was 0.4 mSieverts (mSv) (range 0.027-1.1). This compares favourably with other common radiological procedures and the authors conclude the radiation detriment associated with VFSS is well within acceptable levels	IIb

Reference	Design	Sample	Objective of Study	Conclusion	Level
Wu, C.H., Tzu-Yu, H., Jiann-Chyuan, C., Yeun-Chung, C., & Shiann-Yann, L. (1997) Evaluation of Swallowing Safety with Fiberoptic Endoscope: Comparison with Videofluoroscopic Technique. *Laryngoscope, 107*: 396-401.	Comparative study	28 subjects	Comparison of benefits of each type of study. Identified strengths and weaknesses of each type of assessment.	FEES more sensitive in detecting pharyngeal stasis and laryngeal aspiration. VFSS/MBS better at detecting premature spillage.	III
Zammit-Maempel, I., Chapple, C.L., & Leslie, P. (2007) Radiation Dose in Videofluoroscopic Swallow Studies. *Dysphagia, 22:*13-15.	Case Series	230 adult patients over 45 months (69 F, 161 M) Median 67 years (17-95), 170 cm (147-196), 67 kg (38-102) Head and Neck cancer, TBI, CVA, neurological impairment and unknown aetiology	Measurement of radiation dose in VFSS to show VFSS can be performed using minimal radiation doses. Comparison of dose of Barium Swallow of 41 patients assessed in same conditions evaluated Comparison to previous studies Operator with 15 years experience	Median Dose Area Product (DAP) 1.4 Gy.cm² (0.5-10), Median effective dose 0.2 mSv (0.01-1.4) Length of study 171 sec (18-564) Barium swallow time 144 sec (18-510), DAP 2.5 Gy.cm² (0.4-24.1) In the UK exposure to background radiation is estimated at 1.5-7.5 mSv per year, therefore a VFSS of 0.2 mSv is extremely small comparatively. Associated risk of radiation induced fatal cancer is 1 in 100 000 for an average VFSS, 5%/Sv 18-64 years, less for > 69 years, however double risk for paediatric population Results comparison show VFSS less risk than barium swallow and previous studies	IIa
Zerilli, K.S., Stefans, V.A., & Dipietro, M.A. (1989) Protocol for the use of videofluoroscopy in pediatric swallowing dysfunction. *The American Journal of Occupational Therapy, 44 (5):* 441-446.	Retrospective case series	Retrospective review of 33 bedside and VFSS assessment.	To review management changes following VFSS	VFSS provides therapists with more objective evidence than a bedside swallow assessment for directing management and treatment	III

Additional references:

Ali, W. (2009). Brief Report: What assessment tools are used both in New Zealand and in other countries for grading of evidence? Health Services Assessment Collaboration. Retrieved from: http://www.healthsac.net/downloads/publications/HSAC26%20Grading%20Evidence%20030909%20FINAL.pdf

New Zealand Guideline Group (2010). Handbook for the preparation of explicit Evidence-based Clinical Practice Guidelines. Retrieved from: www.nzgg.org.nz

Royal College Speech and Language Therapists (2005). Clinical Guidelines.

Statistics New Zealand (Tatauranga Aotearoa). Retrieved from: www.stats.govt.nz/census/2006CensushomePage

New Zealand
Speech-language
Therapists' Association
Te Kāhui Kaiwhakatikatika Reo Kōrero o Aotearoa

www.speechtherapy.org.nz
nzsta@speechtherapy.org.nz