

**Improving the identification and management
of aspiration after stroke**

by

**Elizabeth Ellen Boaden
BSc., M.R.C.S.L.T.**

A thesis submitted in partial fulfilment for the requirements for the degree of
Doctorate in Philosophy
by research
at the
University of Central Lancashire

July 2011

Declaration

This thesis is an original piece of work and has not been submitted for a comparable award

TABLE OF CONTENTS

	Page
List of Acronyms	i
Abstract	ii-iii
List of Tables	iv-v
List of Figures	vi
Acknowledgements	vii
Chapter 1	1-10
Introduction	
1.1 Definition of stroke	1
1.2 Dysphagia incidence and prognosis after stroke	2
1.3 Recognition of dysphagia within professional groups	4
1.4 Bedside swallow examinations	7
1.5 Structure of the thesis	8
1.6 Summary	9
Chapter 2	11-24
Normal swallowing	
2.1 Anatomy and physiology of normal swallowing	11
2.2 Does aspiration matter in the younger healthy population?	17
2.3 Does aspiration matter in the older healthy population?	18
2.4 Normal oro-pharyngeal flora	22
2.5 Conclusion	23
2.6 Summary	24
Chapter 3	25-47
Aspiration: symptomatology and clinical determinants in stroke	
3.1 Routes for development of aspiration pneumonia	25
3.2 Risk factors for aspiration pneumonia in stroke	26
3.3 Effects of aspiration in stroke	29
3.4 Symptomatology in stroke	31
3.5 Clinical determinants of aspiration	32
3.6 Aspiration as the focus of any future swallow screening tool	45
3.7 Conclusion	47
3.8 Summary	47

Chapter 4	48-61
Use of instrumental examinations and dysphagia assessments as the 'gold standard' for diagnosis of dysphagia and aspiration	
4.1 Use of instrumental dysphagia examinations	50
4.2 Bedside swallow assessments	56
4.3 Conclusion	60
4.4 Summary	61
Chapter 5	62-84
Bedside swallow screening tools for use with acute stroke	
5.1 Bedside water swallow screening tools	62
5.2 Discussion	73
5.3 Expanded water swallow test: Gugging Swallow Screen (GUSS)	83
5.4 Conclusion	83
5.5 Summary	84
Chapter 6	85-110
Swallowing screening and management survey	
6.1 Survey design	85
6.2 Development of the Survey	86
6.3 Survey distribution	94
6.4 Discussion	100
6.5 Conclusion	108
6.6 Summary	110
Chapter 7	111-139
Development and diagnostic performance of the bedside swallow screening tool (BESST)	
7.1 Aims	112
7.2 Discussion	136
7.3 Conclusion	139
7.4 Summary	139

Chapter 8	140-168
Assessment of the diagnostic accuracy and reliability of a bedside swallow screening tool (besst) for nurses in acute stroke in comparison with the gold standard: main study	
8.1 Changes to BESST procedure	140
8.2 Changes to the BESST documentation	141
8.3 Aim of the tool validation study	146
8.4 Discussion	160
8.5 Conclusion	167
8.6 Summary	167
Chapter 9	169-190
Discussion	
9.1 Key findings	170
9.2 BESST	170
9.3 Clinical determinants	172
9.4 Strengths	175
9.5 Limitations	179
9.6 Implications for practice	182
9.7 Implications for research	184
9.8 Administration of the dysphagia screening tool by different healthcare professionals	186
9.9 Training	187
9.10 Conclusion	188
References	191-207
Appendices	208-346

LIST OF APPENDICES

Appendix 1	Northwestern Dysphagia Patient Check Sheet	208
Appendix 2	Mann Assessment of Swallow Ability	209
Appendix 3	Reflex Cough Test	210
Appendix 4	Water Swallow Test	211
Appendix 5	50ml Water Swallow Test	212
Appendix 6	Standardised Swallow Assessment	213
Appendix 7	Burke Dysphagia Screening Test	214
Appendix 8	Bedside Swallowing Assessment	215
Appendix 9	Timed Test of Swallow	217
Appendix 10	Daniels Assessment Survey	218
Appendix 11	Massey Bedside Swallow Screen	220
Appendix 12	100ml Water Swallow Test	221
Appendix 13	Gugging Swallow Screen	222
Appendix 14	Speech and Language Therapist and Nurse Pilot Questionnaires	224
Appendix 15	Ethical Approval - Questionnaires	243
Appendix 16	Speech and Language Therapist and Nurse Interview Sampling Frame	244
Appendix 17	Nurse Interviews Pilot Questionnaire	246
Appendix 18	Nurse Collated Interview Response	254
Appendix 19	Speech and Language Therapist Interviews for the Pilot Questionnaires	257
Appendix 20	Speech and Language Therapists Collated Interview Responses	268
Appendix 21	Speech and Language Therapists and Nurse Final Questionnaire	274
Appendix 22	Nurse Interviews for Questionnaire – Second Iteration	295
Appendix 23	Speech and Language Therapists Interviews for Questionnaire – Second Iteration	302
Appendix 24	Ethical Approval – Substantial Amendments Questionnaire	311
Appendix 25	Nurse and Speech and Language Therapists Interview data on BESST pre-pilot version	313
Appendix 26	Nurse and Speech and Language Therapists Interview Data on BESST pilot version – Second Iteration	326
Appendix 27	Ethical Approval	336
Appendix 28	Commensurate Decision Making Comments: BESST – Feasibility Study	337
Appendix 29	Ethical Approval – Substantial Amendments for Clinical Study	342
Appendix 30	Dysphagia Screening Tool – Data Decision Sheet	343
Appendix 31	Main Study Reported Bias	344

LIST OF ACRONYMS

BAPEN	British Artificial Parenteral and Enteral Nutrition
BDST	Burke Dysphagia Screening Tool
BESST	Bedside Swallow Screening Tool
BSA	Bedside Swallowing Assessment
CA	Cervical Auscultation
CFU	Colony Forming Units
CI	Confidence Interval
CT	Computerised Tomography
DAS	Daniels Assessment Survey
DH	Department of Health
DNS	Dysphagia Nurse Specialist
FEES	Fibre-optic Endoscopic Evaluation of Swallowing
GUSS	Gugging Swallow Screen
ICWP	Inter-Collegiate Working Party
IDF	Inter-professional Dysphagia Framework
IQR	Inter Quartile Range
IV	Intra Venous
Kw	Kappa statistic weighted
MASA	Mann Assessment of Swallow Ability
MBSS	Massey Bedside Swallow Screen
NBM	Nil by Mouth
NG	Naso Gastric
NHS	National Health Service
NMC	Nursing Midwifery Council
NPV	Negative Predictive Value
NSF	National Service Framework
PPV	Positive Predictive Value
RCSLT	Royal College of Speech and Language Therapists
SIGN	Scottish Intercollegiate Guideline Network
SLT	Speech and Language Therapist
SpO2	Saturation of Peripheral Oxygen
SSA	Standardised Swallow Assessment
TTS	Timed Test of Swallowing
VFES	Videofluoroscopic Examination of Swallowing
WHO	World Health Organisation
WST	Water Swallow Test

ABSTRACT

Dysphagia, a common clinical corollary following stroke, may contribute to aspiration pneumonia, malnutrition, and dehydration which may significantly impair patient rehabilitation.

Survey

Aim: Establish current clinical practice regarding nurse dysphagia screening.

Method: A cross-sectional regional postal survey was undertaken with 60 nurses and 45 Speech and Language Therapists.

Results: Nurses were taught to use water swallow screening tools but, in reality, used a variety of testing materials.

Conclusion: This demonstrated the need for a clinically useful bedside swallow screening tool.

Pilot Study

Aim: Develop and evaluate the diagnostic accuracy of a new BEside Swallow Screening Tool (BESST), for use by nurses with acute stroke patients.

Method: A literature search was undertaken to inform the BESST. Face validity was established using an iterative process of semi-structured interviews with eight specialist SLTs and eight nurses. The tool was piloted on 12 purposefully selected stroke patients by comparing the management options chosen by two nurses using the BESST with those of the Specialist SLT using their bedside assessment (gold standard).

Results: The BESST demonstrated excellent sensitivity (100%) but specificity demonstrated by both nurses was poor (< 45% for both).

Conclusion: A larger validation study of a modified BEEST would be appropriate.

Main Study

Aim: Establish the diagnostic accuracy and utility of the BESST.

Method: Ratings by nurses using the BESST were compared with experienced SLT bedside assessment in 124 consecutively admitted stroke patients.

Results: The BESST demonstrated good agreement between nurses (81%) and within nurses (87% nurse 1, 86% nurse 2), 93% sensitivity, 82% specificity; 71% positive

predictive value, 95% negative predictive value; and overall efficiency was 84%. The BESST dictated the same management as the SLT in 75% of cases, and safely allowed 92% of patients modified oral intake when compared to the water swallow screening tool.

Conclusion: The BESST has potential use in clinical practice, but further research is needed.

LIST OF TABLES

	Page
Table 3.1: Sensitivity and specificity of clinical determinants to indicate stages of swallowing difficulty when compared to VFES.	40
Table 3.2: Sensitivity and specificity of clinical determinants of dysphagia and aspiration during oral trials compared to VFES	45
Table 5.1: Comparison of content, patient management and outcome measures of water swallow screening tools	70
Table 5.2: Comparison of researchers profession, sample size, age and homogeneity of client group, time of assessment post-stroke stroke and sensitivity and specificity of water swallow screening tools	71
Table 5.3: Potential flaws in water swallow screening test validation studies	72
Table 5.4: Bedside swallow screening tool devised to determine dysphagia or aspiration.	73
Table 5.5: Gugging swallow screening tool (GUSS)	82
Table 6.1: Survey responses regarding organisational issues	95
Table 6.2: Survey response regarding professional issues	97
Table 6.3: Survey response regarding practise issues	98
Table 6.4: Survey response regarding practise issues: training	99
Table 6.5: Survey response regarding practise issues: content of training	99
Table 7.1: A summary of ratings made by the SLT and the two nurses on the two days of the study. Each cell shows the number of ratings made by a rater	128
Table 7.2: Comparison of SLT ratings with N1 ratings on day one	129
Table 7.3: Comparison of SLT ratings with N1 ratings on day one, when the data were collapsed to form two categories	130
Table 7.4: Comparison of SLT ratings with N2 ratings on day one	130
Table 7.5: Comparison of SLT ratings with N2 ratings on day one, when the data were collapsed to form two categories	131
Table 7.6: Sensitivity, specificity, Positive Predictive Value (PPV), Negative Predictive Value (NPV) and efficiency of BESST when used by nurses compared with the SLT	131
Table 7.7: Comparison of the ratings of the two nurses on day one	132

LIST OF TABLES (continued)

	Page
Table 7.8: SLT ratings on day one and day two	132
Table 7.9: N1 ratings on day one and day two	133
Table 7.10: Comparison of ratings on the SSA and BESST by N1 on day one	134
Table 7.11: Comparison of ratings on the SSA and BESST by N2 on day one	134
Table 7.12: Comparison of ratings on the SSA and BESST by N1 on day two	134
Table 7.13: Comparison of ratings on the SSA and BESST by N2 on day two	134
Table 8.1: Frequency of type of diet rated by each rater over two assessments in the 136 patients consented into the study	152
Table 8.2: Comparison of assessments by the SLT and N1 on Day 1	154
Table 8.3: Comparison of assessments by the SLT and N1 on Day 2	154
Table 8.4: Comparison of assessments by the SLT and N2 on Day 1	154
Table 8.5: Comparison of assessments by the SLT and N2 on Day 2	154
Table 8.6: Sensitivity, specificity, Positive Predictive Value (PPV), Negative Predictive Value (NPV) and efficiency of BESST when used by nurses compared with the SLT	155
Table 8.7: Comparison of inter-rater agreement between two nurses on day 1	156
Table 8.8: Comparison of inter-rater agreement between two nurses on day 2	156
Table 8.9: Comparison of intra-rater agreement by N1 on patients who did not change medically on consecutive days	157
Table 8.10: Comparison of intra-rater agreement by N2 on patients who did not change medically on consecutive days	157
Table 8.11: Clinical determinants of aspiration in the SSA used by the nurses on the two days	158
Table 8.12: Clinical determinants of aspiration in the BESST used by the nurses on the two days, when tested with water	158
Table 8.13: Clinical determinants of aspiration in the BESST used by the nurses on the two days, when tested with thickened water	159
Table 8.14: Comparison of nurses' NIL BY MOUTH ratings on the SSA with their ratings on the BESST	160

LIST OF FIGURES

	Page
Figure 2.1: Lateral view of a dissected head and neck to demonstrate the anatomy involved in swallowing	15
Figure 2.2: X-ray image, lateral view of pharynx post-swallow: comparison of normal swallow and aspiration of bolus into trachea with residue in the valleculae and pyriform sinus	16
Figure 3.1: Effect on baseline lung tissue viability of repeated episodes of aspiration pneumonia	29
Figure 3.2: Aspiration events and concomitant effects on lung status	30
Figure 4.1: Diagrammatic presentation of sensitivity, specificity, positive predictive values and negative predictive values (adapted from Griner et al., 1981)	49
Figure 6.1: Nurse and SLT response to what drink, food and consistencies and bolus volumes are used as part of the swallow screening	106
Figure 6.2: Comparison of nurse and SLT response to content of training programme	108
Figure 7.1: Bedside Swallow Screening Tool (BESST) used for the pre-pilot study	118
Figure 7.2: Bedside Swallow Screening Tool (BESST) used for the pilot study	123
Figure 7.3: Information Sheet for the Bedside Swallow Screening Tool (BESST) used for the pilot study	124
Figure 7.4: Protocol for pilot study	127
Figure 8.1: Bedside Swallow Screening Tool (BESST) used for the main study	144
Figure 8.2: Information Sheet for the Bedside Swallow Screening Tool (BESST) used for the main study	145
Figure 8.3: Protocol for main study	150
Figure 9.1: Comparison of the BESST and SSA speed of appropriate management for oral intake	176
Figure 9.2: Quality web demonstrating the potential improvement in quality of care offered by the BESST in comparison to the SSA for patients who can tolerate thickened fluids and puree	178

ACKNOWLEDGEMENTS

This work would not have been possible without the laughter, tears and encouragement offered to me from my colleagues in the Speech and Language Therapy Department.

Debbie, how can I ever repay your eternal patience, support and friendship?

I would like to express my sincere gratitude to the Clinical Practice Research Unit team who have given me unfailing support (and coffee) throughout this programme of study.

Thank you to Ben Vickerstaff, Irene McClelland, Gill Ritchie, Debbie Toolan, and Linda Humphries for the massive task in collecting all the raw data. I would also like to acknowledge the expertise of Dr. Cathy Jack, Dr. Jim Anson and Dr. Janice Pownall who have been magnanimous, offering me the benefit of their expert opinion.

Special thanks are given to Dr. Michael Leathley who is a model of integrity and a font of knowledge. I have valued the time he has graciously spent with me, offering encouragement, advice (and lunch).

It is difficult to find the words that recognise the huge contribution of my supervisory team, Professor Caroline Watkins, Dr. Lois Thomas and Anna Hart. Their vast wealth of knowledge and experience they have generously shared with me together with their warmth, support and willingness to share my passion for this subject has been integral to the maintenance of my sanity. Caroline has been a true mentor and guide – Thank you.

Special thanks to my family who have graciously understood my passion for study and research and have allowed me to pursue my dreams to the detriment of being a wife and mother. I promise I'll do better in future!

CHAPTER 1

INTRODUCTION

1.1 Definition of stroke

The World Health Organisation (WHO) define stroke as:

“The interruption of the blood supply to the brain, usually because a blood vessel bursts or is blocked by a clot. This cuts off the supply of oxygen and nutrients, causing damage to the brain tissue..... The effects of a stroke depend on which part of the brain is injured and how severely it is affected. A very severe stroke can cause sudden death”

(WHO, 2009a)

Stroke is a major health problem, affecting 15 million people world wide every year (Grysiewicz et al., 2008). Stroke is reported as the second leading cause of death globally, accounting for 10% of overall fatalities (Bogouslavsky et al., 2003). In the UK, stroke affects approximately 200 people per 100,000 every year (Mant et al., 2004). There are an estimated 111,000 first strokes every year, accounting for approximately 53,000 deaths in the UK per annum (British Heart Foundation and the Stroke Association, 2009).

Overall it has been estimated that stroke costs the NHS £2.8 billion per annum and a further cost of £4.2 billion is incurred by caring for people with stroke and loss of productivity and disability (National Audit Office, 2005-6). Figures show that in England alone, 300,000 people who have suffered a stroke continue to have a moderate to severe disability which necessitates rehabilitation and continuing care needs (National Audit Office, 2005-6).

Whilst the incidence of acute stroke admissions is systematically reported, stroke patients nursed in the community setting together with clinical symptoms of stroke may go unregistered and unnoticed.

1.2 Dysphagia incidence and prognosis after stroke

Dysphagia is the term used to describe eating and swallowing difficulties. It is derived from the Greek word 'dys', meaning 'with difficulty', 'dysfunction' or 'pathology' and 'phagia', meaning 'to eat'. Dysphagia is a serious consequence of stroke because of the risk of aspiration pneumonia, malnutrition, dehydration, weight loss, airway obstruction and ultimately death (Smithard et al., 1996; Mann et al., 2000). Pneumonia is reported in 16% of all people admitted with a stroke and is an important cause of morbidity post-stroke (Royal College of Physicians, 2009). In addition, there are the secondary effects of reduced stamina, increased likelihood of pressure sores, reduced physical recovery, reduced wound healing and increased risk of anxiety or depression (Marks and Rainbow, 2001).

Dysphagia is a common symptom following stroke. Incidence of dysphagia varies from 19% to 81% (Barer, 1989; Meng et al., 2000). The wide disparity in estimated figures is largely accounted for by the definition of 'dysphagia' utilised by researchers, the methods used to identify dysphagia, the clinical determinants considered representative of dysphagia, and the timing of the assessment post-stroke (Mann et al., 1999). Whilst observational studies suggest that in the first 24 hours post-stroke, between 30-40% of conscious individuals present with dysphagia (Royal College of Speech and Language Therapists, 2005), other authors report findings of 50% (60/121) of consecutively admitted patients assessed as being 'at risk of aspiration' owing to dysphagia in the acute phase of stroke (Smithard et al., 1997). This latter figure is supported by a study that identified the bilateral representation of swallowing on the cerebral cortex (Hamdy et al., 1996). The study demonstrated, using MRI scanning on healthy volunteers and stroke patients, that individuals had dysphagia when the dominant cortical hemisphere for swallowing was affected.

The health risk to dysphagic patients with stroke is compounded as many physical and cognitive functions may be impaired and may impact further on the eating process. Decreased levels of alertness, fatigue, inability to maintain trunk and head alignment, reduced postural stability and tone, limb and body apraxia, visual perceptual difficulties, cognitive and communication problems, as well as lack of insight and depression, can all affect the amount of food and drink stroke patients are able to consume. The co-ordination of the swallow mechanism impacts not only on the individual's level of nutrition and hydration, but is an indicator of their rehabilitative potential (Gariballa et al., 1998).

Recovery from dysphagia has been reported in 73% of 121 consecutively admitted acute stroke patients within seven days, with 27% having persisting difficulties (Smithard et al., 1996). At one month, 15% were demonstrated to continue to aspirate on a videofluoroscopy examination. At 6 months, 8% continued to have persistent difficulties and a further 3% developed dysphagia although the aetiology was not identified. The development of problems post-discharge has implications for training carers to identify when swallowing difficulties arise, as well as giving them the skills to appropriately manage these difficulties.

The pressure to deliver a method for identification and management of dysphagia has meant that clinical practice has evolved without underpinning rigorous research evidence. There has been a practical need to find ways in which to identify correctly those individuals with dysphagia and to manage these presenting difficulties because of their impact on medical, social and psychological outcomes. Therefore swallow screening tools have been locally developed and implemented together with training programmes. Efficacy of training programmes to teach the knowledge and competences required for nurses to identify risk of aspiration have not been undertaken. In order to address patient care, risk and cost issues, many organisations have developed programmes to improve collaborative working between Speech and Language Therapists (SLTs) and other healthcare professionals, primarily nurses, in the management of dysphagia. This reinforces and consolidates the development and extension/blurring of professional roles recommended in the Department of Health (DH) documents: “Essence of Care” (DH, 2001a); the “10 Key Roles for Nurses” and the “10 key Roles for Allied Health Professionals” (DH, 2001b).

There are a number of locally developed models of dysphagia screen training, competences and extended professional roles such as the dysphagia trained nurse, aiming to provide better care. However, provision is patchy and tends to be a response to local pressures, rather than a systematic approach to all client groups in all locations. A number of national dysphagia competence guidelines and frameworks have been developed, for example the Royal College of Speech and Language Therapist’s Dysphagia Competence Guidelines (RCSLT, 2005), Scottish Intercollegiate Guideline Network (SIGN, 2004), and Skills for Health workforce competence frameworks, (DH, 2006), but these are client or profession specific. The Interprofessional Dysphagia Framework (IDF) (Boaden et al., 2006) is a professionally endorsed competence framework that identifies the underpinning knowledge and competences required to work in dysphagia regardless of client group or profession. This work was inspired and undertaken in parallel to this programme of work.

Within the UK there is a drive from the Department of Health to develop generic standardisation of practice. These plans have been embodied in a number of reports, for example Fitness for Practice (United Kingdom Central Council for Nursing, Midwifery and Health Visiting Code of Conduct, 1992) the NHS Plan (DH, 2000a), A Health Service of all the talents (DH, 2000b), Agenda for Change (DH, 2004), and Making the Change (DH, 2001b). These reports promote the development of competence and promote the implementation of a competence outcomes-based approach to education. Further reports e.g. National Service Framework (NSF) for Older People (DH, 2001c) and the Clinical Guidelines for Stroke (Inter Collegiate Working Party (ICWP) Stroke, 2008) focus on healthcare professionals having the skills to meet the needs of individuals at the point of need, rather than looking at the roles of specific professions. The standardised approach that is being adopted nationally is based upon National Occupational Standards Health and Social Care (Sector Skills Council, 2009). Skills for Health is the Sector Skills Council for health across the UK. It is important to recognise that there is a necessity to widen the number of professionals, and registered and non-registered carers, who are dysphagia competent. This will allow the provision of person-centred care that is timely, responsive, and integrated into the care plan, rather than care that is dictated by the availability of a single professional group.

1.3 Recognition of dysphagia within professional groups

Historically, the association between swallowing difficulties and impaired clinical outcomes went largely unrecognised (Gordon et al., 1987; Wade and Hewer, 1987). Since the late 1980's, dysphagia assessment and management has been the remit of SLTs who specialised in this field by attendance at specialist post-graduate courses (RCSLT, 2010). Dysphagia was introduced to SLT undergraduate courses in 1999 (RCSLT, 1999). The report acknowledged that SLTs have the skills to address dysphagia (Langmore and Miller, 1994).

UK wide recruitment and retention problems (SLT is recognised as a “shortage” profession) has contributed to increasing pressure on SLT services with referrals to SLT departments rising exponentially (Ellul and Barer, 1994; Enderby and Petheram, 2002).

Concomitant staff shortage and a rise in referrals contribute to difficulties with stroke patients getting timely access to therapists in the UK, with 21% of patients with dysphagia not being assessed by an SLT within 72 hours of admission (RCP, 2009).

This failure to address dysphagia in a timely manner may lead to worse patient outcomes and may increase the time patients spend in hospital (ICWP Stroke, 2008).

Two Dysphagia Policy Review Forums held by the RCSLT (SLT Dysphagia Policy Review Forum 1992 and 1998) recognised the need to involve other professional groups (predominately nurses) in the detection of dysphagia. Involving members of the multi-disciplinary team in the identification and management of dysphagia has been reinforced by “A Health Service of all the Talents” (DH 2000b). This states that a comprehensive and effective health service of all the talents should: demonstrate team working; transcend professional and organisational boundaries; have flexible working to make the best use of the range of skills and knowledge of staff; streamline workforce planning; ensure development which stems from the needs of patients not just of professionals; maximise the contribution of all staff to patient care, do away with barriers; modernise education and training to ensure that staff are equipped with the skills they need to work in a complex changing NHS; develop new, more flexible, careers for staff of all professions and expand the workforce to meet future demands. This concept of inter-disciplinary working is endorsed by the NSF for Older People (DH 2001c) which states that older people’s care in hospital should be:

“delivered by hospital staff who have the right set of skills to meet their needs”

(Standard 4: General Hospital Care, page 51)

To reinforce the role of nursing staff in the care of dysphagia within the context of 24 hour care, the National Clinical Guidelines for Stroke (ICWP Stroke, 2008) state that:

“People with acute stroke should have their swallowing screened by an appropriately trained healthcare professional before being given any oral food, fluid or medication”

(Acute phase care recommendations 4.16.1, page 59)

However patients are still not being offered adequate screening, with only 72% of stroke patients receiving a swallow screening test within 24 hours of admission (RCP, 2009). Therefore further work is required to create a major shift in attitude towards healthcare delivery with the development of services that can respond appropriately at all times, including nights and weekends (ICWP Stroke, 2008). There is, therefore, a need for the Health Service to address both the acute and subsequent management of dysphagia.

Nurses, as part of their role, have a responsibility to ensure that individuals with dysphagia receive adequate nutrition (United Kingdom Central Council for Nursing, Midwifery and Health Visiting Code of Professional Conduct, 1992), even though they rarely receive specific dysphagia tuition at undergraduate level and receive minimal training using specific swallow screening protocols in the workplace. The role of nurses in screening for swallowing difficulties is still subject to regional variation. Nurses report that they fail to receive adequate support in this role and do not always have the necessary skills to ensure that the problems resulting from dysphagia are addressed (Miller and Krawczyk, 2001). As a result, many patients are put at risk of aspiration pneumonia, and preventable malnutrition and dehydration which may increase length of hospital stay (Ellul et al., 1997; ICWP Stroke, 2008).

Despite nurses now being recognised for their contribution to dysphagia in stroke care (Boaden et al., 2006), they still have limited training. Ideally, a nationally recognised intercollegiate framework needs to be in place to specifically support and ratify nurses' roles in dysphagia management, identify the relative parameters of their involvement, identify a recognised framework within which their competence can be assessed, and as a result, define the type and level of training necessary in order for them to function as a competent practitioner. Dysphagia training for nurses focuses on screening for those at risk (ICWP Stroke, 2008), whereas SLTs are trained in using assessment tools to determine diagnosis, and the subsequent development of treatment and management plans. SLTs are able to use a variety of bedside assessment protocols and instrumental examinations to assess the swallow. Speech and Language Therapists have access to a national network of Special Interest Groups and have a national, professionally endorsed programme of under-graduate and post-graduate training at basic, intermediate and advanced levels (RCSLT, 1999).

Media coverage tends to be highly sceptical about the medical management of patients with dysphagia (Levenson, 2004). Through the news media, and 'Not because we are old' Health Advisory Service report (HAS, 1998), there have been well documented accounts of individuals with swallowing disorders being kept nil by mouth for extended periods whilst awaiting assessment. Where SLTs have been solely responsible for screening for dysphagia, individuals may be left nil by mouth for longer than necessary, leading to accusations of individuals being "starved". This negative media coverage contributes to health professionals' anxiety around dysphagia and its management which has resulted in the development of a multi-disciplinary approach to delivery of this aspect of care to stroke patients.

1.4 Bedside swallow examinations

Different levels of bedside swallowing examinations have been developed to determine the presence of swallowing difficulties: screening; specialist assessment; and instrumental examination. Bedside swallow screening tools are used by nurses in order to identify patients at risk of swallowing difficulties and refer for more specialist assessment. More specialist assessments can be undertaken at bedside by SLTs in order to identify the stage of swallowing difficulty and devise a management plan. There are limitations to the bedside examination because the SLT is only able to visualise the oral cavity. This requires them to use their personal training and experience to identify and interpret the clinical determinants of aspiration at the pharyngeal stage of the swallow. Alternative and augmentative instrumental examinations can be utilised to offer additional information, for example, visual dynamics. Videofluoroscopy is acknowledged as the 'gold standard' in the identification of dysphagia as it is a dynamic x-ray of the oro-pharyngeal tract. However, this has limited application to the acute stroke patient as not all stroke services have this facility and it relies on patient capability and compliance. This necessitates the continued use of bedside assessment of the swallow mechanism.

Clinically, nurses who perform bedside swallow screening mostly do so with tools that use water as the screening material¹. Patients are screened by nurses on water swallows and those not demonstrating clinical signs of aspiration are allowed to take not only thin fluids but also normal diet. Diet is given, with general instructions to 'observe' the patient eating rather than the safety of eating being directly assessed. Conversely, patients that show signs of aspiration on water are placed nil by mouth until a SLT is available to fully assess the patient and prescribe appropriate management strategies. As water is notoriously difficult to swallow, patients are deemed unsafe to have anything orally, when modified diet and fluids may have been taken safely. This has led to patients being undernourished, potentially unnecessarily, which could be avoided if a person with appropriate skills could use a diagnostically accurate bedside swallow screening tool that included both fluids and food as testing materials.

¹50ml water swallow test (Gordon et al., 1987); 3 oz water swallow test (DePippo et al., 1992); Standardised Swallowing Assessment (Perry, 2001a,b based on Ellul and Barer 1993, 1994); Burke Dysphagia Screening Test (DePippo et al., 1994); Bedside Swallowing Assessment (Smithard et al., 1996, 1997, 1998); Time Test of Swallowing (Hinds and Wiles, 1998); Daniels Assessment Survey (Daniels et al., 1998); Massey Bedside Swallow Screen (Massey and Jedlicka, 2002); 100 ml water swallow test (Wu et al., 2004).

The aim of the programme of research was therefore to devise a bedside swallow screening tool (BESST), for use by nurses in order to prevent patients being placed nil by mouth unnecessarily until a SLT was available. The BESST uses both thin fluids and a puree diet as testing materials. This would allow nurses to screen patients and offer extended, appropriate management options of thin fluids and normal diet, thickened fluids and puree diet or nil by mouth with consideration of alternative methods for hydration and nutrition.

A valid and reliable bedside swallow screening tool for acute stroke patients, that assesses for both thin liquids and puree consistency and which allows nurses to manage patients' nutrition and hydration, has been published since this research study began (Trapl et al., 2007). The study is discussed in Chapter 5.

1.5 Structure of the thesis

Chapter 1 has presented a brief definition of stroke, the incidence of dysphagia post-stroke, and the role of different professional groups in bedside screening and assessments. It has endeavoured to set the focus of this thesis in the context of the current agenda within the National Health Service.

Chapter 2 will give a description of the complex nature of normal swallowing, provide a definition of dysphagia and aspiration and discuss the effects of aspiration within the normal ageing population. It offers a discussion of how aspiration can occur without any clinical impact.

Chapter 3 details aspiration symptomatology, the requisite features that predispose patients to develop aspiration pneumonia and the potential consequences in stroke patients. It reports the clinical determinants of aspiration and offers a fundamental understanding of why, in some patients, aspiration is important and thereby justifies the need for the development of a diagnostically accurate bedside swallow screening tool.

Chapter 4 presents instrumental examinations and formal bedside assessments that may be used to diagnose dysphagia in stroke patients in the absence of a 'gold standard'. An understanding of this is necessary in considering the research methods used.

Chapter 5 describes the clinical background from which the programme of study emerged. This informed the focus of the literature review surrounding bedside swallow screening tools that underpin the development of the BESST.

Chapter 6 discusses the development of a survey devised to identify current clinical practice regarding nurse screening for dysphagia in stroke patients. The survey, together with the literature review, identified the need for a bedside swallowing screening tool for nurses to use that uses thin fluids and thicker textures as testing materials.

Chapter 7 reports on the development of the BESST using key themes from the survey and a pilot study to examine the feasibility of the BESST. Subsequent pilot study methodology and results are discussed.

Chapter 8 examines the diagnostic performance of the revised BESST on a larger cohort assessing sensitivity and specificity compared to the use of swallow screening tools used in current clinical practice, i.e. the standardised swallow assessment (SSA).

Chapter 9 is concerned with summarising the potential impact of the study on the professional groups, discussing the limitations of the study and suggesting avenues for further research.

1.6 Summary

This chapter has offered a framework for the thesis and has endeavoured to explain the rationale for the series of studies. It demonstrates how the development of a valid and reliable bedside swallow screening tool is an important and necessary clinical step that reinforces the critical role of nursing staff in the identification and management of dysphagia. It sets the study in both the clinical context of stroke and within national clinical guidelines. It offers the reader an overview of the DH agenda in fostering interdisciplinary working in order to meet patient need regardless of location and describes how the swallow screening tool can be viewed as an integral level within the IDF (Boaden et al., 2006).

Briefly stated, the aim of this programme of study was to investigate the need for and subsequently develop a bedside swallow screening tool for nurses to use with stroke patients. As a means of achieving this aim, research objectives were identified and undertaken:

- a survey of current clinical practice
- a feasibility study undertaken on a representative sample of acute stroke patients
- a main study to investigate the diagnostic performance of the bedside swallow screening tool

A summary of the research findings, together with the limitations of the study and direction for further research is presented.

CHAPTER 2

NORMAL SWALLOWING

This chapter provides an overview of the anatomy (Figure 2.1) and physiology of normal swallowing. The consequences of penetration and aspiration of the bolus together with normal oro-pharyngeal flora in normal healthy individuals across the ages are reported.

Swallowing involves co-ordination of a complex sequence of neurological events. It is the process that enables diet and fluids to pass from the mouth to the pharynx and into the oesophagus. The correct quantities of oral intake, based on requirements for a sedentary adult, are: 2.2 litres/day fluids for women and 2.9 litres/day for men (WHO, 2010). It is recognised that fluid intake should approximate 30 ml/kg of body weight per day (Whelan, 2001) as a minimum, but that fluid requirement varies with activity, climate and diet. Calorific intake should approximate to 2000/day for women and 2500/day for men (National Health Service, 2009).

2.1 Anatomy and physiology of normal swallowing

Swallowing involves multiple cortical regions, including the sensorimotor cortex. It is bilaterally, but asymmetrically, organized in the motor cortex (Hamdy et al., 1996). Swallowing involves the recruitment and organization of six cranial nerves and 26 muscles of mouth, pharynx and oesophagus (Donner et al., 1985). It requires anatomic stability, neuromuscular co-ordination, sensory perception, gastro-intestinal function, cardio-respiratory support and integration from the autonomic nervous system (RCSLT, 2006). A person swallows approximately 1000 times each day and 50 times during the night. Outside eating situations, people swallow one litre of saliva per day and 20mls at night. Each person produces 0.1-0.2 mls of saliva per minute, with individual differences in the basal composition (Kaplan and Baum, 1993). Saliva performs essential functions of mucosal protection (Kaplan and Baum, 1993), pH maintenance (Marks and Rainbow, 2001), microbial control (Kaplan and Baum, 1993) teeth remineralisation, bolus formation and translocation, and digestion and taste (Logemann, 1985). Swallowing can be subdivided into stages: the oral stage, the pharyngeal stage and the oesophageal stage (Groher, 1997).

The Oral Stage consists of the oral preparatory and the oral transit stage. The oral preparatory stage normally involves the self-placement of food in the mouth (Logemann, 1983) followed by mastication which is under voluntary control and is therefore not time-limited. A bolus of food is mixed with saliva by rotary, lateral tongue and jaw movements (Logemann, 1985) prior to being pulled into the central groove of the tongue. The bolus is maintained in the oral cavity anteriorly by lip closure, laterally by increased cheek tone (Cichero and Murdoch, 2006) and posteriorly by raising the back of the tongue to prevent premature spillage into the pharynx, together with lowering the soft palate in order to prevent nasal reflux (Hiemae and Palmer, 1999; Murry and Carrau, 2006). Local sensory mechanisms in the oral cavity ascertain the bolus characteristics, i.e. consistency, viscosity, elasticity, volume, temperature and mass to inform the pharyngeal stage of the swallow (Murry and Carrau, 2006).

The oral transit stage involves the transit of the bolus to the tongue base via sequential elevation of the tongue (Marks and Rainbow, 2001; Kennedy et al., 2010) assisted by negative pressure from lip and jaw closure together with a concomitant increase in cheek tone (Murry and Carrau, 2006). In normal swallowing, various patterns of bolus transit are recorded with multiple amounts of cohesive bolus being moved to the tongue base prior to the trigger of the pharyngeal stage (Palmer et al., 1992; Dua et al., 1997; Hiemae and Palmer, 1999). The oral stage is under voluntary control (cranial nerve XII: Hypoglossal) and generally takes less than one second to complete in normal subjects (Daniels and Huckabee, 2008).

The Pharyngeal stage varies between individuals. Collection of a single bolus or several boluses in the valleculae prior to the pharyngeal swallow is considered normal, as is depositing part of the masticated, and therefore cohesive, bolus at the tongue base whilst continuing to prepare the remaining bolus in the oral cavity (Dua et al., 1997; Hiemae and Palmer, 1999). Similarly, healthy individuals may allow the bolus to move from the tongue base or valleculae into the lateral borders of the larynx prior to triggering the pharyngeal swallow (Daniels and Huckabee, 2008). Classically, the pharyngeal swallow involves the transit of the bolus from the tongue base into the oesophagus via valve and pressure changes and is therefore not considered a reflex activity but a neuromuscular, patterned sequenced response (Logemann et al., 1999).

The sequence of events in the pharyngeal stage serves to move the bolus from the pharynx into the oesophagus. The soft palate retracts and elevates, approximating the anterior movement of the arytenoid and the pharyngeal wall. This prevents nasal reflux

(Logemann, 1985) and increases the negative pressure required for movement of the bolus through the pharynx (Perlman et al., 1993).

The tongue base moves forward to increase pharyngeal space as the pillars of fauces constrict behind the bolus. The hyoid bone, pharynx and larynx move anteriorly and superiorly by 2cm (Logemann, 1985) in order to open the relaxed cricopharyngeal sphincter at the opening to the oesophagus (Logemann, 1985; Dodds, 1989). The bolus splits either side of the epiglottis, moves through the lateral borders and merges into a cohesive bolus at the level of the pyriform sinus prior to moving through the cricopharyngeal sphincter (Logemann, 1985). See Figure 2.1.

In the majority of individuals, respiration ceases (swallow apnoea) (Butler et al., 2007) following the initiation of the expiratory breath (Selley et al., 1989a); timing varies between and within individuals. In a minority of swallows (10-20%) inspiration occurs before the swallow (Martin-Harris et al., 2005; Perlman et al., 2005). Swallow apnoea can occur just prior to the oral transfer stage (Hiss et al., 2004; Martin-Harris et al., 2005) or at the onset or termination of the oral transfer stage (Hiss et al., 2004). The sequence of closure of the three mechanisms of airway defence, true vocal fold closure, false vocal fold closure (Shaker et al., 2002), and closure of the epiglottis approximating the arytenoids (Garon et al., 2002) may facilitate ejection of material that has penetrated into the laryngeal vestibule. The posterior and lateral pharyngeal muscles constrict (Olsson et al., 1997), creating a ridge that occupies one third of the pharyngeal space which approximates the posterior moving tongue base to generate pressure to move bolus through the valleculae, lateral borders and pyriform sinus (Cerenko et al., 1989). The bolus passes into the oesophagus through the cricopharyngeal sphincter. This opens within one tenth of a second of airway closure due to the weight of the bolus on the epiglottis, a concomitant decrease in the resting tone of the muscle (Singh and Hamdy, 2006) caused by parasympathetic impulses over the vagus nerve (Morrell, 1992) and the anterior and superior movement of the hyo-laryngeal structure. The cricopharyngeus muscle demonstrates a variable opening time and excursion in response to bolus characteristics. An increase in bolus density or volume causes slower transit times, higher intra-bolus pressure, greater maximal hyoid movement (which creates longer cricopharyngeal sphincter opening time) and greater sphincter diameter (Buchholz et al., 1985). Respiration resumes as the structures return to normal resting position (Marks and Rainbow, 2001). The completion of the expiratory breath aids ejection of any material in the airway (Selley et al., 1989a; Hiss et al., 2004; Martin-Harris et al., 2005). There is an increase in respiratory rate post-

swallow (Hirst et al., 2002) due to swallow apnoea which increases as the volume and viscosity of the bolus increases. Normal respiratory rate is then resumed.

There is considerable adaptation and compensation of swallow physiology for: different bolus characteristics in all stages of the swallow (Buchholz et al., 1985; Tracy et al., 1989; Fucile et al., 1998; Daniels and Huckabee, 2008), alternate drinking patterns i.e. sequential cup drinking swallows and sucking from a straw (Murray et al., 1998; Daniels and Foundas, 2001) and different head and neck postures (Buchholz et al., 1985). Despite the significant adaptations within and between individuals, the pharyngeal stage takes approximately one second to complete.

The Oesophageal stage has a variable time, 2-3 seconds for liquids (Castell and Donner, 1987) and 8-20 seconds for solids (Logemann, 1985; Castell and Donner, 1987). The bolus is moved along a 25cm long flattened tube through the lower oesophageal sphincter and into the stomach (Hendrix, 1993) by peristalsis and gravity (Morrell, 1992).

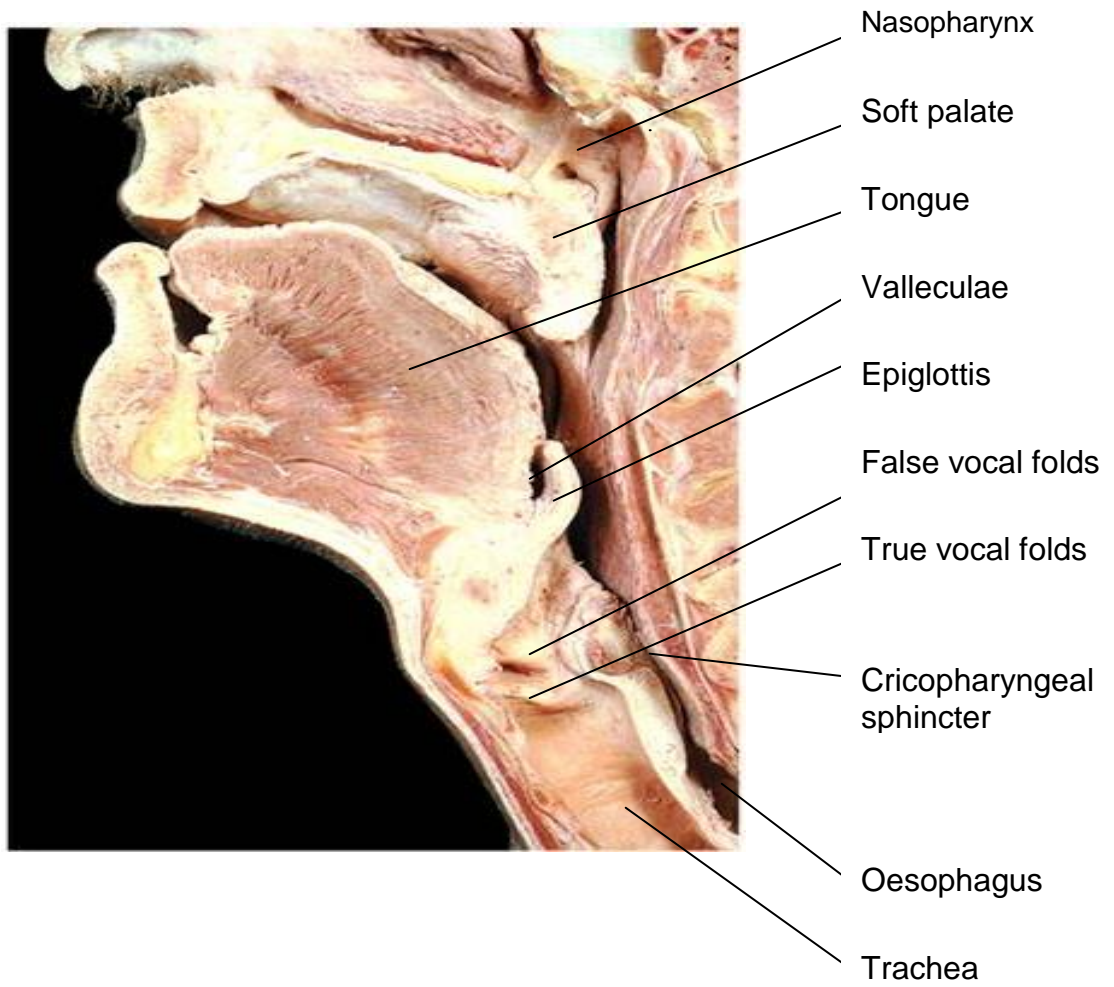


Figure 2.1: Lateral view of a dissected head and neck to demonstrate the anatomy involved in swallowing

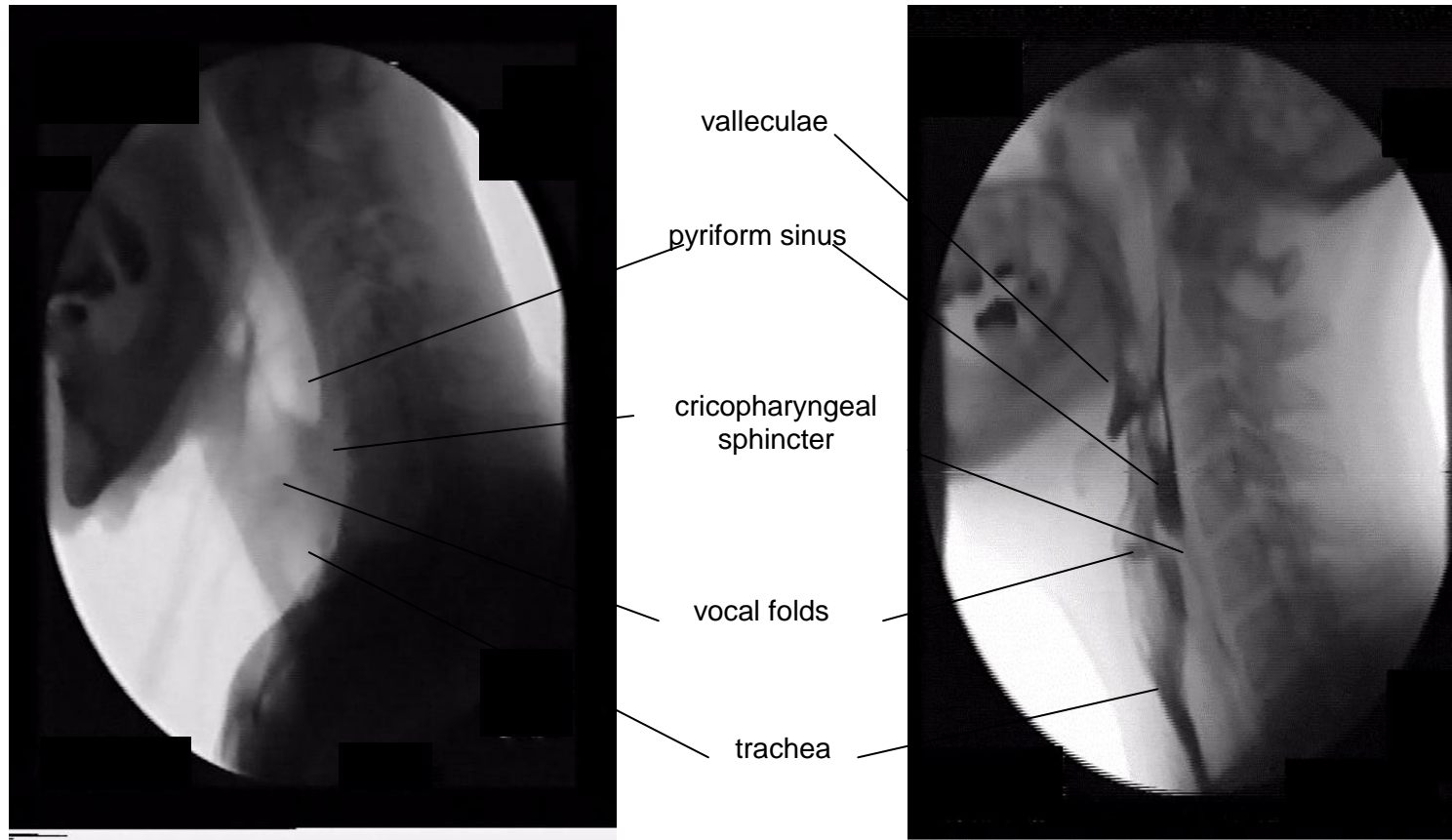


Figure 2.2: X-ray image, lateral view of pharynx post-swallow: comparison of normal swallow and aspiration of bolus into trachea with residue in the valleculae and pyriform sinus

The complexity of swallow physiology (detailed above) does allow for adaptation and compensation, for example unilateral pharyngeal bolus movement swallowing when the head is turned. Historically, any observation of material entering the laryngeal vestibule or moving further into the trachea on Videofluoroscopic examination resulted in modification of oral intake (Butler et al., 2009b). However, penetration, defined as entry of the bolus to the laryngeal vestibule but not below the level of the true vocal cords (Robbins et al., 1992), and aspiration (Figure 2.2), defined as movement of material below the level of the vocal folds, (Logemann, 1983), has been demonstrated to occur in healthy individuals.

2.2 Does aspiration matter in the younger healthy population?

Several studies have documented the presence of penetration and aspiration in the healthy population. In a videofluoroscopic study of 40 normal, healthy individuals (matched for gender) under 50 years of age, 32.5% (13/40) of individuals demonstrated penetration on liquid bolus volumes of 1ml, 3ml, 5ml, 10ml and cup drinking. Out of the collective 364 liquid swallows, penetration was observed on 7.4% (27) swallows. No penetration was observed on 194 collective swallows of 3ml pudding, cookie or bite of apple (Daggett et al., 2006). This study demonstrates that penetration does occur in the younger (<50) healthy population but only infrequently and only with liquid bolus consistency. These results are supported by a further study using simultaneous manometric and endoscopic measures to examine normal swallowing in 23 young adults (mean age 30 years). Each participant performed eight 5ml and 10ml swallows of water and milk (collectively 184 swallows) of which 0.5% (1/184) showed penetration and 0.5% (1/184) showed aspiration (Butler et al., 2009a). These results suggest that small infrequent incidence of both penetration and aspiration may occur without a clinical consequence.

Whilst the disadvantages of videofluoroscopy and endoscopy (discussed in Chapter 4) are acknowledged, there is evidence to suggest that penetration and aspiration may occur in healthy individuals with no clinical consequence (Butler et al., 2009b). There was no evidence of a sensorimotor response (coughing or throat clearing) in any of the studies discussed above, suggesting that in normal healthy adults, small, infrequent episodes of aspiration are tolerated by the body's defence system. It is possible that aspiration in normal healthy adults seldom results in bacterial pneumonia because material is cleared by mucociliary action and alveolar macrophages (Dockrell et al., 2003; Varkey, 2006). An average man inhales approximately 10,000 micro-organisms per day which are trapped by mucus secreted by sub-epithelial glands and moved to the throat by ciliary action and swallowed (Mims, 1979). Small and therefore unfiltered

particles may reach the alveoli where there is no 'mucociliary escalator' but bacteria are subject to macrophage action (Mims, 1979) and are cleared from the lungs. Therefore, in younger healthy people without swallowing difficulties, aspirated water would be absorbed by aquaporin channels in the alveoli and aspirated thickened water would be removed by macrophage action.

Whilst there is acknowledged variation in normal swallow physiology in healthy, younger individuals, there is emerging evidence to suggest that atypical swallow pattern changes occur as a consequence of age.

2.3 Does aspiration matter in the older healthy population?

There is evidence to suggest that penetration and aspiration occur more frequently and across different consistencies in the older (>65 years) population. A definitive explanation for this phenomenon remains elusive. However, there are reported differences in anatomical structure (Leonard et al., 2004), physiology (Daggett et al., 2006; Kelly et al., 2008), timing (Kim et al., 2005; Kurosu and Logemann, 2009; Allen et al., 2010; Hiss et al., 2001; Martin-Harris et al., 2005; Martin-Harris et al., 2007), and perception (Chen et al., 2009) of swallowing in the older population that may offer an explanation for the increase in aspiration events in the elderly.

Changes in anatomical structure

Videofluoroscopic analysis of normal swallowing of 1ml, 3ml and 20ml liquid bolus consistency in 85 elderly subjects (51 female) with a median age of 70 years (range 65 - 88 years) was undertaken. The sample population had chronic conditions of diabetes, hypertension and osteoarthritis, but individuals were eliminated from the study if they had a history of dysphagia, stroke, craniofacial abnormality or neuromuscular disease. In order to make inferences regarding pharyngeal and laryngeal structures, comparisons were made between females in the younger and older population and then males in the two categories. The videofluoroscopic studies demonstrated that in the elderly population when compared to the younger population: the larynx is situated lower in the neck; the distance between the hyoid and larynx at maximal approximation was greater; and maximum width of the pharyngeal space was greater (Leonard et al., 2004). The larger and longer pharyngeal space precipitated a prolonged pharyngeal transit time for the bolus. This variability in structure subsequently demands further adaptation and compensation of the elderly swallow in order to facilitate a competent swallow. In this study no aspiration was observed, however the study limited the bolus

consistencies in respect of size and viscosity which may not have precipitated penetration and aspiration.

Changes associated with physiology and timing

Similar physiological variation in the elderly swallow is reported elsewhere in the literature (Robbins et al., 1992; Kim et al., 2005). In a study of videofluoroscopic evaluation of 40 normal non-dysphagic individuals, twenty aged 21-51 years and twenty aged 70-87 years, the older group were shown to have a longer pharyngeal delay time than younger individuals on both 5ml and 10ml bolus volumes. Pharyngeal delay time was defined as the transition between the oral and the pharyngeal stage of swallowing, i.e. the time taken from the head of the bolus being at the point where the mandible crosses the tongue base to the initiation of laryngeal elevation. Similarly, the stage transition duration (the time between the bolus passing the ramus of the mandible and the initiation of hyoid excursion) increased with the older client group. This means that hyoid excursion occurred after the bolus passed the ramus of the mandible whereas in the younger group hyoid excursion occurred prior to the bolus passing the ramus of the mandible (Kim et al., 2005). This supports previous findings of delayed initiation of hyolaryngeal excursion being the main cause of longer duration of oropharyngeal swallows in the older swallow as evidenced on simultaneous manometry and videofluoroscopy (Robbins et al., 1992). Similar oropharyngeal delay is reported in a study of simultaneous manography and videofluoroscopy of 24 individuals swallowing four bolus volumes of 1ml, 5ml, 10ml and 20ml, in three age categories of 20-29, 30-59 and 60-79 (Tracy et al., 1989). The study reported a slower pharyngeal transit time and a delayed pharyngeal response time. Whilst there is evidence of extended pharyngeal delay and stage transition time in the older group, the studies report only one incidental occurrence of aspiration: a twenty year old who aspirated on one 5ml bolus. Delayed pharyngeal transit time is a phenomenon that is reported elsewhere in the literature (Martin-Harris et al., 2007). In a similar study, using videofluoroscopy and nasal airflow recordings of 76 healthy individuals, 80% of 5ml liquid bolus swallows of older participants (> 50 years) demonstrated pharyngeal delay time (Martin-Harris et al., 2007). Aspiration was not observed in either study during small liquid bolus volumes, but the studies demonstrate that increased aberrant variation in physiology and timing of swallow events in the elderly swallow may not be considered pathogenic.

Disparities also occur with recorded respiratory patterns and swallow apnoea duration in the older population. In a sample of 60 healthy adults (matched for age and gender), expiratory swallow apnoea was demonstrated in 62% of swallows. Although swallow

apnoea duration was variable within the sample, overall, the older population (60-83 years) demonstrated a prolonged swallow apnoea on saliva, 10ml, 15ml, 20ml and 25ml liquid bolus volumes when compared to younger (20-39 years) and middle aged (40-59 years) individuals in the sample (Hiss et al., 2001). The results are supported by a further study of 76 healthy individuals (matched for age, gender and race) who undertook 5ml liquid swallows from a cup with simultaneous videofluoroscopy and respiratory recordings. The mean swallow apnoea duration was one second whilst duration times of 7.83 -10.02 seconds were observed in the older population. The onset of swallow apnoea was variable across the age range but the termination of swallow apnoea was stable in the young population and significantly delayed in the older age (>81 years) group (Martin-Harris et al., 2005). In common with other studies (Selley et al., 1989a; Hiss et al., 2001; Martin-Harris et al., 2003) a dominant exhalatory swallow apnoea pattern was observed: this pattern may be beneficial in the clearing of post-swallow residue (Daniels and Huckabee, 2008). However, other respiratory patterns of expiration-inspiration; inspiration-expiration and inspiration-inspiration were observed predominantly within the over 65 age groups. Despite the differences in swallow apnoea duration and patterns of expiration and inspiration, no penetration or aspiration was noted for any participant (Martin-Harris et al., 2005).

Increase episodes of penetration in the elderly

Several studies report increased episodes of penetration occurring in the elderly population. Videofluoroscopic studies of 98 individuals (50 females) age 20-94 years old, showed laryngeal penetration of all consistencies in 53% (52/98) of the sample. Of the individuals over 50 years old, 64% (37/58) demonstrated penetration which constitutes 16.8% (98/583) of the total liquid swallows in comparison to 32.5% of younger adults (n = 40) who penetrated 7.4% (27/364) of all liquid swallows. Of the older group, 17.2% (10/58) showed penetration of solid bolus consistency of paste, solid and apple which was not observed in the younger group. The older group also demonstrated a greater increase in the frequency of penetration with increase in bolus size in comparison to the younger group. Neither group showed any sensorimotor response to the penetrated material indicating that the boluses did not reach the level of the vocal folds, and that the penetrated material was cleared by the action of airway closure (Daggett et al., 2006). This study shows that material may penetrate the airway at all ages, with an increase in frequency in the older population, but neither liquid nor solid bolus consistencies were aspirated.

Increase in incidence of aspiration in the elderly

More recent studies have shown aspiration to occur in the normal ageing population. Manometric and endoscopic examination of a small study sample of 21 older adults (mean age 75 years), demonstrated 19 episodes of penetration and 11 episodes of aspiration in 168 swallows of 5ml and 10ml bolus volumes without evidence of coughing or throat clearing (Butler et al., 2009a). In a follow up study (Butler et al., 2009b), twenty older (> 65 years) healthy individuals (10 female), undertook 5ml and 10 ml liquid and pudding consistency swallows with Fiberoptic Endoscopic Evaluation of Swallowing and manometry. Participants had no history of dysphagia, voice or speech disorders, pulmonary or neurological disease. Of the total number of swallows analysed, 15% (82/545) of swallows demonstrated penetration. Although the penetration rate of 75% within the population studied are similar to previous studies (Daggatt et al., 2006), this study shows that 30% of this healthy older group aspirated, which equates to 3% of the total number of swallows. The occurrence of aspiration in normal healthy individuals is reported elsewhere in the literature but with much lower frequency. In a videofluoroscopic study of 149 individuals (mean age 57 years; 56% female) aspiration occurred only once, 0.17% of 596 swallows (Allen et al., 2010). These studies demonstrate that although aspiration may occur in normal healthy individuals, the incidence of aspiration is more frequent on liquids, and in the older population. However, overall aspiration is infrequent, of small bolus size, and of no apparent clinical consequence.

Whilst penetration and aspiration has been evidenced in the studies outlined above, the incidence of aspiration could be greater when considering the 20% false negative rate in videofluoroscopy (Clayton et al., 2006). Furthermore aspiration has only been considered in the alert individual, aspiration in sleeping individuals has not been considered.

Quality of life issues

While in terms of airway penetration and aspiration, changes in certain parameters of swallowing have not been found to have an effect, the changes can have profound implications for quality of life. Difficulties eating, resulting in prolonged meal times and a restriction in the variety of foods in the diet, greatly impact on quality of life (Rosenthal et al., 2006). In a single site independent living facility, 15% (16/107) residents reported difficulty swallowing and 23% (25) stated that they consider swallowing difficulties to be a corollary of ageing (Chen et al., 2009). Using response to a single question is a fairly crude analysis of swallow prevalence (35.3% sensitivity, 88.9% specificity). However, it confirms the results from other surveys: 35% (Lindgren and Janzon, 1991) and 33%

(Roy et al., 2007), that there is high incidence of perceived swallowing difficulties amongst the elderly in the primary care setting. Quality of life scores pertaining to some parameters of dysphagia have been reported in other client groups (i.e. head and neck cancer) where scores do not alter prior to and at six months post-treatment, owing to patients' ability to adjust to altered swallow function (Connor et al., 2006). However, patients continue to report that dry mouth, swallow impairment, diet and weight loss impacted on their quality of life.

Despite anomalous anatomical, physiological and durational events reported in the older swallow, information regarding post-swallow state suggests that the older swallow is effective in clearance of the bolus from the pharynx to the oesophagus. Fiberoptic endoscopic evaluation of 51 healthy adults, (21 < 40 years, 30 > 65 years), taking a variety of unmodified consistencies, confirmed that pharyngeal clearance of the bolus was good across both the young and older participants. It was demonstrated that the elderly had less residue in the pharynx following the swallow, than that demonstrated for the younger sample group (Kelly et al., 2008). This shows that although differences in physiology of swallowing are noted in the older group, ageing is not a factor in the presence of pharyngeal residue post-swallow, or on pharyngeal clearance; swallowing in the elderly is not pathological. The studies presented suggest that spacial separation of structures in the pharynx is larger in the elderly population; that the timing of the sequence of events is altered from a younger population, and that the degree of residue after the swallow is also different. However, none of these events describe incidence of laryngeal penetration or aspiration into the airway.

It can therefore be concluded that ageing alone is not a cause of aspiration. It has been suggested that the elderly swallow adapts and compensates for the differences outlined above by increasing the amplitude of pharyngeal pressure in the pharynx (Leonard et al., 2004) as transit times across the larger pharyngeal space are comparable to those of the younger age group. Therefore, whilst age does affect the dynamics of the swallow, the evidence suggests that it does not precipitate ill-health.

As a requisite to understanding the development of pneumonia via aspiration of material from the oral cavity, it is important to consider, not only the anatomy and physiology that contributes to the variation on swallow physiology that may increase the risk of aspiration in both the young and elderly population, but to understand the potential impact of oro-pharyngeal flora.

2.4 Normal oro-pharyngeal flora

Aspiration of oro-pharyngeal flora has been identified as a risk factor for the development of pneumonia (Burke, 2010). However, oro-pharyngeal flora exists within the oral cavity and within saliva. Both innocuous and pathogenic bacteria are attached to the surfaces within the oral cavity creating plaque. Plaque contains anaerobic, pathogenic bacteria that are able to multiply due to the constant source of nutrients within the mouth (Pace and McCullough, 2010). Bacteria within the mouth vary within and between individuals, but in a healthy mouth, 65-85% bacteria are single walled structures (Gram positive), are not motile and numbers will average 100 - 1000 (Neild-Gehrig and Willmann, 2008).

Oro-pharyngeal secretions in healthy individuals contain anaerobes: typically *Peptostreptococcus*, *Veillonella* at approximately 10^8 colony forming units per ml (cfu/ml) of saliva (Mobbs et al., 1999); aerobes: *Viridans streptococci* 10^6 cfu/ml of saliva) as well as pathogenic organisms *Staphylococcus aureus* and *Candida* (Mobbs et al., 1999). *Streptococcus pneumoniae* and *Haemophilus influenzae* are pathogenic organisms that colonise the mouth and nasopharynx prior to introduction into the trachea (Marik and Kaplan, 2003). Aerobic gram-negative bacilli (AGNB) are opportunistic pathogens (*Klebsiella*, *Enterobacter*, *Pseudomonas*, *Serratia*) and are cleared by healthy individuals within 3 hours of acquisition by a variety of mechanisms such as: the mucosal cell lining preventing adherence of pathogens; renewal of mucosal cells; saliva pH; salivary flow; and lactoferrin that is present in saliva which serves to restrict the growth of bacteria; chewing and swallowing; secretory immunoglobulin that prevents adherence of pathogens; and oral flora and absence of receptors for AGNB in the mucosal wall (Mobbs et al., 1999). If bacteria are aspirated onto the lungs during eating and drinking and during sleep, coughing, mucociliary action and the immune system prevent the development of infection. Whilst it is recognised that both innocuous and pathogenic bacteria are present in large numbers within the oral cavity and may be aspirated to the lungs, the individual has multiple defence mechanisms that are able to prevent the development of pneumonia.

2.5 Conclusion

Evidence of penetration and aspiration as a phenomenon of swallowing in normal, healthy individuals is reported in the literature (Butler et al., 2009b; Allen et al., 2010).

The literature presented in this chapter suggests that there is variation in swallow anatomy and physiology within, and between, individual's swallow in both young

people's and older people's swallow. It considers that despite the aberrant patterns observed in the older person's swallow where there is an increase in penetration and aspiration, which, although infrequent, may be a feature of an older person's swallow, these do not in themselves, precipitate infection.

In the older population, swallow adaptation and compensation occurs in order to facilitate transfer of food, drink and saliva from the oral cavity to the oesophagus. The literature suggests that these changes, although considered an extension of normal younger people's swallow patterns, may not be considered pathological. Indeed, although the presence of penetration and aspiration may be considered as a risk, the data suggest that the incidence of penetration and aspiration, albeit inconsistent, cannot be assumed to be indicative of poor patient outcome. Penetration and aspiration occurs infrequently in all healthy individuals and is cleared by a variety of host defence mechanisms. Aspiration in these circumstances does not generally precipitate pneumonia. Therefore, although aspiration of small volumes of food, drink and saliva loaded with oral flora may potentially be considered detrimental, further consideration needs to be given to the requisite features that may increase the risk of developing pneumonia from this aspirated material. This will be discussed in more detail in the following chapter.

2.6 Summary

This chapter presents a description of the parameters of normal swallowing, offers a definition of penetration and aspiration, and details their effects in both the younger and older healthy population. The next chapter details aspiration symptomatology, recognised risk factors and clinical determinants associated with aspiration pneumonia.

CHAPTER 3

ASPIRATION: SYMPTOMATOLOGY AND CLINICAL DETERMINANTS IN STROKE

The previous chapter gave an overview of the normal parameters of swallowing in the younger and older population. It reports that penetration and aspiration of oral intake (food, drink and saliva loaded with oral flora) does not, in the healthy individual, lead to pneumonia, owing to the characteristics of the bolus that is aspirated and the host clearing systems.

Consideration is given in this chapter to the circumstances where aspiration, defined as material entering the airway below the level of the vocal folds (Logemann et al., 1999), may precipitate infection, deterioration in chest status, and pneumonia. The relationship between aspiration, as determined by videofluoroscopy, and the development of pneumonia has been reported elsewhere in different client groups i.e. patients with head and neck cancer (Eisbruch et al., 2002). This chapter details the routes for development of aspiration pneumonia; the risk factors and the requisite features that predispose individuals to develop pneumonia as a consequence of aspiration; the effects and potential consequences of aspiration in stroke patients; individual clinical determinants of aspiration, and how these could be the focus of any future swallow screening tool.

3.1 Route for the development of aspiration pneumonia

Aspiration of refluxed gastric secretions may result in pneumonitis, the clinical presentation of which, may be confused with aspiration pneumonia resulting from aspiration of anaerobic bacteria, (found in oropharyngeal flora) in an individual that is susceptible to aspiration (Bartlett et al., 2010).

Refluxed gastric secretions and contents (pH<2.5) may be aspirated and burn the lung membrane. These gastric secretions carry with them anaerobic flora from the gut. The lung defence system is unable to clear volumes of aspirate exceeding 0.3 ml/kg of body weight, typically 20-25 ml in adults (Varkey, 2006), causing inflammation of gravity-dependent lung tissue (Huxley et al., 1978; O'Connor, 2003) and subsequent chemical pneumonitis. Pneumonia arising from aspirated reflux may be the cause of pneumonitis and is treated as a discrete acute episode that responds to antibiotic

treatment. Whereas aspiration pneumonia, as a result of repeatedly aspirated material from the oropharynx, requires ongoing identification and management.

The previous chapter reports that oral intake and oropharyngeal flora is present and may be aspirated in a healthy population without consequence. However, this chapter portends that in certain circumstances, or with a combination of requisite conditions, aspiration of material and oropharyngeal flora may precipitate aspiration pneumonia.

The majority of anaerobes are unable to survive or grow in the presence of oxygen (Cruickshank, 1970); hence it is aerobic bacteria that are usually associated with respiratory infection. To cause infection, bacteria need to either possess specialist mechanisms that enable them to attach to epithelial cells, or to grow only when there is a reduction in host immune defences. Aerobic gram-negative bacilli (AGNB) are the most frequently isolated microorganism considered to be the cause of aspiration pneumonia (Marik, 2001). Therefore aspiration of aerobic flora originating in the oropharyngeal secretions in compromised patients may result in bacterial pneumonia (Shay, 2002).

3.2 Risk factors for aspiration pneumonia in stroke

Aspiration alone, as identified in the previous chapter, is not sufficient to cause aspiration pneumonia in the absence of one or more predisposing risk factors. Several factors that increase the risk of patients acquiring aspiration pneumonia have been identified in the literature and are presented below.

Bolus characteristics

The risk of developing aspiration pneumonia is determined by bolus characteristics; quantity, acidity, consistency and the infective bacterial state of the bolus aspirated (Varkey, 2006).

Host defence systems

The risk of developing aspiration pneumonia is compounded if the patient's immune status is compromised (Johnson and Hirsch, 2003) particularly if the patient's respiratory clearing system is impaired (Kikawada et al., 2005). In the healthy population, aspiration is cleared by mucociliary and by macrophage action (Mims, 1979). If the individual has a poor or compromised defensive clearing system, the aspirated bolus is not removed and the individual becomes susceptible to pneumonia. Indeed the most severe clinical symptoms of aspiration pneumonia are usually seen in

those individuals with chronic illness and those who are immuno-compromised (Shay, 2002).

Poor oral hygiene

The oro-pharyngeal mucosa in healthy individuals is not receptive to pathogenic aerobic gram-negative bacteria (AGNB) (Mobbs et al., 1999). AGNB are subsequently cleared within three hours of colonisation (LaForce et al., 1976). Patients with increased dependency for oral care (Brady et al., 2007) and tooth decay are at increased risk of aspiration pneumonia (Burke, 2010). Poor dental hygiene and periodontal disease exacerbates the colonisation of potentially pathogenic respiratory tract bacteria in the dental plaque and gingival crevices (Marik, 2001; Shay, 2002; Johnson and Hirsch, 2003; Azarpazhooh and Leake, 2006) which increases the risk of aspiration pneumonia in immuno-compromised individuals (Kikawada et al., 2005). Furthermore, there is evidence of increased colonisation of bacteria in the oral cavity in hospitalised acute stroke patients (Millns et al., 2003). A systematic approach to improving oral hygiene in patients resident in nursing homes has been shown to reduce the rate of pneumonia (Yoneyama et al., 2002). A reduction in oro-pharyngeal bacteria in patients with a high rate of aspiration has been affected by daily oral hygiene, and regular dental care has been shown to be a cost-effective means of reducing morbidity (Tran and Mannen, 2009). Aspiration of oro-pharyngeal bacteria is thus a common cause of morbidity.

Dependency

Dependency for oral care (Scannapieco et al., 1992; Brady et al., 2007) and feeding (Brady et al., 2007), have been identified as predictors for the development of aspiration pneumonia (Langmore et al., 1998).

Reflux

Reflux and subsequent aspiration of gastric contents and oro-pharyngeal flora may be exacerbated by the presence of naso-gastric tubes and bridles (Marik and Kaplan, 2003). Impairment of the upper aerodigestive tract by naso-gastric tubes promotes pathogenic colonisation of the oro-pharynx (Li et al., 2000), as naso-tubes can become dislodged (Johnson and Hirsch, 2003) and can further compromise the integrity of the lower oesophageal sphincter, promoting reflux of gastric contents (Ferrer et al., 1999). Reflux and subsequent aspiration of mixed aerobic-anaerobic bacteria may give rise to aspiration pneumonia in the elderly hospitalised patient (Bartlett, 1993).

Neurological damage

Confounding factors that increase the risk for aspiration are neurological damage (Langmore et al., 1998; Nakagawa et al., 2000; Marik and Kaplan, 2003; Burke, 2010) and subsequent reduced consciousness (Johnson and Hirsch, 2003; Bartlett, 2010) which in turn can lead to an impaired cough reflex and reduced breathing and swallow co-ordination. Impairment of dopamine metabolism as a result of a basal ganglia stroke affects both the glossopharyngeal and vagus nerves thereby impairing the cough reflex (Kikawada et al., 2005) and so the inability to remove penetrated bolus from the larynx. Stress responses to neurological damage may also reduce the production of saliva and increase the numbers of bacteria in the mouth (Burke, 2010) which may then be aspirated onto the lungs.

Medication

Elderly patients in the acute hospital setting are more frequently treated with antacids, histamine blockers and/or proton pump inhibitors. These drugs result in a reduction in the pH of the gastric acid, a subsequent increase in the bacterial load in the stomach, and could subsequently be aspirated onto the lungs in the event of reflux (Bartlett, 2010). Enteral feeds, common in patients with stroke, may encourage colonisation of the oro-pharynx with gram-negative bacteria and *Staphylococcus aureus* (Langmore et al., 1998). Sedatives may impair the protective cough reflex (Johnson and Hirsch, 2003) and some medications result in a reduction in saliva production, which may lead to reduced swallowing, poor oral hygiene and an increase in the number of pathogenic bacteria in the oral cavity (Kikawada et al., 2005). During antibiotic treatment, the respiratory pathogens colonise the oral plaque thereby reducing commensal oral flora (Scannapieco et al., 1992); the risk of pneumonia is increased if aspiration occurs.

Aspiration

Acute stroke patients who aspirate are more likely to develop aspiration pneumonia, and are more likely to die (Holas et al., 1991; O'Connor, 2003; Marik and Kaplan, 2003). Aspiration occurs in approximately 40-50% of stroke patients (Loeb et al., 1999; Marik and Kaplan, 2003) and is associated with impaired cough reflex, reduced laryngeal and pharyngeal sensation, and subsequent silent aspiration (Kikuchi et al., 1994; Holas et al., 1994; Daniels et al., 1998; Ramsey et al., 2005). Swallowing also facilitates clearance of gram-negative bacteria from the oro-pharynx (Kikawada et al., 2005). The implications for the patient with impaired swallowing function following stroke, and a potential concomitant reduction in sensation and motor function in the pharynx and larynx (Smith et al., 1999), are considerable.

Hospital Setting

Acute stroke patients are a high-risk group for aspiration pneumonia as they present with combinations of concomitant risk factors outlined above. AGNB replace anaerobic oropharyngeal flora (Millns et al., 2003) after seven days (Burke, 2010) in this population, due to a combination of change in cleaning the oral cavity, altered epithelial surfaces within the mouth, and changes in salivary flow and distribution (Millns et al., 2003).

In summary, aspiration alone is not sufficient to cause pneumonia. Aspiration pneumonia is multi-factorial, with bolus characteristics and/or an immuno-compromised system requisite to its development.

3.3 Effects of aspiration in stroke

Stroke may disrupt function at every stage of the swallowing process resulting in significant health risks. Stroke may cause uncoordinated or delayed swallowing which may affect a person's nutrition and hydration by reducing the amount of food and fluids that can be taken orally, and may precipitate aspiration of food and drinks onto the lungs (Figure 2.2).

Scarring of the lung tissue is a corollary of aspiration pneumonia (Bartlett, 2010). Therefore, repeated infection from undetected and mismanaged chronic aspiration has the potential to cause a deterioration in baseline lung function and respiratory state over time making the person more prone to infection. This is exemplified by the author in Figure 3.1.

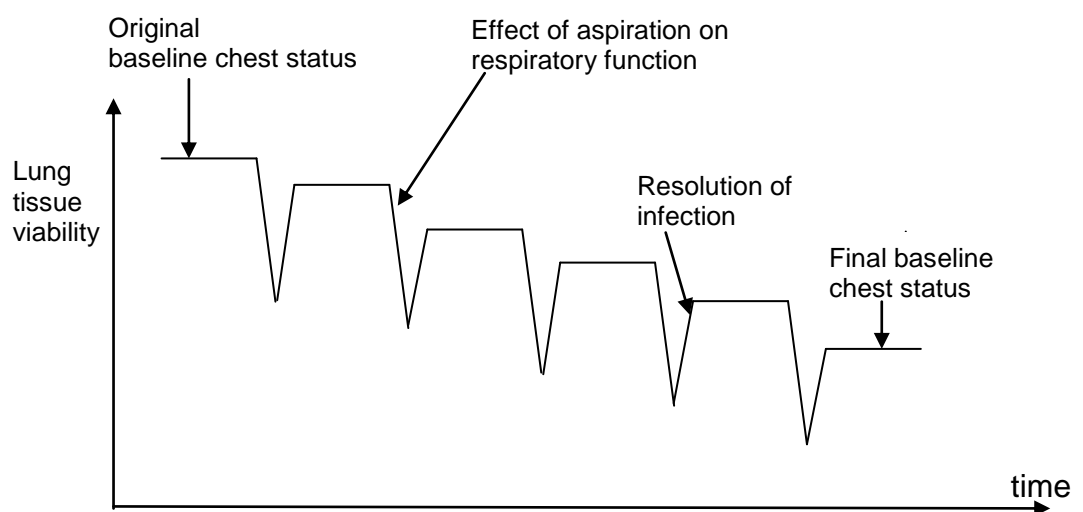
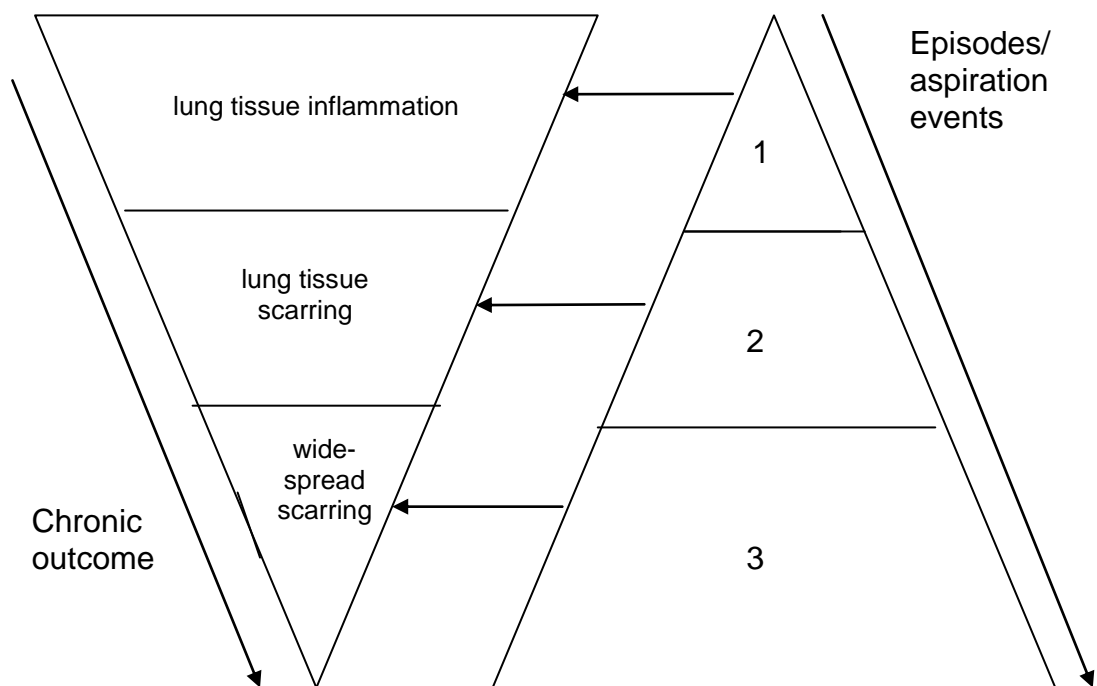


Figure 3.1: Effect on baseline lung tissue viability of repeated episodes of aspiration pneumonia.

Introducing a simple, diagnostically accurate swallow screening tool may encourage nurses to utilise it in the acute stroke patient thereby preventing the possible deterioration in viable lung tissue following repeated episodes of aspiration pneumonia.

Not only does scarring of lung tissue occur following repeated episodes of aspiration pneumonia but lung tissue and therefore lung function deteriorates during a single, acute hospital admission, where patients are aspirating a percentage of each bolus from meals or drinks throughout a 24 hour period (Figure 3.2). This reinforces the need for early detection of aspirated food and drink prior to oral intake.



1 – initial aspiration 2 – further bolus aspiration 3 – continued aspirated
 Figure 3.2: Aspiration events and concomitant effects on lung status

It is acknowledged that the effects on chest status of different aspirated bolus volumes and acidity varies between individuals. However aspiration does, to some extent, affect lung function in all patients, making it imperative that nurses have a bedside screening tool that is able to identify and manage aspiration at the earliest opportunity.

Consequently, aspiration and subsequent infection may compromise a person's respiratory status (Holas et al., 1994; Martino et al., 2000; Marik and Kaplan, 2003), nutritional status (Smithard et al., 1996; Leslie et al., 2002), hydration (Gordon et al., 1987; O'Neill et al., 1992; Watkins et al., 1997; Whelan, 2001) and the ability to take

medication orally (Marks and Rainbow, 2001). The consequences of aspiration may also affect a person's quality of life (McHorney and Rosenbeck, 1998; McHorney et al., 2002; Chen et al., 2009).

Stroke not only affects the swallow but can affect a plethora of other factors impinging on the swallow. These factors include: poor postural stability and hemiparesis (Murry and Carrau, 2006); dyspraxia - a disruption of the voluntary organisation of oro-motor or limb movements, and poor motor skills that affect hand to mouth co-ordination and manipulation of utensils (Wells and Dumbrell, 2006); poor vision (Wells and Dumbrell, 2006); visuo-spatial neglect (Murry and Carrau, 2006); communication difficulties (Perry and Love, 2001); depression (Anderson et al., 1994); cognitive dysfunction (Axelsson et al., 1984; Daniels and Huckabee, 2008), insight (Parker et al., 2004) and olfactory problems (Marks and Rainbow, 2001).

With the potentially profound consequences of aspiration, any variation to the physiology of swallowing has historically been viewed as 'abnormal' and dietary restrictions have been advised (Butler et al., 2009b). Dysphagia would indicate that there are difficulties at any stage of the eating, drinking and swallowing process: this may be identified as difficulties with chewing, which may never compromise a patient's health. However, aspiration, defined as movement of the bolus below the level of the vocal cords (Logemann et al, 1999) may be associated with development of aspiration pneumonia which may significantly affect the patient's health in the short-term and morbidity in the long-term. More recently, authors have highlighted that variation in swallowing, laryngeal penetration, defined as the entry of the bolus to the laryngeal vestibule but not below the level of the true vocal cords (Robbins et al., 1992), and aspiration, may not adversely affect patient outcome (Daggett et al., 2006; Kelly et al., 2008; Butler et al., 2009b) and may therefore be accepted within the parameters of normal. However, as previously discussed, in some patients, aspiration does cause aspiration pneumonia. Currently, we do not know enough about the risk factors, how they exacerbate the effects of aspiration, and how aspiration develops into aspiration pneumonia.

3.4 Symptomatology in stroke

Many cases of community and hospital-acquired pneumonia may be caused by aspiration that goes unrecognised, therefore the incidence of aspiration pneumonia may be underestimated (Marik, 2001). There are no specific diagnostic tests for aspiration pneumonia as the clinical features are often indistinguishable from other

causes of pneumonia, i.e. chest pain, dyspnoea, increased white cell count and consolidation on chest X-ray (O'Connor, 2003) and chronic low-grade fever, persistent cough and sputum production (O'Connor, 2003; Burke, 2010). Further complications arise in that most patients with aspiration pneumonia are infected with multiple types of bacteria (Johnson and Hirsch, 2003). In order to differentially diagnose between pneumonia and pneumonitis, physicians rely upon clinical history, the setting of the acquired infection, (i.e. acute or community acquired), acute or insidious onset and consolidation of gravity dependent fields on X ray (Johnson and Hirsch, 2003). Aspiration of oral intake is more likely to be associated with a right-sided pneumonia. Recurrent pneumonia in the right lung mid-zones and lung bases may be indicative of aspiration as the left bronchus has a more acute angle from the trachea, which means that the right bronchus is less resistant to the passage of material (Dikeman and Kazandjian, 1995).

Despite the difficulties outlined above in identifying aspiration pneumonia and the inter-dependent risk factors associated with its development in stroke patients, a number of clinical determinants may be attributed to the occurrence of aspiration at bedside.

3.5 Clinical determinants of aspiration

As discussed in more detail below, this chapter focuses on the individual principal clinical determinants that continue to emerge from the literature and considers their inclusion in any future bedside swallow screening tool. A tabulated summary of their sensitivity and specificity when compared to VFES is presented (Table 3.1 and Table 3.2).

3.5.1 Definition of sensitivity and specificity

Sensitivity is defined as the proportion of patients who are correctly identified by the screening tool as having the disease (Altman and Bland, 1994a): for this study, the number of people with swallowing difficulties. Specificity is defined as the proportion of patients without the disease who are correctly identified as not having the disease by the screening tool (Altman and Bland, 1994a): for this study, patients without swallowing difficulties. Sensitivity and specificity are useful to compare the utility of a tool in patient groups.

The clinical implications for patients mean that tests and the clinical determinants that suggest an increase in risk of aspiration should have both high sensitivity and high specificity.

3.5.2 Clinical determinants of aspiration at pre-screening stage

Requisite to trials of oral food and drink, patients are required to be conscious and have some degree of intrinsic or extrinsic postural stability (trunk and head control), in order that food and fluids may be introduced into the mouth. It may be advantageous to identify these clinical determinants at a pre-screening stage of a bedside swallow screening tool.

Conscious level

Common to most studies is the recognition that decreased levels of alertness may prevent sufficient oral intake and may precipitate aspiration (Gordon et al., 1987; Smithard et al., 1996; Daniels et al., 1998; Logemann et al., 1999; Perry, 2001a,b; Mann, 2002; Massey and Jedlicka, 2002; Suiter and Leder, 2008; Trapl et al., 2007), as food and drinks may remain in the mouth and never move any further, alternatively they may move through the pharynx, larynx and trachea without a swallow response. Therefore most studies exclude unconscious patients from the study without examining the sensitivity and specificity of the determinant, either by using insufficient levels of alertness as exclusion criteria or as part of the pre-screening section of the screening tool. The Massey Bedside Swallow Screen (Massey and Jedlicka, 2002) reports 100% inter-rater reliability (i.e the extent to which two individuals' ratings agree) between research assistants and SLTs undertaking the screen where lack of alertness is the only clinical determinant that requires the screen to be terminated if not passed. However, criteria for inclusion in the study required all patients to be aware and able to respond to verbal and non-verbal cues. Hence, there could be considerable bias in the estimation of inter-rater reliability as they exclude the subset of severely affected stroke patients, who may have moment by moment variations in their ability to swallow due to fluctuating levels of alertness.

One study alone, the Northwestern Dysphagia Patient Check Sheet (Logemann et al., 1999), examines the effects of alertness on aspiration. It is used as part of a screening tool examining 28 patient variables in a heterogeneous group of 200 patients referred by a physician for assessment of potential dysphagia. Patients were screened within 24 hours of having a videofluoroscopic examination of their swallow (VFES). The chi-square test was used to analyse the ability of each clinical determinant on the

Northwestern Dysphagia Patient Check Sheet to indicate: aspiration; an oral stage disorder; pharyngeal delay; or a pharyngeal disorder. Alertness was significantly associated with dysphagia as 'an oral stage difficulty' rather than a 'pertinent determiner of aspiration'. It should be noted however, that patients had various medical diagnoses and must have been relatively alert in order for them to tolerate the VFES examination. Therefore, the association of alertness with oral stage difficulties in this mixed medical population may not be generalisable for the acute stroke population.

A bedside swallow screen should consider a continuum of alertness in order that patients who are rousable, or are intermittently alert enough to be screened, should not be prevented from having oral intake if their immediate condition suggests it to be appropriate.

Postural stability

Postural stability is comprised of trunk and head control. Where the patient has voluntary control of their posture, this is termed internal stability. If the patient does not have internal stability, they can be supported for the duration of the screen using external supports e.g. pillows. The following studies suggest that postural stability is integral to oral stability, bolus manipulation and chewing, oral bolus transit and oral intake.

Studies either explicitly state postural stability as requisite to the swallow screen (DePippo et al., 1994; Logemann et al., 1999; Smithard et al., 1997; Perry, 2001a,b; Trapl et al., 2007), or it is implied through the test requirements i.e. the patient is required to participate in VFES or FEES (DePippo et al., 1992; Daniels et al., 1998; Massey and Jedlicka, 2002; Suiter and Leder, 2008; Trapl et al., 2007). One study (Trapl et al., 2007), requires patients to sit in a bed in, at least, a 60 degree upright posture. However, all of these studies use postural stability as requisite for oral trials without explanation. The Northwestern Dysphagia Patient Check Sheet (Logemann et al., 1999), uses postural stability as a determinant in their dysphagia check sheet, but found that it was not associated with any stage of swallowing difficulty, or with aspiration either, as an independent variable or in a combination of variables.

In consideration of this clinical determinant for inclusion in a bedside swallow screening tool, it was determined that patients who have no trunk or head stability are unsuitable candidates for screening for oral intake as it affects oral stability, chewing and oral transit, and the safe delivery of the bolus to the mouth. If patients with postural

instability are offered oral trials as part of a swallow screening tool, these patients are placed at a higher risk of material falling unnoticed into the airway.

Any bedside swallow screening tool should therefore consider a continuum of severity that enables patients who are able to be supported in an upright posture, using external support, to undertake the screen.

Wet voice quality

Wet voice quality prior to any oral intake may indicate that the patient is either unaware of, or is unable to initiate, a swallow to remove oral secretions that have penetrated the laryngeal vestibule and are resting on the vocal cords. Therefore, presentation of larger volumes of clear fluids during the swallow screen may serve to deliver more material into the larynx to be aspirated. The Northwestern Dysphagia Patient Check Sheet (Logemann et al., 1999), identifies this clinical determinant as associated with a pharyngeal delay rather than aspiration, with a 35% sensitivity and 85% specificity compared with VFES.

Other studies (Linden and Siebens, 1983; Alberts et al., 1992; Linden et al., 1993; Smithard et al., 1996; Daniels et al., 1998; Logemann et al., 1999; Mann et al., 2000; Perry, 2001a,b; McCullough et al., 2001; McCullough et al., 2005; Massey and Jedlicka, 2002; Suiter and Leder, 2008), consider wet voice quality as a clinical determinant of aspiration during oral trials rather than a pre-screening determinant to assess suitability for oral trials.

Clinically experienced dysphagia practitioners are able to encourage patients to eliminate wet voice quality by asking the patient to cough, or assist in removing secretions in the larynx, prior to commencing oral trials. This practice would be considered inappropriate to be included as part of a screening tool owing to the considerable time it requires to prepare the patient prior to the screen being undertaken. Therefore, as part of a bedside swallow screening tool, nurses should be encouraged to terminate the screen at this stage and refer any patient presenting with wet voicing for a more detailed swallowing assessment.

Poor or absent voluntary cough

In order to assess this determinant at the bedside, patients are asked to perform a voluntary cough which relates physiologically to closure of the false vocal folds (Horner et al., 1988; Smithard et al., 1996; Daniels et al., 1998; Mann et al., 2000; Perry, 2001a,b; Leder and Espinosa, 2002; Massey and Jedlicka, 2002). Failure to perform a

cough by adduction of the false vocal folds suggests that the second mechanism of airway defence during the pharyngeal stage of the swallow is compromised.

The clinical determinant of abnormal voluntary cough achieved a sensitivity of 48% and a specificity of 94% using the chi-square test (Daniels et al., 1998) when compared to VFES undertaken within 5 days. However, using logistic regression analysis, abnormal voluntary cough, together with coughing, in oral trials achieved a sensitivity of 70% and a specificity of 84% with 78% accuracy. This was better than all combinations of determinants of dysphonia, dysarthria, abnormal gag, abnormal volitional cough, cough with oral trials, and voice change with swallow. The study required patients to be classified into 2 subgroups. Those patients who demonstrated none, or just one, of the clinical determinants were given normal diet. The authors demonstrated that 90% of the 55 acute stroke patients had two or more clinical determinants at bedside assessment and recommended patients should be referred for VFES. In this study there was a delay within the time taken to undertake the bedside examination, and the performance of the VFES which was done up to 5 days later. During the delay between bedside swallow screening and VFES, patient's swallow ability could have changed. Therefore there may be a disparity between reported sensitivity and specificity of the clinical determinants and the actual sensitivity and specificity; the VFES may be reflecting true change within the patient. This could potentially render the reported comparison between the bedside swallow screening tool and the VFES inaccurate.

Further concerns may arise with regard to the select sample in that all patients within the study would need to be alert and co-operative with good postural stability in order to tolerate VFES. Therefore, this test may therefore not be appropriate to use on all stroke patients.

Coughing is usually a reflex activity associated with irritation of the vocal cords by entry of the bolus in the larynx. Therefore, absence of a voluntary cough is not indicative of inadequate closure of the vocal cords in the presence of aspiration. Patients who are unable to follow verbal instructions owing to language difficulties, or who are unable to attend to demonstration of coughing owing to cognitive difficulties as a consequence of the stroke, would be inappropriately eliminated from undertaking oral trials.

The ability to perform a voluntary cough was included in the pre-screening section of the BESST as a precaution. It was considered that if a cough reflex was identified as present prior to oral trials, then nurses undertaking the screen could be confident that if

oral trials penetrated the larynx, these patients would have the ability to cough and clear potential aspirate.

History of recurrent pneumonia

Pneumonia may result from infection or reflux as well as from aspirated material. Many patients are predisposed to recurrent episodes of pneumonia owing to respiratory disease. However, episodes of recurrent pneumonia may be indicative that chronic aspiration is occurring. Recurrent pneumonia is a typical clinical corollary in stroke patients who aspirate a percentage of each bolus onto the lungs.

Patient history of recurrent pneumonia was associated with aspiration on VFES as part of a combination with one of two other clinical determinants: coughing and throat clearing on oral trials, and reduced laryngeal elevation during swallowing (Logemann et al., 1999). In combination, where two of the three variables are present, they achieved a sensitivity of 69% and a specificity of 73% when compared to VFES.

It was therefore considered important that, as part of the BESST, nurses would be able to identify and refer patients with a history of recurrent pneumonia for a more detailed assessment of their swallow function, but that it would not prevent patients participating in the swallow screen to identify gross aspiration. It is therefore included in the pre-screening section of the BESST.

The following clinical determinants were not used as part of the BESST in the pre-screening stage; although some authors justify their use as they are indicative of physiological dysfunction rather than being indicative of aspiration.

Dysphonia

Dysphonia can be defined as alteration of vocal quality and pitch. Patients may present with a 'hoarse' voice quality and this is identified by some authors as a clinical determinant of aspiration (Horner et al., 1988; Alberts et al., 1992; Kidd et al., 1993; Horner et al., 1993; Linden et al., 1993; Smithard et al., 1996; Daniels et al., 1998; Mann et al., 2000; Leder and Espinosa, 2002; McCullough et al., 2001; McCullough et al., 2005; Suiter and Leder, 2008). Dysphonia is symptomatic of inadequate adduction of the true vocal cords which provides the first mechanism of airway protection in the larynx during swallowing physiology. However, many individuals are dysphonic owing to a variety of aetiologies (including infection, vocal cord paresis or paralysis, psychological disorders and stress) and therefore dysphonia, although an indicator that

the protective mechanism of the airway may be impaired, is not a definitive clinical determinant of aspiration.

Including this determinant in the BESST would require nurses to prompt vocalisations in patients who may have language or cognitive difficulties, so make further make subjective clinical decisions regarding the quality of phonation. It was considered that this would inappropriately extend the length of the screening tool and would require nurses to acquire further skills that may be more pertinent to a fuller, more detailed assessment of swallowing. This determinant was therefore excluded from the BESST in favour of more clinically accurate determinants, e.g. coughing.

Abnormal gag reflex

Many authors identify absence of, or an abnormal, gag reflex as indicative of aspiration (Linden and Siebens, 1983; Horner et al., 1988; Kidd et al., 1993; Linden et al., 1993; Horner et al., 1993; Smithard et al., 1996; Daniels et al., 1998; Mann et al., 2000; Leder and Espinosa, 2002; Massey and Jedlicka, 2002). However, it has been demonstrated that a gag reflex is not present in 40% of the normal adult population (Bleach, 1993). A similar study (Davies et al., 1995) found that 37% of 140 individuals without swallowing difficulties did not demonstrate a gag reflex. A gag reflex has little to do with ingestion of food and drink, its primary role being retching and vomiting. The absence of the gag reflex as a sign of aspiration has been discredited as presence of the gag reflex indicates that the sensory element of the glossopharyngeal nerve is intact. Awareness of the presence of penetration, or aspiration, of the bolus into the airway is dependent on the integrity of the superior laryngeal branch of the vagus nerve. Although presence of a gag reflex achieved an 81% specificity rating, the sensitivity was only 33% compared to VFES (Logemann et al., 1999). For these reasons the gag reflex was not used in the development of the BESST.

Other

Some studies (Horner et al., 1988; Logemann et al., 1999) use patients' complaints of difficulties swallowing as part of a dysphagia screening tool. Using patients' complaints of swallowing difficulty as a determinant of aspiration may restrict the type of patient for whom a swallow screen would be appropriate, as patients need to be alert, cognisant, understand questions, have insight and be able to express themselves clearly in order to use this as a determinant for aspiration. Some patients may be unreliable historians and all aphasic patients and patients with reduced insight would be prevented from inclusion in the screening using this approach. Although patient complaints require

further investigation, it was not considered to be a clinical determinant for aspiration and therefore was not considered for inclusion in the BESST per se.

Reliance on assistance to place food in the mouth in the oral preparatory stage increases the risk of compromised nutrition (Kayser-Jones and Schell, 1997). Lip seal and mastication can be compromised, with drooling and oral residue in the lateral buccal sulcus owing to poor lingual control and concomitant facial hemiparesis.

The studies identified in Table 3.1 (Logemann et al., 1999; Daniels et al., 1998), have identified the individual clinical determinants of dysphagia and aspiration in comparison to VFES, whereas other studies have tended to only consider the sensitivity and specificity of the overall bedside swallow screen.

Table 3.1 presents sensitivity and specificity of the identified individual clinical determinants of dysphagia and aspiration that may be observed within the pre-screening stage of a potential bedside swallow screening tool.

Table 3.1: Sensitivity and specificity of clinical determinants to indicate stages of swallowing difficulty when compared to VFES

Pre-screening	Sensitivity with VFES	Specificity with VFES	Accepted for use in a screening tool
Alertness	23%*oral stage	88%*oral stage	Yes
Postural stability	not reported	not reported	Yes
Wet voice	41%*aspiration	76%*aspiration	Yes
Voluntary cough	48%†	94%†	Yes
Dysphonia	76%†	68%†	No
Abnormal gag	33%*aspiration 62%†	81%*aspiration 82%†	No
History of recurrent pneumonia	unreported	unreported	Yes
2/3 items: History of recurrent pneumonia, cough, reduced laryngeal elevation	69%*aspiration	73%*aspiration	Yes

* Logemann et al., 1999

† Daniels et al., 1998

Clinical determinants of aspiration in the oral stage

Dysarthria

As a clinical determinant, dysarthria has been defined as ‘a speech disorder resulting from disturbances in muscular control affecting areas of respiration, articulation, phonation, resonance and prosody’ (Daniels et al., 1998). Whilst associated with speech disorder and intelligibility, dysarthria results from a weakness, paralysis or incoordination of speech musculature (Darley et al., 1975). Muscle weakness in the oral cavity may have an impact on swallow ability. Orofacial muscle weakness, or a facial hemiparesis, can cause poor lip seal (Murry and Carrau, 2006), which may cause

loss of the bolus from the lips. Facial paresis caused by facial nerve dysfunction (cranial nerve VII) in stroke patients causes loss of taste and sensation in the tongue and cheek and may also precipitate pocketing or residue in the alveolar sulci, teeth and palate.

Cognitive difficulties alone (Daniels and Huckabee, 2008), or with a concomitant weakness in the intrinsic muscles of the tongue (affected by damage to the hypoglossal nerve, cranial nerve XII), accounts for poor rotary and lateral tongue movement, paucity of chewing and an inability to form a cohesive bolus (Daniels et al., 1999), disorganised and delayed oral transit (Robbins et al., 1993; Daniels et al., 1999) and premature spillage of food and drinks into the pharynx. This increases the risk of aspiration into the trachea prior to the swallow. Poor lingual tone together with a decrease in cheek tone owing to a facial paresis may result in insufficient negative pressure for bolus translocation to the base of the tongue to trigger the swallow (Hendrix, 1993). Orofacial muscle weakness may affect the status of a patient's nutrition and hydration, (Smithard et al., 1996; Daniels et al., 1998; Logemann et al., 1999; Leder and Espinosa, 2002; Massey and Jedlicka, 2002; McCullough et al., 2001; McCullough et al., 2005).

Dysarthria is primarily associated with oral stage difficulties (Logemann et al., 1999), with a reported 64% sensitivity and 75% specificity when compared with VFES (Logemann et al., 1999). This clinical determinant was found to have a sensitivity of 55% and a specificity of 60%, when compared to VFES to denote oral stage difficulties; it failed to denote aspiration. This study is considered in more detail as an assessment of dysphagia in Chapter 4.

Using the chi-square test (Daniels et al., 1998), the clinical determinant of dysarthria gave a sensitivity of 76% and a specificity of 53% when compared to VFES performed within five days. However SLTs were the professional group involved with the assessment of patients. Identification and diagnosis of dysarthria would require further in-depth training outside the scope of a simple screening tool to be undertaken by nurses.

Although dysarthria can be the cause of swallowing difficulty, it is present both at, and outside, the eating and drinking situation and presence of dysarthria is not a clinical determinant of acute aspiration occurring during oral trials.

3.5.4 Clinical determinants of aspiration in the pharyngeal stage

In the pharyngeal stage of the swallow, bilateral or unilateral damage or incoordination of soft palate movement will allow reflux of food and drinks into the nasal cavity. The damage will further decrease the negative pressure required to push the bolus through the pharynx. Normal hyo-laryngeal transit time is 0.75 seconds (Logemann, 1983) but this can be delayed indefinitely post-stroke. Residue in the valleculae alone may be a consequence of inadequate epiglottic movement and closure. Residue in the valleculae and pyriform sinuses, with the potential to be aspirated post-swallow, is caused by decreased muscle contraction in the tongue base and pharyngeal constrictor muscles (Logemann, 1983), delayed or absent superior and anterior hyoid movement (with concomitant limited movement of the thyroid and cricoid cartilages), and incoordination of the cricopharyngeal opening, increasing the risk of aspiration. The cricopharyngeal sphincter normally opens within 0.10 seconds of airway closure in response to sensory information received from the oral cavity (Hiemae and Palmer, 1999). Cricopharyngeal relaxation and opening may be delayed, incomplete, or unco-ordinated, in stroke patients (Castell and Donner, 1987; Daniels and Huckabee, 2008), leading to an increase in pharyngeal residue and the potential risk of aspiration of material into the trachea. Abnormal inspiration observed in stroke patients post-swallow may also serve to draw pharyngeal residue into the airway (Selley et al., 1989b).

Coughing during swallow

Coughing is a protective response to irritation of the airway. One study (Addington et al., 1999) uses the cough reflex as the sole indicator for aspiration. Coughing in response to a laryngeal irritant of l-tartaric acid dissolved in 2ml of sterile normal saline was considered proof of airway protection. The solution was inhaled as a microaerosol 3 times whilst the patient's nose was pinched. The study was undertaken on 400 consecutively admitted stroke patients, of which 5 developed a subsequent pneumonia, compared to patient outcome in 204 patients at a similar facility who had undertaken a bedside clinical examination by SLT, where 27 patients developed pneumonia. However, there are some disadvantages to using this as a sole predictor of aspiration: there are no normative data for coughing response to either the substance (l-tartaric acid) nor the solution used in this study. Coughing has age and gender biases, with women (Kastilik et al., 2002), and children (Chang et al., 1996), having a lower threshold for coughing. Patients with chronic obstructive pulmonary disease present with greater sensitivity to coughing compared with smokers, who have a lower sensitivity.

From a 25 point assessment scale (Mari et al., 1997) found that coughing during swallowing was the most reliable predictor of aspiration, with a 74% sensitivity and specificity, 71% positive predictive value (PPV) and 77% negative predictive value (NPV) when combined with 3 oz water swallow test and history of cough compared with VFES. However, the authors used all neurological diseases as their sample group which may not reflect the results that would be obtained in the acute stroke population.

Although further research is required to validate the Reflex Cough Test, coughing as a clinical determinant was reported to have a high sensitivity (78%), it had a low specificity (58%) to aspiration when compared to VFES (Logemann et al., 1999). However, when used in combination with other variables, reduced laryngeal excursion and history of recurrent pneumonia, the sensitivity was reported at 69% but there was a considerable rise in the specificity to 73%. There is therefore merit in using coughing as a clinical determinant in the BESST as part of a combination of other determinants in oral trials.

Wet voice quality

Wet voice quality post-swallow is indicative of liquids entering the laryngeal vestibule and resting on the surface of the vocal cords. It is therefore considered as a clinical determinant of aspiration as part of a bedside swallow screening tool (Trapl et al., 2007), with a reported sensitivity and specificity of 41% and 76% respectively (Logemann et al., 1999) and 38% and 85% respectively (Daniels et al., 1998). A wet, gargly voice is an audible and discernible clinical determinant of aspiration that may be easily detected by nursing staff, and therefore should be considered as part of a bedside swallow screening tool.

Laryngeal excursion

Superior and anterior movement of the larynx facilitates more horizontal positioning of the epiglottis over the airway, and opening of the cricopharyngeal sphincter allows the bolus to move into the oesophagus. Failure of the larynx to move anteriorly may be evidence that the cricopharyngeal sphincter has not relaxed and opened, and that the bolus has remained in the pharynx. As the airway is opened for respiration to resume, penetration and aspiration of the bolus is likely to occur (Linden et al., 1993; Daniels et al., 1998; Logemann et al., 1999; McCullough et al., 2001).

Multiple swallows per bolus

Swallows are stimulated in response to presence of the bolus in the pharynx, where sensory awareness is preserved. Therefore, the occurrence of repeated swallows is

indicative of bolus residue in the pharynx that may be inspired post-swallow. This determinant is more likely to occur with more viscous material than is used in extended water swallow tests in the form of a puree diet (Logemann et al., 1999). Multiple swallows was therefore considered an important clinical determinant for aspiration in the BESST.

Wet breath sounds

A common clinical feature of acute stroke patients is the presence of wet breath which can be indicative of delayed swallowing, and an inability to manage their secretions. The physiological implications for the occurrence of wet breath sounds post-swallow would be that either their secretions, or the bolus, had entered the laryngeal vestibule and was resting on the vocal folds. Clinical caution should be exercised when wet breath is identified as this could indicate a potential hazard regarding the aspiration of both saliva and oral intake.

Although there is little reported evidence to support its inclusion in a bedside swallow screening tool, on the basis of these clinical observations, the presence of wet breath sounds would be an important clinical aspect to include in the development of a bedside swallow screening tool.

Other

Some authors (Logemann, 1983; DePippo et al., 1994; Smithard et al., 1996) have identified that failure to consume over half of a meal, or prolonged mealtimes, can be used as a determinant of dysphagia. Such observations may alert carers that the patient is failing to consume adequate nutrition and hydration. This may be an important issue for specialist assessment and management of the swallow, however it is not a clinical determinant of aspiration and would be an issue that would need to be monitored as part of on-going clinical care rather as part of a screen. This consequence of dysphagia was therefore not used to inform the BESST.

Although location of stroke (Splaingard et al., 1988; DePippo et al., 1994), evidence of language difficulties (Logemann et al., 1999; Mann et al., 2000), and intubation (Logemann et al., 1999; McCullough et al., 2001) may precipitate dysphagia, they do not specifically denote aspiration and were therefore excluded from the BESST.

The studies identified in Table 3.2 (Logemann et al., 1999; Daniels et al., 1998), have identified the individual clinical determinants of dysphagia and aspiration during oral trials compared to VFES.

Table 3.2: Sensitivity and specificity of clinical determinants of dysphagia and aspiration during oral trials compared to VFES

Oral trials	Sensitivity with VFES	Specificity with VFES	Accepted for use in a screening tool
Cough	78%* single predictor 57%†	58%* single predictor 85%†	Yes
Wet voice	41%* aspiration	76%* aspiration	Yes
Multiple swallows per bolus	58%* aspiration	57%* aspiration	Yes
Wet breath sounds	not reported	not reported	Yes
Reduced laryngeal excursion	66%* single predictor	57%* single predictor	Yes
2/3 items: History of recurrent pneumonia, cough, reduced laryngeal elevation	69%* aspiration	73%* aspiration	Yes

* Logemann et al., 1999

† Daniels et al., 1998

Therefore in formulating a specific bedside swallow screening tool, consideration has been given to the inclusion of many clinical determinants. The following clinical determinants have been identified for a bedside swallow screening tool: patient level of alertness; postural stability; wet voice quality; poor or absent voluntary cough; history of recurrent pneumonia; absent swallow; coughing/throat clearing pre/during/post-swallow; laryngeal excursion; multiple swallows and wet respiratory sounds.

3.6 Aspiration as the focus of any future swallow screening tool

Dysphagia can be defined as difficulty with any stage of swallowing which may cause malnutrition, dehydration or aspiration. Presence of dysphagia may not necessarily

cause significant health risks. However, it may increase the likelihood of aspiration which has been associated with pneumonia and poor patient outcome (Mann et al., 2000). Aspiration, a potential consequence of dysphagia, occurs in the pharyngeal stage of swallowing and is defined as entry of food or fluid below the level of the vocal folds into the trachea (Murry and Carrau, 2006) which may precipitate pneumonia, an acute and potentially life threatening condition. Aspiration, confirmed by videofluoroscopy, has been reported in only 39% of patients with dysphagia (Perlman et al., 1994).

Nutrition and hydration in the acute stages of stroke may be managed using alternative and augmentative medical interventions such as nasogastric tubes and parenteral fluids: intravenous drips or subcutaneous fluids (ICWP Stroke, 2008). However aspiration requires immediate identification in order to reduce the risk of developing potential aspiration pneumonia. It is therefore important that any bedside swallow screening tool, developed for use in the acute stages of stroke, should focus primarily on aspiration in order to reduce the risk of developing aspiration pneumonia in patients.

A further challenge of a swallow screening tool is to identify those patients in which aspiration is occurring. Despite the lack of clarity afforded to health care professionals regarding which stroke patients are likely to develop aspiration pneumonia as a result of aspiration of oral intake, the Clinical Guidelines for Stroke (ICWP, 2008) require appropriately trained health care professionals to screen for swallowing difficulties in all stroke patients.

There is considerable discussion in the literature (outlined above) regarding the defining aspiration pneumonia; identifying the bacteria involved in the developing aspiration pneumonia; and in understanding the body's auto-immune response to lung infection. Further predisposing factors that contribute to the risk of aspiration pneumonia are also outlined. However, there continues to be variation in the literature regarding the individual's physiological response to aspiration, i.e. the clinical determinants of dysphagia and aspiration. The difficulties in defining the determinants arise because of the lack of clarity regarding definitions of 'dysphagia' and 'aspiration' and the different clinical determinants of aspiration that different individuals display in response to the same stimulant. For example, sensitivity of the cough reflex. Concomitant difficulties arise with the structural, spacial and physiological differences that arise with age. As previously discussed, healthy individuals rarely develop aspiration pneumonia, but the compensation and adaptation that occurs in the elderly swallow i.e. increased amplitude and duration of pharyngeal pressure to move the

bolus through the pharynx, (Leonard et al., 2004), may be ineffective or may suggest a greater predisposition to aspiration in stroke.

3.7 Conclusion

Aspiration pneumonia may be caused by aspiration of food and drink that carry anaerobic bacteria (present in saliva) onto the lungs of patients whose compromised immune system is unable to clear it/them.

Aspiration results in altered physiological responses in the swallow process, some of which may be observed at bedside e.g. coughing, wet voice quality. These clinical determinants may alert the clinician to potential difficulties with swallowing. Any future bedside swallow screening tool may be constructed around core clinical determinants of aspiration that nurses can readily identify.

3.8 Summary

This chapter describes the requisite features that predispose patients to develop pneumonia as a consequence of aspiration; aspiration symptomatology following stroke, and the clinical determinants identified as possible indicators of aspiration. It highlights the complexity of swallowing and the devastating and potentially fatal consequences that can occur if aspiration is not detected. It highlights the fundamental components of any future swallow screening tool to be used by nurses.

CHAPTER 4

USE OF INSTRUMENTAL EXAMINATIONS AND DYSPHAGIA ASSESSMENTS AS THE 'GOLD STANDARD' FOR DIAGNOSIS OF DYSPHAGIA AND ASPIRATION

The previous chapter gave an overview of the anatomy and physiology of normal swallowing and the implications of dysphagia in the stroke population. Correctly identifying dysphagia is essential to the provision of high quality care and can ultimately contribute to patient outcome. The clinical consequences of dysphagia in stroke patients, detailed in the previous chapter, have been recognised as having a fundamental impact in the acute stages of stroke patients (ICWP Stroke, 2008).

Hence there is an urgency surrounding the development of a diagnostically accurate swallowing tool for health care professionals to use in the acute stroke care setting. However the complexity and variability of the swallow within and between individuals in the normal swallow (Chapter 2) and the adaptation and compensation evident in dysphagic stroke patients adds to the difficulty in developing such a tool.

A 'gold standard' for the accurate diagnosis of dysphagia, i.e. perfect sensitivity and specificity, does not exist (Reilly et al., 2004). Sensitivity and specificity are defined on page 32.

The positive predictive value (PPV) is useful to understand the relevance of a test result in individual patients, i.e. how likely it is that the individual patient has the disease when they have a positive test (Altman and Bland, 1994b), in this study the patients who have swallowing difficulties when they have a positive test. The negative predictive value (NPV) is the proportion of people with a negative test who do not have the disease (Altman and Bland, 1994b), in this study, the patients who do not have swallowing difficulties when they have negative test. The PPV and the NPV depend on the prevalence of the disease (in this study swallowing difficulties) within the population.

The prevalence of swallowing difficulties within the acute stroke population is dependent on when the swallowing difficulties are assessed. The reported incidence of swallowing difficulties in the literature is variable, but one study reported the incidence of recovery of swallowing difficulties in stroke (Smithard et al., 1997). The study identified that 51% of stroke patients were at risk of aspiration due to swallowing

difficulties within 24-hours, with 27% at risk by the end of the week. Therefore, the prevalence of swallowing difficulties is lower if the test is undertaken at a later time after stroke, which will then affect the PPV and the NPV. This means that when interpreting the results of a test for swallowing difficulties after stroke, in terms of its PPV and NPV, it would be important to identify when the test was undertaken.

The PPV and the NPV are important in identifying the probability that the patient does have swallowing difficulties and thereby inform clinical decision making. In contrast, the sensitivity and specificity of a test for swallowing difficulties are independent of the prevalence of swallowing difficulties and are therefore generally preferred when considering the clinical trial of screening or diagnostic tests.

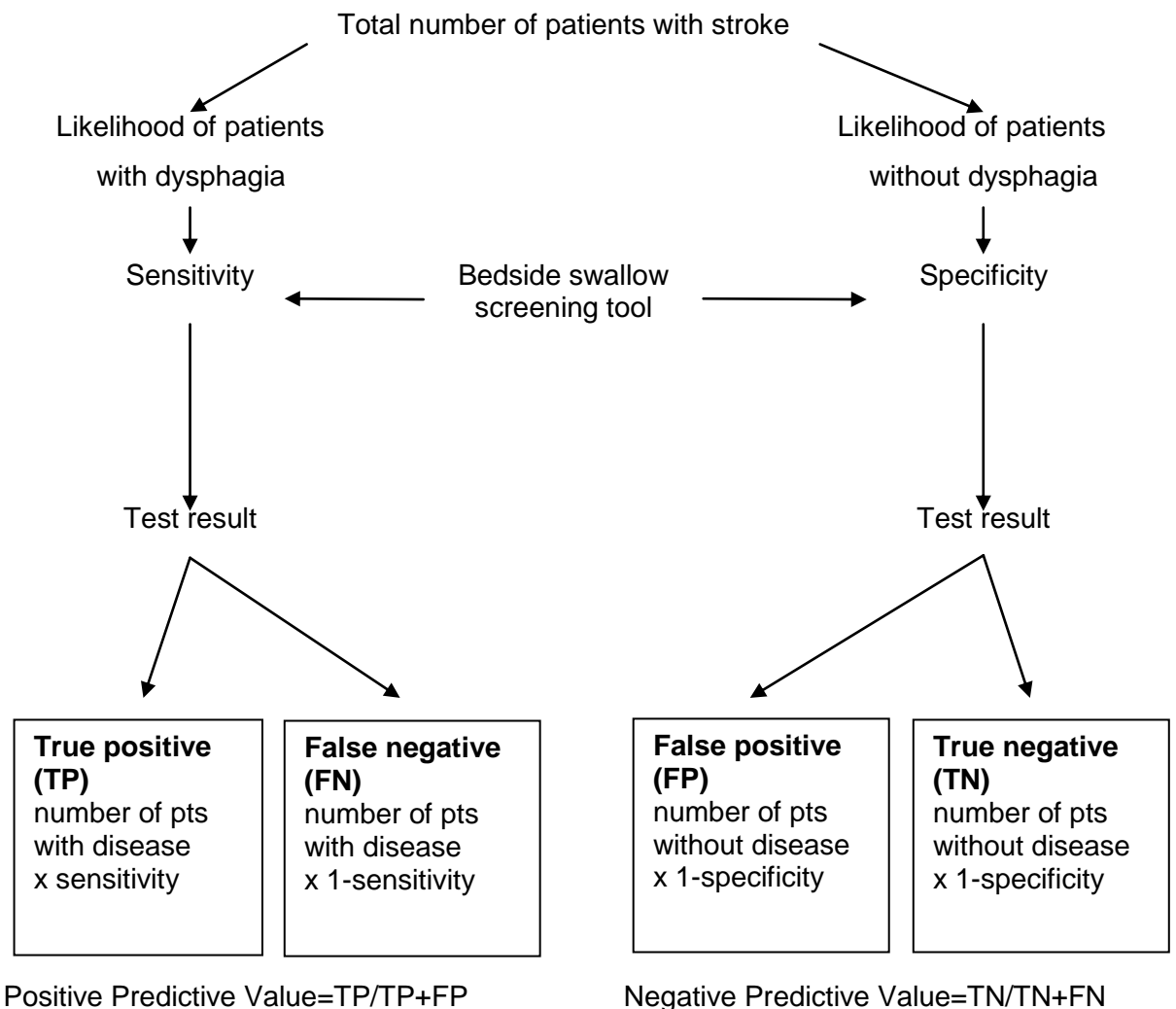


Figure 4.1: Diagrammatic presentation of sensitivity, specificity, positive predictive values and negative predictive values (adapted from Griner et al., 1981)

The overall accuracy of the test (the proportion of patients correctly rated as having the disease or not: in this study the presence or absence of a swallowing difficulty) is termed the efficiency (Jones and Payne, 1997).

For the purpose of this study, a tool with higher sensitivity (i.e. able to identify patients with swallowing difficulties) is less likely to provide a false negative result so that patients with swallowing difficulties will be identified. Low sensitivity results in a higher number of false negatives so that patients who are actually having swallowing difficulties are less likely to be identified by the test. A false negative may result in continued oral intake leading to aspiration, chest infection, malnutrition, dehydration or even death. A tool with a high specificity will correctly identify patients who do not have swallowing difficulties, providing a low number of false positive results. Low specificity allows the clinician to incorrectly identify patients with swallowing difficulties, giving a higher number of false positives. A false positive result may mean that patients are unnecessarily given alternative feeding or modified diets or are placed 'nil orally' when they could have taken a normal diet. The clinical implications for patients mean that tests should have both high sensitivity and high specificity.

In the absence of a definitive tool that allows for the identification, assessment and subsequent management of dysphagia, clinicians have adapted other diagnostic tools from other medical fields.

An overview of instrumental examinations and specialist bedside swallowing assessments is presented in this chapter.

4.1 Use of instrumental dysphagia examinations

In the absence of a 'gold standard' to identify dysphagia and aspiration, instrumental examinations of the swallow have been developed by modifying existing medical examinations. Many instrumental examinations are available in the research setting: manometry (measures pharyngeal pressure alterations during swallowing as an adjunct to dysphagia assessments); scintigraphy (measures the volume of radioisotope bolus residue in the pharynx by generating a two dimensional picture); and ultrasound (uses sound waves to create an image of the oro-pharynx). These instrumental examinations are not considered as clinically viable diagnostic examinations as they do not identify aspiration or the stage of the swallow where the difficulties arise.

Some instrumental examinations, e.g. Videofluoroscopic Examination of Swallowing (VFES) and Fibreoptic Endoscopic Evaluation of Swallowing (FEES), are clinically

accessible in some local trusts but availability is not consistent across the UK. Instrumental examinations aim to: contribute to the detection of aspiration i.e. VFES, FEES®, Pulse Oximetry (SpO₂) and Cervical Auscultation (CA); allow examination of the anatomy and physiology of the oro-pharyngeal tract (VFES, FEES®); or monitor aspects of the swallow mechanism in order to infer abnormal physiological movement of the oro-pharyngeal tract (VFES, CA). However significant limitations apply to these instrumental examinations which are detailed below. VFES and FEES® are recommended for use with dysphagic stroke patients following specialist assessment of suspected aspiration or for stroke patients who require naso-gastric tube feeding or dietary modification for three days post-stroke (ICWP Stroke, 2008).

4.1.1 Videofluoroscopic Examination of Swallowing (VFES)

VFES is the most accurate instrumental examination to identify aspiration (Palmer et al., 1993). VFES is the diagnostic imaging of the oro-pharyngeal swallow. Patients must be able to sit or stand in a 16-inch gap in both anterior and lateral planes in order to screen the whole of the gastro-oesophageal swallow from the lips to the stomach. Patients are required to swallow barium mixed with different fluids and food types in order to simulate the different consistencies consumed during mealtimes. VFES is then used to examine the efficacy of compensatory swallow manoeuvres or techniques in order to inform future management. Consequently patients must be purposefully selected for VFES as they need to demonstrate good trunk and head control, good cognition and need to be compliant.

There are many features (outlined below) that render the VFES inappropriate as a 'gold standard' assessment for the identification of dysphagia or aspiration in the acute stages of stroke.

4.1.1.a Diagnostic accuracy issues

- pH monitoring has demonstrated that 20% of patients have a false negative result on VFES (Clayton et al., 2006)
- The swallow physiology is affected by the presence of an NG tube (Huggins et al., 1999), which are commonly in place post-stroke
- The VFES interpretation and reporting is subjective with different clinicians using locally generated reporting protocols. There is evidence of poor inter-rater reliability in VFES (Kuhlemeier et al., 1998; Singh and Hamdy, 2006; RCSLT, 2007).

4.1.1.b Patient-specific issues

- Not all patients are able to comply with the instructions due to poor posture, cognition or medical state
- Cognitive difficulties may be exacerbated in the VFES environment (Daniels and Huckabee, 2008)
- Many patients who do not demonstrate aspiration in the VFES examination continue to aspirate at the bedside (Singh and Hamdy, 2006) due to the effects of swallow fatigue, positioning and different levels of supervision and expertise compared with specialised staff available during the VFES procedure.
- Detection of aspiration on VFES does not always relate to poor patient outcome

4.1.1.c Staffing issues

- VFES requires a number of specialist clinical staff including a minimum of two SLTs (RCSLT, 2007), a radiologist/radiographer; other people including carers, physiotherapists or nurses may also be present

4.1.1.d Procedural issues

- Patients are exposed to radiation (Singh and Hamdy, 2006) which limits the examination time
- VFES offers only a snapshot of swallow ability using specific postures, head control, bolus consistency and assisted feeding by a specialist multidisciplinary team
- VFES protocols vary across sites with regard to the working definition of dysphagia, bolus size and consistency, number of bolus swallows, assistance offered, instructions offered and the type and number of staff present at the examination. Only one study, the Bedside Swallowing Assessment (Smithard et al., 1997) reports inter-rater reliability of interpreters during VFES
- Many VFES sites have designated monthly clinical slots and therefore are unable to respond in a timely fashion to patients with suspected aspiration
- VFES procedure is not standardised, with clinicians using a combination of protocol and patient driven procedures. Use of measured bolus size and consistencies (Singh and Hamdy, 2006) with the use of different utensils, i.e. liquids via teaspoon, straw or cup (Daniels and Huckabee, 2008), with the cue to 'swallow' (Daniels et al., 2007) all affect swallow physiology
- VFES requires the ingestion of barium infused consistencies which affects the swallow physiology (Singh and Hamdy, 2006)

- VFES should be used to analyse the effectiveness of different compensatory strategies which then limits the amount of time used to detect aspiration

Despite the difficulties outlined, VFES is still considered the 'gold standard' diagnostic instrumental examination of dysphagia and is recommended for use following a specialist dysphagia assessment (ICWP Stroke, 2008). It has been demonstrated to be of significant use in identifying: the need to refer on to other professionals; the effectiveness of compensatory strategies; treatment recommendations and modification of diet texture.

However, it is limited as a 'gold standard' against which comparisons for screening tools can be made in that only alert, cognitively intact patients with good trunk and head control are able to undertake the examination. This renders it unsuitable as the 'gold standard' with which to make comparisons for the clinical utility of bedside screening tools for use with patients in the acute stages of stroke.

4.1.2 Fiberoptic Endoscopic Evaluation of Swallowing (FEES®)

FEES® is a portable, safe and well-tolerated assessment of swallow function at the bedside (Aviv et al., 2000). It involves placement of a flexible fiberoptic endoscope at the level of the nasopharynx in order to give a clear view of the anatomy of the hypopharynx and larynx. It gives information regarding pre- and post-swallow penetration of the airway or aspiration and thereby aims to offer information regarding the risk of aspiration during the meal.

No information can be obtained regarding the oral stage of swallowing, and aspiration during the swallow cannot be observed directly. This is due to closure of the nasopharynx by the soft palate which blocks the view (known as 'white out') but aspiration can be observed pre-swallow and inferred post-swallow by residue in the larynx or material ejected from the trachea by coughing. There is also the unknown effect on swallowing of the local anaesthetic spray delivered to the nostrils prior to the examination (Singh and Hamdy, 2006). FEES® can include risks of

“discomfort, laryngeal spasm, vasovagal stimuli, nosebleed, and allergic reaction, and is contraindicated in patients with movement disorders, cardiac arrhythmias, respiratory distress, bleeding disorders, severe arthritis or osteophytes and deviations in the septum and epiglottis”

(Swigert, 2000 Page 134)

In comparison with VFES, FEES® had a sensitivity of 88% (Langmore et al., 1991) when tested on 21 patients within a 24 hour period of stroke admission. In a further study, (Dziewas et al., 2008) demonstrated penetration or aspiration in nearly 80% of acute stroke patients, although they only included acute stroke patients who had known risk factors for dysphagia.

FEES® involves specialised equipment and specifically trained staff (Singh and Hamdy, 2006). Although some authors (Warnecke et al., 2009) have demonstrated that FEES® can be easily interpreted by inexperienced clinicians after a short lecture, the authors used only experienced (mean 4.5 years) neurologists in their study. FEES® is limited as a 'gold standard' swallow screening tool as it requires the patient to be alert, compliant and be able to follow instructions (ICWP Stroke, 2008).

4.1.3 Pulse Oximetry

Pulse oximetry involves a portable, non-invasive bedside assessment of oxygen saturation in arterial blood with manufacturers claiming a $\approx 2\%$ change in oxygen saturation levels during swallowing as indicative of aspiration (Zaidi et al., 1995) if saturation is between 50% and 100%.

Some authors report no relationship between aspiration and desaturation on pulse oximetry (Colodny, 2000; Leder, 2000) whilst others report desaturation of greater than 2% in 59% of healthy adults (Hirst et al., 2002).

The physiological response to aspiration, and how that affects the recording of desaturation in the arterial blood supply, is still a subject of debate. Some authors claim abnormal swallowing leads to poor ventilation and reduced inspiratory breath (Teramoto et al., 1996), whilst others suggest that aspiration causes bronchospasm leading to hypoxia and desaturation (Zaidi et al., 1995). Desaturation in pulse oximetry has been attributed to a variety of co-occurring factors: poor breath-swallow co-ordination (Teramoto et al., 1996; Colodny, 2000); increased pharyngeal transit time and increased apnoeic period (Sellars et al., 1998) and anticipatory 'breath hold' (Sellars et al., 1998). Co-morbid diseases have also been reported to have an independent effect on oxygen saturation during eating e.g. neuromuscular disease, severe obstructive lung disease (Sherman et al., 1999; Colodny, 2000).

Pulse oximetry cannot be proposed as a 'gold standard' as studies have been inconclusive on the effectiveness of pulse oximetry in the detection of aspiration (Sellars et al., 1998; Colodny, 2000). This has led to clinicians using pulse oximetry as

an adjunct to their clinical assessment (Smith et al., 2000) despite reports of inadequate sensitivity, specificity and predictive values when compared to VFES (Ramsey et al., 2006). In one study (Lim et al., 2001), fifty stroke patients were given 50 ml of water, five swallows of 10 ml aliquots each, and had pulse oximetry readings taken pre- and post- 10 ml water swallow followed by FEES® undertaken by an SLT. Patients were followed up during their inpatient stay for evidence of aspiration pneumonia. Pulse oximetry undertaken pre- and post- 10 ml water swallows, yielded a sensitivity of 100% and a specificity of 70.8% when compared to FEES®. These swallow tests (pulse oximetry and FEES®) were not performed simultaneously and therefore cannot be considered as valid data owing to the fluctuation of swallow function in stroke throughout a 24 hour time period.

The combined bedside assessment of water swallow and pulse oximetry yielded a positive predictive value of 95% but it was noted that both tests identified penetration as aspiration in people without swallowing difficulties as well as in people with swallowing difficulties (Smith et al., 2000). Similarly when pulse oximetry was compared with VFES (Sherman et al., 1999) desaturation was demonstrated on aspiration as well as penetration of the laryngeal vestibule but penetration can be a feature of a normal swallow. If pulse oximetry was accepted clinically then a number of non-aspirators would be inappropriately placed nil by mouth.

4.1.4 Cervical Auscultation

Cervical auscultation is a portable, non-invasive assessment that is easily tolerated (Cichero and Murdoch, 1998). It involves placement of a stethoscope on the lateral borders of the larynx (Hamlet et al., 1990) or on the lateral borders of the tracheal wall (Takahashi et al., 1994). It offers information regarding breath sounds pre- and post-swallow and translates swallow sounds.

To date, the physiological response associated with swallow sounds has not been defined (Leslie et al., 2007). The practice remains as an adjunct to the therapists' clinical opinion owing to the subjective interpretation of sounds by experienced clinicians (Leslie et al., 2004) and therefore could not be considered as a 'gold standard' against which other tools can be validated. Large scale studies are required in order to offer a more robust evidence base for clinical practice.

Summary of instrumental examinations of dysphagia or aspiration

VFES and FEES® require specialist equipment and specifically trained staff to undertake the examination (Ramsey et al., 2003). VFES and FEES® may be considered by some people as invasive examinations that require patients to have good cognition and good communication and understanding in order to be compliant with the examination. They can be considered as diagnostic in that patients who are already suspected as being at risk of aspiration are referred for the procedures for further detailed examinations that identify anatomical and physiological dysfunction.

There is currently conflicting evidence for the use of pulse oximetry and cervical auscultation in the assessment of swallowing function. Although studies have identified them as adjunct procedures to screen for swallowing difficulties (Smith et al., 2000; Lim et al., 2001), further research is required in order to establish the physiological response that gives rise to records of desaturation and the definition of the swallow sounds (Leslie et al., 2007). Although instrumental examinations offer a snapshot of the swallow mechanism, they are not a definitive 'gold standard' for identifying dysphagia in acute stroke patients and further evidence is required to establish the relationship between failing the instrumental examinations and patient outcome.

4.2 Bedside swallow assessments

Bedside swallow assessments remain the cornerstone of clinical practice in most hospitals (Singh and Hamdy, 2006) and differ from a screen in that they are designed to identify abnormal anatomy and physiology at different stages of swallowing resulting in dysphagia and aspiration (Logemann et al., 1999) rather than to simply identify patients at risk of aspiration within a population group. A swallowing assessment should not only focus on the physiological response that precipitates clinical determinants of aspiration but should also consider a wider range of feeding issues that may affect respiration, nutrition and hydration. A swallowing assessment would normally include a cranial nerve assessment and swallow trials of different consistencies (Martino et al., 2005) as key to the development of a hypothesis which is tested during assessment and management.

SLTs are trained to assess and manage dysphagia in a heterogeneous population with a variety of developmental and acquired disorders, all of which display dysphagic characteristics specific to the underlying disorder. They develop a working hypothesis regarding a patient's ability to swallow and tailor the assessment to the patient rather than using a published assessment. Therefore despite the development of published

dysphagia assessments, SLTs continue to rely on their clinical experience when undertaking bedside swallow assessments (McCullough et al., 2001).

Some assessment tools (Logemann et al., 1999; Mann, 2002) are widely available. SLTs formal bedside swallow assessments rely on: the patient and carer case history; behavioural issues; testing cranial nerve function; direct examination of the oral cavity; and also observation for the clinical determinants of aspiration during direct testing of different bolus volumes and consistencies (Singh and Hamdy, 2006).

4.2.1 Northwestern Dysphagia Patient Check Sheet (Logemann et al., 1999)

The Northwestern Dysphagia Patient Check Sheet (Appendix 1) was developed in Chicago and published as a bedside screening test. The check sheet can be considered diagnostic rather than a screening tool as it aims to identify whether dysphagic symptoms originate at the oral or pharyngeal stage of swallowing. It was tested on 200 patients referred by the medical team and assessed within 24 hours following VFES. The population group was mixed: 51 first stroke; 18 multiple strokes; 26 head and neck cancer; 21 spinal cord injuries; 84 other unspecified aetiologies. The study considers 28 clinical determinants of aspiration or dysphagia, where clinicians are asked to rate the determiner as 'safe' or 'unsafe'. The clinical determinants are grouped as: 4 medical history variables; 6 behavioural variables; 2 gross motor functions, 9 oro-motor variables and 7 observations during trial swallows.

- The 4 medical history variables are history of recurrent pneumonia, frequent temperature spikes, aspiration pneumonia mentioned in the medical referral and long-term intubation (1 week) or tracheostomy (6 months).
- The 6 behavioural variables range from level of alertness, patient co-operation or agitation, ability to attend or interact, have an awareness of swallowing difficulties, have an awareness of secretions, and have an ability to manage secretions.
- The 2 gross motor functions are postural difficulties and fatigue.
- The 9 oro-motor variables consider oral, pharyngeal and laryngeal anatomy and physiology, ability to follow directions, dysarthria, facial weakness, oral apraxia, oral sensation, pharyngeal wall contraction on initiation of a gag reflex, saliva swallowing and voluntary cough or throat clearing.
- There are 7 observations during trial swallows, the determiners ranging from swallow apraxia, oral residue, coughing or throat clearing, delayed pharyngeal swallow, reduced laryngeal elevation, gurgly voice quality and

multiple swallows per bolus. The study does not specify how many swallows are identified as multiple nor does it define the clinical symptoms that would constitute a swallow apraxia.

Although definitions of the clinical determinants used in the assessment are offered, the screening check sheet presumes a pre-determined level of training and clinical competence not specified in the study. For example, the clinician is required to observe and record evidence of swallow apraxia, which is identified when a patient eats and drinks normally but swallowing becomes more difficult when they are consciously focusing on the swallow task, are given instructions to swallow (Logemann, 1993), are fed, or are supported to eat and drink by a carer. However, this is not defined within the context of the study.

Aspiration occurring during a mealtime or over a 24-hour period owing to fluctuations in swallow function related to disease progression and medication may not occur on the textures and volumes specified within this study. The screening tool specifies small volumes of food and fluid intake in order to minimise the risk of aspiration to the patient. They suggest 1cc thin liquid, 1cc pudding and a biscuit (if chewing is possible). But they also specify that these can be omitted and substituted with saliva swallows, or alternatively a patient may be observed eating a meal. With such a variability in the type and amount of food eaten, comparisons would be impossible as swallow physiology varies according to the bolus size, texture or consistency (Hiemae and Palmer, 1999) and small volumes used in particular patients may not elicit swallow fatigue which may then result in pharyngeal residue and aspiration.

Although the authors suggest that raters should aim to complete the screening tool within 15-20 minutes, the identification of 28 eclectic variables in a non-compliant and medically unstable population would extend the amount of time taken to complete the screen. Comparison with VFES demonstrated that clinicians were able to identify 71% patients as aspirating, with 69% having an oral stage disorder, 72% having a pharyngeal delay and 70% having a pharyngeal stage disorder. The 28 clinical determinants cannot be shortened because the significance of aspiration relies on the combination of more than 8 variables scoring 'unsafe'.

The study should not be considered as a 'gold standard' for assessment of acute stroke patients, as the authors report that the tool is validated within a convenience sample of heterogeneous patients with various aetiologies. The study subgroup for stroke was too small to permit statistical analysis of the 28 variables. The time of the

assessment post-stroke is not reported and the stroke subgroup needed to be selected in order to be able to co-operate with VFES, which may make it unsuitable for use with patients in the acute stages of stroke.

4.2.2 Mann Assessment of Swallow Ability: MASA (Mann, 2002)

The Mann Assessment of Swallowing Ability (Appendix 2) was designed to be an independent measure of dysphagia and aspiration. The study was undertaken by two experienced speech pathologists on 161 consecutively admitted, first acute stroke patients (with symptom onset <7 days). Patients admitted to the study had previous normal swallowing, had to be conscious and medically stable and have no previous medical condition that could affect swallow function.

Bedside assessment was undertaken within 16 days of stroke admission, and VFES was undertaken within 47 days of stroke admission to detect aspiration. Thirty-three patients were omitted from the study, as they did not participate in both parts of the assessment. The participants' mean age was 71 years with 82 males and 46 females included in the study.

The assessment included a case history from the patient and relatives, an oral motor and sensory assessment together with an assessment of voice, speech and language ability. Patients were required to perform a 'dry' saliva swallow, 5ml water swallow, 20 ml water swallow and an undisclosed volume of thickened fluid as appropriate. SLTs were asked to define swallowing disorders and aspiration as two separate categories using a subjective description of 'any clinical evidence'. Based on the scores the clinician is asked to classify the likelihood of dysphagia into four categories:

- Unlikely: minimal or no evidence of the disorder;
- Possible: limited probability of a disorder requiring continued monitoring;
- Probable: greater risk of a disorder requiring intervention or further evaluation;
- Definite: high likelihood of a disorder requiring immediate intervention or instrumental examination.

The study demonstrated that the speech pathologists identified 51% patients with a swallowing disorder and 49% as aspirating compared to VFES identification of 49% patients with a swallowing disorder and 22% of patients aspirating. For evidence of

dysphagia, the sensitivity and specificity was 73% and 89% respectively. The positive predictive value (PPV) and negative predictive value (NPV) was 92% and 65% respectively. For clinical assessment for any evidence of aspiration, sensitivity and specificity 93% and 63% respectively, with a PPV of 41% and a NPV of 97%. The inter-rater reliability between the two SLTs was good for a diagnosis of dysphagia (k: 0.82) and aspiration (k: 0.75).

The bedside assessment underestimated the number of patients with dysphagia and overestimated the number of patients with aspiration when compared with VFES. However, the study was validated on a select sample of first ever stroke group of younger patients and findings may not be generalisable to older stroke patients who may have had a more severe stroke. There was also a large time gap between the bedside assessment and the VFES which may make comparisons between the assessments unreliable. The MASA does not include a management programme following identification of dysphagia and aspiration.

These detailed bedside dysphagia assessment tools are representative of more assessments traditionally undertaken by SLTs. Assessments consider a range of cognitive, behavioural and medical determiners together with oro-pharyngeal determinants across a range of consistencies. Both radiographic and clinical bedside assessment may have prognostic indicators for dysphagia (Mann, 2002), however, instrumental examinations can only be undertaken in cognitively and physically able patients. Although bedside swallowing assessments do not represent a 'gold standard' for the diagnosis of dysphagia and aspiration, they remain the only assessments available to identify dysphagia and aspiration for all stroke patients in the acute stages of stroke.

These bedside swallow assessments would not be acceptable for nursing staff to use owing to both the amount of training required to understand and interpret the tools and the amount of clinical time required to undertake the tool on each patient. The clinical consequences for the patients identified as being at risk of aspiration would be the same as those patients who were similarly identified as at risk by a dysphagia water swallow screen. Therefore the more detailed dysphagia assessment tools cannot be considered a viable alternative to the water swallow screens.

4.3 Conclusion

Owing to the complex physiological mechanism of swallowing and dysphagia characteristics observed in and confounded by stroke, there has been a search for a gold standard screening tool that allows for the identification of swallowing difficulties. To date no individual clinical determinant or combination of clinical determinants have yielded sufficiently acceptable sensitivity or specificity to be accepted as a gold standard for identification of dysphagia or aspiration.

4.4 Summary

This chapter has considered instrumental examination and bedside observation of clinical determinants of aspiration. The chapter has reported the failure to identify a reliable and valid gold standard assessment for all acute stroke patients whilst the following chapter describes bedside swallow screening tools that are currently available to highlight those patients that are thought to have dysphagia and are at risk of aspiration.

CHAPTER 5

BEDSIDE SWALLOW SCREENING TOOLS FOR USE WITH ACUTE STROKE

The purpose of this chapter is to identify from the literature the utility of bedside swallow screening tools for use by nurses in acute stroke patients. In order to be clinically useful, a screening tool needs to accurately identify the disease (in this instance risk of aspiration) as present or not (validity), be suitable for use in the particular client group for whom it is intended (utility) and can be undertaken by the staff group that would use it clinically. Furthermore, when a risk for aspiration is identified, a screening tool should offer specific advice regarding immediate intervention or management. The specific requirements for a screening tool, in the context of this study, is that it should correctly identify patients at risk of aspiration, and is suitable for all patients following a stroke, including those with decreased or fluctuating levels of consciousness, cognitive difficulties, and postural difficulties. Furthermore the screen should be quick and easy to administer so it can be utilised frequently as the acute patients' swallowing difficulties fluctuate. There is a need to validate potential bedside swallow screening tools against a robust diagnosis, either by an expert speech and language therapist or by using an already validated 'gold standard' diagnostic instrument. This was the principal aim of this programme of work.

A review of the current availability of bedside swallow screening tools was undertaken in order to identify if such a screen is already in current clinical practice.

5.1 Bedside swallow screening tools

Screening can be defined as the systematic application of a test to identify

"People who may be at increased risk of a disease or condition. They can then be offered information, further tests and appropriate treatment to reduce their risk and/or any complications arising from the disease or condition"

United Kingdom National Screening Committee, 2009

Screening tools are regularly implemented in the medical setting in order to identify and eliminate those people affected by a specific disease or condition in order to manage patient risk.

The use of formal swallow screening protocols in clinical practice has been demonstrated to be effective in the prevention of pneumonia (Odderson et al., 1995; Hinchey et al., 2005). The water swallow screening tools are reflective of a screen in that they are: undertaken on all subjects within the population; relatively non-invasive and are relatively straight forward (Cochrane and Holland, 1971) and take minimal time to complete; approximately 15-20 minutes (Logemann et al., 1999). Screening tools should have high sensitivity, i.e. they can accurately identify only those at risk of aspiration who require further testing, and high specificity, i.e. identify only those not at risk of aspiration who do not require further intervention (Martino et al., 2000). It is unlikely that any screening tool will have both 100% sensitivity and specificity. This is particularly true with a swallow screening tool given the complexity of dysphagia. However, the implications for the patient in clinicians failing to recognise the dysphagia are considerable. Poor sensitivity would result in patients not being identified by clinicians at risk of aspiration with the potential consequences of pneumonia, malnutrition and dehydration. Poor specificity would result in patients being inappropriately identified at risk of aspiration, which may result in unnecessary alternative and augmentative feeding. It is therefore incumbent on clinicians to continue to strive for increased accuracy in the bedside screening tools that are developed.

It is recognised that the role of the SLT in dysphagia is to undertake a comprehensive assessment of the anatomy and physiology of the swallow and to generate a hypothesis for the rehabilitation of the swallow (RCSLT, 1998). SLTs are required to identify the stage of breakdown in swallowing by more detailed assessment of the function of the different anatomical features. For example, the inability to cough may suggest that the individual is unable to adduct the false vocal folds and therefore has compromised one of the mechanisms of airway defence. SLTs further assess for the presence of clinical determinants indicative of abnormal physiology. For example, if the individual presents with a wet or gargly voice quality, then it is assumed that saliva or fluids have penetrated the airway, and therefore the individual is at risk of aspirating the bolus. Where resources permit, and patient compliance is assured, this comprehensive bedside assessment can be enhanced by further instrumental examinations of VFES or FEES.

Nurses are acknowledged (Westergren et al., 1999; RCSLT, 1998) as the most appropriate professional group to identify those individuals with stroke who present with a risk of aspiration due to their ability to monitor the individual on a 24-hour basis and their role within the professional group responsible for feeding (United Kingdom Central Council for Nursing, Midwifery and Health Visiting, 1997).

With the recognition of the impact of aspiration in stroke patients in relation to function, rehabilitation and outcome (Chapter 3), and the efficacy of a formal dysphagia screening tool in clinical practice in the prevention of pneumonia (Odderson et al., 1995; Hinchey et al., 2005), a diagnostically accurate bedside swallow screening tool is clinically desirable. However, the clinical tools currently available fall short of the gold standard (defined on page 48), with varying degrees of sensitivity and specificity. Several swallowing screening tools have been developed to identify individuals at risk of aspiration in heterogeneous client groups, but most of the impetus for research comes from stroke.

Bedside swallow screening tools are discussed in the following paragraphs with reference to the reflex cough test and swallow screening tools that consider water as the testing medium. Further details of tests and studies can be found in Tables 5.1-5.4 (page 70 – 73) and Table 5.5 (page 82) but are discussed below.

5.1.1 Reflex Cough Test (Addington et al., 1999; Kastilik et al., 2002; Midgren et al., 1992)

The Reflex Cough Test (Appendix 3) differs from most screening tools in that it does not rely on water as the testing medium. This test uses the presence of the involuntary laryngeal cough reflex in response to inhalation of testing mediums. A weak or absent cough in response to three inhalations of 20% l-tartaric acid dissolved in 2ml of sterile normal saline administered via a nebuliser with a nose clip in situ is regarded as predictive of aspiration (Addington et al., 1999). This prospective study was conducted by doctors on 400 consecutively admitted stroke patients who were given the test. This test group were compared with 204 consecutively admitted stroke patients from a similar facility who did not receive the cough test; these were a control group. In the Reflex Cough Test group, five patients (1.25%) developed pneumonia in the intervention group compared to 27 patients (13.2%) in the control group. The patients identified as having a weak or absent cough reflex were referred to SLT for further detailed assessment, placed nil by mouth and given treatment strategies whilst supported by nasogastric or percutaneous endoscopic gastrostomy feeding. Other cough reflex studies have used citric acid (Kastilik et al., 2002) and capsaicin (Midgren et al., 1992). There are no normative data for the cough response to the different agents and the relative strengths administered. Furthermore cough sensitivity varies between individuals in healthy adults in response to asthma (Chang et al., 1996), reflux (Ferrari et al., 1995) and smoking (Dicpinigaitis, 2003). There is also a gender bias that

is not accounted for in the studies with women having a lower cough threshold (Dicpinigaitis and Rauf, 1989; Kastilik et al., 2002).

Despite the significant impact on patient outcome, reported above, the Reflex Cough Test has not been implemented in clinical practice. Bedside water swallow screening tools continue to be used in the clinical setting (ICWP Stroke, 2000; 2004).

5.1.2 Bedside water swallow screening tools

A review of the literature supports the assertion that there is no definitive screening tool for the identification of swallowing difficulties in the acute stroke population; not with defined clinical determinants that correlate to dysphagia (dysfunction at any stage of the swallow process), or aspiration (food or fluid entering the airway below the level of the vocal folds), as defined by VFES or patient outcome. Since the initial identification of swallowing dysfunction using a water swallow screening tool in 1987, research has focussed on refining the tool, and the clinical determinants within it, rather than producing a swallow screening tool that allows the patients' swallow to be assessed and subsequently managed by nurses within the acute stages of stroke.

Most bedside swallow screening tools are derived from the water swallow test (Wade and Hewer, 1987). Water swallow tests involve a patient swallowing graded volumes of water and observing for clinical determinants of dysphagia or aspiration. Water is the least cohesive consistency and therefore may be aspirated easily if there is dysfunction at any stage of the swallow. Aspiration is usually identified by the clinical determinants of aspiration detailed within the tool which, if present, require the patient to be placed nil by mouth and then await referral for a more detailed assessment of the stage of swallow dysfunction (ICWP Stroke, 2008). The water swallow screening tools do not allow for screening, or immediate management, of the swallow with modified (thickened) fluids and puree diet. This precipitates a delay in management of the patient's swallow and therefore has an immediate impact on the patient's nutrition and hydration. Other concerns regarding management of the patient's swallow arise from patients being allowed to take a normal diet if they pass the test. Therefore, despite the ability to swallow solids is not assessed, patients may be recommended for oral intake following the swallow screening process.

The Water Swallow Test (Wade & Hewer, 1987)

The Water Swallow Test (Appendix 4) was the first attempt to screen for swallow dysfunction in the stroke population. The aim of this simple, subjective screening tool

was to identify the number of stroke patients who had difficulty swallowing water, and as such, it is unsuitable for generalisation into clinical practice. Patients were assessed as soon as possible following stroke onset, then at three weeks and six months post-stroke. Swallow function was assessed by asking the patient to drink an unspecified volume of water from a cup, and then asking their opinion regarding their swallow speed. This screening tool was the first used to assess motor and swallow function in 976 stroke patients in the community and as such has become the basis of a plethora of more refined dysphagia screening tools.

The 50ml water swallow test (Gordon et al., 1987)

The Water Swallow Test (Appendix 5) was honed by quantifying the amount of water to be used i.e. 50mls (Gordon et al., 1987). Stroke patients are required to drink 50mls of water from a cup without choking on more than two occasions. Ninety-one patients had a basic neurological examination on admission to the study and one week later in order to establish cerebral hemisphere stroke, together with a motor examination (motoricity index) and 47 patients received a computed tomography scan. The tool delivered poor sensitivity (46%) and specificity (56%) when compared with patient outcome of chest infection.

The 3oz Water Swallow Test (DePippo et al., 1992)

The primary aim of the 3oz water swallow test was to determine whether the 3oz Water Swallow Test was an accurate method of identifying the need for further evaluation of the swallow by VFES, rather than identification of aspiration. Forty-four resident stroke patients from a rehabilitation setting were purposefully selected for the study. They were identified as having swallowing difficulties: indicated by one or more of seven criteria. The criteria consisted of: bilateral hemisphere stroke; brain-stem stroke; history of pneumonia in the acute stroke phase; coughing associated with feeding; failure to consume half of their meals; prolonged time required for feeding and a non-oral feeding programme in place. They were required to drink 90ml (3oz) of water from a cup without stopping. Patients were deemed to fail the test if they coughed or demonstrated a wet-hoarse voice quality either during the screen, or up to one minute following the screen. Time of VFES following the water swallow test is not reported. The screen reports a sensitivity of 76% and a specificity of 59% for patients within the rehabilitative phase of their swallow recovery which may not be indicative of acute stroke swallow function.

The Standardised Swallow Assessment (Perry, 2001a,b)

The study reports on the sensitivity and specificity of a simplified water swallow test: the Standardised Swallow Assessment (Ellul and Barer, 1993 and 1994). The study reports many methodological flaws detailed within Table 5.3. Standardised Swallow Assessment (Appendix 6) yielded good sensitivity (97%) and specificity (90%) when compared to summative clinical judgement of medical note documentation of referral and intervention by SLT; interview by researcher on admission; evidence of investigation for infection or VFES. However, VFES was only undertaken by the SLTs who supervised some of the nursing staff during the study. The screen is undertaken by different professionals (nurses, SLTs and doctors) who modified the content of the tool, affecting its validity: Nurses completed the tool on only 68 acute stroke patients. The screen uses only water as the testing material and fails to offer immediate management of oral intake following completion of the screen. The clinical management post-swallow remains the same as with previous water swallow tests, i.e. the requirement that the patient is placed nil by mouth and is referred to SLT for further assessment and management.

The Burke Dysphagia Screening Test (DePippo et al., 1994)

The Burke Dysphagia Screening Test validates the 3oz Water Swallow Test in rehabilitation phase of stroke in 139 consecutively admitted stroke patients in the rehabilitation unit. The tool has a pre-screening stage that considers type of stroke; history of pneumonia occurring in the acute phase of stroke; coughing during the 3oz Water Swallow Test; observation and consideration of volume and time taken to eat a meal and not of non-oral feeding program. Sensitivity and specificity is quantified by comparison with medical documentation of pneumonia or respiratory infection, airway obstruction and death. Despite the authors' claim that the tool (Appendix 7) successfully identifies patients who develop medical complications, 'coughing' on the 3oz Water Swallow Test was the only item demonstrating a statistically significant association with the medical complications of dysphagia and aspiration. Use in the rehabilitation stage of stroke alone precludes it as a validated acute stroke swallow screening tool.

The Bedside Swallowing Assessment (Smithard et al., 1997)

The Bedside Swallowing Assessment has a pre-screening stage that considers alertness, posture and dysarthria, and uses water as the testing medium (i.e. three teaspoons of 5mls water and 60mls of water from a cup). It is concerned with the identification of risk of aspiration, rather than identification of dysphagia (Appendix 8). The authors assert that the tool is 'standardised' but fail to report data as confirmation.

The different bolus volumes and consistencies used within the study significantly alter swallow physiology, which in turn will affect the severity ratings of the different raters. Undertaking assessments for comparison on different days is a significant confounding factor within this study owing to recovery of swallow function in the acute stages of stroke. The authors comment that the majority of patients (not quantified) noted as aspirators on VFES were not identified at the bedside; this may be evidence of fluctuation in swallow function between assessments.

The Timed Test of Swallow (Hinds and Wiles, 1998)

The Timed Test of Swallow considers identification of aspiration and dysphagia. It considers both qualitative elements (a questionnaire, and an assessment of cognitive capacity) together with quantitative elements, i.e. detailed oromotor examination and a timed water swallow test of 50ml of water. This lengthy qualitative assessment cannot be undertaken on all stroke patients, thereby rendering it unsuitable for use as a screening tool for nurses to use. The Timed Test of Swallow is validated for use by a neurologist and relies on swallowing speed which is influenced by gender and age (Nathadwarawala et al., 1992; Hughes and Wiles, 1996), and potentially involves large amounts of water being introduced into the trachea in the event of aspiration (Appendix 9). Further flaws include measurement of sensitivity and specificity against medical documentation of referral to SLT, dietary modification, respiratory difficulties and death.

Daniels Assessment Survey (Daniels et al., 1998)

The focus of the Daniels Swallow Test was to identify the clinical determinants and frequency of aspiration which informed a scoring system to categorise mild, moderate or severe dysphagia (Appendix 10). Fifty five male patients with stroke undertook an assessment of oromotor function, a clinical swallowing examination and VFES. The test identified 10 out of the 18 (56%) patients as aspirating when swallow integrity was shown to be intact by VFES. More detailed analysis is reported in the following discussion and within the tables, however the detailed oral examination that requires judgements on the presence of dysphonia, dysarthria, resonance and dyspraxia would render the screen complex, lengthy and outside the remit of a simple, quick screening tool for nursing staff to undertake on all patients.

Massey Bedside Swallow Screen (Massey and Jedlicka, 2002)

The Massey Bedside Swallow Screen study used untrained research assistants to identify dysarthria, dysphasia and to make a subjective decision about whether a teaspoon of water and a glass of water were 'tolerated' (Appendix 11). The authors suggest that the subjective criteria the assistants used must have been similar because

there was high inter-rater reliability. The study was limited by the small sample size (n=25) and the collection of data at a single site. Although the clinical determinants used in the tool were given content validity by six experts in stroke and dysphagia, the inclusion of the gag reflex may not be useful, as the gag reflex has no role in the swallow process. Indeed in a retrospective analysis of 120 patients who had undergone SLT assessment by a Consultant otolaryngologist and VFES, researchers could not identify a link between an absent gag reflex and aspiration (Bleach, 1993). Similarly, there is no justification for inclusion of a 'midline uvula' in the test to suggest the presence of dysphagia. The clinical outcomes used, namely documentation in the medical and nursing notes, of referral to VFES or SLT, or the requirement of a modified diet or sign of a pulmonary infection, do not necessarily indicate presence of dysphagia or aspiration. Management options following the test remain restricted to normal diet (which has not been assessed) or a decision of nil by mouth and referral to SLT.

100mls Water Swallow Test (Wu et al., 2004)

The authors suggest that the 100 ml water swallow test (Appendix 12) would be a viable tool for clinically monitoring the progression of aspiration, but it fails as a screening tool as it demonstrated inherent flaws in its subject sample and fails to offer any direction for patient management based on tool findings. The 100ml Water Swallow Test may be influenced by the purposefully selected sample of dysphagia patients (defined as demonstrating coughing or wet voice quality when drinking 100mls successively from a cup) who were subsequently referred for VFES.

Published water swallow screening tools are presented in Table 5.1 and are critiqued in the discussion.

Table 5.1: Comparison of content, patient management and outcome measures of water swallow screening tools

Water Swallow Tool	Tool	Clinical management following tool	Outcome measures
Water Swallow Test (Wade & Hewer, 1987) UK	Water swallows from a cup (indeterminate amount)	None	None
50mls Water Swallow Test (Gordon et al., 1987) UK	50mls water from a cup without choking on more than 2 occasions	None	Chest infection i.e. cough, fever, examination, or X-ray
3oz Water Swallow Test (DePippo et al., 1992) USA	Drink 3oz water from a cup without interruption. Failure was noted if coughing during the test or coughing and wet-hoarse voice quality 1 minute post-swallow	Not stated	VFES
Standardised Swallow Assessment (SSA) (Perry, 2001a,b) UK	Teaspoon water then 100mls water from beaker and a decision of 'other' concerns	Nil by mouth, IV Referral to SLT	SLT decision, patient opinion, mealtime observation and medical and nursing documentation
Burke Dysphagia Screening Tool (BDST) (DePippo et al., 1994) USA	Failure on 1 of 7 criteria regarding type of stroke, history of pneumonia, 3 oz water with observation of feeding, eating <half meal, prolonged feeding time (>30minutes), non-oral feeding with VFES for patients who failed the test (mean 5 weeks post-stroke)	VFES & SLT referral and safe swallow strategies	Pneumonia documented in medical notes of: recurrent respiratory tract infection; airway obstruction and death.
Bedside Swallowing Assessment (BSA) (Smithard et al., 1997) UK	Pre-assessment of alertness, posture, dysarthria. 3 times 5mls aliquots water from teaspoon then 60mls water	24-48 hours NBM & IV fluids. 7 days NG, modified diet & swallow therapy by SLT	SLT assessment mean day 1 (range 0-5 days) and VFES mean day 2 (range 0-9 days)
Timed Test of Swallowing (TTS) (Hinds & Wiles, 1998) UK	Questionnaire, structured examination and timed 150mls Water Swallow Test	SLT referral	SLT referral, dietary modification, respiratory difficulties and death
Daniels Assessment Survey (DAS) (Daniels et al., 1998) USA	Oro-motor examination, clinical swallowing assessment with water swallows of 5mls (x2), 10mls (x2), 20mls (x2) aliquots and VFES	Pts offered swallow therapy, compensatory strategies, diet alteration and NBM	2/6 clinical determinants Severity score 0-4. VFES (<5 days) Inter-rater reliability 95%. Medical charts reviewed at monthly intervals for 3 months
Massey Bedside Swallow Screen (MBSS) (Massey & Jedlicka, 2002) USA	Levels of alertness, dysarthria, dysphasia, orofacial examination, gag, cough & swallow reflexes present. Teaspoon then glass of water by research assistants <2hours apart. Randomised order, blinded results	NBM, referral to SLT	VFES/SLT/modified diet/ alternative feeding documented in the medical notes
100ml Water Swallow Test (100ml WST) (Wu et al., 2004) Taiwan	Drink 100mls water, timed from 'go' signal to final swallow. Hand dexterity noted.	Not specified	Abnormal swallow speed (>10mls/s) Choking defined as coughing & wet voice. Comparison with VFES

Table 5.2: Comparison of researchers' profession, sample size, age and homogeneity of client group, time of assessment post-stroke and sensitivity and specificity of water swallow screening tools

Water Swallow Tool	Researcher	Sample size	Mean Age (range); gender	Client group	Time of first assessment	Sensitivity/specificity
Water Swallow Test (Wade & Hewer, 1987) UK	Not stated	545 *UTA 93	Not stated	Strokes from 96 general practices, confirmed by neurologist examination or hospital notes.	< 7 days	not stated
50mls Water Swallow Test (Gordon et al., 1987) UK	Not stated	91	70 (26-96) 38 male	Consecutively admitted stroke patients (not restricted to acute stroke)	56 < 48 hrs 26 < 96hrs 9 < 13 days	sensitivity 46% specificity 56%
3oz Water Swallow Test (DePippo et al., 1992) USA	Not stated	44	Not stated	Consecutive stroke with evidence of clinical symptoms of dysphagia	admitted for rehabilitation	sensitivity 76%, specificity 59%
Standardised Swallow Assessment (SSA) (Perry, 2001a,b) UK	Nurses	68 UTA 132	Range 29-98; 22.5% <65yrs	Consecutive acute stroke admission	<24 hours	sensitivity 97% specificity 90%
Burke Dysphagia Screening Tool (BDST) (DePippo et al., 1994) USA	One of two SLTs	139	Range 20-90	consecutively admitted stroke, 2-8 weeks post-stroke with no previous history of dysphagia	<72 hours of admission to unit	patients 7.6 times more likely to develop pneumonia, recurrent upper airway obstruction or death
Bedside Swallowing Assessment (BSA) (Smithard et al., 1997) UK	Doctor	149 UTA 28	Median 79 (40-93) 63 male	Consecutive acute stroke	Day 0, 1, 2, 3, 4, 7, 28 & 6 months	sensitivity 68% specificity 67% compared to VFES
Timed Test Swallowing (TTS) (Hinds & Wiles, 1998) UK	Neurologist	115 UTA 22	75 (24-94)	Consecutive acute stroke acute admission	<72 hours	sensitivity 100% specificity 52% compared to SLT intervention alone
Daniels Assessment Survey (DAS) (Daniels et al., 1998) USA	Specialist SLTs	55 UTA 2	66 (41-93) 55 male	Consecutive, male, conscious stroke acute admissions	<5 days	sensitivity 92.3% specificity 66.7% compared to combined clinical determinants for aspiration
Massey Bedside Swallow Screen (MBSS) (Massey & Jedlicka, 2002) USA	Two research assistants	25	75 (39-87) 16 male	A convenience sample of alert, cognitively intact consecutive acute stroke following hospital intervention	<48 hours	sensitivity 100% specificity 100% compared to referral for SLT, VFES, special diet or chest infection
100ml Water Swallow Test (100ml WST) (Wu et al., 2004) Taiwan	Doctor	59	71 (43-97) 44 male	Consecutive referral to VFES (51 stroke 8 undiagnosed)	24 hours prior to VFES	sensitivity 85.5%, specificity 50% swallow speed sensitivity 47.8%, specificity 91.7% choking (dysphagia) sensitivity 36.4%, specificity 20.8% choking (aspiration)

(*UTA: Unable to assess)

Table 5.3: Potential flaws in water swallow screening test validation studies

Water Swallow Test (Wade & Hewer, 1987) UK	Fails to define the demographics. Offers an indeterminate amount of testing material Vague clinical determinates i.e. 'difficulty' or 'slow' swallowing as reported by patients
50mls Water Swallow Test (Gordon et al., 1987) UK	Identifies dysphagia rather than aspiration. Only patients with stroke onset 14 days prior to admission were excluded from the study Patients are assessed at different time points post-admission 48hrs, 96hrs and 13 days so the time of assessment post-stroke is indeterminable
3oz Water Swallow Test (DePippo et al., 1992) USA	Purposefully selected sample of patients identified from a rehabilitation unit
Standardised Swallow Assessment (SSA) (Perry, 2001a,b) UK	Different professionals undertook the swallow screen: nurses; nurses with SLT supervision; and doctors. The SSA was not consistently applied with doctors extending the screen to include presence of the gag reflex. 'Gold standard' is not an accurate measure of aspiration i.e. passage of the bolus below the level of the vocal folds as it considers a summative clinical assessment of SLT decision, patient opinion, mealtime observation, medical and nursing documentation. 'Considerable training' by the SLTs comprising a single day of theoretical training and 5 practice sessions, not available in all settings and therefore is not easily repeatable. VFES was undertaken in some patients to confirm aspiration where SLTs were unsure of symptoms. Study commenced prior to all the nurses being trained in the delivery of the tool.
Burke Dysphagia Screening Tool (BDST) (DePippo et al., 1994) USA	Participants were recruited from a rehabilitation setting (2-8 weeks post-stroke)
Bedside Swallowing Assessment (BSA) (Smithard et al., 1997) UK	Compares the swallow assessments between doctors and SLTs using two different rating forms. Uses different volumes of water as testing mediums in comparison to the SLTs' use of different consistencies. Does not demonstrate what constitutes an 'unsafe' and therefore a 'fail' score. Comparative assessments undertaken on separate days
Timed Test Swallowing (TTS) (Hinds & Wiles, 1998) UK	Validated for use by a neurologist and therefore may not be suitable for use by nursing staff. Outcome measure of documentation of referral to, or intervention by, a SLT does not signify aspiration
Daniels Assessment Survey (DAS) (Daniels et al., 1998) USA	Used within five days of stroke admission by specialist SLTs therefore may not be appropriate for nurses. Scoring system used to identify 'mild' versus 'moderate' or 'severe' dysphagia with VFES used only for comparison in the moderate/severe category. Average time between the clinical swallowing screen and VFES was 48 hours, differences between tests could be due to fluctuation in the swallow function
Massey Bedside Swallow Screen (MBSS) (Massey & Jedlicka, 2002) USA	Research assistants undertook screening therefore the tool may not be suitable for use by nursing staff. Convenience sample: adult, acute stroke patients who were alert, could follow commands, respond to cues and gave informed consent. Subjective opinion that teaspoon and half a glass of water were 'tolerated'
100ml Water Swallow Test (100ml WST) (Wu et al., 2004) Taiwan	Purposefully selected heterogeneous sample of previously diagnosed dysphagia referred for VFES

5.2 Discussion

There are significant differences between studies in relation to terminology, participants included (including differences in age and gender), clinical determinants of dysphagia/aspiration, clinical determinants of swallow speed, sample size, health professionals used in tool validation, training in tool use, comparison groups, the timing of screening tests and the comparative assessment groups and clinical implications for patient management.

5.2.1 Terminology – Dysphagia or aspiration

Inconsistencies in terminology across the studies reflect a lack of precision about what is being assessed and how it is assessed (Reilly et al, 2004) making comparisons between studies difficult. Swallow screening tools ostensibly have ‘risk of swallowing difficulty’ as their primary focus but this has been interpreted by different authors to mean either dysphagia: dysfunction at any stage of the swallowing process, or aspiration: food and fluid entering the airway and moving below the level of the true vocal folds. Table 5.4 identifies the explicitly reported aim of the bedside swallow screening tools.

Table 5.4: Bedside swallow screening tool devised to determine dysphagia or aspiration.

Water swallow test (Wade & Hewer, 1987) UK	Aspiration
50 ml water swallow test (Gordon et al., 1987) UK	Aspiration
3 oz water swallow test (DePippo et al., 1992) USA	Determine if tool was able to appropriately identify patients for VFES i.e.aspiration
Standardised Swallow Assessment (SSA) (Ellul & Barer, 1993, 1994; Perry, 2001a,b) UK	Aspiration
Burke Dysphagia Screening Tool (BDST) (DePippo et al., 1994) USA	Dysphagia
Bedside Swallowing Assessment (BSA) (Smithard et al., 1997) UK	Aspiration
Timed Test Swallowing (TTS) (Hinds & Wiles, 1998) UK	Aspiration and Dysphagia
Daniels Assessment Survey (DAS) (Daniels et al., 1998) USA	Aspiration and Dysphagia
Massey Bedside Swallow Screen (MBSS) (Massey & Jedlicka, 2002) USA	Dysphagia
100ml Water Swallow Test (100 ml WST) (Wu et al., 2004) Taiwan	Aspiration and Dysphagia

Some studies (WST, 50 ml WST, 3 oz WST, SSA, TTS, BSA, 100 ml WST) attempt to identify those patients at risk of aspiration, confining themselves to the identification of swallowing difficulties at the pharyngeal stage of the swallow. Aspiration is confirmed

by clinical determinants and further comparison with specialist instrumental examination, principally VFES or FEES®.

The BSA, MBSS, DAS, BDST, TTS and 100ml WST use clusters of clinical determinants to identify 'dysphagia', for example the patient's conscious level together with posture, respiration, oro-motor function and swallow speed, but use different clusters, e.g. coughing and wet voice quality or VFES, that are primarily indicative of 'aspiration', as a comparison group. The presence of 'dysphagia' as detected by the bedside screen is compared to the presence of 'aspiration'. Other studies use cognitive, motor and clinical history variables as clinical determinants of dysphagia (DAS, BDST).

Although dysphagia is important in relation to nutrition and hydration, there is no acute risk to the patient when compared to the potential risks associated with aspiration. Nurses have other mechanisms, for example oral intake charts, that may further alert nurses to problems with nutritional intake.

5.2.2 Sample group

The 100ml WST used a heterogeneous group of patients who already had a suspected diagnosis of dysphagia. Most studies include specific inclusion criteria of being alert and co-operative, as stroke patients with reduced and fluctuating levels of consciousness are unable to comply with instrumental examinations. However, in the acute phases of stroke, patients' neurological state fluctuates (Smithard et al., 1997), affecting the swallow and allowing aspiration to go undetected by untrained or unaware nursing staff.

The focus of this thesis is the acute stages of stroke, therefore studies including stroke patients at different stages in the stroke pathway, i.e. >72-hours post-stroke or during the rehabilitation (WST, 50mls WST, 3oz WST, DAS, BDST) or outpatient (100ml WST) stage are not appropriate.

5.2.3 The influence of age and gender on swallow presentation and clinical determinant of swallow speed

Average bolus size for young males is 21 ml (Adnerhill et al., 1986) with normal swallowing speed calculated at 0.75 seconds for oral transit, 0.75 seconds for pharyngeal transit and 2-20 seconds for oesophageal transit (Logemann, 1985). The

BDST, TTS and 100ml WST rely on swallow speed as a method of screening for dysphagia, as it is anticipated that individuals with dysphagia will reduce the size of each bolus, take more swallows, and slow the speed of overall intake (Buchholz et al., 1985). However, bolus size, and swallow speed, can vary significantly with age, with 10mls/second considered abnormal in a population >70 years of age (Nathadwarawala et al., 1992; Hughes and Wiles, 1996). Therefore normal older adults will yield similar swallow speeds to younger patients with swallowing difficulties.

Females tend to have slower swallow speeds (Nathadwarawala et al., 1992); testing of the DAS only included males, but gender parameters are not considered during the Water Swallow Screening tests that require continuous, timed water swallows (BDST, 100ml WST, TTS). Using 10mls/seconds as abnormal is likely to bias the results by underestimating the swallow function of the participants.

The authors of the studies using swallowing speed as a means of screening for aspiration fail to consider altered swallow physiology of sequential swallows evoked when drinking at speed.

To compound the issue, the BDST requires the patient to swallow continuously, or to swallow when timed (BSA, TTS, 100ml WST), which exposes the patient with dysphagia to an increased risk of aspiration as material may rapidly enter the airway.

Age, gender and swallow adaptation all potentially bias the results of the timed swallowing screens and should be considered as explanatory variables in further research.

5.2.4 Sample size

Small sample sizes are evident in many of the studies, with four studies (WST, DAS, MBSS and WST) using fewer than 60 participants. Use of small samples may imply poor precision, potentially limiting particular types of patients from being included in the trial. Small sample sizes may restrict the degree to which the results can be generalised to a larger population. Studies using larger cohorts (SSA, BSA, TTS) are appropriate for further consideration. Despite recruiting 200 participants to test the SSA, only 68 complete screening episodes were completed by dysphagia trained qualified nurses.

The study testing the BSA (Smithard et al., 1997) used different numbers of patients in the screening and comparison group (VFES), as some patients were unable to continue to be part of the study owing to deterioration in their medical state. This is unavoidable when conducting clinical trials, but the number of patients excluded from the study are not made available for analysis. The study testing the TTS (Hinds and Wiles, 1998) completed 92 screens in total but not within a 24 hour period after acute stroke admission. Larger cohort studies are required in order to be able to generalise the results to the acute stroke population.

5.2.5 Health professionals used in tool validation

The professional groups undertaking the swallow screening tests varied from a neurologist (TTS), medical practitioner (100 ml WST, BSA), speech and language therapist (BDST, DAS) and research assistants (MBSS). Having professionals other than nurses responsible for undertaking the water swallow screens renders these tests inappropriate for use on a 24 hour basis on an acute stroke population. Not only is their professional knowledge significantly different but their training and experience within the field of dysphagia will differ, making interpretation of clinical determinants of aspiration, and its management, subject to variation. This may make identification, interpretation and management of presenting clinical determinants of aspiration subject to variation across different professional groups. Only the SSA focuses on nurses using and applying, the dysphagia screening tool, but the tool does not offer nurses options for the immediate management of swallowing difficulty.

5.2.6 Training in the use of the dysphagia screening tool

Many studies do not mention the training required to use the screening tests, possibly due to the simplicity of the swallow screening tool involved (WST, 50 ml WST, 3 oz WST, 100 ml WST). In the MBSS and BSA, all professionals involved were registered as specialists in stroke with the implication that training in recognition of clinical determinants associated with aspiration is not necessary.

Only the SSA reports training in the assessment and management of dysphagia, including a theoretical study day and five supervised practice sessions. This level of support may be untenable in the clinical environment, as it would require continuous training of rotating nursing staff. Training in dysphagia has been demonstrated to improve patient outcome (Hinchey et al., 2005), and therefore training given prior to

tool use needs to be assessed in screening studies in order to evaluate the potential impact on patient outcome.

5.2.7 Clinical determinants

In studies making the clinical determinants of aspiration explicit, most screening tools rely on the cough reflex (BDST, 100 ml WST, MBSS, DAS, TTS, SSA, BSA and the Reflex Cough Test) but this relies on the preservation of pharyngeal sensitivity and an intact cough reflex (Mari et al., 1997). Silent aspiration, defined as the passage of material below the level of the vocal cords (Logemann et al, 1999), without any clinical symptoms of coughing (Wakasugi et al., 2008), has been noted as affecting 42% (Splaingard et al., 1988), 39% (Holas et al., 1994), 22% (Daniels et al., 1997), and 8% of patients (Kidd et al., 1993) when comparisons were made with VFES.

Although some studies do not identify the clinical determinants used to determine aspiration during the study (MASA), some studies include an option of 'other concerns' (SSA, MASA, BSA), allowing the person undertaking the study to apply their clinical experience. This may render the tools unreliable in clinical practice.

The TTS includes a qualitative part to the assessment that involves a questionnaire, with eleven questions asked of the patients. This relies heavily on the patients' cognitive and language skills. When compared with the documentation of SLT referral or intervention (considered the gold standard for the purposes of this thesis), the qualitative component of the TTS was found to be less sensitive (73%) and specific (67%) than the quantitative part of the TTS (sensitivity: 97%; specificity: 69%). When the qualitative and quantitative components of the TTS were combined, there was improved sensitivity (100%) but the specificity decreased (52%). The TTS also counts the number of swallows when calculating the clinical determinant of swallow speed. This relies on observation of movement of the thyroid cartilage which may not be observable, and which may need to be palpated in order to note movement.

Where clinical determinants are defined, most studies identify clusters of clinical determinants which, individually, may vary in their sensitivity and specificity. Most include the cough reflex which is recognised as a prime indicator of aspiration (Logemann et al., 1999, Addington et al., 1999), and which effectively increases the sensitivity of the clinical determinant cluster (100 ml WST, MBSS, DAS, SSA, BSA). Further research is required to determine the sensitivity of the clinical determinants of aspiration.

5.2.8 Comparison groups

Comparison groups vary between studies. Some studies rely on patients' verbal accounts of dysphagia to corroborate presence of dysphagia or aspiration (SSA, TTS). However, this outcome measure has been demonstrated to be unreliable owing to lack of patient insight (Parker et al., 2004).

Most studies concentrate on patient outcome relating to aspiration that is assumed to cause a respiratory event, i.e. the incidence of upper respiratory chest infection or pneumonia (BDST, SSA); frequency of recurrent respiratory tract infection (SSA); respiratory difficulties (TTS); airways obstruction (BDST) or death (BDST). However aspiration is not always associated with a respiratory event and poor patient outcome (Huxley et al., 1978; Feinstone et al., 1996; Garon et al., 1997).

Other studies look to comparisons with VFES (DAS, BDST, SSA, BSA, 100 ml WST, MBSS), widely regarded as the 'gold standard' for the identification of aspiration, but patients have to be medically alert and compliant, and resources are not available at every facility (Perry, 2001a). The timing of the VFES studies is not always undertaken at the time of the bedside swallow screen (BSA, 100 ml WST, MBSS) rendering it invalid as a comparison tool owing to fluctuation in swallow function over time.

Studies examining inter-rater and intra-rater scores (MBSS, DAS, SSA, BSA), comparison with summative judgements (SSA), comparison with SLT assessment (BSA) or take a sub-sample of mealtime assessments (BDST, SSA) do not address swallow fatigue. Assessments are undertaken at different time points except for the MBSS which reported blinded randomised screens being undertaken within 2 hours of each other.

Referral to SLT as an outcome measure (TTS, MBSS) suggests that the nursing staff are concerned that the patient is at risk of aspiration, but does not confirm that the patient is actually aspirating. Examination of records to identify if the patient received modified diet (TTS, MBSS) or tube feeding (MBSS) is unreliable as many patients were placed on modified diet due to levels of fatigue, or inability to chew, regardless of aspiration. Additionally, evidence provided by documentation is not always a reliable reflection of clinical practice. Studies using death as an outcome (BDST, TTS) need to substantiate that aspiration was the cause. Although aspiration pneumonia in the elderly was found to be the cause of death in 43% of cases (Langmore et al., 1991), studies need to differentiate between a chest infection and aspiration pneumonia.

5.2.9 Timing of screening tests and the comparative assessment groups

The aim of this programme of study is to develop a dysphagia screening tool for use by nurses that would allow them to identify and actively manage swallowing difficulties in acute stroke patients. Research has demonstrated that swallowing difficulties resolve rapidly in some patients (Smithard et al., 1997). Therefore, swallow screening tools are required to be timely, i.e. within 24 hours or when patients become medically alert prior to oral intake. Studies undertaken several days or weeks post-stroke (WST, 50 ml WST, BDST, TTS, DAS) have limited use in the acute stroke population.

Fluctuations in swallow status also necessitates contiguous comparison studies. Despite claims by some studies (50 ml WST, 3 oz WST, BDST, TTS, 100 ml WST) that the screens were successful in predicting further medical complications, they are not suitable screening tools for nurses to utilise in the acute stroke care setting.

Only two of the identified swallow screening tests assess acute stroke patients within the first 24 hours of stroke, and used timely comparison groups: the MBSS and the SSA. Early recognition of aspiration is essential in order to reduce the incidence of pneumonia, increase quality and cost effectiveness of care (Odderson et al., 1995) and this should be an integral consideration in all research developing and testing swallow screening tools.

5.2.10 Clinical implications for patient management

It is unclear what the consequences for patient management are following completion of some of the tests, as they fail to define an appropriate treatment and management plan. Most of the water swallow tests (SSA, BSA, BDST, MBSS, TTS) screen for the risk for swallowing difficulties or aspiration with an immediate management option of placing patients on either a normal diet or nil by mouth with referral for more detailed assessment. This dictates that patients are waiting indeterminate time periods for further assessment and decisions regarding nutrition and hydration. This contravenes clinical guidelines (ICWP Stroke, 2004) and professionally endorsed frameworks of active management (Boaden et al., 2006). There is a failure on behalf of these authors to recognise the need for immediate prescribed active management following completion of the tool to maintain nutrition and hydration and prevent adverse effects on patient outcome. Conversely, individuals who pass the water swallow screening tools are allowed to have normal diet without prior assessment of their ability to swallow a variety of different textures. These tools fail to recognise altered physiology

that accompanies different consistencies and the potential for aspiration on normal consistencies.

In preliminary studies prior to the development of the BDST, the 3 oz water swallow test was used in a rehabilitation management programme with patients placed either nil by mouth with NG feeding, an adjusted diet of puree and jelly or normal diet. However, authors report two of the six (33%) NG fed patients; seven of the forty four patients (16%) on adjusted diet; and nine of the 130 patients (7%) on normal diet presented with pneumonia when patient outcomes were assessed (Gottlieb et al., 1996).

Support for the use of modified consistencies as patient management comes from a further study where the 3 oz water swallow test was performed immediately following FEES®, where patients were offered three 5 ml boli of pudding consistency followed by three 5 ml boli of milk (Suiter and Leder, 2008). A high sensitivity (96.3%) confirmed that patients who aspirated on the water swallow test also aspirated on FEES®. However, the water swallow test demonstrated poor specificity (41.1%) in that nearly half of the sample group who failed the water swallow test did not aspirate on water when compared to FEES®. It also failed to detect that approximately half the patients could tolerate some form of oral diet. Limitations of this study include sample bias in that patients must be alert and co-operative in order to tolerate FEES®, rendering the advice to prescribe some oral intake following a successful water swallow not applicable to all acute stroke patients. Further methodological flaws are evident in that during FEES®, prescribed bolus sizes of 5 ml were offered; these may not precipitate aspiration to the same extent as uninterrupted swallows of larger boli (average bolus size 19 ml female and 21 ml male). Similarly there would be differences in head posture and swallow physiology during single teaspoon swallows in FEES® and sequential swallows during cup drinking. As discussed previously in this chapter, using FEES® does not allow the investigator to observe aspiration occurring during the swallow as the view is obliterated during the swallow. Despite these concerns, this study presents some evidence that an expanded water swallow test (to include puree consistency swallows) may be clinically useful. Further research is required to assess its clinical utility as a screening tool for nurses in the acute stroke setting.

With reported outcomes of reduction in health care costs (Odderson et al., 1995; Smithard et al., 1996) and improvement in quality of life (McHorney and Rosenbeck, 1998), appropriate intervention should be initiated following completion of swallow screening tests (Westergren et al., 1999, ICWP Stroke, 2004). With due regard to fluctuation of swallow function throughout the 24 hour period (Smithard et al., 1997),

patients would benefit from repeated screening tests that would allow for planning and modifying appropriate nursing care.

Table 5.5: Gugging swallow screening tool (GUSS)

	Researcher	Sample size	Mean Age (range)/ Sex	Sample group	Time of first assessment	Tool	Management following tool	Comparison group	Sensitivity/ specificity
<p>Gugging Swallow Screen (GUSS)</p> <p>(Trapl et al., 2007), Austria</p> <p><i>[prospective cohort study]</i></p>	SLTs vs. nurses	50 total SLT arm 20 Nurse arm 30	74.6 +/- 2.4)0yrs (26-96) 38 male 53 female	Consecutively admitted stroke patients Stroke confirmed by CT or necropsy. Patients omitted if unconscious or choking observed on fluids on the assessment day.	<24 hrs	<p>Subtest 1.: alert (15 mins), voluntary cough, saliva swallow.</p> <p>Subtest 2: 6 x ½ teaspoon pudding</p> <p>Subtest 3: 5,10, 20 ml water, then 50 ml water timed</p> <p>Subtest 4:5 x small bread bolus (swallow required in <10 seconds)</p> <p>Fail: Each subtest is allocated 5 points. If not 100% successful on each subtest tool is terminated.</p>	Oral diet prescribed on point system	FEES	<p>SLTs: Sensitivity 100% Specificity 50%</p> <p>Nurses Sensitivity 100% Specificity 69%</p>

5.3 Expanded water swallow test: Gugging Swallow Screen (GUSS) (Trapl et al., 2007).

At the time of development of the BESST, and during undertaking the programme of work to produce a diagnostically accurate bedside swallow screening tool that used different consistencies as testing mediums, no other such swallow screening tool was available. Since commencing this programme of studies, a further study has been published: the Gugging Swallow Screen (Appendix 13)

The GUSS is a simple, relatively quick and easily administered bedside swallow screening tool currently under development. Despite the high sensitivity (100%) and specificity (69%) for the identification of dysphagia in comparison to FEES® achieved for nurses using the GUSS, results should be treated tentatively as personal communication with the authors suggests that the GUSS was tested in a small, purposefully selected sample of 30 first-ever stroke patients. The neurologist invited selected patients to take part in the study. FEES® followed a neurological examination, the detail of which is not reported. Patients were included if they were suspected of having dysphagia. The patients were conscious, cognitively able to give informed consent, demonstrated postural control, and were able to co-operate with the research assessment process of bedside assessment and FEES®. All the nurses undertaking the GUSS had extensive experience of working with dysphagic stroke patients, and received further training in dysphagia and how to undertake the GUSS.

Whilst the authors (Trapl et al., 2007) suggest that those acute stroke patients passing the GUSS can manage some type of oral intake, further studies are needed on a larger, heterogeneous acute stroke population, and using a range of grades/ experienced staff.

5.4 Conclusion

Dysphagia is a common clinical presentation following stroke with potentially devastating effects on the individual's physical and psychological well-being. In recognition of the need for early identification and management, bedside swallowing screening tools have been developed. The literature presented suggests that researchers have developed screening tools, with water as the basic testing medium, allowing for informed decision making for drinks, but with an arbitrary decision making process in regard to food. The water swallow test appears to be a good predictor of the ability to swallow thin liquids. However, if a patient fails the water swallow test then this results in a potentially unnecessary restriction of oral intake (Suiter and Leder, 2008).

No large scale study identifies consecutively admitted acute stroke patients as the focus of a nurse swallow screening tool that uses a variety of textures together with a defined management plan that allows for nil by mouth, normal diet and a third option of thickened fluid and puree diet. There is a clinical need for a bedside swallow screening tool that can be used with stroke patients prior to oral intake but that can also be used by nurses to monitor fluctuations in swallow function over time.

5.5 Summary

This chapter critically reviews bedside swallow screening tools for health care professionals to use with stroke patients; currently available within clinical practice.

It is important to recognise aspiration prior to oral intake and to have a diagnostically accurate tool that is able to assist nurses to recognise aspiration, and the ongoing recognition of fluctuations in swallow function. A swallow screening tool needs to give nurses the ability to actively manage the patient throughout a 24 hour cycle in order to eliminate the risk of aspiration, and thereby decrease the potential of a poor patient outcome.

The chapter has demonstrated that, despite the plethora of swallow screening tools available, none fulfil the criteria for an acceptable screening tool. There is therefore a need to develop a diagnostically accurate bedside swallow screening tool for nurses to use in routine clinical practice with all stroke patients, including those with fluctuating or reduced levels of consciousness or poor cognition, that considers different consistencies and guides nurses in a clear patient management plan.

Chapter 6 will present the results of a regional survey developed in order to capture SLT advice and nurses' current clinical practice regarding types and volumes of food and drinks used as test materials to identify stroke patients at risk of aspiration.

CHAPTER 6

SWALLOWING SCREENING AND MANAGEMENT SURVEY

This chapter describes the development of a postal survey designed to capture the current clinical environment from the perspective of nurses and SLTs, and the survey's subsequent use.

6.1 Survey design

A survey is a strategy for collecting factual or categorical information from a sample (Aldridge and Levine, 2001) that provides data representative of a population (Neale, 2009). The survey instrument can be defined as a structured schedule used to elicit predominantly quantitative information, by means of direct questions, from informants, either by self-completion or via interview (McColl et al., 2001).

Cross-sectional surveys (Bowling, 2009) collate data from a single time point, allowing the association of variables to be examined. It is therefore suited to observational studies rather than those examining to cause and effect of events or interventions. Retrospective cross-sectional surveys, allows for large numbers of respondents about behaviour, attitudes or events. However in collecting retrospective information from large numbers of people, there is a concern that the sample group may differ in characteristics or the clinical setting in which they work. They may not have access to complete accurate data as they rely on memory or selective recall when answering questions (Parahoo, 2006). Respondents may also misinterpret events which may result in inaccurate data collection.

Longitudinal surveys are analytic, requiring prospective data collection which may be more reliable than asking respondents to recall events. Asking a panel (using the same sample group) or trend (different groups from the same population) at multiple time points, allows for cause and effect relationships to be established. Prospective studies allow respondents to collect more complete and accurate data as they are aware of what data is required in advance. Collection of data from multiple time points, however, may lead to a high attrition rate through respondent refusal over time and inability to trace a mobile sample group.

The quantitative survey was concerned with 'behavioural' variables rather than 'attributes' or 'opinions' (Aldridge and Levine, 2001) or beliefs (McColl et al., 2001) as it

not only requested factual information regarding the respondents' behaviour but also clarified health care professionals' use and knowledge of services (Neale, 2009).

6.2 Development of the Survey

6.2.1 Aim

The aim of the survey was to investigate the need for the development of a diagnostically accurate screening tool for use by nursing staff that identifies swallowing dysfunction for both water and more solid consistencies, and further prescribes appropriate texture modification for the immediate management of swallowing difficulties in stroke patients.

6.2.2 Objectives

In order to ascertain the need for a swallow screening tool that includes screening for and prescribing modified consistencies, it was important to obtain a snapshot of current clinical practice in swallow screening and management in stroke patients. Objectives were considered within a framework of organisational, professional and practise issues.

(i) Organisational issues

- identify if a dysphagia service to stroke patients is offered within the healthcare setting
- confirm the use of a published or locally developed swallow screening tool to identify dysphagia
- establish the respective roles of the different health care professionals in the delivery of dysphagia identification and management in clinical practice

(ii) Professional issues

- which professional group performs swallow screening on stroke patients
- which professional group performs swallowing assessments on stroke patients
- which professional group makes ongoing management decisions
- which professional group delivers training in dysphagia screening

(iii) Practise issues

- which drinks, food and consistencies are used as part of a bedside swallow screening tool

- what volumes of testing materials are used as part of a dysphagia screening tool
- the content and delivery of training courses

6.2.3 Method

A descriptive, retrospective, cross-sectional postal survey was used.

A self-completion questionnaire as part of a postal survey was considered the most appropriate method of obtaining information from large numbers of professionals (Bourque and Fielder, 1995) over a disparate area, working in different locations and different service areas (Neale, 2009). The questionnaires were used in order to collect valid, reliable, unbiased data from a representative sample of respondents (McColl et al., 2001).

A formal protocol was prepared for the development, dissemination, collection and analysis of the postal survey.

Phase 1: Develop a questionnaire in order to ascertain the information required to meet the objectives outlined in the previous paragraph.

Phase 2: Perform an iterative process of pre-tests to isolate difficulties with design and increase efficacy of the main study (Moser and Kalton, 1971).

Phase 3: Questionnaire distribution

Phase 1: Survey development

The survey was developed over a period of 18 months in collaboration with supervisors. The survey consisted of two questionnaires, (for nurses and SLTs respectively) designed to collect quantitative data to inform the objectives previously outlined. The questionnaires (Appendix 14) were designed in order to facilitate completion and achieve a good response rate. Details regarding response rate and steps taken to facilitate this are given in the discussion.

Ethics

Approval from the Multi-centre Research Ethics Committee (Appendix 15) MREC/04/7/009, and University of Central Lancashire Ethics Committee approval was obtained to pilot and undertake the postal survey.

Phase 2: Pre-testing of the survey tool: first cohort of semi-structured interviews

Purpose

Semi-structured interviews were felt to be the most appropriate research tool to obtain information regarding the accuracy of the questions and whether the predicted responses would be sufficient to inform the development of a swallow screening tool.

Method

The survey tool was subjected to stakeholder review (Fink, 2003) by inviting eight purposefully sampled professionals, four SLTs and four nurses, who had various levels of dysphagia training and experience, to undertake semi-structured interviews (Moser and Kalton, 1971; Neale, 2009).

The interviews ensured that the questions would be reviewed by both experts in the field and potential respondents (Fink, 2003). Interview questions could also be modified in response to interviewees' comments and the interviewer would be allowed to clarify or probe further (Aldridge and Levine, 2001). Key themes from the interviews were used to inform a revised survey.

Successive iterative interviews were undertaken until all interviewees responded that the questions were unambiguous, the format comprehensive and no further pertinent information was necessary.

Setting

A local district hospital that provides a dysphagia service across primary and secondary healthcare to stroke patients was identified as able to offer the range of dysphagia trained nursing and SLT staff who work across a variety of locations.

Sampling

The author contacted the Director of Nursing in order to access the register of nurses who had undertaken in-house dysphagia training by the Speech and Language Therapy Department. There were a total of 12 nurses on the register. Similarly a register of eight members of the SLT department who worked across a variety of locations across the acute and community sector and who reported varying levels of dysphagia training was obtained. All candidates were included in the sampling frame (Appendix 16) in order to eliminate any bias but the number of professionals available for sampling was small. This did not allow for simple, systematic or random sampling. Rather the interviewees were purposefully sampled in order to offer a range of opinion resulting from their clinical experience. It was important that the views of the interviewees reflected that of the population that would receive the survey. In order to achieve this, the interviewees' designation, location of work, experience working with the client group and level of dysphagia training was mapped onto a matrix or sampling frame. Four nurses and four SLTs were purposefully identified from the sampling frame. Each professional was identified as providing care for stroke patients either in acute care and/or community care with a collective experience ranging from six months to ten years post-qualification.

All the professionals approached accepted the invitation to be interviewed, with four nurses and four SLTs invited for each stage of the iterative interviews. Different nurses and SLTs were interviewed at each stage of iterative interviews. This small number was chosen so that modifications to the survey could then be re-examined during a second phase of interviewing. Iterative phases of interviews were implemented until the survey was considered comprehensive, able to elicit answers pertaining to the research questions and in an accessible format to facilitate completion and return.

The individual nurses and SLTs on the register were contacted by telephone. They were given a brief overview of the project, informed of the purpose of the survey and asked if they would be prepared to undertake a 10 minute interview with the researcher and to state convenient times, dates and location to undertake the interview.

Participants were then sent a copy of the survey and were asked to complete it, in order to establish that the instructions for completion were clear, and to comment on each question either in writing or by making mental notes prior to the interview. After two weeks, nurses and SLTs were contacted by telephone and were asked if they had received the questionnaire, whether they had completed the questionnaire and whether they were still prepared to participate in an individual interview. A mutually convenient time and date was then arranged.

An interview protocol was developed to establish a core set of questions aimed at evaluating the validity of each question within the survey, to ensure that each question was specific enough to elicit the desired information and focusing on issues related to layout, format, the sequence of questions, ease of completion, instructions in relation to transition questions, semantic and linguistic syntax of the questions, information omitted from the survey that would be pertinent to the study and time taken to complete the survey.

The nurse interviews took approximately 11-15 minutes and were audio-taped and transcribed (Appendix 17). The data that identified the interviewees was removed and comments for each section of the survey were collated (Appendix 18). The SLT interviews took between 15-20 minutes and the anonymised comments (Appendix 19) were again collated (Appendix 20).

Survey modification

The section below describes how the survey was modified in accordance with the comments received from the interviews.

Title page

The nurse interviewees reported that the title page reflected the content of the document, however two of the SLTs felt that the title failed to indicate that the document was a survey and one interviewee was only made aware of the content of the document by the information in the footer at the bottom of the page. The word 'survey' was therefore added to the title page.

Letter of introduction

The nurses reported that the letter of introduction clearly explained the purpose of the survey and that the amount of time completing the questionnaire concurred with the time stated in the introductory letter. Two of the SLTs reported that it took between 10 and 15 minutes to complete the questionnaire; the time stated in the introductory letter was modified accordingly.

One respondent enquired whether the results were going to be made available to those who completed and returned the questionnaire. The feasibility of providing respondents with survey findings were discussed with supervisors. Different methods of delivering

findings were debated: technical difficulties were envisaged in the development of an internet site, there would also be difficulties with updating the site, assigning responsibility for maintaining the site and financial implications. Asking respondents to provide contact details would be time consuming and sending findings through the post would be a costly option. It was decided that findings would be presented at either a national conference, as part of a regional stroke conference or at a local specialist interest group. A further section was added to the second draft of the survey asking respondents to indicate an interest in attending a forum or a specialist interest group for the dissemination of the findings. The researcher's email address was added to the contact details.

Summary of contents

All interviewees found the summary of contents page useful and felt that the example orientated them to the type of information required and the format of the responses. One interviewee felt that the example was useful but not essential. This page remained unaltered.

Section 1

There was unanimous agreement that the section heading and summary of the section content was both accurate and useful. It was decided to define the word 'screen' in the second draft and the definition was included in this section heading in order to offer further clarity for the questions in the section.

Question 1: Two of the four nurses were unsure whether the question referred to them personally or to the department. Two out of the four SLTs reiterated this comment. Two nurses and one SLT also commented that there was insufficient space for further comments. The question was modified to read 'Do you personally offer a dysphagia service to stroke patients?' Further space was allocated to this question.

Question 2: All nurses and SLTs found this question easy to understand and were able to answer the question as it related to their place of work. One of the SLTs felt that more space should be allocated for respondents to elaborate and this was modified in version two.

Question 3: It is at this point that the wording for the two questionnaires changes in order to address the different perspectives of the professional groups involved. Both questionnaires ask if nurses refer patients to SLT for dysphagia assessment. This was acceptable to all interviewees and remained unaltered.

Question 4: Similarly, this question (in both the SLT and the nurse questionnaires) addresses nurse screening but is modified for the two professional groups. This was acceptable to all interviewees and remained unaltered. Two of the nurses who work in the day hospital who do not undertake dysphagia screening ticked 'no' and were then directed to return the questionnaire. Subsequently, they were not offered the opportunity to comment further or express opinions regarding their clinical practice. This was corrected in the second version of the questionnaire by removing the signpost asking them to refrain from answering further questions and return the questionnaire if they responded 'no' to the question. Instead nurses were signposted to move to question 11.

Question 5: This question focussed on ongoing management of dysphagia by nursing staff. All remaining interviewees, two nurses and four SLTs, did not experience any difficulties with comprehending or completing this question and it remained unaltered.

Section 2

The section heading was agreed by all interviewees as acceptable and it remained unaltered.

Question 6: This question asks about the consistencies that SLTs advise nurses to use and asks the nurses directly to identify the textures they use as part of their dysphagia screening. One of the nursing staff felt that she would have preferred the word 'texture' rather than 'consistencies' and that examples should not have been given. No other comments were received regarding the acceptability of the word and it remained unaltered in version 2. One SLT commented that not all consistencies were represented in the examples given which made her question whether her practice was acceptable. The examples were modified in order to include all consistencies; it was hoped this would encourage therapists to give honest answers rather than ones perceived to be acceptable. One therapist questioned whether it was necessary to record actual quantities of food and fluids used in the screening process. As this information was integral to the final development of the swallowing screening tool, it was introduced in the second version of the survey.

Question 7, 8 and 9 for SLT Questionnaire: This set of questions is concerned with nurse compliance with SLT instructions relating to consistencies trialled during the nurse swallow screening. The questions only occur in the SLT questionnaire as the

researcher was unsure how honestly nurses would answer these questions and concerned about possible alienation of the nursing staff who may then fail to complete and return the questionnaire. One generalist SLT stated that she was unable to answer the question as she did not have the training to inform nurses. One specialist therapist commented that she would actively encourage nurses to use different consistencies and to act within the scope of their competence. As the question revealed details of the protocol in different locations within the hospital, and none of the therapists had difficulty understanding or completing the questions, they remained unaltered.

Section 3

All interviewees agreed that the description of the questions in this section was explanatory and the section heading and description remained unchanged. All respondents agreed with the content, structure and format of the questions in this section (SLT questions 10-14 and Nurse questions 7-11).

All interviewees were able to explain where to return the questionnaires to and had no suggestions for further information required in order to obtain a complete view of nurse swallow screening.

Phase 2: Pre-testing of the survey tool: second cohort of semi-structured interviews

A second iteration of nurse and SLT stakeholder interviews was conducted to critically appraise the modified questionnaire. The data collected was progressive, in that there were less critical responses from subsequent interviewees to the modified questionnaire. All interviewees were able to comprehend and complete the questionnaires. The transitional questions clearly directed those interviewees to the next question so no information was omitted from the responses.

There were no further changes made to the nurse and SLT questionnaires (Appendix 21) as the second iteration of nurse (Appendix 22) and SLT interviews (Appendix 23) did not reveal any major suggested changes to the questionnaires and the iterative process of interviews was terminated at this point.

6.3 Phase 3: Survey distribution

6.3.1 Purpose and Survey Design

In order to establish current clinical practice in the identification and management of dysphagia in stroke patients, a postal survey was conducted.

6.3.2 Setting

The survey was undertaken within the North West Region. The North West Region covers a population size of 4.3 million people with a diversity of stroke care delivery models, and within that, a plethora of models of swallow identification and management across regional teaching hospitals and local district hospitals.

6.3.3 Subjects and sampling

The North West Stroke Task Force database was used to identify healthcare professionals who have an expressed specialist interest in stroke care. All professionals within the database were contacted (72 nurses and 51 SLTs). Respondents had previously indicated that they would be keen to be involved in further research when they gave their details to the database and current contact details were up to date (Jackson and Furnham, 2001). Therefore use of this sample, although it is not representative in terms of motivation to complete and return the questionnaire, was practical and was used in order to maximise the response rate.

6.3.4 Ethics

From drafting the initial survey to completing semi-structured interviews, there was an increase in registered professionals on the North West Region Stroke Database. This increase in numbers was highlighted to the Multi-centre Research Ethics Committee together with the revised survey for approval via the 'Notice of Substantive Amendments' procedure. Approval was obtained prior to undertaking the postal survey (Appendix 24).

6.3.5 Methods

The questionnaire and pre-paid addressed envelope was posted to the identified stroke specialist nurses and SLTs from the North West Stroke Task Force Database. In order to enhance the response rate, questionnaires were sent out in September, thereby avoiding the holiday period. A pre-paid addressed return envelope was enclosed with an opportunity to attend a forum in order to receive the findings from the survey. The returned survey results were entered onto a database. Non-respondents were contacted by telephone four weeks following the closing date in order to identify and

address any difficulties encountered in the completion and return of the questionnaire and send a duplicate questionnaire as required, either by email or post.

6.3.6 Results

Eighty five percent (105/123) of the questionnaires were returned; 83% (60/72) of the nurse questionnaires and 88% (45/51) of the SLT questionnaires. Within the nurse group, six responded to the duplicate questionnaire and in the remaining twelve non-respondents, ten had left their departments and two were on annual leave. Of the SLTs three responded to the second questionnaire and of the non-respondents three were on maternity leave, two were in hospital and one had left the department.

Table 6.1: Survey responses regarding organisational issues

Question	Nurse (n=60)			SLT (n=45)		
	Yes	No	Don't know	Yes	No	Don't know
1. Does the Department offer dysphagia service to stroke patients?	n=56 (93%)	n=4 (7%)	Not asked	Not asked	Not asked	Not asked
2. Do you personally screen for dysphagia?	n=39 (65%)	n=21 (35%)	0	n=39 (87%)	n=6 (13%)	0
3. Do nurses use a swallow screening tool?	n=35 (57%)	n=25 (41%)	n=1 (2%)	n=32 (71%)	n=7 (16%)	n=6 (13%)

Table 6.1 shows that the majority (93%) of respondents identified that a dysphagia screening service was available for stroke patients within their locality. The survey confirmed that the majority of nurses contacted (65%) personally screened for dysphagia and more surprisingly a large percentage (87%) of SLTs reported that they personally screened individual stroke patients for dysphagia. There is a discrepancy in reports from the nurses and SLT regarding the use of a swallow screening tool.

Table 6.2 shows that only a small percentage of SLTs (4%) offered screening to all stroke patients. This confirms that in the majority of cases, SLTs do not offer this

service to all stroke patients, but may perform a screen on individual patients. Similarly nurses report that they do undertake screening on stroke patients (Table 6.1: 65%) but the numbers who report screening on all stroke patients in their clinical setting by SLTs is lower (32%). Both nurses and SLTs report that nurses perform dysphagia screening, 65% and 73% respectively, but both healthcare professionals report a limited number undertake ongoing management decisions, 36% and 29% respectively.

Table 6.2: Survey response regarding professional issues

Question	Nurse (n=60)			SLT (n=45)		
	Yes	No	Don't know	Yes	No	Don't know
1. Dysphagia screening offered to all stroke patients by SLT?	n=19 (32%)	38 (63%)	n=3 (5%)	n=2 (4%)	n=43 (96%)	0
2. Do nurses refer to SLT for assessment?	n=51 (85%)	n=9 (15%)	0	n=34 (76%)	n=11 (24%)	0
3. Do nurses do dysphagia screening?	n=39 (65%)	n=21 (35%)	0	n=33 (73%)	n=12 (27%)	0
4. Do nurses do ongoing management?	n=22 (36%)	n=38 (64%)	Not asked	n=13 (29%)	n=32 (71%)	Not asked

Table 6.3 reports the practise issues in the clinical setting. The SLTs advised nurses to use small quantities, sips (49%) of water (73%) as the testing material for swallow screening. Smaller numbers of SLTs (31%) advised nurses to use food as a testing material and 49% advised that nursing staff should vary the consistency of oral trials.

The nursing staff confirm that they use water as a testing medium (60%) but smaller numbers report that they use other fluids, for example juice (3%) or supplements (2%) to screen for swallowing difficulties. Nurses also report that they use food (35%) as a testing material. The SLTs reported that they felt that the nurses were non-compliant with advice regarding drinks (47%), food (67%) and consistencies (45%) as part of the screening tool.

Table 6.3: Survey response regarding practise issues

Question	Nurse (n=60)			SLT (n=45)		
	Yes	No	Don't know	Yes	No	Don't know
1. What testing materials are advised?						
i. Food	n=21 (35%)	0	0	n=14 (31%)	Not asked	Not asked
ii. Drinks	n=36 (60%) water n=3 (3%) juice			n=33 (73%) water		
iii. Varied consistency	n=1 (2%) supplement			n=22 (49%)		
iv. Volume (sips, teaspoon, cup)	n=33 (55%) n=28 (47%)			n=32 (71%)		
2. Do nurses follow advice for testing material?						
i. Drinks	Not asked	Not asked	Not asked	n=15 (33%)	n=21 (47%)	n=9 (20%)
ii. Food	Not asked	Not asked	Not asked	n=8 (18%)	n=30 (67%)	7 (15%)
iii. Consistency	Not asked	Not asked	Not asked	n=19 (42%)	n=20 (45%)	6 (13%)

Table 6.4 shows a discrepancy in the nurse and SLT reports about training given and training received. The nurses report that only 53% had received training whilst the SLTs report that 71% have received training. However, where training had been given, 94% nurses and 97% SLTs report overwhelmingly that SLTs delivered the training.

Table 6.4: Survey response regarding practise issues: training

Question	Nurse (n=60)			SLT (n=45)		
	Yes	No	Don't know	Yes	No	Don't know
1. Have nurses received training?	n=32 (53%)	n=27 (45%)	n=1 (2%)	n=32 (71%)	n=13 (29%)	Not asked
2. Who delivered training?						
SLTs	n=29 (94%)	–	n=1 (2%)	n=31 (97%)	–	0
Nurse	n=1 (3%)			0		
Both SLT and nurse	n=2 (6%)			n=1 (3%)		

There was considerable agreement between both nurses and SLTs regarding the content of the training package (Table 6.5).

Table 6.5: Survey response regarding practise issues: content of training

Question	Nurse (n=60)	SLT (n=45)
Content of training:		
a. Anatomy of the swallow	n=32 (100%)	n=32 (100%)
b. Swallow physiology	n=31 (97%)	n=32 (100%)
c. Screening protocol	n=31 (97%)	n=32 (100%)
d. Signs of aspiration	n=30 (94%)	n=32 (100%)
e. Documentation	n=28 (88%)	n=30 (94%)
f. How to thicken drinks	n=27 (84%)	n=28 (88%)
g. Referral to SLT	n=30 (94%)	n=32 (100%)
h. Practical session	n=26 (81%)	n=30 (94%)
i. Observation of the trainer	n=28 (88%)	n=19 (59%)
j. Supervision by the trainer	n=26 (81%)	n=25 (78%)
k. Assessment by the trainer	n=24 (75%)	n=27 (84%)
l. Other:	n=5 (16%)	n=8 (25%)

6.4 Discussion

The discussion reports the results, and explores the limitations and flaws inherent in the research methodology and pre-test survey.

6.4.1 Phase 1: Survey methodology

The intention of the survey was to gather information regarding current clinical practice rather than make associations regarding cause and effect or interventions. As such a cross-sectional retrospective survey was felt to be appropriate. Concerns regarding error reporting due to inaccurate recall on behalf of respondents were reduced as the survey focussed primarily on current activity rather than past events. Information regarding the content of training courses was the information most susceptible to inaccurate memory recall but this question was the one that had most agreement between SLTS and nurses.

It was also considered that the postal survey might reduce bias as confidentiality and lack of relationship with the researchers have been reported to elicit more honest answers from respondents (McColl et al., 2001).

Current best practice in questionnaire design and procedure was utilised (McColl et al., 2001) in order to limit the influence of potential bias introduced by the respondent's misinterpretation of questions and lack of accuracy from incomplete recall. The survey's strength lies in the standardised format in which each question is asked of the respondent therefore eliminated the influence of leading questions. Conversely this may lead to bias in that misinterpretation and clarity of questions are unable to be rectified once the survey is distributed. The pre-test survey was undertaken in order to reduce bias introduced by unclear or leading questions. Good practice in survey format and design was used (Bowling, 2009; Fink, 2003; McColl et al., 2001; Neale, 2009) to reduce the number of non-returns. It is recognised that poor response rates may also introduce bias as there may be a difference in the knowledge or ethos of the respondents that did not respond that the survey would not account for (Edwards et al., 2003; Cook et al., 2009) which would affect the validity of the study (Edwards et al., 2003).

The survey aimed to achieve a minimum response rate of 75% (Bowling, 2009). The survey was designed in order to maximise the response rate as postal surveys of healthcare professionals are reported to be low and declining (Cook et al., 2009) with many questionnaires reporting a response rate of less than 50% (Jackson and

Furnham, 2001). There are a number of reported reasons for the lack of response which include: professional scepticism; consumerism with respondents exercising their right not to respond as it doesn't directly affect the respondent; survey fatigue and competition from other surveys; intensification of social life and issues relating to the perceived invasion of privacy and a dislike of form filling (Aldridge and Levine, 2001).

A personalised questionnaire (Edwards et al., 2002) with an introductory letter (Jackson and Furnham, 2001; Edwards et al., 2002) together with an assurance of confidentiality and a statement of how the results were to be utilised (Jackson and Furnham, 2001) was developed. The use of the University official letterhead may have further legitimised the survey and encouraged completion and return of the questionnaire (Edwards et al., 2002). It included the aim of the survey and the details about the researcher (Jackson and Furnham, 2001) followed the title sheet which was salient to the respondents, given their self professed specialism of stroke (McColl et al., 2001; Neale, 2009). It gives an explanation of how the recipients' contact details were obtained and offers an explanation of the unique identifier (Neale, 2009) together with an assurance of confidentiality and subsequent anonymity (Jackson and Furnham, 2001). It assures respondents that it is a short questionnaire (Edwards et al., 2002) by confirming the approximate time taken to complete the questionnaire (10-15 minutes) and a four week return date. It also states that recipients who do not respond within the expected four week time period will be contacted for follow up (Jackson and Furnham, 2001; Edwards et al., 2002) by initially sending a second copy of the questionnaire (Edwards et al., 2002) by e:mail for individuals to complete and return online (Asch et al., 1997) , and secondly, by telephone (Asch et al., 1997) as both a reminder to complete and return the questionnaire and also to clarify any difficulties that the recipient may have had with questionnaire completion. Some authors (Cook et al., 2009) in their study of response rates in healthcare professional surveys, promote the use of reminders and urge researchers to investigate non-response rates in order to obtain more valid and reliable data. It was hoped that the reminders, one with a duplicate questionnaire, would increase the response rate (Jackson and Furnham, 2001; Edwards et al., 2002) and also identify those individuals who had not completed and returned the questionnaire owing to misunderstanding or misinterpretation of the questions. Recipients were asked to contact the author if they wanted to be involved in further aspects of the project and to obtain further copies of the questionnaire for completion by interested colleagues. The researcher's contact address and telephone contact details are repeated. Further attempts to increase the response rates were implemented by avoiding recognised holiday periods for distribution (Jackson and

Furnham, 2001) and including a pre-paid addressed envelope (Edwards et al., 2002) for their convenience.

The high response rate to the questionnaires (85% 105/123): 83% (n = 60/72) nurse responses and 88% (n= 45/51) SLT responses, despite the lack of incentive to return the questionnaires, would suggest a keen interest in the subject area and that the design of the questionnaire facilitated easy completion and return. The postal survey response rate for nurses was 'very good' (70-84%) and was 'excellent' (> 85%) for returns from SLTs (Mangione, 1995). Non-respondents were due to the mobile nature of the sample. A more detailed questionnaire to capture respondents' grades, experience, perceived role and potential role within their clinical setting and how this could potentially increase the quality of care and benefit the patient would have been useful. However this would have increased both the length and complexity of the questionnaire, which may have affected the response rate. Instead, the questionnaire length was kept to a minimum in order to further facilitate a completed return, with focussed questions that would inform the development of the screening tool. A larger sample may have been obtained by approaching SLTs and nurses via the Royal Colleges and special interest groups but this would have incurred significantly more costs and may not have yielded a more representative sample.

There were considerable efforts to structure the questionnaires for ease of completion and to increase response rates. Some recommended methods for increasing response rate were not included in the survey owing to time, cost and staffing resources. It is recognised that a 'trade-off' is often required between the collection of optimal data quality and what is 'practicable' within the restraints of the study (McColl et al, 2001). Some of the incentives that were not adopted were fiscal (Edwards et al., 2003; Cook et al., 2009), coloured ink (Edwards et al., 2003), first class stamps or recorded delivery (Edwards et al., 2003; Cook et al., 2009), and pre-notification contact (McColl et al., 2001; Edwards et al., 2003; Cook et al., 2009).

Short, complete sentences were used for the questions, which were designed to be precise, unambiguous and used simple language (Neale, 2009) in order to facilitate completion of the questionnaire (Fink, 2003). Similarly abbreviations, slang, colloquial expressions, negative and two part questions were avoided (Fink, 2003). The wording of the questions was carefully considered in order to elicit honest answers by avoiding loaded questions and avoiding biased words (Fink, 2003). Closed questions were designed so there was no implied correct answer; individuals were offered 'yes', 'no', 'don't know' tick box answers with available space to elaborate on the issue further if

they felt it appropriate. The questions were phrased with the intention that professionals would not feel defensive about their professional status or their clinical practice. This was an important consideration as there has been considerable criticism of the SLT profession in the media regarding their failure to respond quickly to patients with swallowing difficulties (Levenson, 2004). Training nurses to manage dysphagia, although recognised as an essential part of integrated swallowing care (RCSLT, 1998), is still viewed with caution by some professionals (Miller and Krawczyk, 2001).

Pre-test survey

The pre-test study was integral to the success of the main survey because, despite careful development of the survey, when it was exposed to scrutiny by the different professional groups in the pre-test study there were significant changes required in clinical content, layout and format.

'Pilot studies are often undertaken to pre-test a particular research instrument such as a questionnaire'

(Baker, 1994, Page 182-3)

In this study, it was used to assess whether the survey was realistic and workable, to indicate where difficulties could arise in the main study and to improve internal validity by: identifying ambiguities and difficult questions; recording the time taken to complete the questionnaire; discarding unnecessary questions; modifying difficult or ambiguous questions to improve the appropriateness of answers; establishing that replies could be interpreted in terms of the information that was required; ensuring that all questions were answered; checking that there is a comprehensive range of answers on the closed questions; checking questions were in a logical order and that transitional questions are clearly signposted.

It was recognized that there were limitations to the pre-test due to the small sample size; this may have led to unnecessary modifications to the survey on the basis of pilot data.

Pilot study participants were excluded from the main survey in order to eliminate contamination. This will be discussed further below.

Subjects and Sampling frame

Using this database as the sampling frame ensured that all contacts were made through official channels (Jackson and Furnham, 2001). It is acknowledged that a potential flaw of the study is the use of non-probability, opportunistic sampling frame.

The sample group may all share an ethos (Jackson and Furnham, 2001), or approach particular to the region spawned by local conferences and special interest groups. The database ensured that questionnaires were sent to appropriate health care professionals and as the sample had already declared a particular interest in the subject area (Jackson and Furnham, 2001) it was hoped that this would increase the response rate. However, it is this shared interest that make the sample more highly motivated and less than representative of the population as a whole.

Survey results

(i) Organisational Issues

The survey confirmed that the majority of nurses (65% nurses, n = 39) and 74% SLTs, (n = 33), did formally screen for dysphagia as directed by the Clinical Guidelines for Stroke, 2008. These figures are similar to the results of the National Sentinel Stroke Audit (RCP, 2009).

(ii) Professional Issues

Whilst acknowledging that other professional groups (e.g. doctors) are involved in the identification and management of stroke patients, swallow management is likely to be a minor component of their role. SLTs and nurses were the two professional groups chosen for this survey because of their central role in the management of stroke patients.

A potential flaw in the survey was that information on the grades of nurses and SLTs was not requested. Although this may have affected the results of this survey, a survey of SLT dysphagia practice (Smith, 2007) found that in a cohort of 78 SLTs that clinical location, years of experience and dysphagia training did not influence the patterns of response. An assumption can be made that as the participants were drawn from a voluntary database of clinicians with a specialist interest in stroke and had attended specialist post-graduate training in stroke, that the majority of the group were not newly qualified. However any further research should consider this as a potential factor influencing findings.

Further questioning may reveal that the nurses did follow a swallow protocol but have misinterpreted the question. Further questions would be required to confirm this assumption.

(iii) Practise Issues

The survey identified that 73% (33/45) SLTs advised nurses to use water as their swallow testing protocol because it is the identified testing medium in the water swallow tests and there is a perceived danger in nurses offering different testing consistencies that may be potentially aspirated onto lung tissue. Sixty percent (36/60) of nurses used water as the testing medium. However, three nurses used juice, one of which further identified supplements as an alternative choice of testing medium. There is evidence to suggest that the characteristics of oral intake modify the physiology of the swallow (Kuhlemeier et al., 1998), with taste alone (Logemann et al., 1995) demonstrating an increase in the speed of swallow in stroke patients owing to the increase in sensory stimulation. This is only of concern if the patient is assessed on one taste but then offered different tastes throughout the day as the swallow response will vary. The majority of nurses, however, used water as the testing medium as directed by the swallow screen protocol in use in their clinical setting.

As well as altering the taste of fluids, 55% (33/60) of nurses varied the consistency of the testing material and 35% (21/60) offered food in order to simulate a normal eating experience as part of their screen despite not having an evidence base for such a practice. A variety of testing material was used: honey, yoghurt, mousse, ice cream, liquidised diet, puree diet, soft diet, weetabix®, rice pudding, mashed potato, banana, biscuit, bread, meat and vegetables. The survey similarly identified water thickened to a syrup and puree consistency as a testing protocol in order to replicate a puree diet. This suggests that the nurses are prepared to informally test patients on a variety of tastes and consistencies that are available on the ward in order to meet clinical need despite the lack of evidence for safety.

It was expected that the specialist, and presumably experienced, nurses (targeted as participants in the survey), would modify their clinical practice (Benner, 1984). However, using the same framework of 'novice to expert practitioner,' it was anticipated that the nurses' role has relatively recently encompassed dysphagia screening, and that the nurses would follow the screening protocol more closely. Conversely, a considerable number of nurses used different volumes and different consistencies of oral intake from that dictated by the swallow screening tool.

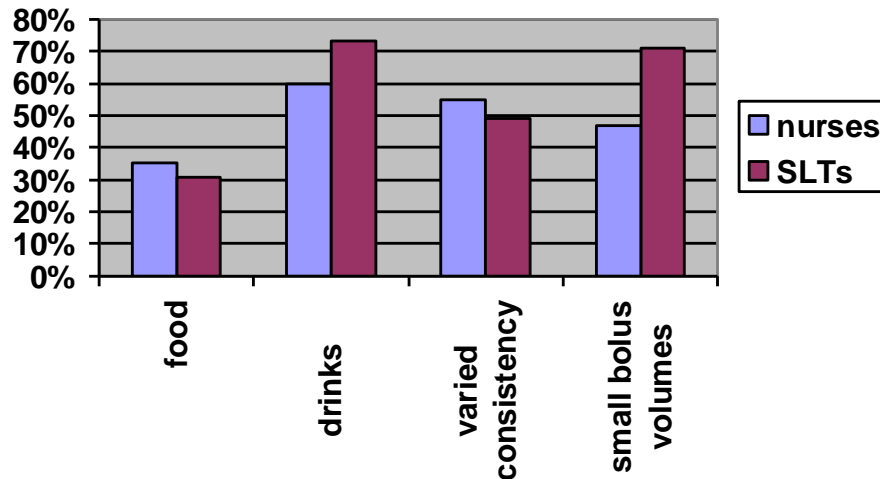


Figure 6.1: Nurse and SLT response to what drink, food and consistencies and bolus volumes are used as part of the swallow screening

Volumes of testing material

The volumes of testing material used as part of the swallow screening tools ranged from 3 teaspoons to 60 ml. Small quantities of water are not indicative of normal swallowing, where average bolus size is 21 ml in the male adult (Adnerhill, 1986), nor are they necessarily sufficient to precipitate signs of aspiration, yet limited volumes of water were offered as part of the screen by 47% (28/60) nurses and 71% (32/45) SLTs. The facial nerve (CN VII) is responsible for motor innervation of the muscles of facial expression and taste over the anterior 2/3 of the tongue. Therefore stroke patients who present with a facial hemiparesis owing to damage of the facial nerve are likely to have loss of taste and therefore have reduced awareness of a small quantity of tasteless material (water) which may be more easily aspirated into the airway.

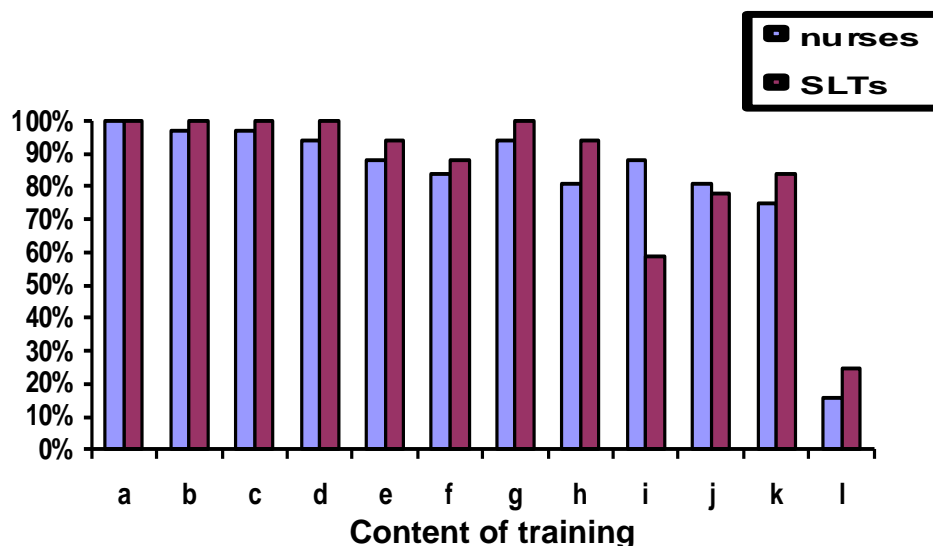
Given the nature of the sampling frame, it can be assumed that participants completing the survey are experienced qualified nurses, an argument further supported by the notion that it is experienced, qualified nurses that would be approached to undertake the training in a clinical setting. This may account for the nurses having the experience and thereby the confidence to use their clinical judgement in modifying formal swallow screening tools. This concept of experienced staff modifying formal clinical procedures is well documented in the literature (Benner, 1984). These results are confirmed by the SLTs: 15 (33%) believed nurses followed their advice for use of drinks, 8 (18%) for use of food and 32 (42%) for the use of consistencies used as part of the swallow screening tool. Perhaps if the nurses were given more ownership of the subject in relation to the training (94% n=29, nurses and 97% n=31, SLTs report SLTs gave the training); swallow screening tool use or how they could adapt or implement immediate management following use of the tool (36% n=22, nurses and 29% n=13, SLTs report

that nurses are involved in ongoing management, with 2 SLTs reporting that management related to consistency modification alone), there may have been more compliance with procedures.

In retrospect, it would have been useful to contact the participants to determine the reasons for their concerns and how they had adapted their training programme to cope with the variations to the swallow screening tool introduced by the nursing staff.

However, in construction of the survey, closed questions were favoured for ease of completion and to encourage questionnaire return. In order to gain some qualitative data, participants were offered an open section for opinions or issues that they felt were not addressed in the questionnaire but this section was not completed.

Where training had been given, 94% nurses and 97% SLTs report overwhelmingly that SLTs delivered the training. Despite there being no nationally agreed formula for dysphagia training, there appears to be uniformity in subject areas for training. The Scottish Intercollegiate Guidelines Network (SIGN, 2004) recommend areas for dysphagia screening should include: underlying medical conditions that may precipitate dysphagia; signs of aspiration and dysphagia; observation of oral intake water swallow test and observation of weight, nutrition and hydration. The Interprofessional Dysphagia Framework (Boaden et al., 2006) proposes the underpinning knowledge base required to fulfil the competencies required for dysphagia screening. Although a formal training package was not produced as part of this project, the knowledge base identified at the level of a Foundation Dysphagia Practitioner would inform a dysphagia screening training programme. Consistency across training programmes could be due to both frameworks being a product of professional consensus and expert opinion. The parameters identified above as part of a dysphagia screening programme arise from the knowledge required to undertake a bedside water swallow screening tool and then refer appropriately to SLT for a detailed bedside swallowing assessment. Therefore the training has emerged from the requirements of clinical practice. As clinical need evolves, subtle changes would arise in a training programme for dysphagia screening.



- a. Anatomy of the swallow
- b. Swallow physiology
- c. Screening protocol
- d. Signs of aspiration
- e. Documentation
- f. How to thicken drinks
- g. Referral to SLT
- h. Practical session
- i. Observation of trainer
- j. Supervision by the trainer
- k. Assessment by the trainer
- l. Other:

Figure 6.2: Comparison of nurse and SLT response to content of training programme

Screening and ongoing management

For the purpose of the survey, screening was defined as ‘a quick check of the person’s ability to swallow’; this was deliberately vague in order to be inclusive of all aspects of the nurses’ role. Further questions were then asked regarding locally and nationally developed tools used in clinical practice. Ongoing management was asked in terms of the nurse personally defining the ongoing dysphagia management plan. Some confusion may have arisen regarding the degree of protocol-led management, consistency modification or independent management plans. Participants were given space to comment but again did not complete the free text components of the survey.

6.5 Conclusion

Stakeholder interviews ensured that the information obtained was detailed and pertinent to the development of the swallow screening tool. The high response rate for the questionnaires suggests that the questionnaire was user-friendly and encouraged people to respond, resulting in data that reflected current clinical practice amongst the sampled staff.

The survey demonstrates the variation in swallow screening across the North West. Most organisations had introduced nurse swallow screening for stroke patients using a simple, validated bedside testing protocol i.e. water swallow test. Similarly most SLT departments had delivered similar training packages regarding identification of aspiration, a practical component of observation of and assessment by SLT trainers, modification of consistencies, documentation and referral to SLTs for a more detailed assessment.

However, more detailed investigation reveals that there is no common swallow screening tool that is acceptable to all organisations. It is still considered the remit of the nursing staff to screen for dysphagia with water as the advised testing medium, possibly due to clinical concern regarding the identification and management of dysphagia in stroke patients. However, there is considerable variation by nurses in the implementation of the tool and the ongoing management of patients, with 55% (33/61) nursing staff using other consistencies and food types in order to more accurately simulate a normal eating environment. This suggests that an evidence-based swallow screening tool that considers both water and puree diet consistency fluids may be clinically acceptable and inform clinical practice.

Although role definition and education has been cited as a reason for nurse resistance and non-compliance with swallow screening (Miller and Krawczyk, 2001), poor co-operation and lack of resources are also considered contributory factors (Head et al., 2007). The Inter-professional Dysphagia Framework (Boaden et al., 2006) uses the national framework in order to give a national mobile workforce a common language with an identified knowledge and skill set. The development of a national training programme that could be taught on nurse pre-registration training programmes (Head et al., 2007) may serve to influence the cultural barriers to acceptance of swallow screening by nursing staff. The development of an acceptable bedside swallow screening tool that allows nurses to identify and immediately manage patients with swallowing difficulties in the short term would contribute to nurses' ownership of swallowing difficulties and contribute to overall cultural change.

Since the completion of this Dysphagia Screening and Assessment Survey in 2005, an email survey has been undertaken (Head et al., 2007) that considers dysphagia screening practices across England and Wales. However it canvases the opinions of dysphagia lead specialists in 52 acute NHS trusts across England and Wales. SLTS were asked if nurses undertook dysphagia screening, provide the grades of nurses undertaking the screening, give reasons for trusts where nurses did not undertake

screening and to provide a copy of the dysphagia screening tool. The survey achieved an excellent response rate of 96% (49), Screening was predominantly the remit of D grade nurses with training time varying from two hours to three days. Wet voice was the main criteria for terminating the water swallow test and placing the patient nil orally. The reasons for some trusts not undertaking screening were the same as those identified in the literature (Miller and Krawczyk, 2001) a lack of staff time and resources and poor co-operation. This survey reports similar high response rates to the survey undertaken as a precursor to the BESST and reports valuable information regarding grades of nurses undertaking the screens together with time required for training. However, it does not address the content of training packages nor does it ask nursing staff to report on the use of other testing materials to water nor their compliance with water swallow test protocol.

Published dysphagia surveys (Martino et al., 2004; Pettigrew and O'Toole, 2007; Logemann et al., 2008) question SLTs regarding their individual dysphagia assessment and management rather than the dysphagia screening practice within their organisation. The survey reported here is the first to consider SLTs' perceptions and expectations of nurse screening and how it is implemented as well as nurses' reports of the dysphagia training they received and their role in the screening process.

6.6 Summary

This chapter has described the development and implementation of a survey to identify the current clinical practice and training in the North West Region in swallow screening and management in stroke patients. The survey demonstrated that nurses did undertake swallow screening but that they adapted the local protocol to be more clinically valuable. The survey results were used to inform the development and diagnostic performance of the Bedside Swallow Screening Tool in the following chapter.

CHAPTER 7

DEVELOPMENT AND DIAGNOSTIC PERFORMANCE OF THE BEDSIDE SWALLOW SCREENING TOOL (BESST)

Chapter 1 outlined government directives urging the extension of knowledge and skills of healthcare professionals in order to meet the needs of patients with swallowing difficulties following stroke. The survey, described in Chapter 6, reinforced the view from both SLTs and nurses that bedside swallow screening was becoming an integral role of nurses. It demonstrated that an expanded water swallow test was being undertaken in some areas without a formal evidence base. In view of the significant detrimental effects of dysphagia in stroke patients and the evidence to suggest that a formal programme of dysphagia screening is effective in improving patient outcome (Hinchey et al., 2005), a screening tool for identification and immediate management of swallowing difficulties that allows for modified oral intake while awaiting specialist assessment was developed as part of this programme of work.

The literature review identified that screening tools are available, but many of these were of limited use because: they do not offer management options other than nil by mouth with referral to SLT for further more detailed assessment; or they have not been validated in a complete sample of stroke patients. Those using instrumental examination as the gold standard were required to limit the type of stroke patients in the sample due to the need for full cooperation with the examination. It is only by using the SLT as the gold standard that all patients requiring screening could be included in the sample. Further difficulties arise in that many screening tools were validated using other professionals (doctors, research nurses and SLTs) rather than the professional group for whom they were intended: nurses on the stroke unit and other nurses caring for stroke patients.

In a study of 121 consecutively admitted stroke patients, approximately 51% presented with dysphagia (Smithard et al., 1997), involving a combination of factors outlined above. These symptoms fluctuated throughout the course of the stroke process. Some symptoms were observed to resolve within seven days with 27% of patients (28/110) remaining at risk. At six months, 8% (6/110) had persistent difficulties, and 3% (2/110) had developed swallowing difficulties (Smithard et al., 1997).

Changes in swallow function can be attributed to a plethora of factors including spontaneous recovery, cerebral oedema, continued bleeding, extension of stroke, further strokes (Perry and Love, 2001) or may simply be associated with swallow fatigue, increased exertion or decreased levels of alertness. Stroke progression and medications may also affect conscious levels or swallow physiology (Smithard et al., 1997).

As swallow function has been demonstrated to alter throughout a 24-hour period, it is important that those involved directly in the ongoing care of the patient are aware of the indicators of dysphagia and realise when swallowing needs formally reassessing. Clinical tools should be simple, robust in the identification of dysphagia, and be able to be used by staff involved in the day-to-day care of stroke patients. Any bedside swallow screening tool should be able to be undertaken on an acute stroke patient, as an initial screen but could usefully be used as an ongoing review tool to monitor the patients swallow function within a 24 hour period following the screen.

Therefore, there was an identified requirement to validate a swallow screening tool undertaken by nurses on a heterogeneous sample of stroke patients against current clinical practice (expert SLT opinion). A screening tool that offers the safe implementation of a modified diet could potentially increase a patient's quality of life. At the same time this potential benefit in quality of life must be tempered against the risk of introducing a further option that could lead to an unacceptable increase in risk to the patient's safety.

This chapter describes the development of a bedside swallow screening tool, the BESST, and a feasibility study to estimate the diagnostic accuracy of the tool when compared with currently accepted clinical practice.

7.1 Aims:

1. To develop a BEdside Swallow Screening Tool (BESST) for use by nurses with all stroke patients with extended immediate management options of nil by mouth, normal oral intake and a further management option of modified oral intake
2. To explore face validity for the BESST using expert opinion
3. To conduct initial testing of the BESST to estimate:
 - a) Sensitivity, specificity, positive predictive values, negative predictive values and efficiency
 - b) Inter-rater and intra-rater reliability
 - c) Comparison of the BESST and usual practice (SSA)

d) Nurses' views of the utility of the BESST

7.1.1 Development a bedside swallow screening tool (BESST) for use by nurses with all stroke patients with extended immediate management options of nil by mouth, normal oral intake and a further management option of modified oral intake.

BESST development:

In the initial stages of development, the main points of discussion centred around the types and order of oral consistencies to be offered during the swallow screening tool. Typically in stroke, the swallow is delayed. Fluids are thickened to increase the viscosity of the bolus. This allows the bolus to remain in the oral cavity and to allow time for the swallow to initiate rather than having thin fluids moving into the pharynx and being aspirated prior to the triggering of the swallow. Modified diet, i.e. puree and thickened fluids, are the easiest consistency to swallow (Swigert, 2000; Trapl et al., 2007) requiring little or no manipulation in the oral cavity. Assessment with a thickened fluid and puree diet would be advantageous in a bedside swallow screening tool as it would allow nurses to offer an immediate management option following completion of the bedside swallow screening tool.

Although thickened fluids and puree diet may be acceptable as part of a bedside swallow screening tool and for immediate management following a screen whilst awaiting a more detailed swallowing assessment, continued use of thickened fluids and puree diet require monitoring as some individuals find thickened fluids unpalatable (Goulding and Bakheit, 2000; Whelan, 2001). This may lead to reduced fluid intake, dehydration, constipation, avoidance of modified texture and a poorly combined diet. Non-compliance with thickened oral intake was investigated in a small study (Whelan, 2001) that recruited 24 newly diagnosed stroke patients requiring thickened fluids to syrup consistency as determined by a SLT using a bedside assessment or VFES. Patients were randomly assigned to powder thickened fluids as part of normal clinical care or manufactured pre-thickened drinks, with staff asked to continue to deliver routine clinical care and record hourly fluid intake measured by calibrated beakers and infusion pumps, and output measured via urinary catheter. Patients were monitored for 14 days. The mean daily thickened fluid intake was 455ml/day, which represents an average of 22% of an individual's daily fluid requirement. This resulted in the use of supplementary fluids which, when prescribed by the medical team, the amount given

(742ml/day) averaged 64% or less of the patient's requirements. This resulted in patients not receiving adequate fluid intake as insufficient amounts were given over too short a period of time. The unpalatability of thickened fluids and consequent non-compliance was only one reason cited for poor fluid intake (Whelan, 2001). The study had no exclusion criteria in an attempt to replicate the clinical environment, therefore aphasic patients were unable to ask for drinks whilst others may have required assistance with oral intake due to inability to hold the cup. Ward staff priorities, lack of staff and relatives not understanding the need for and the correct volume of thickened fluids were cited as further reasons for the poor volumes of intake. A concomitant audit of ward staff compliance with prescribed fluid viscosity revealed that less than 50% of patients received the correct consistency of thickened fluid.

Despite the small numbers involved in this study, it confirms the findings of other studies that report inadequate thickened fluid intake for acute dysphagic stroke patients (Garon et al., 1997; Philip and Greenwood, 2000).

Of further concern is the use of subjective descriptions of viscosity, i.e. honey, custard, pudding etc. within the clinical setting. Interpretation of these terms by individual professionals has been identified as contributing to a lack of specificity in the provision of thickened drinks (Goulding and Bakheit, 2000). Although small numbers were used within this study, the control group (n=10) receiving current clinical practice, received thicker than required drinks in comparison to the study group (n=9) who had drinks thickened using a viscometer in order to accurately deliver the prescribed consistency. Additional concerns are identified with the use of pureed meals which are commonly utilised for individuals with dysphagia (Martin, 1993). However these are less nutritionally dense and tube feeding may be required in addition in order for the patient to achieve their recommended daily allowance (Swigert, 2000).

Studies outlined above have identified some issues in relation to the use of thickened fluids and pureed diets. Whilst acknowledging such potentially limiting risks, from a clinical perspective being able to control swallow function in such a manner has to be considered worthwhile. Therefore the use of thickened fluids and pureed food was included in the development of the bedside swallow screening tool.

There was due consideration to offering a puree consistency prior to water swallow trials, as more patients would be able to swallow this consistency and move to the next swallow trial consistency. Some authors (Trapl et al., 2007; Weinhardt et al., 2008) direct individuals to testing initially with more solid textures as these are easier to

swallow, maintaining their integrity within the oral cavity for a longer period than water and therefore less easily aspirated (Swigert, 2000). However, the sequence in which the consistencies are offered was altered to reflect the usual clinical practice of water swallow screen prior to testing further consistencies in order to aid acceptance of the screen by nursing staff.

A solid consistency (biscuit) was also considered for inclusion in order to identify if the patient had sufficient chewing capacity to safely tolerate a normal diet. However, in early development discussions, nurses felt that this would increase the complexity of the screening tool beyond acceptability. Therefore a compromise of extending the tool as far as a puree consistency was agreed.

BESST pre-pilot version: A pre-pilot version of the bedside swallow screening tool (BESST) was developed (Figure 7.1). It consisted of 3 stages:

Stage 1. Pre-screening stage

Stage 2. Direct swallow trials

a. water

b. modified consistency i.e. thickened water to a semi-solid consistency

Stage 3. Management decision

Stage 1 Pre-screening

The pre-screening stage included clinical determinants of aspiration outlined in Chapter 3. Absence of any of the pre-screening items: consent; alert; trunk control; head control; clear voice quality and the ability to perform a voluntary cough or throat clear, would result in termination of the screen.

In patients with a pre-admission history of pneumonia, nurses were directed to continue with the screen as the pneumonia may have been due to concomitant medical issues rather than aspiration. However they were directed to refer patients for a specialist, more detailed assessment subsequent to screening with the BESST (regardless of their BESST score) to attempt to ascertain if chronic silent aspiration was responsible for recurrent episodes of pneumonia. Once the pre-screening has been completed, if it is directed as safe to continue, the direct assessment of swallowing would be performed.

Stage 2a Direct water swallow trials

The BESST introduces oral trials using a water swallow test. Nurses are directed to give 5 ml of water from an unspouted cup three times in order to identify a risk for aspiration on small bolus volumes prior to offering 50 ml from an unspouted cup. The water was delivered via cup rather than teaspoon as this is a more normal way to take drinks. The clinical determinants in the Standardised Swallow Assessment (SSA) are: absent swallow; coughing; choking; breathless; wet/gurgly voice; other. Informed by Chapter 3, the clinical determinants used in the BESST are: absent swallow; cough/throat clearing; wet voice; reduced laryngeal elevation (determined by palpation); multiple swallows and breath sounds. The clinical determinants of aspiration are not exactly the same between the SSA and the BESST. The SSA has 'breathlessness' and 'other' whereas the BESST has 'breath sounds'. However, there was deemed to be sufficient overlap between the clinical determinants to allow comparison between the two screening tools. If the patient is deemed to aspirate on thin fluids, the rater is directed to continue to offer thickened fluids owing to altered physiology for swallowing and the thickened fluid being potentially an easier consistency to swallow.

Stage 2b Modified consistency swallow trials

The water swallow test was extended by allowing trials of a modified consistency. The patient is then offered one teaspoon of thickened water thickened to a semi-solid consistency. If successful, the patient is offered 100 ml of water, thickened to a semi-solid consistency (to emulate a puree diet), from a teaspoon. Sachets were used to ensure that consistency did not vary on different days and to avoid contamination of the thickener. With each consistency the patient is observed for the following same clinical determinants of aspiration outlined for water trials.

Identification of any clinical determinants of aspiration, are marked on the tool and direct nurses to the appropriate management.

Stage 3 Management options

The management options that allow for oral intake were determined by the safe swallowing of a particular consistency i.e. absence of any clinical determinants of aspiration with that consistency. There were four management options:

Action 1: Thin fluid and liquid diet

(where the patient refused to continue to semi-solid screening)

Action 2: Thin fluids and normal diet

(for patients who passed all parts of the test and could demonstrate up/down jaw and tongue movements and side to side tongue movements i.e. chewing)

Action 3: Thickened fluids to puree consistency, soft/puree diet

(for patients who demonstrated signs of aspiration on thin fluids, passed the modified oral intake and were unable to demonstrate up/down jaw and tongue movements and side to side tongue movements)

Action 4: Nil by mouth

(for patients who failed all oral trials)

No training was offered to the nurses in order to establish if they could undertake the tool without the extensive training programmes integral to most other screening tools. Training requirements may make it difficult to implement a bedside swallow screening tool across an organisation owing to the ongoing commitment required to train a mobile workforce.

Patients Details	Dysphagia Screening Tool	Assessment Details
Log List Number: <input type="text"/>		Assessors Number: <input type="text"/>
Stroke Register Number: <input type="text"/>		Date: <input type="text"/>
		Time: <input type="text"/>

Pre-screening Information: Please tick the box in the 'yes' or 'no' column

	Yes	No
• Consent (Verbal or written)	<input type="checkbox"/>	<input type="checkbox"/>
• Alert (Or rousable from drowsy)	<input type="checkbox"/>	<input type="checkbox"/>
• Trunk Control (Self Maintained or supported in upright position)	<input type="checkbox"/>	<input type="checkbox"/>
• Head Control (Self Maintained or supported)	<input type="checkbox"/>	<input type="checkbox"/>
• Clear Voice Quality	<input type="checkbox"/>	<input type="checkbox"/>
• Can they voluntarily cough or throat clear	<input type="checkbox"/>	<input type="checkbox"/>

***If the patient scores 'No' for any of the above items, DO NOT continue with the assessment. *If the patient has a pre-admission history of recurrent pneumonia within the last 12 months, continue with the assessment and refer to the SLT department.**

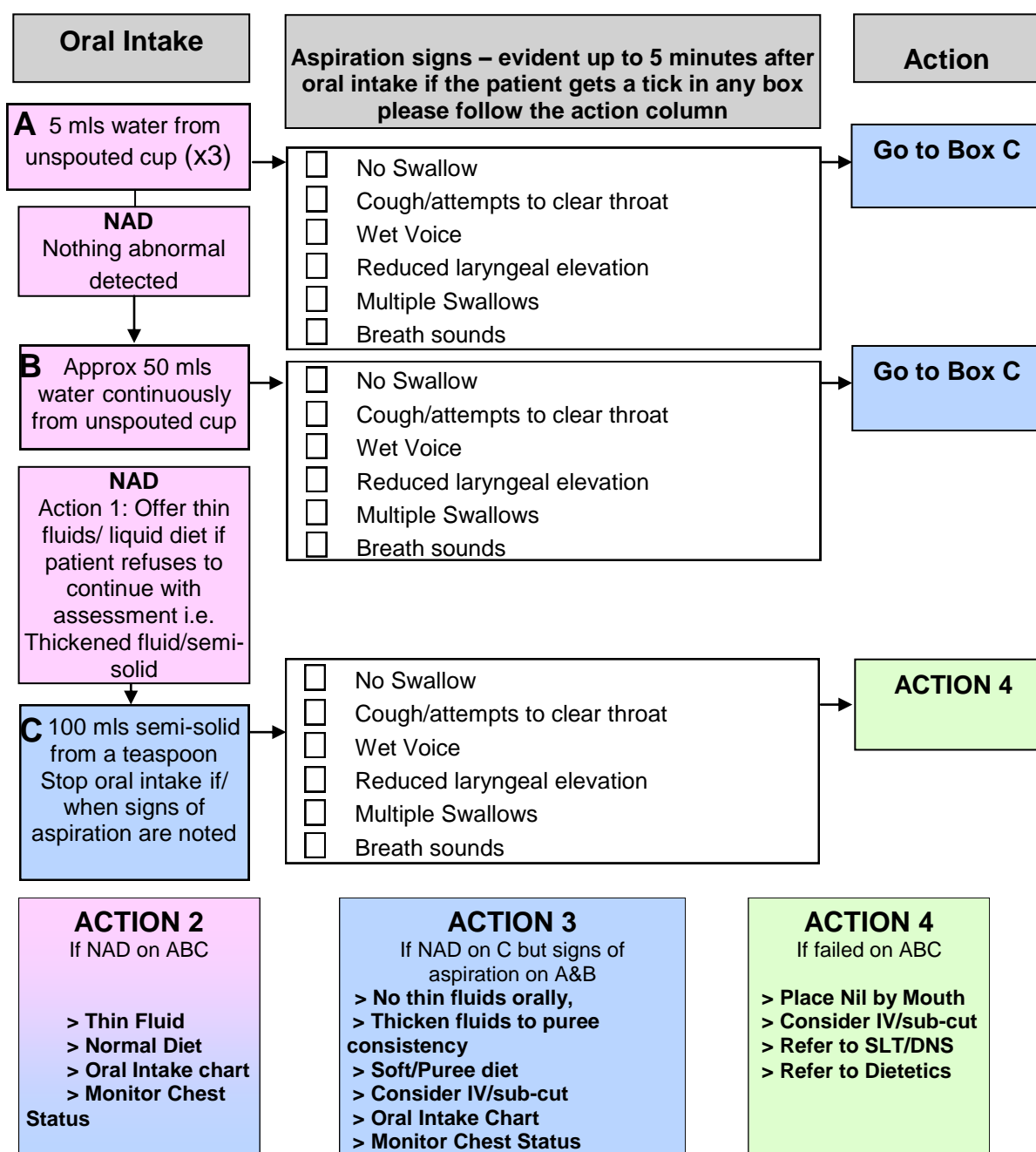


Figure 7.1: Bedside Swallow Screening Tool (BESST) used for the pre-pilot study

7.1.2. Exploring face validity for the BESST from stakeholder opinion

Method

Following development of the BESST for the pre-pilot study (Figure 7.1), an iterative process of semi-structured interviews was undertaken with specialist stakeholders, nurses and SLTs (Appendix 25), in order to check for face validity of the tool. Face validity is defined as the degree to which a measurement appears to reflect the variable it has been designed to measure (Mosby, 2005). This was achieved by undertaking stakeholder interviews (Moser and Kalton, 1971; Fink, 2003; Neale, 2009) with experienced professionals. In order to identify interviewees, a matrix of experienced SLTs from a large teaching hospital and experienced nursing staff was developed and approached for inclusion in the study. The BESST was subjected to stakeholder review by inviting six purposefully sampled professionals, nurses (n=3) and SLTs (n=3), who had various levels of dysphagia training and experience, to undertake semi-structured interviews. Semi-structured interviews were felt to be the most appropriate research approach to obtain face validity of the screening tool in order that discrepancies and concerns regarding dysphagia terminology and accuracy of the content could inform modification and so would inform further refinement of the swallow screening tool to increase clinical acceptability.

Use of semi-structured interviews ensured that the items within the screen were reviewed by both experts in the field and potential users (Fink, 2003). Semi-structured interviews allowed the interviewer to modify interview questions regarding the screen in response to interviewees' comments and to clarify or probe further (Aldridge and Levine, 2001). Key themes from the interviews were used to inform the second round of interviews.

Successive iterative interviews were undertaken following iterative versions of the tool until all interviewees responded that the screen was unambiguous, the format comprehensive and no further pertinent information was necessary.

Key themes or concerns emerging from the initial interviews with nurses and SLTs were identified using thematic analysis (Aronson, 1994). Following data immersion, segments of text were highlighted and coded using constant comparison. Owing to the limited number of interviews and transcripts, data saturation was not considered. The themes were then used to modify the BESST. A second process of interviews with nurses (n=3) and SLTs (n=3) was undertaken (Appendix 26).

Results: pre-pilot BESST stakeholder interviews – first iteration and subsequent modifications made to the BESST

BESST pre-pilot version: The following key themes emerged following the first iteration of semi-interviews.

Patient details: All SLTs requested more information regarding either patient demographics or the assessor name and designation. However, this was not a screening tool that was for use on the wards initially, rather a research tool. The boxes therefore related to information relating to the stroke admission list and the assessors during the research period. Patient and assessor details may be added to the form at the point that the screen is introduced into the clinical setting. No changes were made to the pilot version.

Stage 1 Pre-screening

One nurse and one SLT queried the requirement for verbal or written consent for some acute stroke patients. On further reflection, the issue of consent was considered to be part of all nursing practice rather than specifically dysphagia. The item was therefore removed from the pilot version of the BESST.

Five of the six interviewees expressed concern regarding the definition of 'clear voice quality'. It was defined for the pilot version of the BESST.

Two nurses expressed concern that they would be unsure if the patient had recurrent episodes of pneumonia, but this was considered essential for the nurses to highlight in order for more detailed swallowing assessment to be undertaken. The term 'pneumonia' was altered to 'chest infections' at the suggestion of one of the SLTs.

One SLT expressed concern that immediate action following identification of any of the pre-screening items was not explicit. Nurses would be directed to terminate the screen at this point but the protocol would not direct them to place the patient nil by mouth. This was made clearer in the pilot version.

Stage 2a Direct water swallow trials

No concerns were expressed regarding the volume or container used as part of the water swallowing.

Two SLTs expressed concern that the nurses would not be able to interpret 'reduced laryngeal elevation' as a clinical determinant of aspiration. The terms 'weak and incomplete' laryngeal elevation were felt to be more descriptive by the interviewees and were substituted in the pilot version. One SLT felt that 'multiple swallows' and 'breath sounds' would also be difficult to identify. These determinants were defined for the pilot version of the BESST, with one or two clearing swallows considered normal. 'Breath sounds' were expanded to be more specific and direct the individual to listen more acutely for 'wet breath sounds'.

Stage 2b Modified consistency swallow trials

One nurse and all SLTs commented that they would be unable to interpret 'semi-solid' texture and requested further clarity. Two SLTs were unsure how much 100 ml would equate to in the clinical setting. Both the consistency and quantity of modified oral intake were made more explicit in the subsequent pilot version. The term 'semi-solid' was altered to 'puree', which was determined to be more reliably interpreted, although it was acknowledged that puree may still alter in viscosity as the consistency is dependent on the person delivering the screen. The quantity of puree consistency, 100 ml, was further defined as approximately three tablespoons.

Stage 3 Management options

All interviewees expressed concern regarding the term 'DNS' (dysphagia nurse specialist). This is a specialist role only available in some geographical areas and was therefore removed from the pilot version of the BESST.

Interviewees identified a lack of clarity in some of the terminology used which may lead to different interpretations and therefore render the BESST unreliable. Therefore an information sheet was devised and was made available on the reverse side of the screening tool (Figure 7.3), to offer further guidance to nurses undertaking the screening tool. It contains a glossary and a diagram to facilitate accurate palpation of hyo-laryngeal excursion.

Results: pre-pilot BESST stakeholder interviews – second iteration and subsequent modifications made to the BESST

The second iteration of stakeholder interviews confirmed that the terminology was clear and that the layout and format allowed easy completion. A final suggestion of colour-

coding the tool was incorporated to add further clarity to the layout of the BESST. Minor changes were required in order to facilitate completion of the swallow screening tool by the nurses on the wards. With the majority of concerns addressed in the second version of the BESST (Figure 7.2) further iterations of interviews were not required.

Following the theoretical exploration of the acceptability of the proposed BESST and noting these amendments, the next phase would be to undertake a feasibility study, the results of which would only be used to inform the research in terms of undertaking a larger clinical trial rather than to inform clinical care.

Patients Details Log List Number: <input style="width: 80%;" type="text"/> Stroke Register Number: <input style="width: 80%;" type="text"/>	<h2 style="margin: 0;">Dysphagia Screening Tool</h2>	Assessment Details Assessors Number: <input style="width: 80%;" type="text"/> Date: <input style="width: 80%;" type="text"/> Time: <input style="width: 80%;" type="text"/>
--	--	---

Pre-screening Information: Please	Yes	No
• Alert (Or rousable from drowsy)	<input type="checkbox"/>	<input type="checkbox"/>
• Trunk Control (Self Maintained or supported in upright position)	<input type="checkbox"/>	<input type="checkbox"/>
• Head Control (Self Maintained or supported)	<input type="checkbox"/>	<input type="checkbox"/>
• Clear Voice Quality	<input type="checkbox"/>	<input type="checkbox"/>
• Can they voluntarily cough	<input type="checkbox"/>	<input type="checkbox"/>

*If the patient scores 'No' for any of the above items, DO NOT continue with the assessment and follow ACTION 4
 *If the patient has a pre-admission history of recurrent chest infections, continue with the assessment and refer to the SLT department.

Oral Intake	Aspiration signs (tick)	Action
A 5 mls water from unspouted cup (x3) ↓ NAD Nothing abnormal detected	<input type="checkbox"/> No Swallow <input type="checkbox"/> Cough/throat clear <input type="checkbox"/> Wet Voice <input type="checkbox"/> Weak & incomplete up & forward movement of the larynx <input type="checkbox"/> Multiple Swallows <input type="checkbox"/> Wet breath sounds	Trial puree (Box C)
B Approx 50 mls water from unspouted cup ↓ NAD	<input type="checkbox"/> No Swallow <input type="checkbox"/> Cough/throat clear <input type="checkbox"/> Wet Voice <input type="checkbox"/> Weak & incomplete up & forward movement of the larynx <input type="checkbox"/> Multiple Swallows <input type="checkbox"/> Wet breath sounds	Trial puree (Box C)
C One teaspoon of puree ↓ NAD	<input type="checkbox"/> No Swallow <input type="checkbox"/> Cough/throat clear <input type="checkbox"/> Wet Voice <input type="checkbox"/> Weak & incomplete up & forward movement of the larynx <input type="checkbox"/> Multiple Swallows <input type="checkbox"/> Wet breath sounds	ACTION 4
D 100 mls puree from spoon ↓ NAD Action 1	<input type="checkbox"/> No Swallow <input type="checkbox"/> Cough/throat clear <input type="checkbox"/> Wet Voice <input type="checkbox"/> Weak & incomplete up & forward movement of the larynx <input type="checkbox"/> Multiple Swallows <input type="checkbox"/> Wet breath sounds	ACTION 4

ACTION 1 If NAD on ABCD and can demonstrate up/down jaw movement & side to side tongue movement. <ul style="list-style-type: none"> Thin Fluid Normal Diet Oral Intake chart Monitor Chest Status 	ACTION 2 If NAD on ABCD <ul style="list-style-type: none"> Thin Fluids Puree Diet Oral Intake Chart Monitor Chest Status 	ACTION 3 If NAD on C&D but signs of aspiration on A&B <ul style="list-style-type: none"> Remove the bolus No fluids orally, thicken fluids to puree consistency Soft/Puree diet Consider IV/sub-cut Oral Intake Chart Monitor Chest Status Refer to SLT Refer to Dietetics 	ACTION 4 If failed on ABCD <ul style="list-style-type: none"> Remove Bolus Place Nil by Mouth Consider IV/sub-cut Refer to Dietetics
--	---	---	---

Figure 7.2: Bedside Swallow Screening Tool (BESST) used for the pilot study

Information Sheet

In order to screen for dysphagia and act appropriately, please follow the arrows in the flow diagram overleaf. You should be directed to choose one action box at the bottom of the page as a result of your screen.

Pre-screening Information

Alert

The patient should sufficiently alert to be able to co-operate with the assessment. You should be able to rouse the patient who is in a drowsy state for an assessment of their ability to swallow food and drink.

Trunk control

The patient should be able to sit upright or be stable when given external support either by the chair, bed or supported by pillows.

Head control

The patient should be able to maintain their head upright or be stable when given external support either by the chair, bed or supported by pillows.

Clear Voice quality

The patient should have a clear voice quality. It should not sound 'wet' or 'gargly'. This is an indication that the patient is not managing to swallow their own saliva and that the saliva is entering the airway. You may get this information by listening to the patient's voice quality or by asking them to say 'ah'.

Voluntary Cough

Ask the patient to cough. You should be able to hear the cough clearly, as it is a protective mechanism to prevent food and drinks entering the airway.

Pre-admission history of recurrent pneumonia

Sometimes the patient has no signs of aspiration but develops persistent, recurrent chest infections. This may indicate that small amounts of food and drink are entering the airway. This should be referred to the speech and language therapy department for a more detailed assessment.

Oral Intake Column

Liquids from unspouted cup

When taking liquids from a cup it is important that the individual does not put their head backwards to get the liquid from the bottom. They should keep looking forwards with their head upright when they are swallowing.

Puree

100mls of puree is equivalent to 3 tablespoons.

Aspiration signs column

If you observe any of the signs of aspiration then you should not continue with the assessment and should follow the instructions in the action column.

In a 'normal swallow', the Adam's apple moves up and forward by approximately 2 cm. You can feel this by placing your fingers on the throat. Put your index finger under the chin, to feel the tongue moving. Put your middle finger on the hyoid bone (see diagram) and your third finger on the Adam's apple (see diagram). Ask the patient to swallow. If the hyoid and Adam's apple movement up and forward is weak or incomplete the muscle at the top of the gut will not open and food and drink will go into the airway instead.

Multiple swallows

If the patient takes several swallows it may indicate that some of the food and drink is sticking in the throat and the patient is unsuccessful in trying to clear it. One or two swallows per mouth full is considered normal.

Wet breath sounds

Food or drink has entered the airway if the patient's breathing sounds wet or rattling after the swallow.

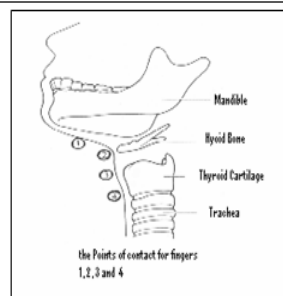


Figure 7.3: Information Sheet for the Bedside Swallow Screening Tool (BESST) used for the pilot study

7.1.3. Identifying the feasibility of undertaking a further validation study

Setting

The feasibility study was undertaken at an acute stroke unit in an inner city teaching hospital serving a population of 250,000.

Subjects and sampling

Inclusion criteria: stroke patients with first or recurrent acute stroke early after the event or at a later point in their hospital stay if a marked deterioration in medical status has occurred. Patients who present either with or without a facial hemiparesis, with or without a hemiparesis and with or without a history of recurrent chest infections.

Exclusion criteria: Those with aspiration pneumonia, or those in a state of agitation, confusion or distress.

Ethics

Ethical approval was given (Appendix 27) to undertake testing of the BESST in the clinical setting. Patients who agreed to be approached to participate in the study by the Research SLT were allowed a maximum of 12 hours to consent to inclusion in the study. Consent needed to be gained in a timely fashion owing to the clinical need for intervention regarding nutrition and hydration. Witnessed patient consent and relative assent was sought if the patient was unable to give written consent. This was in keeping with ethical requirements at this time.

Method

Twelve acute stroke patients admitted to the stroke unit were identified. It is difficult to make an assessment regarding the generalisability of the clinical characteristics of such a small sample and the population from which it is drawn. Instead, the purpose of the pilot study was to reflect the full range of management options in the pilot tool; therefore, patients were purposefully selected (by the SLT) to reflect the range of swallow dysfunction and not necessarily stroke severity, per se.

The 12 stroke patients each received contiguous, but independent, swallow screens from one SLT (used as the gold standard for the purposes of this study) using a

conventional bedside assessment, one stroke specialist nurse (N1) and one research nurse (N2). In order to explore inter-rater reliability patients were rated for swallowing problems at their bedside by the SLT, who used his clinical judgement, and by the two nurses who used the BESST. The nurses were asked to follow the instructions on how to use the tool (available on the back of the tool) to guide use. Neither nurse had experience of assessing dysphagia in patients with neurological problems, and the nurses were therefore required to follow the BESST without being able to draw on previous experience. All used the same four management options of 'normal', 'soft diet', 'thickened fluids' and 'NBM'. The procedure was repeated on all patients on the following day in order to explore intra-rater reliability. In order to minimise the effects of fluctuation in the patients' medical state, the SLT (gold standard) identified changes in patients' status by discussion with nursing staff and examination of the medical notes and nursing cardex prior to his assessment. Any patients who demonstrably deteriorated or improved had their data excluded from the assessment of intra-rater reliability.

All raters were asked to record contemporaneous reasons for their decisions as well as to record any potential bias that may have influenced their management decision, e.g. drinks on bedside cabinets or clinical dilemmas, for example whether or not to continue assessment if the patient coughed whilst trying to swallow water (Appendix 31).

In order to minimise the effects of swallow fatigue upon the results from repetitive screens over a 30 minute period, the raters' order of assessment was randomised. This was achieved by using blocks of six, allowing each of the raters undertaking the screen to be first in the list once, second in the list once, and third in the list once, i.e. 1, 2, 3; 1, 3, 2; 2, 1, 3; 2, 3, 1; 3, 1, 2; 3, 2, 1. The sequences were placed in opaque envelopes and shuffled. One nurse selected an envelope (from the block of six) to identify the order of screens for a patient. All raters were blind to each others' ratings.

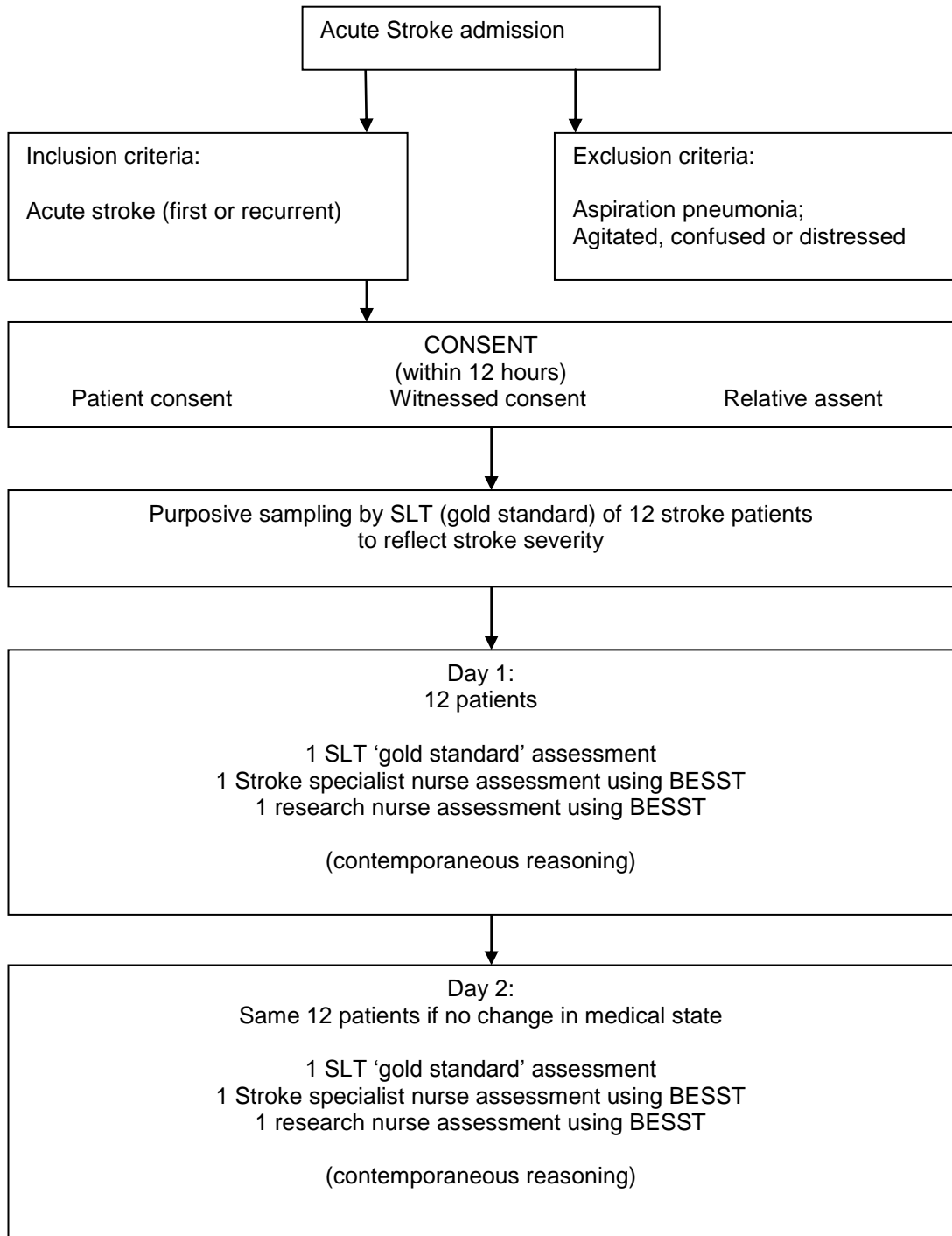


Figure 7.4: Protocol for pilot study

Results

Patients assessed by the SLT and the Nurses (N)

Table 7.1 shows that according to the SLT there was a reasonable degree of variability of ratings on both days. However, both nurses tended to be more cautious in their ratings and rated many more patients as nil by mouth.

Table 7.1: A summary of ratings made by the SLT and the two nurses on the two days of the study. Each cell shows the number of ratings made by a rater

	Day 1			Day 2		
	SLT	N1	N2	SLT	N1	N2
Normal	5	3	3	5	2	2
Soft diet	3	0	0	3	0	0
Thickened fluid	1	1	0	1	2	1
Nil by mouth	3	8	9	3	8	9
Total	12	12	12	12	12	12

D1 = day one; D2 = day two.

The diagnostic performance of the tool was assessed by comparing the ratings of the SLT on day one with the nurses' ratings on day one. The results were similar on the two days, so the results for day two are not presented. The agreement between the SLT and N1 can be seen in Table 7.2. In the table, cells to the left of the diagonal (descriptor) represent an impact on clinical care that puts the patient potentially at risk. In contrast, cells to the right of the diagonal (descriptor) represent an impact on clinical care that does not put the patient at risk but which might be considered to reduce their quality of life.

Table 7.2: Comparison of SLT ratings with N1 ratings on day one

SLT \ N1	Normal	Soft diet	Thickened fluid	NBM	Total
Normal	3	0	0	2	5
Soft diet	0	0	0	3	3
Thickened Fluid	0	0	1	0	1
Nil by mouth	0	0	0	3	3
Total	3	0	1	8	12

Analysis of these data revealed:

Percentage Agreement = 58.3%;

Kappa = 0.42

7.1.3.a Sensitivity, specificity, positive predictive values, negative predictive values and efficiency

Sensitivity is defined as the proportion of a group of patients (rated as modified diet or nil by mouth) correctly identified as cases (dysphagia) by the test, and specificity is the proportion of a group of non-case patients (rated as normal diet) correctly identified by the test. Sensitivity and specificity are not affected by the prevalence of the problem in the population. The positive predictive value (PPV) is the likelihood that an individual with a positive test (rated as modified diet or nil by mouth) has dysphagia. The negative predictive value (NPV) is the likelihood that an individual with a negative test (rated as normal diet) does not have dysphagia. PPV and NPV are influenced by the proportion of people in the population with the problem. The difference between the positive and negative predictive values (when the prevalence of a condition in a given population is taken into consideration) indicates the incremental gain (gain in diagnostic accuracy) obtained by using the test rather than by guessing (Griner et al., 1981). Knowing the incremental gain allows professionals to understand how the test may perform in a cohort (Griner et al., 1981). The overall accuracy of the test (the proportion correctly rated as having dysphagia or not) is the efficiency.

To estimate the sensitivity, specificity, PPV, NPV, and the efficiency of the tool, the data were collapsed into two categories. A normal category, which included the ratings of normal, soft diet and thickened fluid, and a nil by mouth category. The results of collapsing the data are summarised in Table 7.3.

Currently, the swallow screen used in practice by nurses would result in a rating of either normal diet or nil by mouth. The aim of the BESST is to promote ratings other

than nil by mouth in circumstances where it is safe for the patient to take some form of modified diet. This would mean that the patient was not put nil by mouth unnecessarily. The data were therefore collapsed in this way to identify the number of ratings other than nil by mouth.

Table 7.3: Comparison of SLT ratings with N1 ratings on day one, when the data were collapsed to form two categories

SLT \ N1	Normal	Nil by mouth	Total
Normal	4	5	9
Nil by mouth	0	3	3
Total	4	8	12

Table 7.3 shows that when N1 uses the tool they tend to be cautious, rating five patients as nil by mouth when the SLT has rated them as normal. This approach may reduce the risk of aspiration, but in the long term, may also introduce a risk of malnutrition or dehydration. Perhaps more importantly, when using the tool the nurse did not rate anyone who should have been nil by mouth as able to have a normal diet. If the tool had been used to direct management, then, patients would not have been put at risk of aspiration.

The agreement between the SLT and N2 can be seen in Table 7.4.

Table 7.4: Comparison of SLT ratings with N2 ratings on day one

SLT \ N2	Normal	Soft diet	Thickened fluid	Nil by mouth	Total
Normal	3	0	0	2	5
Soft diet	0	0	0	3	3
Thickened fluid	0	0	0	1	1
Nil by mouth	0	0	0	3	3
Total	3	0	0	9	12

Analysis of these data revealed:
Percentage Agreement = 50.0%;

Kappa = 0.29

Table 7.5: Comparison of SLT ratings with N2 ratings on day one, when the data were collapsed to form two categories

SLT \ N2	Normal	Nil by mouth	Total
Normal	3	6	9
Nil by mouth	0	3	3
Total	3	9	12

Table 7.5 shows that when N2 used the tool they also tended to be cautious, rating six patients as nil by mouth when the SLT has rated them as normal. As with N1, the nurse did not rate anyone who should have been nil by mouth as able to have a normal diet.

The cautious approach by both nurses has contributed to the high sensitivity but low specificity of the tool, which is summarised in Table 7.6

Table 7.6: Sensitivity, specificity, Positive Predictive Value (PPV), Negative Predictive Value (NPV) and efficiency of BESST when used by nurses compared with the SLT

	Successes	Failures	Total	Proportion	Lower CI	Upper CI
SLT vs. N1						
Sensitivity	3	0	3	100%	%	%
Specificity	4	5	9	44.4%	%	%
PPV	3	5	8	37.5%	%	%
NPV	4	0	4	100%	%	%
Efficiency	7	5	12	58.3%	%	%
SLT vs. N2						
Sensitivity	3	0	3	100%	%	%
Specificity	3	6	9	33.3%	%	%
PPV	3	6	9	33.3%	%	%
NPV	3	0	3	100%	%	%
Efficiency	6	6	12	50%	%	%

7.1.3.b Inter-rater and intra-rater reliability

The inter-rater reliability was assessed between N1 and N2 on day one and day two. The levels of agreement were similar on the two days, therefore only the raw data from day one are presented.

Table 7.7: Comparison of the ratings of the two nurses on day one

N1 \ N2	Normal	Soft diet	Thickened fluid	Nil by mouth	Total
Normal	3	0	0	0	3
Soft diet	0	0	0	0	0
Thickened fluid	0	0	0	1	1
Nil by mouth	0	0	0	8	8
Total	3	0	0	8	12

Analysis of these data revealed:

Percentage Agreement = 91.7%;

Kappa = 0.81

Table 7.7 shows excellent inter-rater agreement between the two nurses on day one. The ratings were generally either 'normal' or 'nil by mouth.'

Before exploring intra-rater reliability, those patients who were rated the same on the two days by the SLT were selected for analysis.

Table 7.8: SLT ratings on day one and day two

GS1 \ GS2	Normal	Soft diet	Thickened fluid	Nil by mouth	Total
Normal	5	0	0	0	5
Soft diet	0	3	0	0	3
Thickened fluid	0	0	1	0	1
Nil by mouth	0	0	0	3	3
Total	5	3	1	3	12

Analysis of these data revealed:

Percentage Agreement = 100%;

Kappa = 1

Table 7.8 shows that the SLT rated all patients the same on both days. Therefore, all patients were included in the assessment of intra-rater reliability. The SLT rated at least one patient in each management option; the rating most often used was 'normal'.

Table 7.9: N1 ratings on day one and day two

Day one \ Day two	Normal	Soft diet	Thickened fluid	Nil by mouth	Total
Normal	2	0	0	1	3
Soft diet	0	0	0	0	0
Thickened fluid	0	0	1	0	1
Nil by mouth	0	0	1	7	8
Total	2	0	2	8	12

Analysis of these data revealed:

Percentage Agreement = 83.3%;

Kappa = 0.67

Table 7.9 shows the intra-rater agreement for N1. The nurse made a majority of their ratings as nil by mouth. For N2, the distribution of data was similar, resulting in a percentage agreement of 83.3% and a Kappa of 0.58.

7.1.3.c Comparison of BESST and usual practice (SSA)

The clinical determinants of the SSA are subsumed within the BESST. The BESST includes further clinical determinants that were determined by the literature outlined in Chapter 3. Comparisons were made between the two tests by analysing the raw data and determining what action plan the raters would have taken given the clinical determinants that they observed.

To test further the diagnostic performance of the BESST, the ratings of the management options from the SSA were compared with the ratings of the management options from the BESST. The comparisons are outlined in the four tables below.

Table 7.10: Comparison of ratings on the SSA and BESST by N1 on day one

BESST \ SSA	Normal	Soft diet	Thickened fluid	Nil by mouth	Total
Normal	3	0	0	5 [^]	8
Nil by mouth	0	0	1 [*]	3	4
Total	3	0	1	8	12

*SLT rated as: thickened fluid

[^]SLT rated as: normal = 2, soft diet = 2, nil by mouth = 1

Table 7.11: Comparison of ratings on the SSA and BESST by N2 on day one

BESST \ SSA	Normal	Soft diet	Thickened fluid	Nil by mouth	Total
Normal	3	0	0	2 [^]	5
Nil by mouth	0	0	0	7	7
Total	3	0	0	9	12

[^]SLT rated as: normal = 1, soft diet = 1

Table 7.12: Comparison of ratings on the SSA and BESST by N1 on day two

BESST \ SSA	Normal	Soft diet	Thickened fluid	Nil by mouth	Total
Normal	2	0	2	4 [^]	8
Nil by mouth	0	0	0	4	4
Total	2	0	2	8	12

[^]SLT rated as: normal = 3, soft diet = 1

Table 7.13: Comparison of ratings on the SSA and BESST by N2 on day two

BESST \ SSA	Normal	Soft diet	Thickened fluid	Nil by mouth	Total
Normal	2	0	0	4 [^]	6
Nil by mouth	0	0	1 [*]	5	6
Total	2	0	1	9	12

*SLT rated as: soft diet

[^]SLT rated as: normal = 3, soft diet = 1

The data from Tables 7.10 through 7.13 raise three issues. Firstly, that the nurses did not often use the soft diet or thickened fluid option. Secondly, when they did use the thickened fluid option, this was a safe option compared with the SLT. Thirdly, that a

number of patients were rated as nil by mouth using the BESST but normal according to the SSA. This led to an exploration of the raw data where the BESST rating was nil by mouth and the SSA was normal diet.

Preliminary findings indicate that there were two patients who were rated nil by mouth by the BESST and normal by the SSA on both days by both nurses. Furthermore, on day two, both nurses rated a further two patients as nil by mouth using the BESST and normal using the SSA. The SLT had rated these patients as normal diet using his own assessment. Therefore, in a majority of cases, the same patients were the source of the discrepancies between the tools. In these cases, the SLT had determined that the resulting cough on puree consistency was a dry cough as opposed to a cough in response to aspiration and therefore placed the patient on normal diet. The nurses observed a cough, and regardless of the quality of the cough, followed the BESST and placed the patient nil by mouth.

7.1.3.d Nurses' views of the utility of the BESST

The contemporaneous decision making (Appendix 28) of the nurses suggested that they had four main areas of concern when implementing the screening tool: confidence; format; interpretation of terms; too many management options.

Nurses were not confident enough with the BESST to rate people as suitable for soft diet or thickened fluid. This is exemplified by some of their comments:

"It does get quite difficult and you really do have to think quite carefully about it, it's not actually very simple really from my point of view"

"...felt a bit better today about doing the test a second time"

Similarly, concerns regarding the format of the tool were expressed:

"Using a new form it can take few times to actually get used to using how it's all laid out"

"I'm also finding the sections A, B, C and D having quite a lot of information in them and can be quite easy to go wrong when following through like A and then going to box C and then A, B, C and D are not clearly standing out initially"

“The middle section does appear to be a little sort of more fiddly especially when you get to the different actions that you are supposed to go to”

Interpretation of the terms used within the form also caused some concern when the form was utilised in clinical practice, despite the lack of concern from the stakeholders in the face validity examination of the screen:

“...was a bit confused about ‘cough stroke throat clear”

“...multiple swallows, I ticked this box because he took two swallows but I still wasn’t sure whether multiple swallows was three or more swallows”

Having multiple options available appeared to cause further consternation on behalf of the nurses:

“Following actions 1, 2, 3 and 4 is really complicated when you are looking for NADs at various things and whether or not they’ve got up or down jaw movements it does get quite difficult and you really do have to think quite carefully about it”

7.2 Discussion

This section provides a synopsis of the results from the pilot study. It explores the potential diagnostic accuracy of the BESST compared to the bedside clinical assessment of the SLT thereby allowing patients to have their swallowing managed within the acute stages of stroke rather than waiting for further specialist assessments by SLT. A larger validation study would facilitate further examination of the advantages and limitations of the BESST when compared to nurses’ current clinical practice, i.e. using the water swallow screening tool (SSA).

The pilot was integral to the development of the BESST because it highlighted several areas of study methodology and content of the tool that would potentially improve the diagnostic accuracy of the BESST.

7.2.1 Sample group

The pilot aimed to make the sample representative of the range of severity of dysphagia in the acute stroke population by restricting the exclusion criteria, broadening the inclusion criteria and purposeful sampling by the SLT. Other studies, including the GUSS (Trapl et al., 2007), excluded patients who were not medically alert and co-operative and those with cognitive or language difficulties. However, practical considerations regarding time constraints and recruitment required modification of the approach to sampling to allow for consecutively admitted stroke patients in the validation study.

7.2.2 Sensitivity and specificity

In order to be clinically effective, the BESST needs to be able to accurately identify patients with aspiration (high sensitivity) whilst recognising all those patients who do not present with aspiration (high specificity). The BESST demonstrated excellent sensitivity (100%) with both N1 and N2 when compared to the SLT. The specificity demonstrated by both N1 (44.4%) and N2 (33.3%) was poor. The BESST pilot results do not compare favourably with the specificity of 90% identified in the SSA (Perry, 2001a,b) and that of 69% identified in the GUSS (Trapl et al., 2007). The low specificity may be a result of the nurses being overcautious, placing six patients nil by mouth compared with the SLT rating of normal diet. In this pilot the use of the BESST may have overestimated the number of patients at risk of aspiration.

7.2.3 Changes in methodology

The range of ratings by the different raters demonstrate that the nurses tended to rate the patients as either normal or nil by mouth, tending to rate more patients nil by mouth. They made limited use of the middle ratings of soft diet and thickened fluid. This tendency to revert to usual clinical practice had consequences when diagnostic performance of the BESST was tested. It was found to have excellent sensitivity but relatively poor specificity. The conservative approach, by both nurses, led to a high proportion of false negatives, which explained the low specificity of the BESST. Thus, where the nurses were certain that a patient did not have a swallowing problem they were confident enough to rate the patient as able to have a normal diet. However, as soon as a patient's response to the BESST suggested some sort of swallowing problem, the nurses moved swiftly from normal to nil by mouth, despite the presence of a potentially more appropriate management option, e.g. soft diet. Both nurses behaved similarly with the BESST and therefore had good agreement on ratings of normal or nil

by mouth. This meant that the BESST had good intra- and inter-rater reliability when comparing nurses with each other.

In order to address the lack of confidence demonstrated by the nurses in their contemporaneous reasoning for management options in the feasibility study, it was decided to allow the nurses to discuss their findings with the SLT following the completion of the BESST when conducting the main study. The aim was to more accurately reflect the clinical environment and to increase the nurses' learning and confidence over time whilst still removing the time constraints of training nurses in dysphagia. This is more reflective of clinical practice in which the BESST would be utilised.

7.2.4 Changes in content of the BESST

Format

The pre-screening observations were expanded, offering a continuum of difficulty for each of the pre-screening clinical determinants. Terminology for these expanded determinants was informed by World Health Organisation definitions (WHO, 2009b): unconscious; stuporosed; rousable; and alert. The terminology were coded red, to reinforce termination of the screen, and green, to indicate continuation of the screen, to facilitate completion of the pre-screening stage. The format of the BESST was modified giving a traffic light colour-coding system and clearer 'yes', 'no' options for each of the testing materials.

When testing for evidence of clinical determinants for water and thickened water swallows, rather than a tick box, nurses were given a 'yes', 'no' option. Screening for 5 ml swallows three times was eliminated from the screening tool because this is accounted for when the patient takes the first three sips of water during the 50 ml swallow screen. The initial trial of thickened water from a teaspoon was eliminated from the BESST because this was subsumed within the 100 ml thickened water trials.

Interpretation of terms

Further clarity was added to the information sheet by defining the continuum of clinical determinants used in the pre-screening stage and the clinical determinants of aspiration in the oral trials stage. The quantities of thickener for the volume of water required were more clearly defined. Utensils were also specified as changes in the amount of bolus offered would affect the number of multiple swallows identified.

Management options

The BESST provided the nurses with four options. The options of soft diet and thickened fluids were in addition to standard clinical practice, which would be normal or nil by mouth. The preponderance of normal and nil by mouth ratings meant that few of the ratings took advantage of the additional options. Management options were reduced to: normal diet and fluids, modified diet and fluids and nil by mouth. This offered the nurses one further option to the SSA that still allowed for some oral intake if no clinical signs of aspiration were noted on thickened fluids and puree diet. This is discussed further in the next chapter.

7.3 Conclusion

The results of this pilot study suggest that the BESST is potentially a practical alternative to the SSA. The high sensitivity suggests that it may be useful in the identification of aspiration of thin drinks and thickened puree-consistency oral intake in stroke patients: the use of the screen would not increase the risk to the patient over current clinical practice. The data from the 12 patients in the pilot study suggest that the BESST has no benefit over the SSA in relation to its ability to identify aspiration. At the same time the data do not indicate that using the BESST would put patients at increased risk of aspiration. Further work with the BESST can be considered because it has the potential benefit of offering a modified oral intake option. The contemporaneous reasoning offered by the nurses suggests that only minor changes were required to the BESST in order to improve its use.

A larger validation study was therefore performed to examine the validity (ability to accurately identify dysphagia as present or not), and the utility (suitable for use with stroke population) of the BESST and to ensure that it can be used by the health care professionals who would undertake screening in the clinical setting.

7.4 Summary

The results from this pilot suggested that some modifications to the BESST and its implementation, outlined in the next chapter, may improve its diagnostic performance and reliability.

CHAPTER 8

ASSESSMENT OF THE DIAGNOSTIC ACCURACY AND RELIABILITY OF A BEDSIDE SWALLOW SCREENING TOOL (BESST) FOR NURSES IN ACUTE STROKE IN COMPARISON WITH THE GOLD STANDARD: MAIN STUDY

The previous chapter suggested that a main study to examine the diagnostic accuracy and utility of the BESST was justified. The pilot study did not show a complete disparity in results between the nurses using the BESST as a screening tool and the gold standard assessment for the identification and management of dysphagia in stroke patients. This chapter presents the detailed changes made to the BESST in view of the difficulties found in the pilot study, and outlined in the previous chapter. The diagnostic accuracy and reliability of the BESST in comparison with the gold standard SLT assessment will be further examined. Similarly, further testing of the clinical utility of the BESST in comparison to current clinically accepted water swallow screen (SSA) will be appraised in this chapter.

The pilot study was fundamental to the main study because changes were made to the methodology, procedure, documentation and the swallow screening tool.

8.1 Changes to BESST procedure

8.1.1 Methodology

The pilot study aimed to make the sample representative of the total acute stroke population by: limiting the exclusion criteria; using broad inclusion criteria; and by purposeful sampling undertaken by SLT. This approach caused significant difficulties with recruitment to the study, owing to the practical constraints of time and resources. Only 12 patients were recruited in a 12 month period.

The main study had an estimated required sample size of 140 patients. In order to achieve this number of participants, consecutive admissions to the acute stroke unit were to be invited to participate in the study. All patients were considered for inclusion in the study. Patients were only excluded if they were transferred to the rehabilitation unit at another site, or home, prior to contact with the researcher.

Poor recruitment in the pilot study was contributed to by the use of an expert SLT to identify patients for inclusion in the study. The SLT, recruited from clinical practice, was inexperienced at obtaining consent for research purposes. Furthermore, despite having additional funding to support participation, in reality they retained all of the clinical and administrative duties pertaining to their designation. This together with practical considerations of annual leave, sick leave and mandatory duties to the Trust caused significant delays in recruitment to the study. Instead, an experienced research nurse was invited to undertake this role. The research nurse, experienced at obtaining consent from patients who may be unable to give written consent and who may experience cognitive difficulties as a result of their stroke, was therefore identified as the appropriate professional to obtain consent from patients willing to be included in the main study.

In the main study it was agreed that the nurses would be allowed to discuss their findings with the SLT. However, in order to maintain the integrity of the ratings, discussion of their concerns were only allowed following the completion of the BESST on each patient and only after they had made, recorded and submitted their ratings. The intent was to increase the nurses' knowledge and confidence with the BESST over time. This is more reflective of clinical practice and may reduce the reluctance of the research nurses to choose options not available to them previously in the SSA.

8.2 Changes to the BESST documentation

8.2.1 Information Sheet

Interpretation of terms

Further clarity was added to the information sheet (Figure 8.2) by defining the continuum of clinical determinants used in the pre-screening stage and the clinical determinants of aspiration in the oral trials stage. The quantities of thickener for the volume of water required were more clearly defined. Utensils were also specified as changes in the amount of bolus offered would affect the number of multiple swallows identified.

The information sheet was clarified by specifying the quantities of thickener for the volume of water required. Similarly, a more precise definition was offered regarding the clinical determinant 'multiple swallows'. The number of clearing swallows was quantified so that nurses were no longer required to use their subjective opinion as to how many swallows would constitute 'abnormal'.

The clinical determinants 'wet voice' and 'cough/throat clear' were defined on the tool and the clinical implications of these determinants given.

8.2.2 Bedside |Swallow Screening Tool

Stage 1 Pre-screening

The pre-screening observations, where clinicians identify patients at a high risk of aspiration, was modified and expanded to include a more detailed observation of conscious level using World Health Organisation terminology (identified on page 138).

The pre-screening observations were expanded, offering a continuum of difficulty for each of the pre-screening clinical determinants.

Instead of raters being required to indicate 'yes' or 'no' to identify the presence or absence of a clinical feature, raters were offered a range within the clinical feature to identify its degree of severity e.g. Pilot study: 'Alert – Yes/No'; Main Study: 'Circle the appropriate clinical feature: Unconscious, Stuporosed, Rousable, Alert'. These observations were coded red, to reinforce termination of the screen, or green, to indicate continuation of the screen, to facilitate completion of the pre-screening stage.

Stage 2a Direct water swallow trials

Screening for 5 ml swallows three times was eliminated from the screening tool because this is accounted for when the patient takes the first three sips of water during the 50 ml swallow screen.

When testing for evidence of clinical determinants for water swallows, rather than a tick box, nurses were given a 'yes', 'no' option.

Stage 2b Modified consistency swallow trials

The stages of oral trials were reduced with the initial trial of thickened water from a teaspoon being eliminated from the BESST because this was subsumed within the 100 ml thickened water trials.

Nurses commented that they used different spoons to deliver the thickened water. A desert spoon would offer approximately 19 ml of thickened water, whereas a teaspoon

would offer approximately 3-4 ml. This would directly impact on the number of clearing or multiple swallows that occurred. It was agreed and made explicit on the BESST that only a teaspoon should be used and the number of swallows regarded as abnormal for the type of spoon offered was further stated.

If patients refused the tasteless thickened water as a testing medium they would automatically be placed nil by mouth. This anomaly was undetected in the development stages of the BESST. Refusal of thickened consistency would result in patients who were suitable for normal diet and fluids being misallocated to the nil by mouth management option. This was highlighted by the nursing staff whilst undertaking the pilot study. The tool was modified to allow the research nurses to offer a pre-prepared food that was identified as being the same consistency as the thickened water. This would allow patients to complete the whole screen, thereby preventing them being placed inappropriately nil by mouth, and allow the nurses to be directed to the appropriate management option.

Stage 3 Management decision

In the pilot, the BESST provided the nurses with four options: the reduction to three options will be explained here. The options of soft diet and thickened fluids were in addition to standard clinical practice, which would be normal or nil by mouth. The preponderance of normal and nil by mouth ratings meant that few of the ratings took advantage of the additional options. In response to nurses' concerns regarding the complexity of the form and their limited use of the 'soft diet' management option in the pilot study, this option was eliminated from the tool. It was originally included because it was perceived to add to the quality of care received by those patients who have poor chewing skills. However, patients requiring this modification to their diet would be able to access it by choosing soft options from the hospital diet sheet. It was therefore not an integral management option in the BESST. The number of management options was therefore collapsed from four to three i.e. normal diet, modified oral intake, and nil by mouth. This offered the nurses one further option to the SSA (where they could only allocate normal diet or NBM) that still allowed for some oral intake if no clinical signs of aspiration were noted on thickened fluids and puree diet. This is discussed further in the next chapter.

Colour-coding was removed from the pilot, and was replaced with a traffic light system in order to further direct nurses' choice of management options i.e. green: normal diet; amber: modified oral intake; red: nil by mouth.

The BESST screening tool (Figure 8.1) and Information sheet (Figure 8.2) used in the main study is detailed below.

Dysphagia Screening Tool	Assessors number:		Study Number:	
	Date:		Stroke Register Number:	
	Time:			

Pre screening information: Please circle 1 appropriate choice from each line below:

Unconscious	Stupor/semi	Rousable	Alert
No trunk control	Can be supported upright	Trunk control	
No head control	Can be supported	Head control	
Wet, gurgly voice quality	Normal voice quality		
Absence of cough reflex upon request	Cough reflex on request		

If you circle any red options above, DO NOT continue with the assessment and follow Action 3.
If the patient has a pre-admission history of recurrent chest infections, continue with the assessment and refer to SLT department.

Aspiration Signs:
If any signs of aspiration occur when taking water or thickened water, please circle 'Yes' in the appropriate column:

Water 50mls water from a cup		Thickened water 100mls thickened water to puree consistency from teaspoon.		Aspiration signs
Yes	No	Yes	No	
Yes	No	Yes	No	Cough/Throat Clearing Present
Yes	No	Yes	No	Wet Voice
Yes	No	Yes	No	Weak up and forward movement of larynx
Yes	No	Yes	No	Multiple Swallows (more than 3 swallows per teaspoon)
Yes	No	Yes	No	Wet breath sounds

<p>If you circled No in the box above i.e. No signs of aspiration on water</p>	<p>If you circled No in the box above i.e. No signs of aspiration on thickened water</p>	<p>Action 1 If no signs of aspiration on water and thickened water:</p> <ul style="list-style-type: none"> ● Thin fluid ● Normal Diet (Supervised for first meal) ● Oral Intake Chart ● Monitor Chest Status
<p>If you circled Yes in the box above i.e. Signs of aspiration on water</p>	<p>If you circled No in the box above i.e. No signs of aspiration on thickened water</p>	<p>Action 2 If signs of aspiration on water but no signs of aspiration on thickened water:</p> <ul style="list-style-type: none"> ● Thickened fluids to puree consistency ● Puree diet (Supervised for first meal) ● Consider IV/Sub-cut fluids ● Oral Intake chart ● Monitor chest status ● Refer to SLT ● Refer to dietetics
<p>If you circled Yes in the box above i.e. Signs of aspiration on water</p>	<p>If you circled Yes in the box above i.e. Signs of aspiration on thickened water</p>	<p>Action 3 If signs of aspiration on both water and thickened water:</p> <ul style="list-style-type: none"> ● Place Nil by mouth ● Consider IV/Sub-cut fluids ● Refer to dietetics

Figure 8.1: Bedside Swallow Screening Tool (BESST) used for the main study

Information Sheet

In order to screen for dysphagia and act appropriately, please follow the arrows in the flow diagram overleaf. You should be directed to choose one action box at the bottom of the page as a result of your screen.

<p>Pre-screening Information</p> <p>Alert The patient should be sufficiently alert to be able to co-operate with the assessment. You should be able to rouse the patient who is in a drowsy state for an assessment of their ability to swallow food and drink.</p> <p>Stuporosed State of almost complete unconsciousness from which a person can be roused only briefly and by vigorous external stimulus</p> <p>Trunk control The patient should be able to sit upright or be stable when given external support either by the chair, bed or supported by pillows.</p> <p>Head control The patient should be able to maintain their head upright or be stable when given external support either by the chair, bed or supported by pillows.</p> <p>Clear Voice quality The patient should have a clear voice quality. It should not sound 'wet' or 'gargly'. This is an indication that the patient is not managing to swallow their own saliva and that the saliva is entering the airway. You may get this information by listening to the patient's voice quality or by asking them to say 'ah'.</p> <p>Voluntary Cough Ask the patient to cough. You should be able to hear the cough clearly, as it is a protective mechanism to prevent food and drinks entering the airway.</p> <p>Pre-admission history of recurrent pneumonia Sometimes the patient has no signs of aspiration but develop persistent, recurrent chest infections. This may indicate that small amounts of food and drink are entering the airway. This should be referred to the speech and language therapy department for a more detailed assessment.</p>
<p>Oral Intake Column</p> <p>Liquids from unspouted cup When taking liquids from a cup it is important that the individual does not put their head backwards to get the liquid from the bottom. They should keep looking forwards with their head upright when they are swallowing.</p> <p>Thickened Fluid/Puree (11x15ml level scoops to 1000ml of water) 100mls of puree is equivalent to 3 tablespoons. Use a teaspoon. If the patient refuses thickened fluids, try normal food of the same consistency. If the patient still refuses or is too fatigued to continue, offer thin fluids orally and reassess with thickened fluids/ puree at a later date.</p>
<p>Aspiration signs column</p> <p>Signs of aspiration may occur immediately pre-swallow, during the swallow or post-swallow they may also occur up to 5 minutes after the swallow. If you observe any of the signs of aspiration then you should not continue with the assessment and should follow the instructions in the action column.</p> <p>In a 'normal swallow', the adam's apple moves up and forward by approximately 2 cm. You can feel this by placing your fingers on the throat. Put your index finger under the chin, to feel the tongue moving. Put your middle finger on the hyoid bone (see diagram) and your third finger on the adam's apple (see diagram). Ask the patient to swallow.</p> <p>No swallow /weak up and forward movement of the larynx If the hyoid and adam's apple movement up and forward is weak or incomplete the muscle at the top of the gut will not open and food and drink will go into the airway instead.</p> <p>Cough/Throat clear These signs are stimulated in an effort to expel food or drink which has entered the airway or to clear residue in the throat.</p> <p>Wet Voice Food or drink has entered the airway if the patient's voice sounds wet or rattling before, during or after the swallow</p> <p>Multiple swallows The patient may take several swallows, or more than 3 swallows. This indicates that some of the food and drink is sticking in the throat and the patient is unsuccessful in trying to clear it. One or two swallows per mouthful is considered normal.</p> <p>Wet breath sounds Food or drink has entered the airway if the patient's breathing sounds wet or rattling before, during or after the swallow.</p>



Figure 8.2: Information Sheet for the Bedside Swallow Screening Tool (BESST) used for the main study

8.3 Aim of the tool validation study

To establish the diagnostic accuracy and utility of the BESST as a swallow screening tool by:

1. Determining the intra- and inter-rater reliability of the BESST within, and between nurses, and the gold standard SLT bedside clinical assessment.
2. Determining the sensitivity, specificity, the positive and negative predictive values of BESST in identifying aspiration in patients following a stroke, and the efficiency of the BESST when undertaken by a nurse not trained in dysphagia assessment compared with the gold standard SLT bedside clinical assessment.
3. Exploration of the clinical determinants of aspiration reported by the nurses.
4. Identifying how the management options from the BESST compare with those made by the gold standard SLT bedside clinical assessment.

Ethical Approval

A notice of substantial amendments was applied for, and was approved (Appendix 29), from the relevant Research Ethics Committee; with amendments regarding the BESST format, procedure and sample size.

Subjects

Consecutive stroke patients admitted to an acute stroke unit in a large teaching hospital from November 2005 to April 2006 were identified. All patients were considered for inclusion in the study. Patients were excluded if they were transferred to the rehabilitation unit at another site, or home, prior to contact with the researcher.

Sample size

From previous pilot work, it was found that the proportion of “successes” for the tool was between 0.150 and 0.174. Successes were defined as complete agreement with the SLT when rating for nil by mouth, modified, or normal diet. Assuming that the true value of the kappa is 0.6, with a two-sided 95% confidence interval for the kappa to extend 0.2 from the observed value of kappa, and the proportion of successes to be 0.174, we would need a sample size of 110 patients. Should the proportion of successes be 0.150, a sample size of 124 patients would be required. To achieve a sample of 110 to 124 patients, 140 patients would need to be recruited to allow for attrition.

Procedure

Each participant was initially approached by the research nurse and invited to participate in the study. They were given an information sheet regarding the study and were given 12 hours to consider their participation. Written consent was obtained from the participant, or relative assent was obtained from their next of kin if the participant had cognitive or language difficulties and were unable to personally give informed consent. Witnessed consent was obtained where the participant was able to indicate agreement to take part in the study but was unable to physically sign the form.

Once consent or assent had been obtained, the researcher recorded details of the patient's age, sex, date of stroke onset, date of admission, pre-existing dysphagia, pre-existing nutrition/hydration status and stroke type (Appendix 30).

Each patient was assessed on two consecutive days by three raters: the SLT, a nurse from the wards (N1) and a research nurse (N2). The SLT and N2 were the same raters used in the feasibility study. The general nurse, not experienced in nursing stroke patients was new to the study.

The nurses were asked to follow the instructions on how to use the tool, available on the back of the tool. Nurse 2 had limited experience of undertaking the pilot screen, that is they had used the screen on 12 purposefully selected stroke patients, but neither nurse had received targeted training using the BESST, nor experience of assessing dysphagia in patients with neurological problems as part of their day to day work. The nurses were therefore required to follow the BESST without drawing on previous experience. All raters were asked to record contemporaneous reasons for their decisions, as well as to record any bias that may have influenced their management decision, e.g. drinks at bedside cabinets or clinical dilemmas. For example, whether or not to continue assessment if the patient coughed on swallowing water.

Patients were rated for swallowing problems at their bedside by the specialist SLT, who used his clinical judgement (gold standard assessment), and by the two nurses who used the BESST. Each patient received contiguous but independent swallow screens and the raters' order of assessment was randomised to minimise the effects of swallow fatigue. As described previously on page 126, the two nurses' assessments and the assessment by the SLT meant that each patient was assessed three times, over a 30

minute period on average, on each of the 2 days. All raters were blind to the results of each others' ratings.

To minimise the effects of fluctuation in the patient's medical state for the intra-rater reliability studies, undertaken on day 2, the SLT identified changes in patients' status by discussion with nursing staff and examination of the medical notes and nursing cardex prior to the series of randomised SLT assessment and BESST screens. Any patients who demonstrably deteriorated or improved had their data excluded from the assessment of intra-rater reliability.

For patients included in the study, the results of assessments were not used to inform clinical care.

Gold Standard assessment

The gold standard assessment was the SLT's normal assessment and clinical care, which typically included a case history; discussion with the patient, relatives and staff; lunchtime observations; cervical auscultation; pulse oximetry and laryngeal palpation. The laryngeal palpation includes four finger assessment using different consistencies of 2-3 spoons of water (average capacity 7 ml/spoon), bolus swallows from a cup (average bolus 20 ml), sequential drinking from a cup, and assessing the person's ability to swallow yoghurt consistency and biscuit. The SLT confirmed that the clinical determinants of aspiration included in the gold standard assessment typically include absent swallow reflex, coughing, wet voice, wet breath sounds, and repetitive clearing swallows. Patients are observed for abnormal responses and reflexes that are indicative of silent aspiration e.g. hiccups and yawning. Further testing includes posture modification, different bolus consistencies and compensatory safe swallow strategies. The SLT reported that their management decision regarding the safest consistency to be taken orally is based on some, or all, of their clinical assessment described above, with eclectic use of different assessments and observations dependant on the patient's clinical presentation. This is reflective of clinical practice within the hospital setting (McCullough et al., 1999).

Bedside Swallow Screening Tool (BESST)

Stage 1 Pre-screening

The BESST (Figure 8.1 and Figure 8.2) includes a pre-screening where clinicians identify patients at a high risk of aspiration. This pre-screening includes:

- conscious level (unconscious; stuporosed; rousable; alert)
- trunk control (no trunk control; can be supported upright; has trunk control)
head control (no head control; can be supported; has head control)
- voice quality (wet gargly voice; normal voice)
- ability to perform a voluntary cough on request ('yes' or 'no').

The BESST dictates that patients identified as at high risk of aspiration i.e. unconscious; stuporosed; no trunk or head control; has a wet gargly voice; and are unable to perform a voluntary cough, should be placed nil by mouth and referred immediately for a more specialist dysphagia assessment. The BESST also dictates that patients who have a pre-admission history of recurrent chest infections should be referred for a specialist dysphagia assessment subsequent to screening with the BESST (regardless of their BESST score). Once the pre-screening has been completed, if it is safe to continue, the direct assessment where swallowing is tested is performed.

Stage 2 Direct swallow trials (a water, b modified consistency)

The person completing the direct assessment with the BESST offers the patient two consistencies: first, 50 ml water from an un-spouted beaker; second, 100 ml of water, thickened to a puree consistency, i.e. to emulate a puree diet, from a teaspoon (one 9 g sachet to 80 ml of drinking water). Sachets are used, for research and in clinical practice, to ensure that consistency does not vary on different days and to avoid contamination of the thickener. With each consistency the patient is observed for the following clinical determinants of aspiration: absent swallow; cough/throat clearing; wet voice; weak up and forward movement of the larynx (determined by palpation), multiple swallows (more than three swallows per teaspoon of pureed water) and wet breath sounds.

Stage 3 Management options

The BESST utilises a 'traffic light system,' i.e. a colour scheme which aims to reinforce the written instructions directing raters to the appropriate management option. Patients are rated either nil by mouth (red), modified diet (amber), or normal diet (green).

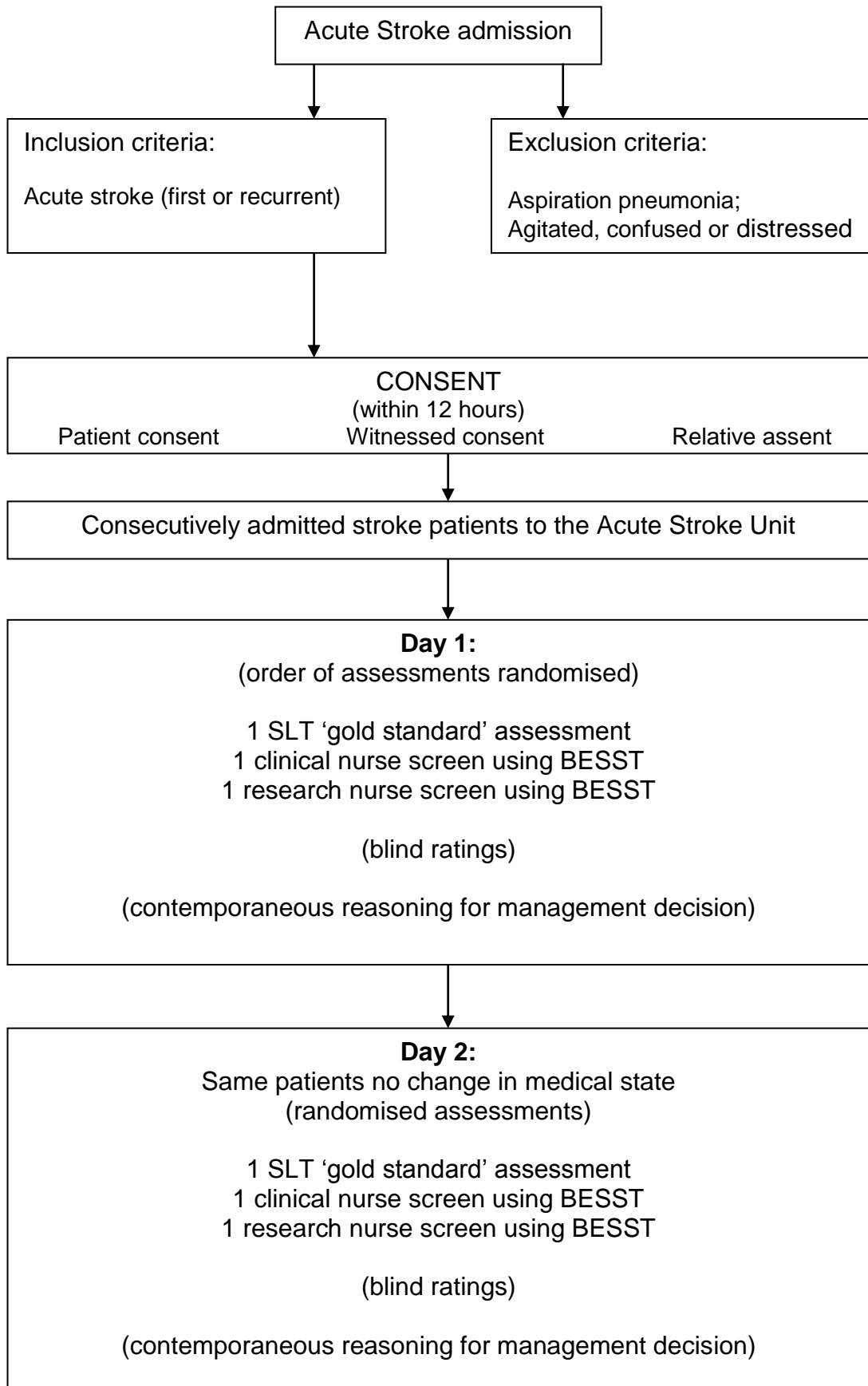


Figure 8.3: Protocol for main study

Statistical analysis

Categorical data are described with frequencies and percentages. Interval data are described with means and standard deviations. Inter-rater and intra-rater reliability were calculated using a weighted Kappa statistic (Kw) and 95% confidence intervals (CI) calculated. Weightings were used to take into account the safety of management decisions. A rating of normal diet by the SLT and thickened fluids or modified diet by the nurses would not be considered complete disagreement, as this situation may affect the patient's quality of care rather than their safety. In contrast, a rating of nil by mouth by the SLT and modified or normal diet by the nurses would be considered complete disagreement because it would, if used to inform care, potentially put the patient at risk. A weighting of 0.75 was used for ratings of normal diet and modified diet because these disagreements would not indicate a potentially unsafe decision.

For all other comparisons, weightings were set to 0 because once a rating of nil by mouth has been made by the SLT, any other rating would be potentially unsafe. Results were interpreted as suggested by Altman (1991), <0.21: poor agreement; 0.21-0.40: fair agreement; 0.41-0.60: moderate agreement; 0.61-0.80: good agreement; 0.81-1.00: very good agreement.

Clinical utility was explored using sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and efficiency. Sensitivity is defined as the proportion of patients (in this study rated as modified diet or nil by mouth) who are correctly identified as cases (swallowing problem) by the test, and specificity is the proportion of non-case patients (in this study rated as normal diet) who are correctly identified by the test. The PPV is the proportion of people with a positive test (in this study, rated as modified diet or nil by mouth) who do have swallowing problems. The NPV is the proportion of people with a negative test (in this study, rated as normal diet) who do not have swallowing problems. The overall accuracy of the test (the proportion correctly rated as having a swallowing problem or not) is the efficiency. To calculate these values the ratings were dichotomised: normal diet was compared with modified diet and nil by mouth, combined.

Results

Of the 370 people identified with acute stroke admitted to an acute stroke unit in a large teaching hospital from November 2005-April 2006, 234 (63.2%) were transferred to the rehabilitation unit at another site or home prior to contact with the researcher and so consent or assent was obtained for 136 (36.8%). Of the patients who consented, 12

(9%) subsequently refused, were transferred before the first assessment or were withdrawn by the SLT due to deteriorating clinical status. Therefore, of the patients where consent was obtained, 124 (91%) patients were included in the study.

Patients were assessed and rated between 1 and 77 days after stroke onset; the median time since stroke was 7 days (IQR 5-11). In contrast to the majority of patients, one patient was only admitted to hospital very late after onset (77 days).

The median age of the patients was 75 years (interquartile range [IQR] 66-82) and 64/136 (47%) were female. The median length of stay was 3 weeks (range 11.5 - 42.5 days), with 85% patients discharged alive. The computerised tomography (CT) scans, available for 60% patients, demonstrated that 90% of these people (n=67) had ischaemic strokes with 10% having haemorrhagic strokes. These figures are reflective of those reported elsewhere in the literature of 87% ischemic strokes and 13% hemorrhagic strokes (Donnan et al., 2008). Despite the limited CT scan data, the results suggest that the sample group may be considered reflective of the larger population.

8.3.1 Intra- and Inter-rater reliability

The ratings of the three raters on each of the two days is presented in Table 8.1.

Table 8.1: Frequency of type of diet rated by each rater over two assessments in the 136 patients consented into the study

RATER	SLT		N1		N2	
	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2
Normal diet	77 56%	62 45%	69 51%	53 39%	61 45%	51 38%
Modified diet	16 12%	15 11%	11 8%	10 7%	18 13%	14 10%
Nil by mouth	27 20%	20 15%	38 28%	32 24%	46 34%	34 25%
*Unable to assess	16 12%	39 29%	18 13%	41 30%	11 8%	37 27%

*Unable to assess owing to refusal to be assessed, deterioration in medical condition, or transfer to another location.

The number of ratings performed by each rater on the two days differed due to patients being transferred or refusing further assessment. A complete case analysis was used

to make estimates of sensitivity, specificity, PPV, NPV, efficiency, and inter- and intra-rater agreement. The SLT and N1 saw 115 patients on day 1 and 93 patients on day 2 (Table 8.1). The SLT and N2 saw 119 patients on day 1 and 96 patients on day 2 (Table 8.1). For inter-rater reliability between the nurses there were 117 and 95 patients who were assessed by both nurses on day 1 and day 2 respectively (Table 8.1). For the intra-rater reliability, 78 patients were identified who were rated by the SLT on day 1 and day 2. Of the 78 patients, N1 rated 74 patients on both days 1 and 2, while N2 rated 77 patients on both days (Table 8.1).

Table 8.2: Comparison of assessments by the SLT and N1 on Day 1

SLT \ N1	Normal diet	Modified diet	Nil by mouth	Total
Normal diet	62	4	10	76
Modified diet	3	6	5	14
Nil by mouth	1	1	23	25
Total	66	11	38	115

Table 8.3: Comparison of assessments by the SLT and N1 on Day 2

SLT \ N1	Normal diet	Modified diet	Nil by mouth	Total
Normal diet	48	6	7	61
Modified diet	4	4	6	14
Nil by mouth	0	0	18	18
Total	52	10	31	93

Table 8.4: Comparison of assessments by the SLT and N2 on Day 1

SLT \ N2	Normal diet	Modified diet	Nil by mouth	Total
Normal diet	54	7	16	77
Modified diet	3	7	6	16
Nil by mouth	0	4	22	26
Total	57	18	44	119

Table 8.5: Comparison of assessments by the SLT and N2 on Day 2

SLT \ N2	Normal diet	Modified diet	Nil by mouth	Total
Normal diet	47	4	10	61
Modified diet	3	7	5	15
Nil by mouth	0	1	19	20
Total	50	12	34	96

On day 1, compared with the SLT there was 84% agreement with N1 [Kw=0.63, CI=0.48-0.78] and 76% agreement with N2 [Kw=0.50, CI=0.36-0.64] (Table 8.2). On day 2 agreement between the SLT and N1 was 83% [Kw=0.62, CI=0.45-0.79], and between the SLT and N2 was 82% [Kw=0.59, CI=0.42-0.76] (Tables 8.2 to 8.5).

8.3.2 Sensitivity, specificity, positive predictive value, negative predictive value and efficiency of the BESST

The sensitivity, specificity, PPV, NPV and efficiency of the BESST can be seen in Table 8.3. The values of these measures showed some variation based on the nurse and the day of the assessment. The sensitivity of the BESST ranged from 87.5% (95% CI, 76.0%-99.0%) to 92.9% (95% CI, 85.1%-100%) and the specificity ranged from 70.1% (95% CI, 59.9%-80.4%) to 81.6% (95% CI, 72.9%-90.3%). The PPV of the BESST ranged from 62.9% (95% CI, 50.9%-74.9%) to 71.4% (95% CI, 58.8%- 84.1%) and the NPV ranged from 92.3% (95% CI, 58.8%-84.1%) to 94.7% (95% CI, 88.9%-100%). The overall efficiency ranged from 78.2% (95% CI, 70.7%-85.6%) to 84.3% (95% CI, 77.7%-91.0%).

Table 8.6: Sensitivity, specificity, Positive Predictive Value (PPV), Negative Predictive Value (NPV) and efficiency of BESST when used by nurses compared with the SLT

	Successes	Failures	Total	Proportion	Lower CI	Upper CI
SLT vs. N1, Day 1						
Sensitivity	35	4	39	89.7%	80.2%	99.3%
Specificity	62	14	76	81.6%	72.9%	90.3%
PPV	35	14	49	71.4%	58.8%	84.1%
NPV	62	4	66	93.9%	88.2%	99.7%
Efficiency	97	18	115	84.3%	77.7%	91.0%
SLT vs. N1, Day 2						
Sensitivity	28	4	32	87.5%	76.0%	99.0%
Specificity	48	13	61	78.7%	68.4%	89.0%
PPV	28	13	41	68.3%	54.0%	82.5%
NPV	48	4	52	92.3%	58.8%	84.1%
Efficiency	76	17	93	81.7%	73.9%	89.6%
SLT vs. N2, Day 1						
Sensitivity	39	3	42	92.9%	85.1%	100.0%
Specificity	54	23	77	70.1%	59.9%	80.4%
PPV	39	23	62	62.9%	50.9%	74.9%
NPV	54	3	57	94.7%	88.9%	100.0%
Efficiency	93	26	119	78.2%	70.7%	85.6%
SLT vs. N2, Day 2						
Sensitivity	32	3	35	91.4%	82.2%	100.0%
Specificity	47	14	61	77.0%	66.5%	87.6%
PPV	32	14	46	69.6%	56.3%	82.9%
NPV	47	3	50	94.0%	87.4%	100.6%
Efficiency	79	17	96	82.3%	74.7%	89.9%

Between N1 and N2 there was 81% agreement [Kw=0.61, CI=0.45-0.77] on day 1 and 81% agreement [Kw=0.64, CI=0.46-0.82] on day 2 (Tables 8.7 and 8.8).

Table 8.7: Comparison of inter-rater agreement between two nurses on day 1

N2 \ N1	Normal diet	Modified diet	Nil by mouth	Total
Normal diet	54	2	3	59
Modified diet	6	6	5	17
Nil by mouth	9	3	29	41
Total	69	11	37	117

Table 8.8: Comparison of inter-rater agreement between two nurses on day 2

N2 \ N1	Normal diet	Modified diet	Nil by mouth	Total
Normal diet	45	3	3	51
Modified diet	4	4	5	13
Nil by mouth	4	3	24	31
Total	53	10	32	95

Patients who were rated the same on both days by the SLT were selected and then compared each nurse's ratings between the two days (Tables 8.9 and 8.10). 87% agreement [Kw=0.70, CI=0.49-0.91] was reported for N1 and 86% agreement [Kw=0.71, CI=0.51-0.91] for N2.

Table 8.9: Comparison of intra-rater agreement by N1 on patients who did not change medically on consecutive days

Day 1 \ Day 2	Normal diet	Modified diet	Nil by mouth	Total
Normal diet	42	0	2	44
Modified diet	3	2	0	5
Nil by mouth	5	2	18	25
Total	50	4	20	74

Table 8.10: Comparison of intra-rater agreement by N2 on patients who did not change medically on consecutive days

Day 1 \ Day 2	Normal diet	Modified diet	Nil by mouth	Total
Normal diet	37	5	2	44
Modified diet	1	2	2	5
Nil by mouth	2	3	23	28
Total	40	10	27	77

8.3.3 Clinical determinants of aspiration in the SSA and the BESST

Of the four clinical determinants of aspiration in the SSA the nurses only used two: 'cough' and 'wet voice' (Table 8.11).

Table 8.11: Clinical determinants of aspiration in the SSA used by the nurses on the two days

Clinical determinants	N1, day 1	N2, day 1	N1, day 2	N2, day 2
Swallow absent	0	0	0	0
Cough	14	19	11	16
Breathlessness	0	0	0	0
Wet gurgly voice	13	8	3	1

The BESST has six clinical determinants of aspiration (Table 8.12). When testing with water, the only category not used by the nurses was 'swallow absent'. The most frequently used determinants were 'cough', 'wet breath sounds' and 'wet voice'.

Table 8.12: Clinical determinants of aspiration in the BESST used by the nurses on the two days, when tested with water

Clinical determinants	N1, day 1	N2, day 1	N1, day 2	N2, day 2
Swallow absent	0	0	0	0
Cough	14	20	11	16
Wet voice	13	8	3	1
Weak movement of larynx	0	2	0	0
Multiple swallows	1	10	0	8
Wet breath sounds	7	17	4	4

When testing with thickened water the nurses used all available determinants (Table 8.13). The most frequently used determinant was 'wet breath sounds'.

Table 8.13: Clinical determinants of aspiration in the BESST used by the nurses on the two days, when tested with thickened water

Clinical determinants	N1, day 1	N2, day 1	N1, day 2	N2, day 2
Swallow absent	0	3	0	0
Cough	3	4	3	4
Wet voice	5	5	0	3
Weak movement of larynx	0	2	0	0
Multiple swallows	6	5	3	0
Wet breath sounds	5	13	2	11

The clinical determinants of aspiration in the BESST can potentially be used to estimate the management options that would be dictated by the SSA. To explore the potential benefit of using the BESST, patients who were rated as nil by mouth on the SSA were selected and their ratings compared with the BESST (Table 8.14). Raters using the BESST rather than the SSA correctly (according to the SLT rating) identified that no patient should have had a normal diet. Of the 70 ratings of nil by mouth on the SSA, the BESST indicated that for 38 (54%) ratings, it would have been possible to provide a modified diet rather than placing the patient nil by mouth. When compared with the SLT assessment, it was found that in 35 (92%) of the 38 ratings, patients would have been appropriately placed on a modified diet. This means that for 3 (8%) of the 38 ratings, patients would have been put at risk by being given modified diet when they should have been nil by mouth.

8.3.4 BESST compared to the SLT

For the purpose of this study, a specialist SLT was considered the gold standard; their clinical assessment identified 58/135 (43%) and 73/135 (54%) of patients with dysphagia on days 1 and 2, respectively. These figures are consistent with values reported elsewhere in the literature (Smithard et al., 1997), who report prevalence for dysphagia early post-stroke at 51%. In addition the results of the BESST further demonstrated good agreement between the specialist SLT and the nurses, with slightly better agreement found with N1 (84%) compared with N2 (76%).

Table 8.14: Comparison of nurses' nil by mouth ratings on the SSA with their ratings on the BESST

Day	Rater	SSA – Nil by mouth	BESST – Normal	BESST – Modified	BESST – Nil by mouth
1	N1	19	0	*11 (58%)	8 (42%)
	N2	24	0	*9 (38%)	15 (62%)
2	N1	12	0	9 (75%)	3 (25%)
	N2	15	0	†9 (60%)	6 (40%)

*The same patient was rated 'modified' by the nurses using the BESST but nil by mouth by the SLT. The SLT identified subtle signs of aspiration on auscultation at bedside that he believed would require further instrumental examination.

†This patient (different to the patient on day 1) was rated 'modified' by one of the nurses using the BESST but nil by mouth by the SLT. The patient refused to participate in the assessment of oral intake by the SLT, which therefore meant they were placed nil by mouth.

8.4 Discussion

The purpose of this study was to determine if nurses could perform a bedside swallow screening, for consecutively admitted stroke patients, using a tool that allowed them to place patients on a normal diet, nil by mouth, or modified oral intake. The introduction of the modified oral intake category provided a potential feeding regimen that was outside of the scope of the commonly used screening tool, the SSA. This latter option has the potential to prevent some patients being placed nil by mouth, which hypothetically may compromise both their quality of life and levels of nutrition and hydration. However, these were not directly measured within the scope of this programme of study.

Many swallow screening tools rely on delivery of measured amounts of water with observation of clinical determinants of aspiration, outlined in Chapter 5. This programme of study aimed to devise a tool for use early after stroke, for patients with first or subsequent strokes, which has a third management option of modified oral intake. In addition, it was important to develop a swallow screening tool that did not require complex examination of the findings that would require specialist knowledge, but rather one that could be followed in a step-by-step manner. The BESST presents as a flow diagram with instructions how to continue depending on clinical observations. Study nurses were instructed on the terminology used in the BESST and how to translate their clinical observations into BESST ratings. In view of the fact that swallow function can fluctuate throughout 24 hours (Smithard et al., 1996) and can vary throughout the acute and rehabilitative stages (Smithard et al., 1996), it was important

to devise a tool that can be used with first and subsequent stroke patients. The BESST is therefore designed to be used prior to any oral intake or used as a review tool for patients whose swallow function fluctuates or whose medical status changes.

8.4.1 Use of the SLT as the gold standard

A potential limitation of the study is the use of the SLT as the clinical 'gold standard'. Alternative gold standards used in previous research have involved the instrumental examination of dysphagia with videofluoroscopy (e.g., Wu et al., 2004) or FEES® (Trapl et al., 2007). However, no instrumental examination of dysphagia is currently available in the clinical setting that satisfies the criteria required of a SLT with perfect sensitivity and specificity on diagnosis. Choice of an experienced SLT as the gold standard reflects current clinical practice. The BESST needed to be compared with current best practice of a bedside swallowing assessment which, in practice, is by a stroke specialist SLT.

For the majority (75%) of screens undertaken, the BESST dictated the same patient management as the clinical bedside assessment of the SLT. The BESST demonstrated good agreement between nurses (81% on both days) and within nurses (87% for N1, and 86% for N2).

Where there were disagreements between the SLT and the nurses, it was assumed that the SLT used his experience to more accurately observe the clinical determinants of aspiration and was therefore selecting a more appropriate management option. Analysis of the raw data (both the choices of management options and the contemporaneous reasoning underpinning the SLT gold standard assessment) was undertaken.

By limiting the exclusion criteria to assess the diagnostic performance of the BESST on consecutively admitted stroke patients, the clinical features of the stroke together with concomitant medical aetiologies, expected in the elderly, may make the patients difficult to assess.

The BESST precludes the nurses from using clinical judgement; this caused concern to the nurses when assigning management options. In the majority of ratings the nurses chose the option prescribed by the BESST but on occasion they ignored the directed option and chose a more cautious alternative, wanting to consult with SLT. In normal clinical practice this facility would have been made available to them. This inability to

deviate from the BESST protocol contributed to the more cautious approach taken by the nurses, and consequentially, an increase in nil by mouth ratings.

In two cases where the patient coughed, causing the nurses to place the patient nil by mouth the SLT decided that the cough was 'not significant' and therefore went on to advise normal diet. Similarly the clinical determinant of 'wet voice' was noted by all three raters, causing the nurses to advise two patients to be placed nil by mouth where the SLT chose normal diet. Even when faced with a combination of clinical determinants, (wet voice, cough and multiple swallows on water), the SLT continued to put the patient on normal fluids on day 1.

Without having a detailed individual patient profile and from the limited data given as part of the contemporaneous reasoning from the SLT, a possible explanation for how such clinical conclusions were achieved could be that the SLT was drawing on professional experience and using 'tacit knowledge'. It appears the SLT was not confining opinion to the profile of clinical symptoms, but providing a holistic assessment informed by experience, formal training and professional practice. The SLT had considerable undergraduate and post-graduate training, together with several years clinical experience assessing and managing dysphagia in acute stroke patients.

Whilst SLTs may undertake standardised training at local and national levels, an assumption that could be made is that SLTs would assess a patient in a similar way, achieving similar outcomes. However, due to various levels of clinical subjectivity, this might not be a clinical reality, and brings into question the use of an individual SLT as the gold standard, which could be seen as a potential flaw in the study. The only alternative to using an SLT as the gold standard is to use instrumental examinations of the swallow, but this could be seen as clinically appropriate both in terms of being used as a screening tool and for the client group. However, allocation of one SLT to a specific ward is common clinical practice and the study was designed to compare the results of the BESST used by nurses to current clinical practice, which would be the SLT.

8.4.2 Nurses' clinical experience and influences

On two occasions there were disagreements between the management option actually chosen by the nurses and the management option that the nurse should have chosen by using the BESST. On these two occasions, the nurses were influenced by their clinical judgment and reverted to the safest option of nil by mouth, even though the

BESST dictated that the patients could be placed on a modified diet. The more cautious approach by the nurses on these two occasions is reflected in the overall study results. Where disagreements occurred, they were due to a tendency of the nurses to not place patients on a normal diet, i.e. they did not follow the protocol dictated by the BESST. The more clinically experienced staff nurse was less cautious than the research nurse. This may be due to the more experienced nurse considering the context of the symptoms and having a greater understanding of the process of patient review and assessment.

In this study, a research nurse and a clinically experienced staff nurse were invited to participate, because it was felt that it would be important to explore how nurses with different levels of clinical experience would be able to implement the BESST (including reading the information sheet and following the protocol). As a means of achieving this, a decision was taken not to offer the nurses any formal training. This will be discussed further in Chapter 9.

They were encouraged to discuss global issues relating to the BESST and the testing procedure with the SLT, but not more specific issues regarding individual patients. This reflects the clinical environment where the BESST has been designed to be used. Despite the nurses being reassured that the study results would not be used to dictate clinical care, and being encouraged to raise concerns with the medical team should they wish, it is still possible that concern for patients' welfare resulted in a more cautious approach. These concerns, and their implications for ratings, may have been overcome by providing structured BESST training to these nurses who were inexperienced in caring for neurological patients with dysphagia. Training in the use of a bedside swallow screen can have a positive impact on the clinical utility of bedside swallow screening tools and on patient outcome (Hinchey et al., 2005).

8.4.3 Clinical determinants of aspiration

The clinical determinants of aspiration in the BESST were explored in order to identify the discriminatory items. The results from this exploratory analysis suggested that firstly 'cough' and secondly, 'wet gurgly voice' were the most observed and discriminatory clinical determinants that influenced the nurses' ratings and choice of management option in the analysis of the SSA. 'Absent swallow' and 'breathlessness' were not rated by either nurse on either day. This may be due to these determinants being less audible and therefore more difficult to detect. These data need to be the subject of further research to determine why some determinants were not recognised

and if training nurses in the clinical signs of aspiration would improve the diagnostic accuracy of the BESST.

In the BESST the nurses used the determinant 'cough' as the primary determinant to indicate aspiration with water. 'Wet breath sounds' and 'wet voice' were similarly reported by both the nurses over the two days. The determinant 'weak movement of larynx' was used on just two occasions. This determinant requires palpation of the hyo-laryngeal structures. Nurses are unfamiliar with this protocol and were not trained to palpate the larynx.

On thickened fluids, 'wet breath sounds' was the most frequently reported clinical determinant of aspiration. 'Cough' was similarly identified as a key determinant of aspiration when using thickened fluids. Ratings of 'multiple swallows' were more prevalent in the identification of thickened fluids than water. It is presumed that patients with swallowing difficulties required more than one swallow to clear the bolus residue from the pharynx. 'Weak movement of the larynx' was identified on only two occasions, which is again likely to be due to a lack of familiarity with this determinant as suggested in the previous paragraph.

8.4.4 Environmental bias

The contemporaneous reasoning data (Appendix 36) were considered to establish the relationship between nurse decision making, and influences from the wider clinical environment (patient's overall medical state; food and drink by the bedside; signs above the bed; patient reports).

Within the study, two patients had naso-gastric tubes insitu, of which one presented with concomitant oxygen. All raters concluded that for these patients a nil by mouth option was the most appropriate. It could be assumed from this that the nurses were influenced by the patient's presenting medical state. However, this does not wholly demonstrate how nurses reached other management options because only 16 management options chosen correlated with the 47 (34%) comments identified as potential bias. Indeed, of the 19 patients, where either the patient was known to the SLT or the patient had a sign by the bed indicating the type of oral intake prescribed by the SLT in charge of the patient's clinical care, nine were given the correlating management option. This suggests that the nurses and SLT were not unduly influenced by the potential environmental bias.

Other possible influencing factors on the nurses' decision making processes include the presence of food and drink being left by the bed. This factor was reported for eight patients. Six of the eight patients were given a normal diet rating. Discrepancies in ratings between the nurses were documented for the remaining patients. However, no trends were observed, with all raters defining different management options of nil by mouth and modified diet. This shows that the nurses may not have been influenced by the food and drink available at the patients' bedside.

In one incident, a patient reported, "I'm not supposed to drink," but the option chosen by the nurse was normal diet. This demonstrates that whilst environmental influences existed (where bias could have affected the nurses' management options) they did not necessarily influence the nurses' decisions regarding management options chosen during the BESST study.

8.4.5 Protocol and procedure

There were inherent limitations in the protocol. Some of these weaknesses could not be avoided when assessing individuals in a clinical setting. As a contingency, the protocol was modified in anticipation of the potential bias. A critical examination of the main study protocol is presented.

The limited exclusion criteria meant that the BESST was undertaken on a realistic sample that can be considered representative of the population which is targeted by the BESST. The study invited patients with varied and fluctuating levels of alertness and cognition. Relative assent was gained for those who were unable to give informed consent due to reduction in cognition and/or communication difficulties. Therefore, patients were not selected by other professionals for their likely compliance with the screen. This is in contrast with another study where patients were purposively selected for inclusion (Trapl et al., 2007).

Despite trying to ensure that as many patients as possible on the acute stroke unit were included, several patients were identified but could not be included because they were either discharged home or transferred off site to a rehabilitation unit. As such, it is likely that the majority of this group were more medically stable. Ideally medically stable patients should have been included so that the performance of the tool could be assessed in patients presenting with many different problems. Patients from the acute stroke unit, who were in the more acute stages of stroke, have a greater propensity to fluctuating swallow function. Assessing patients with different levels of swallowing

problems will tend to increase the utility of the BESST because it reflects clinical practice.

Patients were assessed and rated between 1 and 77 days after stroke onset; the median time since stroke was 7 days (IQR 5-11). In contrast to the majority of patients, one patient was only admitted to hospital very late after onset (77 days). Whilst acknowledging that inclusion of data from this person with late hospital admission after stroke could skew the research outcomes, allowing this data to be included in the study does allow for a tentative examination of how the BESST could assist with bedside swallow assessment for those patients whose swallow function fluctuates post-stroke.

Furthermore, as might be anticipated by identifying the sample group from consecutive hospital admissions, the study group included patients with concomitant medical difficulties. However, nurses were still able to use the BESST to screen for the risk of aspiration which would lead to a referral to a SLT for a more specialist assessment. Although this could be perceived as a potential limitation of the study, it simulates a realistic environment in which the BESST is designed to be utilised.

A potential limitation of the study was that some patients could have refused to continue with successive assessments by three different raters. In order to overcome these effects and the effects of swallow fatigue, the sequencing to the screens was randomised.

The presentation, amount, and sequence of drinks and puree consistency are consistently applied in the BESST. Choking on fluids could have prompted refusal of the patients to continue with the test, or swallow fatigue could have been responsible for failure of the patients in the later part of the test. In ordering the sequences of testing mediums, the puree consistency was given last because it is recognised as an easier consistency to swallow; encouraging the patients to continue with the screen. In retrospect, it would have been useful to randomise the order of testing mediums offered. This is a factor that could be the focus of further research.

All raters were aware that the swallow function may fluctuate. It was therefore important to record what the raters observed and how they were directed by the BESST. Recording this information suggested that the raters were not unduly influenced by the clinical environment or patient's medical condition. There was only one occasion recorded where the SLT remembered the patient's specific difficulties from the screen undertaken on day 1.

8.5 Conclusion

In order for a screening tool to be acceptable for use in clinical practice, where the results and subsequent interventions arising from these have major implications for the patient, it needs to demonstrate high sensitivity and specificity. For the majority of screens undertaken, 75% of ratings demonstrated complete agreement with the gold standard SLT clinical bedside assessment.

When compared to the SSA, the BESST allowed 35/38 (92%) patients a modified diet where the SSA would have placed the patients nil by mouth. The BESST accorded with the gold standard in these cases and therefore offered nurses a potentially acceptable extension to their current role without compromising patient safety. It is certainly preferable to the current climate, demonstrated within the survey, where nurses have adopted different testing mediums without any evidence base.

When comparing the BESST between N1 and the gold standard on day 1, the sensitivity was 89.7%. This is lower than the 100% sensitivity of another screening tool, the GUSS. Although the BESST does not perform better than the GUSS in the identification of aspiration, it was able to identify patients who did not have aspiration more accurately (specificity 81.6% and 50% respectively), and would have therefore, in this scenario, have offered more appropriate clinical care.

The BESST accords with definitions of a screening tool in that it is simple to use (Cochrane and Holland, 1971; Logemann et al., 1999), and relatively quick to administer (approximately 10 minutes). It has clear definitions of the clinical determinants of aspiration and clear instructions on scoring. The results demonstrate that the BESST has the potential for use in the acute stroke setting.

8.6 Summary

This chapter has presented the results of a large study undertaken on consecutively admitted patients to an acute stroke unit. The aim of this chapter was to establish the diagnostic accuracy of a tool that, subsequent to further testing, may be acceptable in clinical practice. The strengths and limitations of the main study have been presented.

The next chapter will present a critical appraisal of the programme of empirical studies; with suggestions how the research project could have been performed differently. It will explore how this research could be developed, how future research could improve on the results obtained in this preliminary study, how the clinical practice of nurses could be

developed to meet with recommendations of national clinical guidelines, and ultimately to show how to improve the quality of patient care and improve patient outcome.

CHAPTER 9

DISCUSSION

This thesis presents a series of empirical studies, which culminate in the delivery of a preliminary bedside swallow screening tool (BESST) for nurses to use with acute stroke patients who all need screening for swallowing difficulties. The BESST allows nurses to recommend the use of modified oral intake in patients who have swallowing problems. At the inception of the programme of work, bedside swallow screening tools would only allow nurses to recommend the management options of normal diet or nil by mouth.

Since commencing this research, other tools have been developed (as previously noted in Chapter 5) that fulfil these criteria. Anecdotally, in some geographical areas, both nurses and SLTs have implemented alternative swallow screening tools. These tools introduce the use of modified oral intake as an extension to management options dictated by water swallow screening tools without them having first been formally tested, or if tested, have only been tested in a homogenous sample.

This study is still able to add a valuable and unique contribution to current knowledge by using a heterogeneous sample of stroke patients to assess the clinical utility of the bedside swallow screening tool (BESST). The BESST is unique as a screening tool because it did not use nurses who are trained or experienced in the field of dysphagia in its assessment of diagnostic accuracy. This has the potential to make the tool appropriate for staff not specifically trained in dysphagia screening to implement. The use of the BESST eliminates the need for formal training programmes that require a significant commitment from the SLT department. Anecdotally, the inability to provide the training may be the cause of failure to implement formal screening protocols within the clinical setting.

Further contributions to knowledge were made with the nurse questionnaire. Other surveys have explored the issue of nurses undertaking bedside swallow screening. These surveys have only asked SLTs, who are assumed to have the definitive knowledge of formal dysphagia screening protocols, and not the nurses who are actually performing the screening. The questionnaire in this study therefore allowed the nurses' role in the implementation of bedside swallow screening tools to be acknowledged and examined.

This chapter presents a synopsis of the principal findings of this programme of work. It presents the potential limitations of this research, the implications for clinical practice and the scope for further research.

9.1 Key findings

The aim of this programme of work was to develop a bedside swallow screening tool to identify aspiration in acute stroke patients. The tool needed to have high sensitivity and specificity in detecting aspiration when compared to a clinical gold standard (in this work the senior SLT) and to be acceptable to nurses. A programme of study was undertaken to achieve this. The study began with a survey of nurses, which found that nurses did perform water swallow screening but used local protocols which adapted existing tools as they thought that the tools would then be more clinically useful. It was found that 55% of nurses used consistencies other than water suggesting a swallow screening tool that offered modified oral intake would likely be adopted into clinical practice. This result led to the development of a swallow screening tool that included modified consistencies within both testing materials, and in its management options. Stakeholder interviews established the face validity of the tool. A pilot study showed that the tool had the potential to be used in clinical practice but needed to be modified in terms of its format and content before it was tested further. Preliminary testing of the revised tool (BESST) was performed in a sample of stroke patients. The BESST was tested for inter and intra-rater reliability by an SLT and two nurses. The BESST showed that it had the potential to be used by nurses in clinical practice but further research is still required to further understand some inconsistencies in ratings.

9.2 BESST

This study included patients of both sexes and a range of ages, together with people with first and subsequent strokes. Of the 124 patients who consented to participate in the study, the median age was 74 years (range 66-82 years). The older age of the patients was to be expected as there is evidence of increasing prevalence of stroke with advancing age. The percentage of patients over 70 years was 52%. This may affect results obtained because age may affect bolus size. Bolus size might increase the number of multiple swallows observed during puree swallows (BESST allows three swallows per spoonful in order to pass the determinant) and influence the number of false positives identified in the study.

There were relatively similar numbers of males and females (n=64, 47% females) which would allow an undertaking of the effects of sex gender differences in swallow physiology, in terms of bolus size and number of swallows per volume of oral intake.

The centre used to recruit patients could be viewed as fairly typical of many stroke services developed in England. The profile of the patients admitted and recruited allows comparison with other centres; assisting clinicians in understanding relevance.

In the main study, the BESST demonstrated good agreement between nurses (81%) and within nurses (87% for N1 and 86% for N2). When comparing the nurses' ratings with the SLT: the sensitivity of the BESST ranged from 87.5% to 92.9%; the specificity from 70.1% to 81.6%; the PPV from 62.9% to 71.4% and the NPV from 92.3% to 94.7%; the overall efficiency from 78.2% to 84.3%. Optimally acceptable levels of specificity and sensitivity depend on the purpose of the screening tool and the impact that incorrect identification of difficulties have upon the patient. Although a false positive would restrict the oral intake, and therefore the quality of care the patient receives, a false negative would result in the patient receiving oral intake that may be aspirated onto the lungs and potentially cause pneumonia. The BESST did have limitations because patient safety was compromised in 3/38 (8%) of ratings: the BESST rated safe for modified diet where the 'gold standard' senior SLT placed the patient nil by mouth. Two of the ratings related to one patient. For this patient, the SLT identified subtle signs of aspiration on auscultation at bedside, which he believed would require further instrumental examination. The third rating related to a patient who refused to participate in the assessment of oral intake by the SLT, which therefore meant they were placed nil by mouth.

The clinical nurse produced better agreement with the SLT (84%) when undertaking the BESST rather than the research nurse (76%). This result could have been anticipated in view of the direct care offered to patients by the clinical nurse on a 24 hour basis, and a greater familiarity with identification of abnormal swallowing. The clinically experienced nurse would be more likely to have known which patients were at higher risk of aspiration. From the data emerging from the main study, the knowledge, skill and experience of the clinical nurse influenced the way in which clinical determinants of aspiration are identified and interpreted.

There were a small number (2) of disagreements between the management option actually chosen by the nurses and the management option that the nurse should have chosen by using the BESST. On these two occasions, the nurses were influenced by

their clinical judgment and reverted to the safest option of nil by mouth, even though the BESST dictated that the patients could be placed safely on a modified diet. The more cautious approach by the nurses in these two cases is actually reflected in the overall study results. Where disagreements occurred, it was down to a tendency of the nurses to not place patients on a normal diet. There was a slight difference between the nurses in terms of choice of options. The more clinically experienced staff nurse was less cautious than the research nurse. This may be due to the more experienced nurse considering the context of the symptoms and having a greater understanding of the process of patient review and assessment; resulting in a less overcautious rating.

Despite the obvious benefits of using clinically qualified staff, these need to be considered in the light of knowledge and skills competence frameworks (Benner, 1984; Storey et al., 2002) that stress the effects of experience on interpretation of test results. Five levels of competence are defined; from novice to expert practitioners. The 'novice' interprets instructions and follows protocol dictated in the tests they apply. Conversely, experienced 'expert' clinicians make clinical decisions based on 'gut feelings' and show an increasing propensity toward making judgements not based on the protocols dictated in tests. This pattern of behaviour was demonstrated during the survey, whereby the specialist nurses extended the water swallow tests to satisfy clinical need, regardless of the evidence base and contrary to instructions given by the SLTs in their training.

9.3 Clinical determinants

There is considerable emphasis in clinical practice on diagnosing dysphagia. Various health care professionals are able to identify problems related to dysphagia, either via urea and electrolyte results showing dehydration, or through oral intake charts. This study determined that its clinical focus would be that of aspiration, defined as entry of bolus material below the level of the vocal cords, rather than dysphagia. Aspiration requires a specific assessment and will not necessarily be observed through normal intervention with patients by nursing and health care professional assessments. In order to identify patients who may be at risk of aspiration post-stroke, swallow screening tools usually define a number of clinical determinants that indicate a pathological response to swallowing, and would therefore indicate that aspiration had occurred.

The clinical determinants, used within the BESST to detect aspiration, were based on available literature and were presented on the Information Sheet in a way that was

easy to interpret without prior SLT training. The BESST requires a simple observation of the clinical determinant to signify aspiration prior to being directed to the appropriate management option.

Where the clinical determinants of aspiration are explicit, most screening tools rely on the cough reflex (DePippo et al., 1994; Smithard et al., 1997; Daniels et al., 1998; Hinds and Wiles, 1998; Addington et al., 1999; Perry, 2001a,b; Massey and Jedlicka, 2002; Wu et al., 2004) but this relies on the preservation of pharyngeal sensitivity and an intact cough reflex (Mari et al., 1997). Most studies identify clusters of clinical determinants (Smithard et al., 1997; Daniels et al., 1998; Perry, 2001a,b; Massey and Jedlicka, 2002; Wu et al., 2004), which individually may vary in their sensitivity and specificity. Nevertheless, all of these studies include recognition of the cough reflex, which is recognised as a prime indicator of aspiration (Logemann et al., 1999; Addington et al., 1999). This effectively increases the sensitivity of the combined clinical determinants.

However, aspiration can occur silently, with the patient not demonstrating any pathophysiological response to aspiration. Absence of a cough reflex owing to diminished laryngeal sensitivity caused by the stroke would result in aspirated material going undetected. Evidence of silent aspiration has been reported in the literature, with different levels of prevalence: 22% of patients (Daniels et al. 1997), 39% of patients (Holas et al. 1994) and 8% of patients (Kidd et al. 1993) when comparisons were made on VFES.

Exploring the face validity of the BESST suggested that the nurses would understand the clinical determinants described on the Information sheet. However, the interviews undertaken to establish face validity were only undertaken on a small sample size (six nurses and six SLTs). Despite assurances that the clinical determinants were explicit, further research may identify that they were incorrectly assigned to patients as coughing during the procedure may be due to a plethora of other medical conditions.

The clinical determinants of aspiration in the SSA that the nurses used were 'cough' and 'wet gurgly voice'. Neither nurse used 'absent swallow' or 'breathlessness'. This could be interpreted to mean that these determinants are more difficult to detect because they are silent. However, when using the BESST, and when testing with water, the determinant 'wet breath sounds' was frequently observed. Therefore, it might be that seeing the words 'wet breath sounds' makes the nurses more vigilant and consequently more predisposed to listen for the sounds. When using the BESST and

when testing with thickened fluids, 'wet breath sounds' and 'cough' were still frequently reported.

'Weak movement of the larynx' was used as a determinant on only four occasions (two when testing with water). This determinant requires palpation of the hyo-laryngeal structures. Nurses are unfamiliar with this protocol and were not trained to palpate the larynx. This has implications for training if the diagnostic accuracy of the BESST is to be improved.

Analysis of the nurses' contemporaneous reasoning did not reveal specific reasons to justify their patterns of observation. A potential reason for the nurses being unable to accurately discriminate these determinants may be due to the confounding clinical features that present with stroke. Reduced levels of alertness, fatigue, reduced appetite and lack of insight may be present. These symptoms may obscure the clinical determinants of aspiration, and result in nurses failing to identify patients at risk.

The contemporaneous reasoning data further demonstrates that clinicians and nurses prevaricate when required to determine the relative importance of various symptoms of aspiration in clinical practice. This means that even when clinical determinants are observed by all raters, some are disregarded as insignificant. In these instances the rater is using their knowledge and experience to determine what clinical determinants are relevant.

Some studies include an option of 'other concerns' (Smithard et al., 1997; Perry, 2001a,b), allowing the person undertaking the study to apply their clinical experience. However, this renders the tools unreliable in clinical practice because the clinical reasoning, that is not reported, varies between individual health care professionals.

Therefore, the effects of training to observe and report clinical determinants of aspiration may result in a more diagnostically accurate tool. Further research that investigated the effectiveness of the training in swallow screening, offered to nurses and health care assistants, may prove to be useful in the identification of aspiration. Particularly because nurses and health care assistants are often the healthcare group that are commissioned with the task of feeding the patients who need assistance; this healthcare group are therefore most likely to notice ongoing and fluctuating aspiration signs.

9.4 Strengths

The BESST was designed with various foci: delivery of a screening tool in a timely fashion in order to maintain the integrity of lung tissue and function; and potentially improve the quality of care offered to stroke patients with dysphagia. The introduction of a swallow screening tool with a management option of modified oral intake is an extension of the water swallow screening tool (SSA) used in current clinical practice.

The SSA is based on the widely accepted 3 oz water swallow test screen (DePippo et al., 1992). However, the clinical utility of the SSA has been questioned (Suiter and Leder, 2008). It was suggested that 1,304/1,849 (71%) of patients were being unnecessarily denied oral intake when the 3 oz water swallow test was compared with FEES® in a heterogeneous population (Suiter and Leder, 2008). Moreover, other research supports the idea that if a screening tool is used, which gives the option of a modified diet, then patients can be safely given a modified diet rather than be left nil by mouth (Trapl et al., 2007).

The BESST would have allowed a modified diet on 35/38 (92%) occasions where the SSA would have placed the patients nil by mouth, potentially unnecessarily. Therefore, the BESST offers the potential for an improved quality of care over the SSA because it agreed with the SLT, and allowed modified diet in the majority of cases. The three patients where the BESST would have potentially made an unsafe recommendation is discussed in detail on page 171.

Whilst the SSA does offer nurses the facility to identify clinical determinants of aspirated fluids, it offers limited management options which may incur a delay in the introduction of oral intake whilst awaiting further specialist assessment. The BESST offers the facility for nurses to modify oral intake immediately following the screen (Figure 8.1), without a delay.

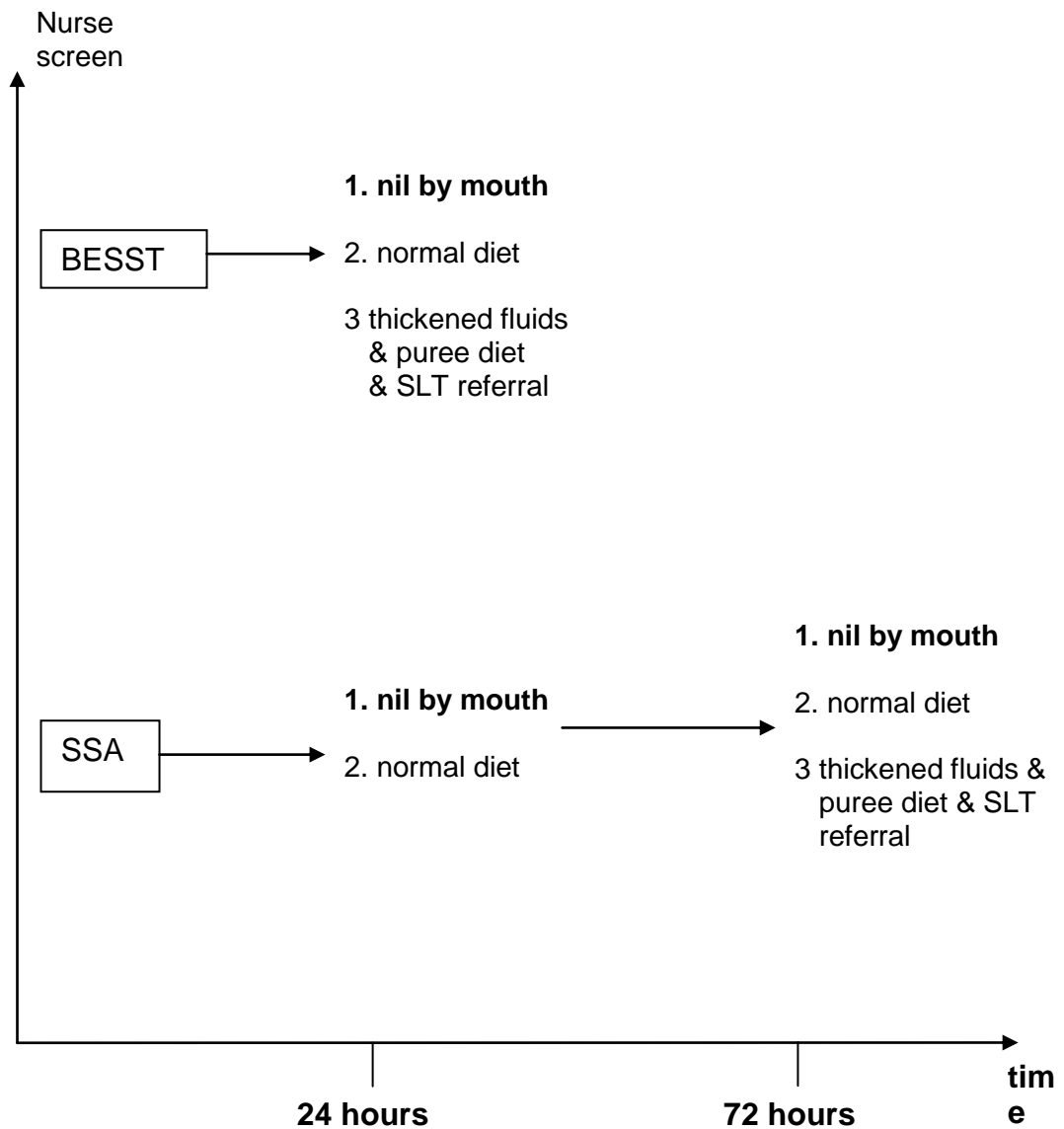


Figure 9.1: Comparison of the BESST and SSA speed of appropriate management for oral intake

For patients who would ultimately be placed on thickened fluids and puree diet by the SLT undertaking the specialist assessment, the BESST, rather than the SSA, would be the preferred screening tool for the nurses performing the screen. The SSA would dictate that the patient should receive nil by mouth and possible naso-gastric tube feeding whilst awaiting the SLT assessment. However, the BESST would allow modified oral intake immediately following the screening tool, thereby considerably reducing the time taken to reach the appropriate management option, and improving the patient experience by preventing a nil by mouth scenario and obviating the need for a naso-gastric tube.

There is the potential for improvement in the quality of care some patients receive by nurses using the BESST instead of the SSA. This increase in quality is defined in the quality web (Figure 9.2). The quality web demonstrates the improvement in the quality of care offered by the BESST through providing nurses with an evidence base to their clinical practice; this could potentially improve nurse compliance in conducting swallow screening tools. It offers a modified oral intake management option over the water swallow test nil by mouth option and a further improvement of modified oral intake in contrast to alternative nutrition and hydration. This may have the additional effect of improving patient comfort and reducing the psychological and rehabilitative decline owing to nil by mouth status. It offers the potential to decrease the length of time the patient would be nil by mouth by rapid implementation of an appropriate management option. An option of oral intake over nil by mouth would be more likely to maintain the integrity of oral hygiene rather than being reliant on nurse vigilance. However, further research would need to be undertaken to confirm whether this was an improvement in care in terms of patient outcome and whether patients perceive or rate the potential improvement in care offered by the BESST.

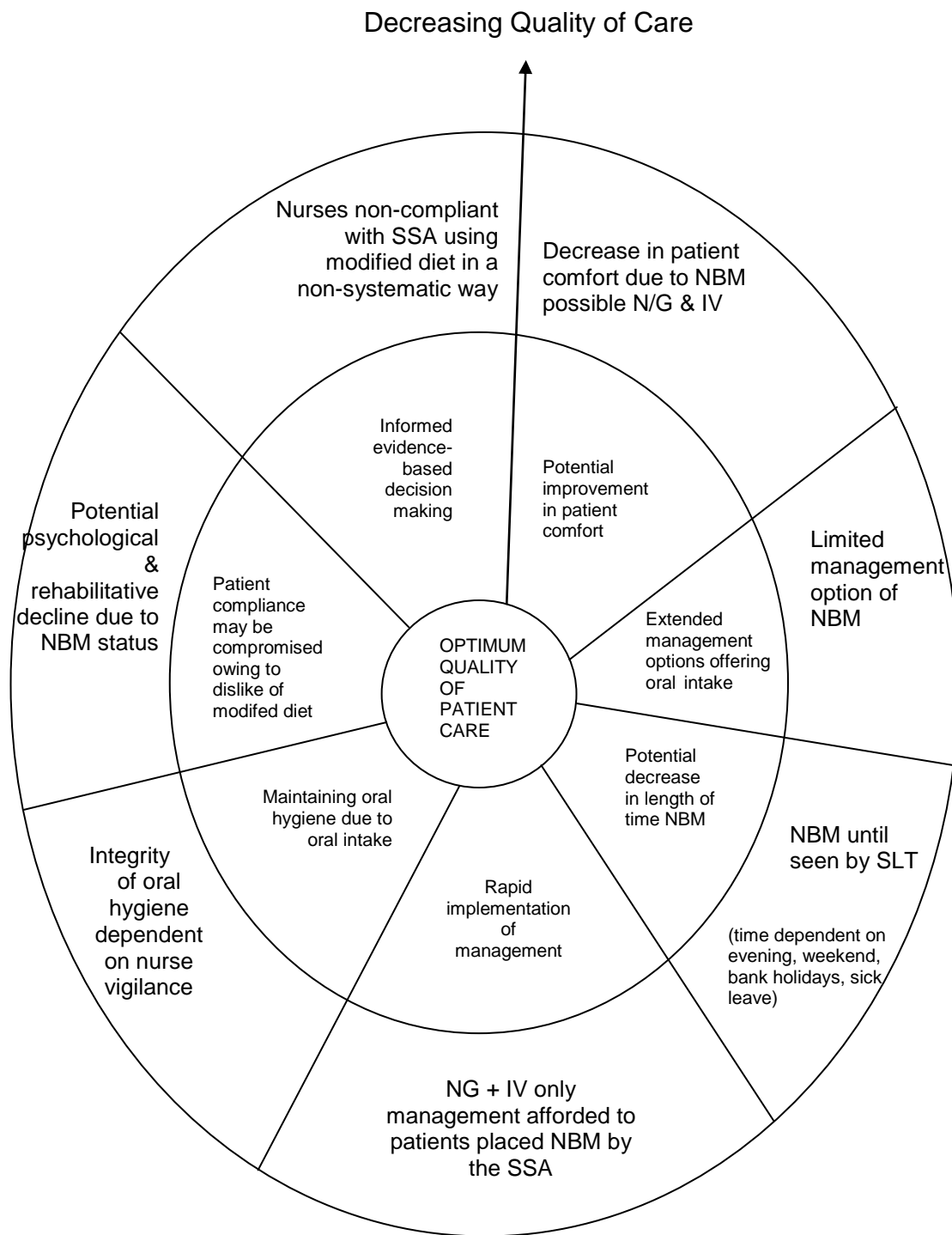


Figure 9.2: Quality web demonstrating the potential improvement in quality of care offered by the BESST in comparison to the SSA for patients who can tolerate thickened fluids and puree diet

An alternative dysphagia screening tool, the Gugging Swallowing Screen has been developed (Trapl et al., 2007). The GUSS has been tested in a highly selected sample of first-ever stroke patients who were identified as having suspected dysphagia by a Neurologist. The patients were conscious, cognitively able to give informed consent, demonstrated postural control and were able to co-operate with the research assessment process of bedside assessment and Fibreoptic Endoscopic Evaluation of Swallowing (FEES®). All the nurses undertaking the GUSS had extensive experience working with dysphagic stroke patients, and received further training in dysphagia and how to undertake the GUSS (Trapl et al., 2007).

Rather than using a highly selected sample, the BESST used consecutively admitted acute stroke patients. This established the utility of the BESST in a more generalisable population of stroke patients. Whilst the GUSS has only been used by experienced nurses with specific dysphagia training, the BESST was developed for use by nurses regardless of their experience or training; increasing staff groups able to perform dysphagia screening.

The performance of the GUSS and BESST, within the context of their respective study methodologies, is comparable. Basing scores for the BESST on the comparison between the SLT and N1 on day 1, the sensitivity for the GUSS and BESST was 100% and 89.7% respectively. For the GUSS and the BESST respectively, the specificity was 50% and 81.6%; the PPV was 81% and 71.4%; and the NPV was 100% and 93.9%.

In this scenario, the BESST yields good sensitivity and good specificity and with further research may be considered acceptable for the purpose of a bedside swallow screening tool.

9.5 Limitations

9.5.1 Gold standard

A gold standard is usually a rigorous assessment with high sensitivity and specificity; however, there is currently no gold standard for the identification of aspiration. In the absence of a 'gold standard' to identify dysphagia and aspiration, instrumental examinations of the swallow have been developed by modifying existing medical examinations. Many instrumental examinations, available in the research scenario: manometry; scintigraphy and ultrasound are not considered clinically viable diagnostic examinations. The Videofluoroscopic Evaluation of Swallowing (VFES) and the Fibreoptic Endoscopic Evaluation of Swallowing (FEES®) are recommended for use

with dysphagic stroke patients following specialist assessment or for stroke patients who require naso-gastric tube feeding for up to 4 days post-stroke (ICWP Stroke, 2008). However, these assessments may only be available to co-operative, cognitively intact patients at scheduled clinical times and are not available across all healthcare trusts across the UK.

Instrumental examinations aim to: contribute to the detection of aspiration; allow examination of the anatomy and physiology of the oro-pharyngeal tract to infer abnormal physiological movement of the oro-pharyngeal tract (Martin-Harris et al., 2000). However, no instrumental examination to diagnose dysphagia is currently available in the clinical setting that satisfies the criteria required of a gold standard with perfect sensitivity and specificity. Additionally, significant procedural and patient limitations apply to these instrumental examinations that render them inappropriate as a dysphagia screening tool.

Furthermore, these instrumental examinations require a plethora of specialist clinical staff and the procedure is not standardised, with clinicians using a combination of protocol and patient driven procedures. Procedural limitations of VFES and FEES® include: patients swallowing a bolus mixed with other preparations to make them visible during the examination; use of measured bolus size and consistencies with the use of different utensils i.e. liquids via teaspoon, straw or cup (Daniels and Huckabee, 2008) with the cue to 'swallow' (Daniels et al., 2007) that affects swallow physiology. Patients are exposed to radiation in VFES that only offers a snapshot of swallow function and cannot be repetitively administered. Further discrepancies occur as VFES interpretation and reporting is subjective, with different clinicians using locally generated reporting protocols. There is evidence of poor inter-rater reliability in VFES (Kuhlemeier et al., 1998; RCSLT, 2007).

There are many patient specific limitations as patients must have good levels of alertness, compliance and cognition, together with good or supported postural stability with no fluctuations in their medical state. When monitoring tracheal pH, it was demonstrated that 20% patients have a false negative result on VFES (Clayton et al., 2006) as many patients who do not demonstrate aspiration in the VFES examination continue to aspirate at bedside owing to swallow fatigue, positioning, different levels of supervision and expertise at bedside compared with specialised staff available during the VFES procedure (Ramsey et al., 2003). Therefore detection of aspiration on VFES does not always relate to poor patient outcome.

The aim of the study was to compare the BESST with current best practice of a bedside swallowing assessment, which currently, is by a specialist dysphagia SLT in stroke. A diagnosis of aspiration following a detailed bedside dysphagia assessment by a specialist SLT is generally accepted as the “gold standard” against which patients’ clinical care is modified. For this reason, and partly down to experiential realism, choice of an experienced SLT as the gold standard was determined, but this is recognised as a potential limitation of the testing of the BESST.

It is acknowledged that the experienced clinician would make management decisions in their gold standard assessment based not only on the presenting clinical determinants of aspiration, but also on their interpretation of these symptoms using previous knowledge and experience. Presence of ‘cough’, a key clinical determinant of aspiration in all bedside swallow screening tools, did not always result in the gold standard SLT’s identification of aspiration, dismissing some coughing as ‘insignificant’. Whilst recognising the individuality of each specialist clinician, the assumption is made, for the purpose of this study, that any two specialist SLTs would identify aspiration and manage patients equivocally. A further limitation of the gold standard SLT is that due to a reliance on their interpretation of clinical determinants, but also due to the confounding influence of silent aspiration, SLTs demonstrate a 40% false negative rate (Logemann, 1998).

The same gold standard SLT was used for both the pilot and the main study, therefore it was not possible, within the confines of this study, to identify disparities in the interpretation of clinical determinants determined by different specialist SLTs consideration of the patients’ medical condition and prognosis.

However, the specialist ‘gold standard’ SLT used in the BESST did identify 58/135 (43%) and 73/135 (54%) patients with dysphagia on days 1 and 2, respectively and these figures are consistent with values reported elsewhere in the literature (Smithard, et al., 1997). This would suggest that the SLT was representative of SLTs undertaking bedside clinical swallow assessments.

Use of an individual gold standard SLT had limitations in terms of diagnostic accuracy, and the education, training and experience that this individual SLT brings to the study. However, the gold standard had partaken in nationally endorsed training programmes at under-graduate and post-graduate level, was engaged in a specialist network of dysphagia therapists designed to share knowledge and clinical practice, and worked within a team of therapists. This culmination of expertise and experience, justifies the

assumption that the SLT's role within the study would be representative of that of his colleagues.

9.6 Implications for practice

9.6.1 Clinical implications for patient management

There is a failure on behalf of some authors to recognise: the need for immediate prescribed active management following completion of the tool; to maintain nutrition and hydration; and the effects this may have on patient outcome.

Most of the water swallow tests (DePippo et al., 1994; Smithard et al., 1997; Hinds and Wiles, 1998; Perry, 2001a,b; Massey and Jedlicka, 2002) screen for the risk for swallowing difficulties, or aspiration, with an immediate management option of placing patients on either a normal diet or nil by mouth with referral for more detailed assessment. This dictates that patients are waiting indeterminate time periods for further assessment and decisions regarding nutrition and hydration which contravenes current clinical guidelines (ICWP Stroke, 2008) and professionally endorsed frameworks of active management (Boaden et al., 2006). With reported outcomes of reduction in health care costs (Odderson et al., 1995; Smithard et al., 1996) and improvement in quality of life (McHorney and Rosenbeck, 1998), appropriate intervention should be initiated following completion of swallow screening tests (Westergren et al., 1999; ICWP Stroke, 2004).

The BESST prescribes a clinical management plan following completion of the screen. There is evidence to suggest that individual patient symptoms observed during the main study had an influence on the choices made between the SLT and the nurses. Both nurses placed one patient nil by mouth owing to the patient coughing when given a drink, however, the SLT was aware that the patient had coughed on drinks for 3-4 years and remained asymptomatic resulting in the SLT recommending a normal diet.

The raters' contemporaneous reasoning showed that the nurses placed a patient with a dual aetiology of stroke and learning difficulties nil by mouth, but the SLT recommended a modified diet with possible consideration of normal diet owing to 'compliance issues'. Another patient who was allocated modified diet by the nurses, was placed on normal diet by the SLT, who acknowledged the secondary diagnosis of cancer with brain metastases and a two month prognosis. In these instances, the SLT took a holistic palliative care approach, allowing potentially unsafe oral intake in view of the patient's quality of life and prognosis.

In some cases therefore, the BESST may direct the nurses to a management option that may not be the most appropriate holistically but may in fact be representative of swallow function. However, in reality, the nurses would be in possession of patient details and armed with that information might make more appropriate holistic management decisions rather than rely solely on the clinical determinants of aspiration displayed by the patient. These discrepancies in management options between the SLT and the nurses are to some extent a product of the research context rather than a reflection of the clinical situation.

9.6.2 Clinical implications for patient outcome

Individuals who pass the water screening swallow tools are allowed to have normal diet without prior assessment of their ability to swallow a variety of different textures which fails to recognise altered physiology that accompanies altered consistencies and the potential for aspiration on normal consistencies. For example, the 3 oz water swallow test was used in a rehabilitation management programme with patients placed either: nil by mouth with NG feeding; having an adjusted diet of puree and jelly; or normal diet. However, authors report two of the six (33%) NG fed patients; seven of the forty four patients (16%) on adjusted diet; and nine of the 130 patients (7%) on normal diet presented with pneumonia when patient outcomes were assessed (Gottlieb et al., 1996).

Most studies concentrate on patient outcome relating to aspiration that is assumed to cause a respiratory event i.e. the incidence of upper respiratory chest infection or pneumonia (DePippo et al., 1994; Perry, 2001a,b; Massey and Jedlicka, 2002); frequency of recurrent respiratory tract infection (Perry, 2001a,b); respiratory difficulties (Hinds and Wiles, 1998); airways obstruction (DePippo et al., 1994) or death (DePippo et al., 1994). However, as previously discussed in Chapter 3, aspiration is not always associated with a respiratory event and poor patient outcome (Huxley et al., 1978; Feinstone et al., 1996; Garon et al., 1997) as discussed in Chapter 2.

The implications of aspiration are unknown owing to inconclusive evidence in the literature regarding the association of aspiration and development of pneumonia. Aspiration pneumonia in the elderly was found to be the cause of a 43% mortality rate (Langmore et al., 1991). However, definitive results regarding aspiration and patient outcome are confused by several factors: baseline lung function and pre-existing medical conditions that may predispose patients to aspiration; poor dental hygiene;

quantity, acidity, frequency, infective state of the bolus; and patient compliance with prescribed management options.

It is unknown how much healthy individuals aspirate without developing a chest infection. On reflection, aspiration should not be the primary focus of further research but rather patient outcome. Identification and elimination of the discrete parameters that initiate a chest infection secondary to aspiration may be a more important consideration for further research. The characteristics of those patients who are found to be aspirating but who do not develop pneumonia need to be identified: this would serve to inform further research.

9.7 Implications for research

There are many limitations to the study that were highlighted by the main study.

Currently, there is no acknowledged gold standard for the detection of aspiration demonstrating 100% sensitivity and specificity. All screening tools, both instrumental examinations and bedside screening protocols are limited in their attempts to diagnose aspiration. The use of the specialist SLT as the gold standard in the study has been presented, but a more rigorous comparison of generalist and specialist SLT skills in identification of aspiration at different levels of training and competence is warranted. In order to be more confident in the performance of the BESST, the gold standard SLT could be examined against other dysphagia specialist stroke practitioners or with instrumental examinations. However, in order to use instrumental examinations the patient has to be compliant, leading to the inclusion of a more select group of patients when testing the tool, which would reduce understanding of its utility in clinical practice.

The clinical determinants used within the BESST, although clearly defined on the Information sheet, were still subject to interpretation by the raters according to their level of knowledge, experience and familiarity with the patient. Further research is needed to differentiate which clinical determinants are most easily identified and interpreted by the nurses and which combinations of determinants improve overall diagnostic accuracy.

The reporting accuracy of the BESST may have been affected by use of nurses who were not familiar with caring for neurologically impaired patients. In clinical practice, the nurses on the ward that are familiar with the patient and their pre-existing medical condition as well as be cognisant with the characteristics of stroke that would mask

aspiration, would undertake the screen. This would allow them to make a more holistic management decision that might reflect that of the SLT and would therefore improve agreement between the BESST and the bedside assessment. The degree of familiarity and clinical experience with this population may be critical in regards to BESST outcome. An exploration of nurses at different grades and experience undertaking swallow screening tools may suggest an improvement in diagnostic accuracy and therefore direct role extension to specific qualified staff.

The research nurses were also subjected to time constraints and had to complete the BESST when required. In clinical practice, nurses would be more likely to return or repeatedly administer the test if they had any initial reservations.

Diagnostic accuracy may have been improved by increasing the exclusion criteria and limiting research consideration to first or subsequent strokes. This would eliminate the confounding clinical features of pre-existing medical conditions but would limit the BESST's utility in clinical practice. Similarly, the sample group may be unrepresentative of stroke patients as a population owing to the research being undertaken at a single site. Larger multi-site studies may improve the validity of the tool.

The BESST for use with use by nurses for stroke patients may offer nurses a swallow screening tool that allows for modified diet and therefore is more acceptable in the clinical setting than previously available tools. Although this would need further qualitative investigation, measures of clinical acceptability could be undertaken. This may consider patients' opinions regarding improvements in quality of care and nurses' perceptions regarding implementation of the tool. This may reveal an explanation for nurses' compliance with swallow screening tools.

Despite the inevitable ethical and clinical difficulties and cost implications inherent in clinical research, a more rigorous assessment of the efficacy of swallow screening tools used in different populations may improve sensitivity and specificity, and give nurses and other professionals the appropriate tools to provide optimum clinical care. Further research may improve the diagnostic accuracy of the tool but additional investigation would be required prior to swallow screening tools being introduced in other conditions and across different ages in both primary and secondary care settings

9.8 Administration of the dysphagia screening tool by different healthcare professionals

The professional groups undertaking the various water swallow screening tests presented in Chapter 5, vary from nurses (Perry, 2001a,b), SLTs (DePippo et al., 1994; Daniels et al., 1998), physicians (Smithard et al., 1997), neurologists (Hinds and Wiles, 1998), and research assistants (Massey and Jedlicka, 2002). Not only is their professional knowledge and training significantly different, but their training and their experience within the field of dysphagia will differ, which will have an effect on their interpretation of presenting clinical determinants of aspiration and will bias the results. Whilst acknowledging the role of other healthcare professionals in acute stroke patient care, their remit does not allow for 24 hour care currently provided by nursing staff. In order for these screening tools to be used in the clinical setting, these tests would need further validation with nursing staff.

The multi-disciplinary team have a valuable contribution to the identification of dysphagia and ongoing monitoring of the swallow function owing to their respective roles of examining patient medical states. Physiotherapy will often prompt a dysphagia referral owing to deterioration in chest status, whilst Occupational therapists may be alerted to perceptual issues or practical constraints regarding utensils that impact on the oral intake of food and drink. Pharmacists may identify an issue if there are difficulties taking tablets and may request a dysphagia assessment prior to prescribing medication in different solutions. Any member of the team, working in an environment that requires keen observation of patient symptoms, may be alerted to clinical determinants of aspiration that include coughing and wet voice quality. The whole multidisciplinary team therefore have a vital role in the identification and ongoing monitoring of dysphagia in stroke patients. With due regard to fluctuation of swallow function throughout the 24 hour period (Smithard et al., 1997) patients would benefit from repeated screening tests that would allow for planning and modifying appropriate nursing care.

Further examination of the contribution of other healthcare professionals to the identification and ongoing management of aspiration may demonstrate an improvement of patient experiences and outcome in acute and rehabilitative stages of stroke. Although a staff nurse and a research nurse were used in the context of this study, further research is required to demonstrate that the BESST could yield similar results in other professional groups that are non-specialist dysphagia practitioners. It could also be a practical tool for all professionals working as a Foundation Level Practitioner as identified by the Inter- professional Dysphagia Framework (Boaden et al., 2006).

9.9 Training

Many studies do not mention the training required to undertake the screening tests possibly due to the simplicity of the swallow screening tool involved (WST; 50 ml WST; 3 oz WST; 100 ml WST). In the MBSS all professionals involved were registered as specialists in stroke and imply that training in recognition of clinical determinants associated with aspiration is not necessary. Similarly, the BSA (Smithard et al., 1997) reports that no training was offered to the medical researchers undertaking the screen. The consultant physician in this study (Smithard et al., 1997) had significant experience of the stroke population and had extensive theoretical knowledge around the subject of dysphagia, thereby distinguishing the consultant from general physicians.

Only the SSA and GUSS report training in the assessment and management of dysphagia and administration of the swallow screening tools. The SSA requires nurses to attend a theoretical study day together with five successful supervised practice sessions. This level of support would be untenable in the clinical environment because it would require continual training of rotating nursing staff.

The BESST was used by a research nurse who had limited clinical experience and by a clinically experienced nurse in the speciality of intensive care. They were identified, partly due to clinical expediency, but more appropriately to establish if the BESST could be used without the extensive training identified in other studies (Perry, 2001a,b). The nurses were not offered formal training as part of the BESST study. They were encouraged to discuss global issues relating to the BESST and the testing procedure but not more specific issues regarding individual patients. This would reflect the clinical environment where the BESST has been designed to be used. The nurses were reassured that results of the BESST undertaken in a research scenario did not have implications for clinical care and that any concerns raised by the BESST should be highlighted to the medical team. Nevertheless, there is still a possibility that concerns for the patients' welfare clouded some judgements. These concerns, and their implications for rating i.e. cautious approach, may have been overcome by providing structured training in how to use the BESST, particularly as neither of the nurses had experience with swallowing in a neurological client group.

Despite nurses being required to feed patients (United Kingdom Central Council for Nursing, Midwifery and Health Visiting, 1997), dysphagia is not presently delivered as part of their pre-registration training. Therefore, it is possible to anticipate that nurses might not feel confident in the identification of aspiration especially in stroke patients who present with similar concomitant symptoms. Currently, nurses are trained in small

numbers on the wards, and are required to attend further training sessions annually in order to maintain their clinical competence. This training approach diverts clinical time from the patients and further efficacy studies may suggest that this role could be more appropriately assigned to a specialist training facilitator. It may also identify if training improved nurses' ability to identify or discriminate symptoms as a consequence of aspiration or other medical conditions.

Further research would be needed to identify if training was effective in improving both compliance with the tool, and identification and interpretation of the clinical determinants of aspiration. The IDF was developed in an attempt to define the training and skills required at each level of dysphagia practitioner in order that this subset of skills could become generic national training. Other studies (Trapl et al., 2007) propose training for nurses at a pre-registration level. If this was introduced, this may go some way to overcome the resistance that some nurses may have to extending their role. Future research focusing on reducing negative cultural factors for nurses could be undertaken, possibly drawing on models of action research. This methodology could potentially enable nurses to identify the disparity between their current clinical practice and national clinical guidelines. Dysphagia training at pre-registration level and linked to the IDF, could be endorsed by the professional colleges and may overcome cultural issues identified by other studies (Miller and Krawczyk, 2001).

Dysphagia training undertaken as part of further research with the BESST may improve its diagnostic accuracy. Training in the use of a bedside swallow screen has been demonstrated to have a positive impact on the utility of bedside swallow screening tools in a clinical environment and positive patient outcome (Hinchey et al., 2005). It is not possible to determine, without more detailed examination, whether training at pre-registration level would be effective in order to establish a critical mass of nurses in the clinical setting to support each other. Teaching large cohorts of nurses at pre-registration level would also allow some peer support in the clinical setting and would overcome the need for nurses to be released from the ward in order to attend training.

Further research should be undertaken to understand and explore nurses' views on bedside swallow screening tools and the level of experience or training needed.

9.10 Conclusion

Eating and drinking is an extremely emotive subject and a screening tool that could potentially deprive the patient of oral intake needs to be rigorously tested prior to being

introduced into clinical practice. Conversely, if the patient is constantly aspirating, then a screening tool that introduces appropriate oral intake may be welcomed by both patients and professional staff.

Despite the British Medical Association's guidance regarding nutrition and hydration, supported by the British Artificial Parenteral and Enteral Nutrition group (BAPEN), professionals harbour concerns that removal of food and drink outside the parameters of palliative care, contravenes a patients' basic human right. Fuelling these emotive opinions is the paucity of evidence directly linking aspiration and development of aspiration pneumonia. Some individuals, once placed nil by mouth, report that they have reduced pleasure in life (McHorney et al., 2002).

Depriving patients oral intake, even on medical grounds and for the patient's long term benefit, has a significant emotional impact on nurses who anecdotally report that unless the patient falls in the parameters of palliative care or end of life dying pathway, they are resistant to take responsibility for imposing such a regimen.

The consequences of failing a swallow screening test are vast, both physically and psychologically, and are not without serious complications themselves, for example, intravenous drips can cause local inflammation and infection which may deteriorate to septicaemia, so a high specificity is required. Also the cost of alternative nutrition and hydration is high, so screening tools have an obligation to be accurate from both the perspective of patient care and cost to the health service.

The BESST accords with definitions of a screening tool in that it is simple to use, and is relatively quick to administer (approximately 10 minutes), making it acceptable to use in a busy clinical setting. It has clear definitions of the clinical determinants of aspiration and clear instructions on how to score it. The BESST demonstrates good sensitivity and specificity and good agreement between the gold standard SLT and the nurses. Agreement between and within raters was reasonable. The BESST has the potential to safely reduce the number of patients being placed nil by mouth. Use of the BESST in the acute stroke setting may enable non-specialist staff to screen and manage routine dysphagia throughout a 24 hour basis. Further research aimed at experienced staff with familiarity of stroke patients and who are trained to use the BESST may improve its validity and reliability without compromising patient safety.

The BESST contributes to the systematic identification and management of aspiration by nurses on acute stroke patients and may improve patient outcome, reduce the

length of time the patient remains nil orally, improve patients experience of hospital, and improve the quality of care patients receive whilst in an acute care setting. Despite its limitations, the BESST is more favourable than the ad-hoc clinical practices that some nurses adopt as evidenced by the survey in Chapter 6. It may prove to be a more useful tool than some as it is simple to use, is quick and may be useful when used as a prerequisite to a more specialist assessment.

Contributing to current knowledge is the questionnaire of nurses' clinical activity regarding implementation of the water bedside swallow screening tool. The main contribution to knowledge from this programme of study comes from the development of a screening tool that develops the current clinically used SSA by offering a third option of modified diet. The tool demonstrated utility when used by untrained nurses screening consecutively admitted stroke patients.

REFERENCES

- Addington, W. R., Stephens, R. E. and Goulding R. E. (1999) Anesthesia for the superior laryngeal nerves and tartaric acid-induced cough. *Archives of Physical Medicine and Rehabilitation* 80:12:1584-1207.
- Adnerhill, I., Ekberg, O. and Groher, M. E. (1986) Determining normal bolus size for thin liquids. *Dysphagia* 4:1:1-3.
- Alberts, M. J., Horner, J., Gray, L. and Brazer, S. R. (1992) Aspiration after Stroke: Lesion analysis by brain MRI. *Dysphagia* 7:3:170-173.
- Aldridge, A. and Levine, K. (2001) Surveying the social world. Principles and practice in survey research. Buckingham: Open University Press.
- Allen, J. E., White, C. J., Leonard, R. J. and Belafsky, P. C. (2010) Prevalence of penetration and aspiration on videofluoroscopy in normal individuals without dysphagia. *Otolaryngology Head and Neck Surgery* 142:208-213.
- Altman, D.G. (1991) Practical Statistics for Medical Research Chapman and Hall, London. 389-391.
- Altman, D. G. and Bland, J.M. (1994a) Diagnostic tests 1: sensitivity and specificity. *British Medical Journal* 308:1552.
- Altman, D. G. and Bland, J.M. (1994b) Diagnostic tests 2: predictive values. *British Medical Journal* 309:102.
- Aronson, J. (1994) A Pragmatic View of Thematic Analysis. The Qualitative Report. 2:1 (<http://www.nova.edu/ssss/QR/BackIssues/QR2-1/aronson.html>) [accessed 7 April 2010].
- Anderson, G., Vestergaard, K., Riis, J. O. and Laurantzen, L. (1994) Incidence of post-stroke depression during the first year in a large unselected stroke population determined using a valid standardized rating scale. *Acta Psychiatrica Scandinavica* 90:190-195.
- Asch, D., Jedrzejewski, M. and Christakis, N. (1997) Response rates to mail surveys published in medical journals. *Journal of Clinical Epidemiology* 50:1129-1136.
- Aviv, J. E., Kaplan, S. T., Thomson, J. E., Spitzer, J., Diamond, B. and Close, L. G. (2000) The safety of flexible evaluation of swallowing with sensory testing (FEESST): an analysis of 500 consecutive evaluations. *Dysphagia* 15:39-44.
- Axelsson, K., Norberg, A. and Asplund, K. (1984) Eating after a stroke-towards an integrated view. *International Journal Nursing Studies* 21:93-99.
- Azarpazhooh, A. and Leake, J. L. (2006) Systematic review of the association between respiratory diseases and oral health. *Journal of Periodontology* 77:9:1465-1482.
- Baker, T. L. (1994) Doing Social Research (2nd Edn.) New York: McGraw-Hill Inc.
- Barer, D. H. (1989) The natural history and functional consequences of dysphagia after hemispheric stroke. *Journal of Neurology, Neurosurgery, and Psychiatry* 52:2:236-241.
- Bartlett, J. G. (1993) Anaerobic bacterial infections of the lung and pleural space. *Clinical Infectious Diseases* 4:S248-55.

- Bartlett, J. G. (2010) Aspiration Pneumonia in adults. <http://www.uptodate.com/home/store.do>. [accessed 25 April 2011].
- Benner, P. (1984) From novice to expert: Excellence and power in clinical nursing practice. Addison-Wesley Publishers Company, California.
- Bleach, N. R. (1993) The gag reflex and aspiration: a retrospective analysis of 120 patients assessed by videofluoroscopy. *Clinical Otolaryngology and Allied Sciences* 18:4:303-307.
- Boaden, E. E., Davies, S. R., Storey, L. and Watkins, C. L. (2006) Inter-professional Dysphagia Framework on behalf of the National Steering Committee on Dysphagia. http://www.rcslt.org/members/publications/Framework_pdf [accessed 10 August 2006].
- Bogousslavsky, J., Aarli, J. and Kimura, J. (2003) Stroke: time for a global campaign? *Cerebrovascular Diseases* 16:2:111-3.
- Bourque, L. B. and Fielder, E. P. (1995) How to conduct self-administered and mail surveys. Thousand Oaks: Sage Publications.
- Bowling, A. (2009) Data collection methods in quantitative research: questionnaires, interviews and their response rates. Research methods in health: Investigating health and health services (3rd Ed.). Open University Press, Maidenhead, Berkshire. SL6 2QL
- Brady, M. C., Furlanetto, D. L., Hunter, R. V., Lewis, S. C. and Milne, V. (2007) Improving oral hygiene in patients after stroke. *Stroke* 38:1115-6.
- British Heart Foundation and The Stroke Association (2009) Stroke statistics 2009. <http://www.heartstats.org/datapage.asp?id=8615> [accessed 12 January 2010].
- Buchholz, D. W., Bosma, J. F., and Donner, M.W. (1985) Adaptation, Compensation and Decompensation of the Pharyngeal Swallow. *Gastrointestinal Radiology* 10:235-239.
- Burke, A. C. (2010) Pneumonia Essentials (3rd Ed.). Jones and Bartlett publishers international, London. UK.
- Butler, S. G., Stuart, A., Pressman, H., Poage, G. and Roche, W. J. (2007) Preliminary investigation of swallowing apnea duration and swallow/respiratory phase relationships in individuals with cerebral vascular accident. *Dysphagia* 22:3:215-224.
- Butler, S.G., Stuart, A. and Kemp, S. (2009a) Flexible endoscopic evaluation of swallowing in healthy young and older adults. *Annals of Otolaryngology, Rhinology & Laryngology* 118:2: 99-106.
- Butler, S.G., Stuart, A., Markley, M. S. and Rees, C. (2009b) Penetration and aspiration in healthy older adults as assessed during endoscopic evaluation of swallowing. *Annals of Otolaryngology, Rhinology & Laryngology* 118:3:190-198.
- Castell, D. O. and Donner, M. W. (1987) Evaluation of dysphagia: a careful history is crucial. *Dysphagia* 2:2:65-71.
- Cerenko, D., McConnel, F. M. and Jackson, R.T. (1989) Quantitative assessment of pharyngeal bolus driving forces. *Otolaryngology Head and Neck Surgery* 100:1:57-63.

- Chang, A. B., Phelan, P. D., Roberts, R. G. and Robertson, C. F. (1996) Capsain cough receptor sensitivity test in children. *European Respiratory Journal* 9:11:2220-2223.
- Chen, P., Golub, J., Hapner, E. R. and Johns, M. M. (2009) Prevalence of perceived dysphagia and quality of life impairment in a geriatric population. *Dysphagia* 24:1-6.
- Cichero, J. A. Y. and Murdoch, B. E. (1998) The Physiologic Cause of Swallowing Sounds: Answers from Heart Sounds and Vocal Tract Acoustics. *Dysphagia* 13, 39-52.
- Cichero, J. A. Y. and Murdoch, B. E. (2006) Applied anatomy and physiology of the normal swallow. *Dysphagia: Foundation, Theory and Practice*. Wiley and Sons Ltd. West Sussex UK.
- Clayton, J., Jack, C. A., Ryall, C., Tran, J., Hilal E. and Gosney, E. (2006) Tracheal pH monitoring and aspiration in acute stroke. *Age and Ageing* 35:1:47-53.
- Cochrane, A. L. and Holland, W. W. (1971) Validation of screening procedures. *British Medical Bulletin* 27:1:3-8.
- Colodny, N. (2000) Comparison of dysphagics and non-dysphagics on pulse oximetry during oral feeding. *Dysphagia* 15:2:68-73.
- Connor, N.P., Cohen, S.B., Kammer, R. E., Sullivan, P. A., Brewer, K. A., Hong, T. S., Chappell, R. J. and Harari, P. M. (2006) Impact of conventional radiotherapy on health-related quality of life and critical functions of the head and neck. *International Journal of Radiation Oncology, Biology, Physics* 65:4:1051-62.
- Cook, J. V., Dickenson, H. O. and Eccles, M. P. (2009) Response rates in postal surveys of healthcare professionals between 1996 and 2005: An observational study. *BMC Health Services Research* 9:160. <http://www.biomedcentral.com/1472-6963/9/160> [accessed 15 November 2009].
- Cruickshank, R. (1970) *Medical microbiology a guide to the laboratory diagnosis and control of infection* (11th edition) E & S Livingstone Ltd., Edinburgh & London.
- Daggett, A., Logemann, J., Rademaker, A. and Pauloski, B. (2006) Laryngeal penetration during deglutition in normal subjects of various ages. *Dysphagia* 21:4:270-275.
- Daniels, S. K., Brailey, K. and Foundas, A. L. (1999) Lingual disco-ordination and dysphagia following acute stroke: Analysis of lesion location. *Dysphagia* 14:2:85-92.
- Daniels, S. K., Brailey, K., Priestly, D. H., Herrington, L. R., Weisberg, L. A. and Foundas, A. L. (1998) Aspiration in patients with acute stroke. *Archives of Physical Medicine and Rehabilitation* 79:1:14-19.
- Daniels, S. K. and Foundas, A. L. (2001) Swallow physiology of sequential straw drinking. *Dysphagia* 16:3:176-182.
- Daniels, S. K. and Huckabee, M. (2008) *Dysphagia Following Stroke*. Plural Clinical Dysphagia Series, Plural Publishing inc. San Diego, Oxford, Brisbane.
- Daniels, S. K., McAdam, C.P., Brailey, K. and Foundas, A. L. (1997) Clinical assessment of swallowing and prediction of dysphagia severity. *American Journal of Speech-Language Pathology* 6:4:7-24.

- Daniels, S. K., Schroeder, M. F., DeGeorge, P. C., Corey, D. M. and Rosenbeck, J. C. (2007) Effects of verbal cue on bolus flow during swallowing. *American Journal of Speech-Language Pathology* 16:2:140-147.
- Darley, F., Aronson, A. and Brown, J. (1975) *Motor Speech Disorders*. Saunders (W.B.) Co. Ltd.
- Davies, A. E., Kidd, D., Stone, S. P. and MacMahon, J. (1995) Pharyngeal sensation and gag reflex in healthy subjects. *Lancet* 345:8948:487-488.
- DePippo, K. L., Holas, M. A. and Reding, M. J. (1992) Validation of the 3oz water swallow test for aspiration following stroke. *Archives of Neurology* 49:12:1259-1261.
- DePippo, K. L., Holas, M. A. and Reding, M. J. (1994) The Burke dysphagia screening test: Validation of its use in patients with stroke. *Archives of Physical Medicine and Rehabilitation* 75:12:1284-1286.
- Department of Health (2000a) The NHS plan: a plan for investment, a plan for reform www.dh.gov.uk/en/Publicationsandstatistics/PublicationsPolicyAndGuidance/DH_4002960 [accessed 10 September 2009].
- Department of Health (2000b) A Health Service of all the talents: Developing the NHS workforce. Consultation Document on the Review of Workforce Planning. Department of Health, London. www.dh.gov.uk/en/Publicationsandstatistics/PublicationsPolicyAndGuidance/DH_4007967 [accessed 13 October 2009].
- Department of Health (2001a) The Essence of Care: Patient-focused benchmarking for health care practitioners. www.dh.gov.uk/en/Publicationsandstatistics/PublicationsPolicyAndGuidance/DH_4005475 [accessed 21 September 2009].
- Department of Health (2001b) Making the Change: a strategy for the professions in healthcare science www.dh.gov.uk/en/Publicationsandstatistics/PublicationsPolicyAndGuidance/DH_4010607 [accessed 10 December 2009].
- Department of Health (2001c) National Service Framework for Older People. London: Department of Health. www.dh.gov.uk/en/Publicationsandstatistics/PublicationsPolicyAndGuidance/DH_4003066 [accessed 10 December 2009].
- Department of Health (2004) Agenda for Change www.dh.gov.uk/en/Publicationsandstatistics/PublicationsPolicyAndGuidance/DH_4095943 [accessed 13 April 2009].
- Department of Health (2006) Skills for Health Competences/National Occupational Standards https://tools.skillsforhealth.org.uk/competence_search/?search=&advanced=1&suite%5b%5d=49 [accessed 13 November 2007].
- Dicpinigaitis, P. V. (2003) Cough reflex sensitivity in cigarette smokers. *Chest* 123:3:685-688.
- Dicpinigaitis, P. V. and Rauf, K. (1998) The influence of gender on cough reflex sensitivity. *Chest* 113:5:1319-1321.

- Dikeman, K. J. and Kazandjian, M. S. (1995) Communication and swallowing management of tracheostomized and ventilator-dependent adults. Singular publishing Group, San Diego.
- Dockrell, D. H., Marriott, H. M., Prince, L. R., Ridger, V. C., Ince, P. G., Hellewell, P. G. and Whyte, M. K. B. (2003) Alveolar Macrophage Apoptosis Contributes to Pneumococcal Clearance in a Resolving Model of Pulmonary Infection. *The Journal of Immunology* 171:5380-5388.
- Dodds, W. J. (1989) The physiology of swallowing. *Dysphagia* 3:171-178.
- Donnan, G. A., Fisher, M., Macleod, M. and Davis, S. M. (2008) Stroke. *Lancet* 371:9624:1612–23.
- Donner, M.J., Bosma, J. F. and Robertson, D. L. (1985) Anatomy and Physiology of the Pharynx. *Gastrointestinal Radiology* 10:192-212.
- Dua, K. S., Ren, J., Bardan, E., Xie, P. and Shaker, R. (1997) Co-ordination of deglutitive glottal function and pharyngeal bolus transit during normal eating. *Gastroenterology* 112:1:73-83.
- Dziewas, R., Warnecke, T., Olenberg, S., Teismann, I., Zimmermann, J., Kramer, C., Ritter, M., Ringelstein, E. B. and Schabitz, W. R. (2008) Towards a basic endoscopic assessment of swallowing in acute stroke – development and evaluation of a simple dysphagia score. *Cerebrovascular Diseases* 26:1:41-47.
- Edwards, P., Roberts, I., Clarke, M., DiGuseppi, C., Prata, S., Wentz, R., Kwan, I. and Cooper, R. (2002) Increasing response rates to postal questionnaires: systematic review. *British Medical Journal* 324: 1183.
- Edwards, P., Roberts, I., Clarke, M., DiGuseppi, C., Prata, S., Wentz, R., Kwan, I. and Cooper, R. (2003) Methods to increase response rates to postal questionnaires. The Cochrane Database of Methodology Reviews 4. (Available online from the Cochrane Library) <http://www.mrw.interscience.wiley.com/cochrane/clmethrev/articles/MR000008/pdf/fs.html> [accessed 7 February 2010].
- Eisbruch, A., Lyden, T., Bradford, C. R., Dawson, L. A., Haxer, M. A., Miller, A. E., Teknos, T. N., Chepeha, D. B., Hogikyan, N. D., Terrell, J. E. and Wolf, G.T. (2002) Objective assessment of swallowing dysfunction and aspiration after radiation concurrent with chemotherapy for head and neck cancer. *International Journal of Radiation Oncology, Biology, Physics* 53:1:23-28.
- Ellul, J. and Barer, D. and the Northwestern Dysphagia Study Group (1993) Detection and Management of Dysphagia in Patients with Acute Stroke. *Age and Ageing* 22:2:17.
- Ellul, J. and Barer, D. (1994) Detection and management of dysphagia in acute stroke by nonspecialist ward staff. *Cerebrovascular Diseases* 4:4:251.
- Ellul, J., Barer, D. and Fall, S. (1997) on behalf of ESDB/CODA Collaborators. Improving detection and management of swallowing problems in acute stroke: a Multicentre study. *Cerebrovascular Diseases* 7:4:18.
- Enderby, P. and Petheram, B. (2002) Has aphasia therapy been swallowed up? *Clinical Rehabilitation* 16:6:604-608.

- Feinstone, H. M., Greene-Finestone, L. S., Wilson, E. S. and Teasell, R. W. (1996) Prolonged length of stay and reduced functional improvement rate in malnourished stroke rehabilitation patients. *Archives of Physical Medicine and Rehabilitation* 77:4:340-345.
- Ferrari, M., Olivieri, M., Sembenini, C., Benini, L., Zuccali, V., Bardelli, E., Bovo, P.; Cavallini, G., Vantini, I. and Lo Cascio, V. (1995) Tussive effect of capsaicin in patients with gastroesophageal reflux without cough. *American Journal of Respiratory and Critical Care Medicine* 151:2Pt1:340-345.
- Ferrer, M., Bauer, T. T., Torres, A., Hernandez, C. and Piera, C. (1999) Effect of nasogastric tube size on gastroesophageal reflux and microaspiration in intubated patients. *Annals of Internal Medicine* 130:991-994.
- Fink, A. (2003) The survey handbook. 2nd Edition. Thousand Oaks: Sage Publications.
- Fucile, S., Wright, P.M., Chan, I., Yee, S., Langlais, M. and Gisel, E. G. (1998) Functional Oral-motor Skills: Do They Change with Age? *Dysphagia* 13:195-201.
- Gariballa, S. E., Parker, S. G., Taub, N. and Castleden, M. (1998) Nutritional status of hospitalised acute stroke patients. *British Journal of Nutrition* 79:6:481-487.
- Garon, B. R., Engle, M. and Ormiston, C. (1997) A randomized control study to determine the effects of unlimited oral intake of water in patients with identified aspiration. *Journal of Neurologic Rehabilitation* 11:139-148.
- Garon, B. R., Huang, Z., Hommeyer, S., Eckmann, D., Stern, G. A. and Ormiston, C. (2002) Epiglottic Dysfunction: Abnormal Epiglottic Movement Patterns. *Dysphagia* 17:57-68.
- Gordon, C., Langton-Hewer, R. and Wade, D. T. (1987) Dysphagia in acute stroke. *British Medical Journal* 295: 411-414.
- Gottlieb, D., Kipnis, M., Sister, E., Vardi, Y. and Brill, S. (1996) Validation of the 50ml³ Drinking test for evaluation of post stroke dysphagia. *Disability and Rehabilitation* 18:10:529-532.
- Goulding, R. and Bakheit, A. M. (2000) Evaluation of the benefits of monitoring fluid thickness in the dietary management of dysphagic stroke patients. *Clinical Rehabilitation* 14:2:119-124.
- Griner, P. F., Mayewski, R. J., Mushlin, A. I. and Greenland, P. (1981) Selection and interpretation of diagnostic tests and procedures, principles and applications. *Annals of Internal Medicine* 94:4:553-600.
- Groher, M. E. (1997) Dysphagia, Diagnosis and Management (3rd Ed). Ed. Butterworth-Heinemann, Boston
- Grysiwicz, R. A., Thomas, K. and Pandey, D. K. (2008) Epidemiology of ischemic and hemorrhagic stroke: incidence, prevalence, mortality, and risk factors. *Neurologic Clinics* 26:871-895.
- Hamdy, S., Aziz, Q., Rothwell, J. C., Singh, K. D., Barlow, J., Hughes, D. G., Tallis, R. C. and Thompson, D. G. (1996) The cortical topography of human swallowing musculature in health and disease. *Nature Medicine* 2:11:1217-1224.

- Hamlet, S. L., Nelson, R. L. and Patterson, R. L. (1990) Interpreting the sounds of swallowing: Fluid flow through the cricopharyngeus. *Annals of Otolaryngology, Rhinology, and Laryngology* 99:9:1:749-752.
- Head, K., Weeks, K., Stroud, A. and Coll, A. (2007) A survey of dysphagia screening practices across England and Wales. *International Journal of Therapy and Rehabilitation* 14:9:409 – 417.
- Health Advisory Service 2000 (1998) "Not because they are old" An independent inquiry into the care of older people on acute wards in general hospital. London: HAS 2000 (Category: B3)
- Hendrix, T. R. (1993) Art and science of history taking in the patient with difficulty swallowing. *Dysphagia* 8:2:69-73.
- Hiiemae, K. M. and Palmer, J. B. (1999) Food transport and bolus formation during complete feeding sequences on foods of different initial consistency. *Dysphagia* 14:1:31-42.
- Hinchey, J.A., Shephard, T., Furie, K., Smith, D., Wang, D. and Tonn, S. (2005) Formal dysphagia screening protocols prevent pneumonia. *Stroke* 36:1972-1976.
- Hinds, N. P. and Wiles, C. M. (1998) Assessment of swallowing and referral to speech and language therapists in acute stroke. *Quarterly Journal of Medicine* 92:12:829-835.
- Hirst, L. J., Ford, G. A., Gibson, G.J. and Wilson, J. A. (2002) Swallow-induced alterations in breathing in normal older people. *Dysphagia* 17:2:152-161.
- Hiss, S. G., Strauss, M., Treole, K., Stuart, A. and Boutilier, S. (2004) Effects of age, gender, bolus volume, bolus viscosity, and gustation on swallowing apnea onset relative to lingual bolus propulsion onset in normal adults. *Journal of Speech, Language, and Hearing Research* 47:3:572-583.
- Hiss, S. G., Treole, K. and Stuart, A. (2001) Effects of age, gender, bolus volume, and trial on swallow apnea duration and swallow/respiratory phase relationships of normal adults. *Dysphagia* 16:128-135.
- Holas, M. A., DePippo, K. L. and Reding, M. J. (1991) Timing of aspiration and relative risk of death following stroke. *Clinical Research* 39:664.
- Holas, M. A., DePippo, K. L. and Reding, M. J. (1994) Aspiration and relative risk of medical complications following stroke. *Archives of Neurology* 51:10:1051-1053.
- Horner, J., Brazer, S. R. and Massey, E. W. (1993) Aspiration in bilateral stroke patients: A validation study. *Neurology* 43:2:430-433.
- Horner, J., Massey, E. W., Riski, J. E., Lathrop, D. L. and Chase, K. N. (1988) Aspiration following stroke: Clinical correlates and outcome. *Neurology* 38:9:1359-1362.
- Huggins, P. S., Tuomi, S. K. and Young, C. (1999) Effects of naso-gastric tubes on the young, normal swallowing mechanism. *Dysphagia* 14:3:157-161.
- Hughes, T. A. and Wiles, C. M. (1996) Clinical measurement of swallowing in health and in neurogenic dysphagia. *Quarterly Journal of Medicine* 89:2:109-116.

- Huxley, E. J., Viroslav, J., Gray, W. R. and Pierce, A. K. (1978) Pharyngeal aspiration in normal subjects and patients with depressed consciousness. *American Journal of Medicine* 64:564-568.
- Intercollegiate Working Party for Stroke (2004) National Clinical Guidelines for Stroke 2nd Edition. Royal College of Physicians. London.
- Intercollegiate Working Party for Stroke (2008) National Clinical Guidelines for Stroke 3rd Edition. Royal College of Physicians. London.
- Jackson, C. J. and Furnham, A. (2001) Designing and analysing questionnaires and surveys: a manual for health professionals and administrators. Whurr Publishers Ltd. 19b Compton Terrace, London N1 2UN.
- Johnson, J. L. and Hirsch, C. S. (2003) Aspiration pneumonia. *Postgraduate Medicine* 113:3:99-112.
- Jones, R. and Payne, B. (1997) Clinical investigation and statistics in laboratory medicine. ACB Venture Publications.
- Kaplan, M. D. and Baum, B. J. (1993) The functions of saliva. *Dysphagia* 8:225-229.
- Kastilik, J. A., Thompson, R. H., Aziz, I., Ojoo, J. C., Redington, A. E. and Morice, A. H. (2002) Sex-related differences in cough reflex sensitivity in patients with chronic cough. *American Journal of Respiration and Critical Care Medicine* 166:7:961-964.
- Kayser-Jones, J. and Schell, E. (1997) The effect of staffing on the quality of care at mealtime. *Nursing Outlook* 45:2:64-72.
- Kelly, A. M., MacFarlane, K., Ghufoor, K., Drinnan, M. J. and Lew-Gor, S. (2008) Pharyngeal residue across the lifespan: a first look at what's normal. *Clinical Otolaryngology* 33:4:348-51.
- Kennedy, D., Kieser, J., Bolter, C., Swain, M., Singh, B. and Waddell, J. N. (2010) Tongue pressure patterns during water swallowing. *Dysphagia* 25:1:11-19.
- Kidd, D., Lawson, J., Nesbitt, R. and MacMahon, J. (1993) Aspiration in acute stroke: A clinical study with videofluoroscopy. *Quarterly Journal of Medicine* 86:12:825-829.
- Kikawada, M., Iwamoto, T. and Takasaki, M. (2005) Aspiration and infection in the elderly: Epidemiology, diagnosis and management. *Drugs and aging* 22:2:115-130.
- Kikuchi, R., Watabe, N., Konno, T., Mishina, N., Sekizawa, K. and Sasaki, H. (1994) High incidence of silent aspiration in elderly patients with community-acquired pneumonia. *American Journal of Respiratory and Critical Care Medicine* 150:251-253.
- Kim, Y., McCullough, G. H. and Asp, C. W. (2005) Temporal measurements of pharyngeal swallowing in normal populations. *Dysphagia* 20:4:290-296.
- Kuhlemeier, K. V., Yates, P. and Palmer, J. B. (1998) Intra- and inter-rater variation in the evaluation of videofluorographic swallowing studies. *Dysphagia* 13:142-147.
- Kurosu, A. and Logemann, J. A. (2009) Gender effects on airway closure in normal subjects. *Dysphagia* 25:4:284-290.
- LaForce, F. M., Hopkins, J. and Trow, R. (1976) Human defenses against gram-negative rods. *American Review of Respiratory Disorders* 114:929-935.

- Langmore, S. E. and Miller, R. M. (1994) Behavioural treatment for adults with oropharyngeal dysphagia. *Archives of Physical Medicine and Rehabilitation* 75:1154-1160.
- Langmore, S. E., Schatz, K. and Olson, N. (1991) Endoscopic and videofluoroscopic evaluations of swallowing and aspiration in acute stroke patients. *Annals of Otolaryngology, Rhinology Laryngology* 100: 678-681.
- Langmore, S. E., Terpenning, M. S., Schork, A., Chen, Y., Murray, J. T., Lopatin, D. and Loesche, W. J. (1998) Predictors of aspiration pneumonia: how important is dysphagia? *Dysphagia* 13:2:69-81.
- Leder, S. B. (2000) Use of arterial oxygen saturation, heart rate, and blood pressure as indirect objective physiologic markers to predict aspiration. *Dysphagia* 15:4:201-205.
- Leder, S. B. and Espinosa, J. F. (2002) Aspiration risk after acute stroke: comparison of clinical examination and fiberoptic endoscopic evaluation of swallowing. *Dysphagia* 17:3:214-218.
- Leonard, R., Kendall, K. A. and McKenzie, S. (2004) Structural displacements affecting pharyngeal constriction in nondysphagic elderly and nonelderly adults. *Dysphagia* 19:2:133-41.
- Leslie, P., Drinnan, M. J., Finn, P., Ford, G. A. and Wilson, J. A. (2002) Swallow respiration patterns in dysphagic patients following acute stroke. *Dysphagia* 17:3:202-207.
- Leslie, P., Drinnan, M. J., Finn, P., Ford, G. A. and Wilson, J. A. (2004) Reliability and validity of cervical auscultation: A controlled comparison using videofluoroscopy. *Dysphagia* 19:4:232-240.
- Leslie, P., Drinnan, M. J., Zammit-Maempel, I., Coyle, J. L., Ford, G. A. and Wilson, J. A. (2007) Cervical auscultation synchronized with images from endoscopy swallow evaluations. *Dysphagia* 22:4:290-298.
- Levenson, R. (2004) Lessons from the end of a life. *British Medical Journal* 329:1244.
- Li, X., Kollyveit, K. M. Tronstad, L. and Olsen, I. (2000) Systemic Diseases Caused by Oral Infection. *Clinical Microbiology Reviews* 4:13:547-558.
- Lim, S. H. B., Lieu, P. K., Phua, S. Y., Seshadri, R., Venketasubramanian, N., Lee, S. H. and Choo, P. W. J. (2001) Accuracy of bedside clinical methods compared with fiberoptic endoscopic examination of swallowing (FEES) in determining the risk of aspiration in acute stroke patients. *Dysphagia* 16:1:1-6.
- Linden, P., Kuhlemeier, K. V. and Patterson, C. (1993) The probability of correctly predicting subglottic penetration from clinical observations. *Dysphagia* 8:3:170-179.
- Linden, P. and Siebens, A. A. (1983) Dysphagia: Predicting laryngeal penetration. *Archives of Physical Medicine and Rehabilitation* 64:6:281-284.
- Lindgren, S. and Janzon, L. (1991) Prevalence of swallowing complaints and clinical findings among 50-79 year old men and women in an urban population. *Dysphagia* 6:4:187-192.

- Loeb, M., McGreer, A., McArthur, M., Walter, S. and Simor, A. E. (1999) Risk factors for pneumonia and other lower respiratory tract infections in elderly residents of long-term care facilities. *Archives of International Medicine* 159:2058-2064.
- Logemann, J. A. (1983) Evaluation and Treatment of Swallowing Disorders (1st. ed.) San Diego, CA: College-Hill.
- Logemann, J. A. (1985) Evaluation and Treatment of Swallowing Disorders. College Hill Publication Little, Brown and Company Boston.
- Logemann, J. A. (1993) Manual for the Videofluorographic Study of Swallowing. PRO-ED, Inc. 8700 Shoal Creek Boulevard, Austin, Texas.
- Logemann, J. A. (1998) Evaluation and treatment of swallowing disorders (2ed.) Austin. Pro-ed.
- Logemann, J. A., Pauloski, B. R., Colangelo, L., Lazarus, C., Fujiu, M. and Kahrilas, P. J. (1995) Effects of a sour bolus on oropharyngeal swallowing measures in patients with neurogenic dysphagia. *Journal of Speech and Hearing Research* 38:3:556-563.
- Logemann, J. A., Rademaker, A., Pauloski, B. R., Antinoja, J., Bacon, M., Bernstein, M., Gaziano, J., Grande, B., Kelchner, L., Kelly, A., Klaben, B., Lundy, D., Newman, L., Santa, D., Stachowiak, L., Stangl-McBreen, C., Atkinson, C., Bassani, H., Czapla, M., Farquharson, J., Larsen, K., Lewis, V., Logan, H., Nitschke, T. and Veis, S. (2008) What information do clinicians use in recommending oral versus nonoral feeding in oropharyngeal dysphagic patients? *Dysphagia* 23:4:378-84.
- Logemann, J. A., Veis, S. and Colangelo, L. (1999) A screening procedure for oropharyngeal dysphagia. *Dysphagia* 14:1:44-51.
- Mangione, T. W. (1995) Mail surveys – improving the quality. Thousand Oaks, CA: Sage.
- Mann, G., Hankey, G.J. and Cameron, D. (2000) Swallowing disorders following acute stroke: prevalence and diagnostic accuracy. *Cerebrovascular Diseases* 10:5:380-386.
- Mann, G., Hankey, G.J. and Cameron, D. (1999) Swallowing function after stroke: prognosis and prognostic factors at 6 months. *Stroke* 30:4:744-748.
- Mann, G. (2002) MASA: The Mann Assessment of Swallowing Ability. Clifton Park, NY: Thomson Delmar Learning.
- Mant, J., Wade, D. T. and Winner, S. (2004) Health care needs assessment: stroke. (in Stevens, A., Raftery, J., Mant J. et al Health care needs assessment: the epidemiologically based needs assessment review, first series (2nd ed.) Oxford: Radcliffe Medical Press 141-244.
- Mari F., Matei, M., Ceravolo, M.G., Pisani, A., Montesi, A. and Provinciali, L. (1997) Predictive value of clinical indices in detecting aspiration in patients with neurological disorders. *Journal of Neurology, Neurosurgery, and Psychiatry* 63:456-460.
- Marik, P. E. (2001) Aspiration pneumonitis and aspiration pneumonia. *The New England Journal of Medicine* 344:665-671.
- Marik, P. E. and Kaplan, D. (2003) Aspiration pneumonia and dysphagia in the elderly. *Chest* 124:328-336.

- Marks, L. and Rainbow, D. (2001) Working with Dysphagia. Speechmark Publishing Ltd, Telford Road, Bicester, Oxon OX26 4LQ U.K.
- Martin, A.W. (1993) Dietary management of swallowing disorders. *Dysphagia* 6:129-135.
- Martin-Harris, B., Brodsky, M. B., Michel, Y., Ford, C. L., Walters, B. and Heffner, J. (2005) Breathing and swallowing dynamics across the adult lifespan. *Archives of Otolaryngology- Head and Neck Surgery* 131:9:762-770.
- Martin-Harris, B., Brodsky, M. B., Michel, Y., Lee, F. and Walters, B. (2007) Delayed initiation of the pharyngeal swallow: Normal variability in adult swallows. *Journal of Speech, Language and Hearing Research* 50:585-594.
- Martin-Harris, B., Logemann, J. A., McMahon, S., Schleicher, M. and Sandidge, J. (2000) Clinical utility of the modified barium swallow. *Dysphagia* 15:3:136-141.
- Martin-Harris, B., Brodsky, M.B., Price, C.C., Michel, Y. and Walters, B. (2003) Temporal coordination of pharyngeal and laryngeal dynamics with breathing during swallowing: single liquid swallows. *Journal of Applied Physiology* 94:1735-1743.
- Martino, R., Foley, N., Bhogal, S., Diamant, N., Speechley, M. and Teasell, R. (2005) Dysphagia after stroke: Incidence, diagnosis, and pulmonary complications. *Stroke* 36:12:2756-2763.
- Martino, R., Pron, G. and Diamant, N. (2000) Screening for oropharyngeal dysphagia in stroke: insufficient evidence for guidelines. *Dysphagia* 15:1:19-30.
- Martino, R., Pron, G. and Diamant, N. (2004) Oropharyngeal dysphagia: Surveying practice patterns of the speech-language pathologist. *Dysphagia* 19:3:165-176.
- Massey, R. and Jedlicka, D. (2002) The Massey bedside swallowing screen. *Journal of Neuroscience Nursing* 34:5:252-26.
- McColl, E., Jacoby, A., Thomas, L., Soutter, J., Bamford, C., Steen, N., Thomas, R., Harvey, E., Garratt, A. and Bond, J. (2001) Design and use of questionnaires: a review of best practice applicable to surveys of health service staff and patients. *Health Technology Assessment* 5:31.
- McCullough, G. H., Rosenbeck, J. C., Wertz, R. T., McCoy, S., Mann, G. and McCullough, K. (2005) Utility of clinical swallowing examination measures for detecting aspiration post-stroke. *Journal of Speech, Language and Hearing Research* 6:1280-1293.
- McCullough, G. H., Wertz, R. T. and Rosenbeck, J. C. (2001) Sensitivity and specificity of clinical/bedside examination signs for detecting aspiration in adults subsequent to stroke. *Journal of Communication Disorders* 34:1-2:55-72.
- McCullough, G., Wertz, R., Rosenbek, J. and Dinneen, C. (1999) Clinicians' preferences and practices in conducting clinical/bedside examinations in an adult, neurogenic population. *American Journal of Speech-Language Pathology* 8:149-163.
- McHorney, C. A., Robbins, J., Lomax, K., Rosenbeck, J. C., Chignell, K. and Kramer, A. E. (2002) The SWAL-QOL and SWAL-CARE outcomes tool for Oropharyngeal dysphagia in adults: III. Documentation of reliability and validity. *Dysphagia* 17:2:97-114.

- McHorney, C. A. and Rosenbek, J. C. (1998) Functional Outcome Assessment of Adults with Oropharyngeal Dysphagia. *Seminars in Speech and Language* 19:235-246.
- Meng, N. H., Wang, T. G. and Lien, I. N. (2000) Dysphagia in patients with brainstem stroke: Incidence and outcome. *American Journal of Physical Medicine and Rehabilitation* 79:2:170-175.
- Midgren, B., Hansson, L., Karlsson, J. A., Simonsson, B. G. and Persson, C. G. (1992) Capsaicin-induced cough in humans. *American Review of Respiratory Disease* 146:2:347-351.
- Miller, R. and Krawczyk, K. (2001) Dysphagia Training Programme: Fixes that fail or effective interdisciplinary working. *International Journal of Disorders of Communication* 36:357-362.
- Millns, B., Gosney, M., Jack, C. I. A., Martin, M. V. and Wright, A. E. (2003) Acute stroke predisposes to oral gram-negative bacilli- a cause of aspiration pneumonia? *Gerontology* 49:173-176.
- Mims, C. A. (1979) *The pathogenesis of infectious disease*. Academic Press 24/28 Oval Road, London.
- Mobbs, M. J., Hendrick, K. F., Sunderland, D. and Davies P. D. O. (1999) Oropharyngeal gram-negative bacillary carriage: A survey of 120 healthy individuals. *Chest* 115:1570-1575.
- Morrell, R. M. (1992) Neurological Disorders of Swallowing. In *Dysphagia: Diagnosis and Management* (2ed) Groher, M. E. Butterworth-Heinemann, USA.
- Mosby's Dictionary of Complementary and Alternative Medicine. (c) 2005, Elsevier
- Moser, C. A. and Kalton, G. (1971) (2nd ed.) *Survey Methods in Social Investigation*. London: Heinemann Educational Books.
- Murray, K. A., Larson, C. R. and Logemann, J. A. (1998) Electromyographic Response of the Labial Muscles during Normal Liquid Swallows Using a Spoon, a Straw and a Cup. *Dysphagia* 13:160-166.
- Murry, T. and Carrau, R. L. (2006) *Clinical Management of Swallowing Disorders* (2nd Ed.) Plural Publishing Inc. San Diego, Oxford, Brisbane.
- Nakagawa, T., Sekizawa, K., Nakajoh, K., Tanji, H. Sasaki, A. and Sasaki, H. (2000) Silent cerebral infarction: a potential risk for pneumonia in the elderly. *Journal of Internal Medicine* 247:255-259.
- Nathadwarawala, K. M., Nicklin, J. and Wiles, C. (1992) A timed test of swallowing capacity for neurological patients. *Journal Neurology, Neurosurgery and Psychiatry* 55:822-825.
- National Audit Office (2005-6) *Reducing Brain Damage: faster access to better stroke care* (HC 452 session) London:NAO.
- National Health Service (2009)
<http://www.nhs.uk/chq/pages/1126.aspx?categoryid=51&subcategoryid=165> [accessed 30 February 2009].

Neale, J. (2009) Research methods for health and social care. Chapter 9. Surveys
Watson M., Coombes, L. Palgrave Macmillan Publishers Ltd., Houndmills,
Basingstoke, Hampshire RG21 6XS.

Neild-Gehrig, J. S. and Willmann, D. E. (2008) Foundations of periodontics for the
dental hygienist. (2nd Ed.) Baltimore. Lippincott Williams and Wilkins

O'Connor, S. (2003) Aspiration pneumonia and pneumonitis. *Australian Prescriber*
26:14-17.

Odderson, I. R., Keaton, J. C. and McKenna, B. S. (1995) Swallow management in
patients on an acute stroke pathway: Quality is cost effective. *Archives of Physical
Medicine and Rehabilitation* 76:12:1130-1133.

Olsson R., Kjellin O. and Ekberg O. (1997) Videomanometric aspects of pharyngeal
constrictor activity. *Dysphagia* 11:83-86.

O'Neill, P. A., Davies, I., Fullerton, K. J. and Bennett, D. (1992) Fluid balance in elderly
patients following acute stroke. *Age and Ageing* 21:280-285.

Pace, C. C. and McCullough, G. H. (2010) The association between oral
microorganisms and aspiration pneumonia in the institutionalized elderly: review and
recommendations. *Dysphagia* 25:4:307-322.

Palmer, J. B., Kuhlemeier, K. V., Tippet, D. C. and Lynch, C. (1993) A protocol for the
videofluorographic swallow study. *Dysphagia* 8:209-214.

Palmer, J. B., Rudin, N. J., Lara, G. and Crompton, A. W. (1992) Co-ordination of
mastication and swallowing. *Dysphagia* 7:4:187-200.

Parahoo, K. (2006) Nursing research: principles, process and issues 2nd edition.
Palgrave Macmillan and Houndmills, Basingstoke, Hampshire RG21 6XS

Parker, C., Power, M., Hamdy, S., Bowen, A., Tyrrell, P. and Thompson, D. G. (2004)
Awareness of dysphagia by patients following stroke predicts swallowing performance.
Dysphagia 19:1:28-35.

Perlman, A. L., Booth, B. M. and Grayhack, J. P. (1994) Videofluoroscopic predictors of
aspiration in patients with oropharyngeal dysphagia. *Dysphagia* 9:90-95

Perlman, A. L., He, X., Barkmeier, J. and Van Leer, E. (2005) Bolus location associated
with videofluoroscopic and respirodeglutometric events. *Journal of Speech, Language,
and Hearing Research* 48:1:21-33.

Perlman, A. L., Shultz, J. G. and VanDaele, D. J. (1993) Effects of age, gender, bolus
volume, and bolus viscosity on oropharyngeal pressure during swallowing. *Journal of
Applied Physiology* 75:1:33-37.

Perry, L. (2001a) Screening swallowing function of patients with acute stroke. Part one:
Identification, implementation and initial evaluation of a screening tool for use by
nurses. *Journal of Clinical Nursing* 110:4:463-473.

Perry, L. (2001b) Screening swallowing function of patients with acute stroke. Part two:
Detailed evaluation of the tool used by nurses. *Journal of Clinical Nursing* 10:4:474-
481.

Perry, L. and Love, C. P. (2001) Screening for dysphagia and aspiration in acute stroke: a systematic review. *Dysphagia* 16:7-18.

Pettigrew, C. M. and O'Toole C. (2007) Dysphagia evaluation practices of speech and language therapists in Ireland: clinical assessment and instrumental examination decision-making. *Dysphagia* 22:3:235-244.

Philip, K. E. A. and Greenwood, C. E. (2000) Nutrient contribution of infant cereals used as fluid thickening agents in diets fed to the elderly. *Journal of the American Dietetic Association* 100:549-554.

Ramsey, D. J., Smithard, D. G. and Kalra, L. (2003) Early Assessments of Dysphagia and Aspiration Risk in Acute Stroke Patients. *Stroke* 34:5:1252-1257.

Ramsey, D., Smithard, D. and Kalra, L. (2005). Silent aspiration: What do we know? *Dysphagia* 20:3:218-225.

Ramsey, D. J., Smithard, D. G. and Kalra, L. (2006) Can Pulse Oximetry or a bedside swallowing assessment be used to detect aspiration after stroke. *Stroke Journal* 37:12:2984-2988.

Reilly, S., Douglas, J., and Oates, J. (2004) Evidence based practice in speech pathology. Whurr publishers.

Robbins, J., Hamilton, J. W., Lof, G. L. and Kempster, G. B. (1992) Oropharyngeal swallowing in normal adults of different ages. *Gastroenterology* 103:3:823-829.

Robbins, J., Levine, R. L., Maser, A., Rosenbeck, J. C. and Kempster, G. B. (1993) Swallowing after unilateral stroke of the cerebral cortex. *Archives of Physical Medicine and Rehabilitation* 74:12:1295-1300.

Rosenthal, D. I., Lewin, J. S. and Eisbruch, A. (2006) Prevention and treatment of dysphagia and aspiration after chemoradiation for head and neck cancer. *Journal of Clinical Oncology* 24:17:2636-2643.

Roy, N., Stemple, J., Merrill, R. M. and Thomas L. (2007) Dysphagia in the elderly: preliminary evidence of prevalence, risk factors, and socioemotional effects. *Annals of Otolaryngology Rhinology and Laryngology* 116:11:858-865.

Royal College of Physicians of London (2009) National Sentinel Stroke Audit Phase 2 (clinical audit) 2008 <http://www.rcplondon.ac.uk/clinical-standards/ceeu/Current-work/stroke/Documents/stroke-audit-report-2008.pdf> [accessed 27 March 2009].

Royal College Speech and Language Therapists (1992) Dysphagia Policy Review Forum, London.

Royal College Speech and Language Therapists (1998) Dysphagia Policy Review Forum, Manchester.

Royal College Speech and Language Therapists (1999) Recommendations for Pre and Post- registration Dysphagia Education and Training. Advanced Studies Committee, Dysphagia Working Group. Royal College of Speech and Language Therapy policy statement.

Royal College Speech and Language Therapists (2005) Clinical Guidelines Speechmark publishing Ltd. Telford Road, Bicester, Oxon.

Royal College Speech and Language Therapists (2006) *Communicating Quality 3*. www.rcslt.org. [accessed 3 March 2008].

Royal College Speech and Language Therapists, (2007) Videofluoroscopic evaluation of oropharyngeal swallowing Disorders (VFS) in Adults: The role of SLTs: Royal College of Speech and Language Therapy policy statement.

Royal College Speech and Language Therapists, (2010) http://www.rcslt.org/speech_and_language_therapy/commissioning/dysphagia [accessed 4 November 2010]

Scannapieco, F. A., Stewart, E. M. and Mylotte, J. M. (1992) Colonization of dental plaque by respiratory pathogens in medical intensive care patients. *Critical Care Medicine* 20:6:740-745.

Scottish Intercollegiate Guidelines Network (2004) Management of patients with stroke: Identification and Management of Dysphagia. <http://www.sign.ac.uk/pdf/sign78.pdf> [accessed 9 November 2010].

Sector Skills Council: National occupational standards [http://www.skillsforcare.org.uk/developing_skills/National_Occupational_Standards/National_Occupational_Standards_\(NOS\)_Health_and_Social_Care.aspx](http://www.skillsforcare.org.uk/developing_skills/National_Occupational_Standards/National_Occupational_Standards_(NOS)_Health_and_Social_Care.aspx) [accessed 4 November 2009].

Sellars, C., Dunnet, C. and Carter, R. (1998) A preliminary comparison of videofluoroscopy of swallow and pulse oximetry in the identification of aspiration in dysphagic patients. *Dysphagia* 13:2:82-86.

Selley, W. G., Flack, F. C., Ellis, R. E. and Brooks, W. A. (1989a) Respiratory patterns associated with swallowing: Part 1. The normal adult pattern and changes with age. *Age and Ageing* 18:3:168-172.

Selley, W. G., Flack, F. C., Ellis, R. E. and Brooks, W. A. (1989b) Respiratory patterns associated with swallowing: Part 2. Neurologically impaired dysphagic patients. *Age and Ageing* 8:3:173-176.

Shaker, R., Dua, K. S., Ren, J., Xie, P., Funahashi, A. and Schapira, R. M. (2002) *Dysphagia* 17:13-18.

Shay, K. (2002) Infectious Complications of Dental and Periodontal Diseases in the Elderly Population. *Clinical Infectious Diseases* 34:1215-23.

Sherman, B., Nisenbom, J., Jesberger, B., Morrow, C. and Jesberger, J. (1999) Assessment of dysphagia with the use of pulse oximetry. *Dysphagia* 14:152-156.

Singh, S. and Hamdy, S. (2006) Dysphagia in stroke patients. *Postgraduate Medical Journal* 82:383-391.

Smith, P. A. (2007) Assessment and management of aspiration in patients with dysphagia: a survey of practicing speech-language pathologists. *Journal of Medical Speech - Language Pathology*

Smith, C. H., Logemann, J. A., Colangelo, L. A., Rademaker, A. W. and Pauloski, B. R. (1999) Incidence and Patient Characteristics Associated with Silent Aspiration in the Acute care Setting. *Dysphagia* 14:1-7.

- Smith, H. A., Lee, S. H., O'Neill, P. A. and Connolly, M. J. (2000) The combination of bedside swallowing assessment and oxygen saturation monitoring in acute stroke: a safe and humane screening tool. *Age and Ageing* 29:6.
- Smithard, D. G., O'Neill, P. A., England, R. E., Parks, C. L., Wyatt, R., Martin, D. F. and Morris, J. (1997) The natural history of dysphagia following a stroke. *Dysphagia* 12:4:188-193.
- Smithard, D. G., O'Neill, P. A., Park, C., Morris, J., Wyatt, R., England, R. and Martin, D. F. (1996) Complications and outcome after acute stroke. Does dysphagia matter? *Stroke* 27:1200-1204.
- Splaingard, M. L., Hutchins, B., Sulton, L. D. and Chaudhuri, G. (1988) Aspiration in rehabilitation patients: videofluoroscopy vs bedside clinical assessment. *Archives of Physical Medicine and Rehabilitation* 60:8:637-640.
- Storey, L., Howard, J. and Gillies, A. (2002) *Competency in Healthcare*. Radcliffe Medical Oxford.
- Suiter, D.M. and Leder, S.B. (2008) Clinical Utility of the 3-ounce Water Swallow Test. *Dysphagia* 23:3:244-250.
- Swigert, N.B. (2000) *The Source for Dysphagia Updated and Expanded*. LinguiSystems Inc. 3100 4th Avenue, East Moline USA.
- Takahashi, K., Groher, M. E. and Michi, K. (1994) Methodology for detecting swallow sounds. *Dysphagia* 9:1:54-62.
- Teramoto, S., Fukuchi, Y. and Ouchi, Y. (1996) Oxygen desaturation on swallowing in patients with stroke: what does it mean? *Age and Ageing* 25:333-336.
- Tracy, J. F., Logemann, J. A., Kahrilas, P. J., Jacob, P., Kobara, M. and Krugler, C. (1989) Preliminary observations on the effects of age on oropharyngeal deglutition. *Dysphagia* 4:2:90-94.
- Tran, P. and Mannen, J. (2009) Improving oral healthcare: improving the quality of life for patients after a stroke. *Special Care in Dentistry* 29:5:218-221.
- Trapl, M., Enderle, P., Nowotny, M., Teuschl, Y., Matz, K., Dachenhausen, A. and Brainin, M. (2007) Dysphagia bedside screening for acute-stroke patients: The Gugging Swallowing Screen. *Stroke* 38:2948-2952.
- United Kingdom Central Council for Nursing, Midwifery and Health Visiting Code of Professional Conduct. (1992) London, UKCC.
- United Kingdom National Screening Committee. www.screening.nhs.uk/screening [accessed 23 March 2009].
- United Kingdom Central Council for Nursing, Midwifery and Health Visiting (1997) Nurses have responsibility for the feeding of patients. Press Release 8, May 1997.
- Varkey, A. B. (2006) Pneumonia, Aspiration (emedicine from WebMD) [accessed 18 March 2008]
- Wade, D. T. and Hower, R. L. (1987) Motor loss and swallowing difficulty after stroke: frequency, recovery and prognosis. *Acta Neurologica Scandinavica* 76:50-54.

- Wakasugi, Y., Tohara, H., Hattori, F., Motohashi, Y., Nakane, A., Goto, S., Ouchi, Y., Mikushi, S., Takeuchi, S. and Uematsu, H. (2008) Screening test for silent aspiration at the bedside. *Dysphagia* 23:4:364-370.
- Warnecke, T., Teismann, I., Oelenberg, S., Hamacher, C., Ringelstein, E. B., Schabitz, W. R. and Dziawas, R. (2009) Towards a basic evaluation of swallowing in acute stroke – identification of salient findings by the inexperienced examiner. *BioMed Central Medical Education* 9:13.
- Watkins, C., Lightbody, E., Theofanidis, D. and Sharma, A. K. (1997) Hydration in acute stroke: where do we go from here? *Clinical Effectiveness in Nursing* 1:76-84.
- Weinhardt, J., Hazelett, S., Barrett, D., Lada, R., Enos, T. and Keleman, R. (2008) Accuracy of bedside screening: A comparison of registered nurses and speech therapists. *Rehabilitation Nursing* 33:6:247-252.
- Wells, J. L. and Dumbrell, A. C. (2006) Nutrition and Ageing: Assessment and treatment of compromised nutritional status in frail elderly patients. *Clinical Interventions in Ageing* 1:1:67-79.
- Westergren, A., Hallberg, I. R. and Ohlsson, O. (1999) Nursing assessment of dysphagia among patients with stroke. *Scandinavian Journal of Caring Science* 13:274-282.
- Whelan, K. (2001) Inadequate fluid intakes in dysphagic acute stroke. *Clinical Nutrition* 20:5:423-428.
- World Health Organisation (2009a)
https://www.who.int/topics/cerebrovascular_accident/en [accessed 29 November 2010].
- World Health Organisation (2009b)
http://www.who.int/topics/cerebrovascular_accident/en [accessed 12 June 2005]
- World Health Organisation (2010) <https://www.who.int/water-sanitation-health/diseases/wsh0302/en/print.html> [accessed 3 January 2010].
- Wu, M., Chang, Y., Wang T. and Lin L. (2004) Evaluating Swallowing Dysfunction Using a 100-ml Water Swallowing Test. *Dysphagia* 19:1:43-47.
- Yoneyama, T., Yoshida, M., Takashi, M. D., Mukaiyama, H., Okamoto, Hiroshi, D. D. S., Hoshiba, K., Ihara, S., Yanagisawa, S., Ariumi, S., Morita, T., Mizuno, Y., Ohsawa, T., Akagawa, Y., Hashimoto, K. and Sasaki, H. (2002) Oral care reduces pneumonia of elderly patients in nursing homes. *Journal of the American Geriatrics Society* 50:3:430-433.
- Zaidi, N. H., Smith, H. A., King, S. C., Park, C., O'Neill, P. A. and Connolly, M. J. (1995) Oxygen desaturation on swallowing as a potential marker of aspiration in acute stroke. *Age and Ageing* 24:267-270.

APPENDIX 1

Northwestern Dysphagia Patient Check Sheet

(Logemann et al., 1999)

		Safe	Unsafe
Medical history variables			
1	History of recurrent pneumonia		
2	Frequent temperature spikes		
3	Question of aspiration pneumonia		
4	Long-term intubation (+1 week) or tracheostomy (+6months)		
Behavioural variables			
5	Alertness		
6	Co-operativeness/agitation		
7	Attention/interaction ability		
8	Awareness of problem(s) swallowing		
9	Awareness of secretions		
10	Ability to manage secretions		
Gross motor function			
11	Postural control		
12	Fatigability		
Oral motor test results			
13	Oral, pharyngeal, laryngeal anatomy and physiology		
14	Ability to follow directions		
15	Dysarthria		
16	Facial weakness		
17	Oral apraxia		
18	Oral sensation		
19	Pharyngeal wall contraction on gag		
20	Saliva swallows		
21	Voluntary cough, throat clearing		
Observations during trial swallows: 1cc thin liquid, 1cc pudding, 1/4 Lorna Doone cookie (if chewing was possible)			
22	Apraxia of swallow		
23	Oral residue		
24	Coughing/throat clearing		
25	Delayed pharyngeal swallow		
26	Reduced laryngeal elevation		
27	Gurgly voice		
28	Multiple swallows per bolus		

Test reproduced from article

APPENDIX 2

Mann Assessment of Swallow Ability (MASA)

(Mann, 2002)

Quantify each qualitative component as normal, mildly impaired, moderately impaired, severely impaired or not assessable.	
General patient examination	
	Consciousness
	Cooperation
	Language function
	Verbal and oral praxis
	Articulation
Oral preparation	
	Control of saliva (eg drooling)
	Oral hygiene (eg tongue coating)
	Lip seal
	Tongue movement (degree and co-ordination)
	Tongue strength
	Oral preparation
	Respiration (airway patency, supported or independent ventilation, respiratory rate and rhythm)
	Respiratory disease (chest infection, airway obstruction)
Oral phase	
	Gag reflex
	Palatal movement and competence
	Oral transit time (measured from entry point at lips to swallowing reflex trigger)
	Bolus clearance (presence or absence of residue in the mouth after swallowing is completed)
Pharyngeal phase	
	Pharyngeal control
	Pharyngeal pooling and laryngeal elevation
	Cough:reflex
	Cough:voluntary
	Voice quality
	Tracheostomy

Test reproduced from article

APPENDIX 3

Reflex Cough Test

(Addington et al., 1999)

1.	Dissolve 20% solution of prescription-grade l-tartaric acid in 2ml of sterile normal saline.
2.	Place the solution in a Bennett Twin nebulizer (output 0.2ml/min).
3.	Pinch the patient's nose closed.
4.	Inhale as a microaerosol.
5.	Instruct the patient exhale, place the mouthpiece and take a sharp, deep inhalation. Leakage around the mouthpiece and 'puffing' are not considered acceptable.
6.	Terminate the test when either a cough response is elicited or the patient fails to respond after 3 inhalations.

Determinants of swallow screen taken from article methodology

APPENDIX 4

Water Swallow Test

(Wade and Hewer, 1987)

Patient balanced in sitting position Unable Needs support Normal	Yes/No Yes/No Yes/No
Unable to swallow as comatose/has NG	Yes/No
Choked on swallowing	Yes/No
Swallowing was obviously difficult and abnormal	Yes/No
Swallowing was slow (patients opinion sought as to normal speed)	Yes/No
Normal	Yes/No

Determinants of swallow screen taken from article methodology

APPENDIX 5

50ml Water Swallow Test

(Gordon et al., 1987)

Swallow Assessment	Yes	No
Can the patient sit upright or be supported		
Can the patient hold the beaker need support to hold the beaker		
Drink 50ml water steadily from a beaker or medicine container		
If choking, sit for a few minutes		
Drink a further 50ml water steadily from a beaker or medicine container		
Dysphagia if patient unable to drink water or chokes more than once over the two assessments		

Determinants of swallow screen taken from article methodology

APPENDIX 6

Standardised Swallow Assessment (SSA)

(Perry, 2001a)

Pre – Swallow Screenig Checklist (complete within 24 hours of admission)

Name:

Ward:

1. Is the patient awake and alert, or responding to speech?	Yes	No
2. Is the patient able to be positioned upright, with some head control?		
If your answer is NO to either of the above questions GO NO FURTHER AND DO NOT SCREEN. Reassess every 24 hours and if the patient remains inappropriate for screening or referral to SLT, discuss hydration and nutrition with medical team		
3. Can the patient cough when asked to?		
4. Is the patient able to maintain some control of their saliva?		
5. Is the patient able to lick top and bottom lip?		
6. Is the patient able to breathe freely? ie no difficulty breathing or problems maintaining SaO ₂		
If answers to questions 3-6 are YES-proceed with screen If any answer is NO-stop and refer to SLT		
Finally-	Proceed	Stop & refer
7. Does the patient have a 'WET' or 'HOARSE'-sounding voice?		
If in doubt, discuss with SLT or medical team		
Pre-screen-Date and sign.....		

Patient is alert and has sitting balance	
Offer 3x teaspoon water. On each teaspoon observe for	Absent swallow:water dribbles out of mouth
	Coughing
	Choking
	Breathless
	Wet/gurgly voice
	If fail any item, place nil by mouth and refer to SLT
If NAD offer 50ml water in a glass	Absent swallow:water dribbles out of mouth
	Coughing
	Choking
	Breathless
	Wet/gurgly voice
	If fail any item, place nil by mouth and refer to SLT
If OK order diet as appropriate. Make sure patient is sat up to eat and supervise patient eating test meal. Any concerns, refer to SLT. Repeat assessment if any deterioration. If no concerns, continue and maintain vigilance.	

Test reproduced from article

APPENDIX 7

Burke Dysphagia Screening Test

(DePippo et al., 1994)

Patient Name:

ID Number:

Date of Evaluation:

	Present	Absent
1. Bilateral stroke		
2. Brainstem stroke		
3. History of pneumonia acute stroke phase		
4. Coughing associated with feeding or during 3oz water swallow test		
5. Failure to consume one half of meals		
6. Prolonged time required for feeding		
7. Non-oral feeding program in progress		
Presence of one or more of these features is scored as failing the Burke Dysphagia Screening Test.		
Results: Pass Fail		

Test reproduced from article

APPENDIX 8

Bedside Swallowing Assessment (BSA)

(Smithard et al., 1997)

Swallow Assessment

Clinical determinant	Marking scheme	
Conscious level	Alert=1, drowsy but rousable=2, response but no eye opening to speech=3, responds to pain=4	
Head and trunk control	Normal sitting balance=1, sitting balance not maintained=2, head control only=3, no head control=4	
Breathing pattern	Normal=1, abnormal=2	
Lip closure	Normal=1, abnormal=2	
Palate movement	Symmetrical=1, asymmetrical=2, minimal/absent=3	
Laryngeal function	(Aah/ee) Normal=1, weak=2, absent=3	
Gag	Present=1, absent=2	
Voluntary cough	Normal=1, weak=2, absent=3	
Stage 1: Teaspoon of 5ml water x 3		
Dribbles water	None/once=1, >once=2	
Laryngeal movement on attempted swallow	Yes=1, no=2	
Repeated movements 'felt'	None/once=1, >once=2	
Cough on swallowing	None/once=1, >once=2	
Stridulous on swallowing	No=1, yes=2	
Laryngeal function after swallowing	Normal=1, weak/wet=2, absent=3	
Stage 2: If the swallow is normal in stage 1 (2 of 3 attempts) try 60 mls of water in a beaker		
Able to finish?	Yes=1, no=2	
Time taken to finish in seconds		
Number of sips		
Cough during or after swallowing	No=1, yes=2	
Stridor during or after swallowing	No=1, yes=2	
Laryngeal function after swallowing	Normal=1, weak/wet=2, absent=3	
Do you feel aspiration is present	No=1, possible=2, yes=3	

Test reproduced from article

Head posture	Normal /abnormal
Trunk control	Normal /abnormal
Alertness	Alert/ drowsy/ unconscious
Communication	Normal /abnormal
Respiration	Normal /abnormal
Lip closure: - At rest - Eating/drinking - Speech	Normal /weak/ absent Normal /weak/ absent Normal /weak/ absent
Tongue movements: - Protrusion - Lateral movement - velar movement	Normal /weak/ absent Normal /weak/ absent Normal /weak/ absent
Gag reflex	Stroke side: present /absent Normal side: present /absent
Palatal function: - Speech - Nasal regurgitation	Normal /abnormal Yes /no
Tongue function: - Eating - Drinking - Drooling - Jaw movement	Normal /abnormal Normal /abnormal Present /absent Normal /abnormal
Laryngeal function: - voluntary cough - phonation preswallow - involuntary cough - phonation post-swallow	Normal /weak/ absent Normal /abnormal /absent Normal /weak/ absent Normal /abnormal /absent
Swallow reflex	Normal /delayed /absent
Pharyngeal function: - regurgitation - pooling in pharynx - no. of swallows to clear bolus from pharynx - tracheal penetration (cough) - laryngeal penetration - Do you feel aspiration is present?	Yes /no Yes /no 1 2 3 4 >4 Present /absent Present /absent Yes /no

Test reproduced from article

APPENDIX 9

Timed Test of Swallow (TTS)

(Hinds and Wiles, 1998)

Patient questionnaire (qualitative)
At the present time:
1. Do you have a problem with your swallowing?
2. Do you have difficulty keeping food or drink in your mouth?
3. Do you have difficulty using your tongue to move food around in your mouth?
4. Do you have episodes of coughing when eating or drinking?
5. Does food or drink 'go down the wrong way' i.e. into your breathing tubes?
6. Are you aware of having to be careful when eating or drinking in case things 'go down the wrong way' into your breathing tubes?
7. Does food ever get stuck in your throat?
8. Do liquids come back through your nose when you swallow them?
9. Do you have any other major medical problems?
10a. Do you wear dentures? b. If so, are they top bottom or both? c. Do they fit well?
11. Do you take any of the following medicine every day? - antidepressants - minor tranquillisers - major tranquillisers - other drugs

Timed test of swallowing (quantitative)
Preliminaries: The patient should be alert, seated or well propped up, able to clear oral secretions and cooperate. There should be no obvious respiratory distress or voice/laryngeal dysfunction.
Procedure: The patient is first given a small amount of water from a teaspoon (i.e. 5-10ml) to drink to ensure the test is safe to perform; patients choking on this small amount do not proceed to the full test and are recorded as an abnormal test.
Next 100-150ml water is given and the patient is asked to drink all the water as quickly as possible. Any residual water left over is measured.
The number of swallows is counted by observing the movement of the thyroid cartilage.
The stopwatch is started when the first drop of water touches the lip and stopped when the subject first breathes following the last swallow.
The test is defined as being abnormal if either quantitative elements i.e. swallowing capacity (ml/s), volume/swallow (ml) are outside the 95% prediction interval for age and sex (reference range or chart available from the authors); or qualitative elements such as coughing during the test or a wet hoarse voice after the test were present.

Test reproduced from article

APPENDIX 10

Daniels Assessment Survey

(Daniels et al., 1998)

Orofacial examination	
Mandible	Symmetry on extension, strength Nonspeech co-ordination: isolated movement, repetitive movement Speech coordination: isolated movement (a), repetitive (a)
Lips	Symmetry: Rest Retraction Protrusion Strength Nonspeech co-ordination: repetitive movement, alternating movement Speech co-ordination: repetitive movement (pw), alternating movement (pw)
Tongue	Symmetry: Rest Protrusion Lateralisation Elevation Yes/No Lateralisation Yes/No Fasciculations Yes/No Strength Nonspeech co-ordination: repetitive movement, alternating movement Speech co-ordination: repetitive movement tk, alternating movement (ptk) Multisyllabic word repetition (tiptop, baseball player, several, caterpillar, emphasize) Laryngeal function: Isolated movement (i i i on one breath), Alternating movement (u i) Buccofacial apraxia “blow out a candle” “lick an ice cream cone” “kiss a baby” “sip through a straw” “lick milk off your top lip”
Velum	Symmetry: rest elevation Speech coordination: repetitive movement (a) Appearance of hard palate Dentition
Reflexes	Gag Swallow
Additional Information	Facial numbness/tingling Yes/no Light touch Dysphonia Dysarthria Breath support Resonance Volitional cough: Yes/No

Dysphonia	A voice disturbance in the parameters of vocal quality, pitch or intensity
Dysarthria	A speech disorder resulting from the disturbances in muscular control affecting the areas of respiration, articulation, phonation, resonance or prosody
Abnormal gag reflex	Either absent or weakened velar or pharyngeal wall contraction, unilaterally or bilaterally, in response to tactile stimulation of the posterior pharyngeal wall
Abnormal volitional cough	A weak response, verbalised response, or no response on given the command to cough
Cough after swallow	Cough immediate or within 1 minute of ingestion of calibrated volumes of water (5,10 and 20ml presented in duplicate
Voiced change after swallow	Alteration on voice quality following ingestion of calibrated volumes of water

Daniels Assessment Survey Severity Rating Scale

Severity rating	Characteristics
0	Normal swallowing: Overall normal functioning of the Oropharyngeal swallowing mechanism with no resultant supraglottic penetration or aspiration
1	Mild dysphagia: Oral or pharyngeal dysfunction resulting in no more than intermittent evidence of trace supraglottic penetration with immediate clearing
2	Moderate dysphagia: Oral or pharyngeal dysfunction resulting in consistent supraglottic penetration with laryngeal vestibule stasis or two or less instances of aspiration of a single viscosity
3	Moderate-severe dysphagia: Oral or pharyngeal dysfunction resulting in consistent aspiration of a single viscosity
4	Severe dysphagia: Oral or pharyngeal dysfunction resulting in consistent aspiration of more than one consistency

Test reproduced from article

APPENDIX 11

Massey Bedside Swallow Screen

(Massey and Jedlicka, 2002)

	Yes	No (stop)	Comments
1. Patient is alert (can follow command)			
2. Dysarthria (speech slurred or garbled)			
3. Aphasia (trouble speaking or understanding words)			
4. Able to clench teeth			
5. Able to close lips			
6. Face is symmetrical with movement			
7. Tongue is midline			
8. Uvula is midline			
9. Gag reflex is present			
10. Has voluntary cough (have patient cough 2 times)			
11. Able to swallow own secretions (no drooling)			
12. Swallow reflex is present			
13. Give a teaspoon of water a. swallows without choking b. voice sounds gurgly c. coughed after water d. water dribbles out of mouth	 a b c d	 a b c d	
14. Give a 60cc of water (if teaspoon was tolerated) a. swallows without choking b. voice sounds gurgly c. coughed after water d. water dribbles out of mouth	 a b c d	 a b c d	

Test reproduced from article

APPENDIX 12

100ml Water Swallow Test

(Wu et al., 2004)

	Time taken
Drink 100mls water on instruction 'go'	
Stop assessment if choking noted and subtract amount left from 100mls	
Note coughing up to 1 minute following water intake	

Determinants of swallow screen taken from article methodology

APPENDIX 13
Gugging Swallow Screen
 (Trapl et al., 2007)

<h1 style="margin: 0;">G U S S</h1> <p style="margin: 0;">(Gugging Swallowing Screen)</p>		Name: _____ Date: _____ Time: _____	
<p>1. Preliminary Investigation /Indirect Swallowing Test</p>			
	YES	NO	
Vigilance (<i>The patient must be alert for at least for 15 minutes</i>)	1 <input type="checkbox"/>	0 <input type="checkbox"/>	
Cough and/or throat clearing (<i>voluntary cough</i>) (<i>Patient should cough or clear his or her throat twice</i>)	1 <input type="checkbox"/>	0 <input type="checkbox"/>	
Saliva Swallow:	1 <input type="checkbox"/>	0 <input type="checkbox"/>	
• Swallowing successful	0 <input type="checkbox"/>	1 <input type="checkbox"/>	
• Drooling	0 <input type="checkbox"/>	1 <input type="checkbox"/>	
• Voice change (hoarse, gurgly, coated, weak)	0 <input type="checkbox"/>	1 <input type="checkbox"/>	
SUM:	(5)		
	1 - 4= Investigate further [†] 5= Continue with part 2		
<p>2. Direct Swallowing Test (Material: Aqua bi, flat teaspoon, food thickener, bread)</p>			
<i>In the following order:</i>	1 →	2 →	3 →
	SEMISOLID*	LIQUID**	SOLID ***
DEGLUTITION:			
▪ Swallowing not possible	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>
▪ Swallowing delayed (> 2 sec.) (Solid textures > 10 sec.)	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
▪ Swallowing successful	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
COUGH (involuntary): (<i>before, during or after swallowing – until 3 minutes later</i>)			
▪ Yes	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>
▪ No	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
DROOLING:			
▪ Yes	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>
▪ No	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
VOICE CHANGE: (<i>listen to the voice before and after swallowing - Patient should speak „O“</i>)			
▪ Yes	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>
▪ No	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
SUM:	(5)	(5)	(5)
	1 - 4= Investigate further [†] 5= Continue Liquid	1 - 4= Investigate further [†] 5= Continue Solid	1 - 4= Investigate further [†] 5= Normal
SUM: (Indirect Swallowing Test AND Direct Swallowing Test)			_____ (20)
*	First administer ½ up to a half teaspoon Aqua bi with food thickener (pudding-like consistency). If there are no symptoms apply 3 to 5 teaspoons. Assess after the 5 th spoonful.		
**	3, 5, 10, 20 ml Aqua bi - if there are no symptoms continue with 50 ml Aqua bi (Daniels et al. 2000; Gottlieb et al. 1996) Assess and stop the investigation when one of the criteria is observed!		
***	Clinical: dry bread; FEES: dry bread which is dipped in coloured liquid		
†	Use functional investigations such as Videofluoroscopic Evaluation of Swallowing (VFES) , Fiberoptic Endoscopic Evaluation of Swallowing (FEES)		

GUSS

(Gugging Swallowing Screen)

GUSS - EVALUATION

	RESULTS	SEVERITY CODE	RECOMMENDATIONS
20	Semisolid / liquid and solid texture successful	Slight / No Dysphagia minimal risk of aspiration	<ul style="list-style-type: none"> • Normal Diet • Regular Liquids (<u>First time under supervision of the SLT or a trained stroke nurse!</u>)
15-19	Semisolid and liquid texture successful and Solid unsuccessful	Slight Dysphagia with a low risk of aspiration	<ul style="list-style-type: none"> • Dysphagia Diet (pureed and soft food) • Liquids very slowly - one sip at a time • Functional swallowing assessments such as Fiberoptic Endoscopic Evaluation of Swallowing (FEES) or Videofluoroscopic Evaluation of Swallowing (VFES) • Refer to Speech and Language Therapist (SLT)
10-14	Semisolid swallow success sful and Liquids unsuccessful	Moderate dysphagia with a risk of aspiration	<p>Dysphagia diet beginning with:</p> <ul style="list-style-type: none"> • Semisolid textures such as baby food and additional parenteral feeding. • All liquids must be thickened! • Pills must be crushed and mixed with thick liquid. • No liquid medication! • Further functional swallowing assessments (FEES, VFES) • Refer to Speech and Language Therapist (SLT) <p style="text-align: center;"><i>Supplementation with nasogastric tube or parenteral</i></p>
0-9	Preliminary investigation unsuccessful or Semisolid swallow unsuccessful	Severe dysphagia with a high risk of aspiration	<ul style="list-style-type: none"> • NPO (non per os = nothing by mouth) • Further functional swallowing assessment (FEES, VFES) • Refer to Speech and Language Therapist (SLT) <p style="text-align: center;"><i>Supplementation with nasogastric tube or parenteral</i></p>

Test reproduced from article

APPENDIX 14

Speech and Language Therapist and Nurse Pilot Questionnaires

Speech and Language Therapist Questionnaire – pilot

***DYSPHAGIA SCREENING
AND
ASSESSMENT***

Elizabeth Boaden
Principal Speech and Language Therapist
c/o Research Unit
Department of Nursing
Faculty of Health
University of Central Lancashire
Greenbank Building
Preston
PR1 2HE

Research Unit
Department of Nursing
Faculty of Health
University of Central Lancashire
Greenbank Building
Preston
PR1 2HE

Dear-----,

I am working with the University of Central Lancashire to develop a standardised dysphagia screening tool for nurses to use with stroke patients. To date no studies have examined the relative safety of materials aspirated onto the lungs. I would like to establish which drinks, food and consistencies you advise nurses to offer patients in their dysphagia screen.

The questionnaire should take no longer than 5 minutes to complete.

Your name and contact details were accessed from the North West Regional Stroke Taskforce Database as a Speech and Language Therapist with a specialist interest in stroke. If you have colleagues that would be interested in completing the questionnaire please either photocopy the questionnaire or contact me directly for further copies.

Each questionnaire has a unique numerical identifier in the top right hand corner. This will be used to identify which questionnaires have been returned. It is important for me to collate information from as many questionnaires as I can and I will therefore follow this letter with a telephone call to all those who do not return their questionnaire. Following this anonymity will be guaranteed by removal of the identifier.

I would be grateful if you would return the completed questionnaire and consent in the stamped addressed envelope provided by Friday 9th May 2003.

If you have any queries regarding the project or would like to be involved further, please do not hesitate to contact me at the address below.

Thank you for your time

Yours sincerely,

Elizabeth Boaden
Principal Speech and Language Therapist
C/o Research Unit
Department of Nursing
Faculty of Health
University of Central Lancashire
Greenbank Building
Preston
PR1 2HE

Contact Number: 01257 245290

About this Questionnaire

The questionnaire is divided into four sections, each concerning a different issue:

Section 1 asks about the nature of the dysphagia service provided to stroke patients that you care for, for example: which disciplines are involved, who performs the screen and who provides ongoing management decisions.

Section 2 asks about which drinks, food and consistencies are used as part of a dysphagia screen.

Section 3 asks about screening tools used, and provision of training to use these.

Section 4 gives you the opportunity to provide further information.

The questions follow a set formula. You are asked to tick the appropriate box to indicate your answer and are given an opportunity to elaborate or clarify your answer in the comments section of each question.

An example is shown below:

Are you involved in the delivery of care to stroke patients?	
<input checked="" type="checkbox"/>	Yes
<input type="checkbox"/>	No
Comments	<u>I work in the community, providing a domiciliary</u> <u>rehabilitation service as part of a multi-disciplinary team</u> _____

Dysphagia Assessment and Screening

Section 1: You will be asked a series of questions regarding the dysphagia service offered to stroke patients and the responsibilities of different professionals in dysphagia screening and assessment. Please tick the box that applies to you. A comment section is available at the end of the questionnaire for any additional information you may wish to give.

1. Do you offer a dysphagia service to stroke patients?

(Please tick the appropriate boxes)

Yes

If you ticked "yes" which setting do you work in?

Hospital

Community

Both

No

Comments _____

If you answered *Yes* please continue.

If you answered *No* to this question please return the questionnaire without answering further questions. Thank you.

2. Are *all* stroke patients routinely screened for dysphagia by a Speech and Language Therapist?

(Please tick the appropriate box)

Yes

No

Don't know

Comments _____

3. Do any nurses refer to Speech and Language therapy for a dysphagia assessment?
(Please tick the appropriate box)

- Yes
- No
- Don't know

Comments

4. Do any nurses working with you do dysphagia screening?
(Please tick the appropriate box and include further explanation if you ticked don't know)

- Yes
- No
- Don't know

Comments

If you answered *Yes* please continue.

If you answered *No* to this question please return the questionnaire without answering further questions. Thank you.

5. Do any nurses working with you do ongoing dysphagia management?
(Please tick the appropriate box and include further explanation)

- Yes (please give details)

- No (please give details)

- Don't know

Comments

Section 2:

This section asks about which drinks, food types and consistencies are offered to patients as part of dysphagia screening. Please tick the box that applies to you. A comment section is available at the end of the questionnaire for any additional information you may wish to give.

6. What drink, food and consistencies do you personally advise nurses to use as part of their dysphagia screening?

Drinks eg: water, tea

Food eg: yoghurt, weetabix

Consistencies eg: syrup, puree, soft mashed

7. Do nurses use ONLY the drinks that you personally advise them to use as part of their dysphagia screening?
(Please tick the appropriate box)

- Yes
 No (please give details)

Don't know

8. Do nurses use only the food that you personally advise them to use as part of their dysphagia screening?
(Please tick the appropriate box)

- Yes
 No (please give details)

Don't know

9. Do nurses use only the consistencies that you personally advise them to use as part of their dysphagia screening?

(Please tick the appropriate box)

Yes

No (please give details)

Don't know

Section 3:

The questions in this section relate to nurses use of formal and informal dysphagia screening tools, which tools are used, and what training nurses have received in the use of the tool. Please tick the box that applies to you. A comments section is available at the end of the questionnaire for any additional information you may wish to give.

10. Do any nurses working with you use a dysphagia screening tool?

(Please tick the appropriate box and include further explanation if appropriate)

Yes (please give details of the tool)

Published (please specify)

Devised locally

(enclose a copy if you have one)

No

11. Have any nurses working with you received training on how to use a dysphagia screening tool?

(Please tick the box that applies)

- Yes
- No (please go to question 14)
- Don't know (please go to question 14)

12 Who provided the training?

(Please tick the appropriate box and include further explanation if you ticked other)

- Speech and Language Therapist
- Nurse
- Other (please specify) _____

- Don't know

13 Do you know what was included in the training?
(please tick all that apply and add further comments if appropriate)

- No (please go to question 14)**

- Yes (please tick all the boxes that apply)**
 - Anatomy of the swallow**
 - How the normal swallow works**
 - The screening tool**
 - The signs of aspiration**
 - Documentation**
 - How to thicken drinks**
 - How to refer to speech and language therapy for a further assessment**
 - Hands on practical session**
 - Observation of the trainer**
 - Supervision by the trainer**
 - Assessment by the trainer**
 - Other (please specify)**

Section 4:

14 Please use this box for any other comments you may wish to add

Please tick this box if you do not wish to be contacted again with regard to this project.

Thank you for taking time to complete this questionnaire

Please place completed questionnaire in the reply paid envelope and return to :

Liz Boaden,
Speech and Language Therapist,
c/o Research Unit, Department of Nursing, Faculty of Health, University of Central
Lancashire, Greenbank Building, Preston
PR1 2HE

***DYSPHAGIA SCREENING
AND
ASSESSMENT***

Elizabeth Boaden
Principal Speech and Language Therapist
c/o Research Unit
Department of Nursing
Faculty of Health
University of Central Lancashire
Greenbank Building
Preston
PR1 2HE

Research Unit
Department of Nursing
Faculty of Health
University of Central Lancashire
Greenbank Building
Preston
PR1 2HE

Dear-----,

I am working with the University of Central Lancashire to develop a standardised dysphagia screening tool for nurses to use with stroke patients. To date no studies have examined the relative safety of materials aspirated onto the lungs. I would like to establish which drinks, food and consistencies you advise nurses to offer patients in their dysphagia screen.

The questionnaire should take no longer than 5 minutes to complete.

Your name and contact details were accessed from the North West Regional Stroke Taskforce Database as a Speech and Language Therapist with a specialist interest in stroke. If you have colleagues that would be interested in completing the questionnaire please either photocopy the questionnaire or contact me directly for further copies.

Each questionnaire has a unique numerical identifier in the top right hand corner. This will be used to identify which questionnaires have been returned. It is important for me to collate information from as many questionnaires as I can and I will therefore follow this letter with a telephone call to all those who do not return their questionnaire. Following this anonymity will be guaranteed by removal of the identifier.

I would be grateful if you would return the completed questionnaire and consent in the stamped addressed envelope provided by Friday 9th May 2003.

If you have any queries regarding the project or would like to be involved further, please do not hesitate to contact me at the address below.

Thank you for your time

Yours sincerely,

Elizabeth Boaden
Principal Speech and Language Therapist
C/o Research Unit
Department of Nursing
Faculty of Health
University of Central Lancashire
Greenbank Building
Preston
PR1 2HE

Contact Number: 01257 245290

About this Questionnaire

The questionnaire is divided into four sections, each concerning a different issue:

Section 1 asks about the nature of the dysphagia service provided to stroke patients that you care for, for example: which disciplines are involved, who performs the screen and who provides ongoing management decisions.

Section 2 asks about which drinks, food and consistencies are used as part of a dysphagia screen.

Section 3 asks about screening tools used, and provision of training to use these.

Section 4 gives you the opportunity to provide further information.

The questions follow a set formula. You are asked to tick the appropriate box to indicate your answer and are given an opportunity to elaborate or clarify your answer in the comments section of each question.

An example is shown below:

Are you involved in the delivery of care to stroke patients?	
<input checked="" type="checkbox"/>	Yes
<input type="checkbox"/>	No
Comments	<u>I work in the community, providing a domiciliary</u> <u>rehabilitation service as part of a multi-disciplinary team</u> <u>_____</u>

Dysphagia Screening and Assessment

Section 1:

This section contains a series of questions about the dysphagia service offered to stroke patients and the responsibilities of different professionals in dysphagia screening and assessment. Please tick the boxes that apply to you. A comments section is available at the end of the questionnaire for any additional information you may wish to give.

1. Do you offer a dysphagia service to stroke patients?
(Please tick the appropriate boxes)

Yes
If you ticked “yes” which setting do you work in?
Hospital
Community
Both

No

Comments _____

If you answered *Yes* please continue.
If you answered *No* to this question please return the questionnaire without answering further questions. Thank you.

2. Are all stroke patients routinely screened for dysphagia by a Speech and Language Therapist?
(Please tick the appropriate box)

Yes
 No
 Don't know

Comments _____

3. Do you refer to the Speech and Language Therapists for dysphagia assessments?
(Please tick the appropriate box and include further explanation if appropriate)

Yes

No

Other (please specify) _____

4. Do you do dysphagia screening?
(Please tick the appropriate box and include further explanation if appropriate)

Yes

No

Other (please specify) _____

If you answered *Yes* please continue.

If you answered *No* to this question please return the questionnaire without answering further questions. Thank you.

5 Do you do ongoing management of dysphagia?
(Please tick the appropriate box and include further explanation if appropriate)

Yes (please give details) _____

No

Section 2:

This section asks about which drinks, food types and consistencies are offered to patients as part of a dysphagia screening tool. Please tick the box that applies to you. A comments section is available at the end of the questionnaire for any additional information you may wish to give.

6 What drink, food and consistencies do you use as part of your dysphagia screening?

Drinks eg: water, tea

Food eg: yoghurt, weetabix

Consistencies eg: syrup, puree, soft mashed

Section 3:

The questions in this section relate to use of formal and informal dysphagia screening tools, which tools are used, and what training you have received in the use of the tool. Please tick the box that applies to you. A comments section is available at the end of the questionnaire for any additional information you may wish to give.

7. Do you use a dysphagia screening tool?

(Please tick the appropriate box and include further explanation if appropriate)

Yes (please give details of the tool) _____

Published (please specify) _____

Devised locally _____
(enclose a copy if you have one)

No

8. Have you received training on how to use a dysphagia screening tool?

(Please tick the box that applies)

Yes (please specify)

No (please go to question 11)

Don't know (please go to question 11)

9. Who provided the training?

(Please tick the appropriate box and include further explanation if you ticked other)

Speech and Language Therapist

Nurse

Other (please specify) _____

Don't know

10. Do you know what was included in the training?

(please tick all that apply and add further comments if appropriate)

- No (please go to question 11)**

- Yes (please tick all the boxes that apply)**
 - Anatomy of the swallow**
 - How the normal swallow works**
 - The screening tool**
 - The signs of aspiration**
 - Documentation**
 - How to thicken drinks**
 - How to refer to speech and language therapy for a further assessment**
 - Hands on practical session**
 - Observation of the trainer**
 - Supervision by the trainer**
 - Assessment by the trainer**
 - Other (please specify)**

Section 4:

11. Please use this box for any further comments you may wish to add

Please tick this box if you do not wish to be contacted again with regard to this project.

Thank you for taking time to complete this questionnaire

Please place completed questionnaire in the reply paid envelope and return to :

Liz Boaden,
Speech and Language Therapist,
c/o Research Unit, Department of Nursing, Faculty of Health, University of Central
Lancashire, Greenbank Building, Preston
PR1 2HE

APPENDIX 15

Ethical Approval - Questionnaires

APPENDIX 16

SLT and nurse questionnaire interview sampling frame

Nurses

Name	Designation	Location	Level of Dysphagia training	Type of training
1	Staff nurse	Day Hospital	Screening theory	In house
2	Stroke Nurse Co-ordinator	Acute Stroke Care, medical assessment unit, general wards, stroke unit	Post-graduate training	Nationally accredited course
3	Ward manager	Acute general medical ward	Screening theory and practical skills assessed	In house
4	Staff nurse	Day Hospital	Screening theory	In house
5	Ward manager	Acute general medical ward	Screening theory	In house
6	Staff Nurse	Acute general medical ward	Screening theory and practical skills assessed	In house
7	Staff nurse	Day Hospital	Screening theory	In house
8	Ward manager	Acute general medical ward	Screening theory and practical skills assessed	In house
9 (not used)	Ward manager	Acute general medical ward	Screening theory and practical skills assessed	In house
10(not used)	Staff Nurse	Acute general medical ward	Screening theory	In house
11(not used)	Staff Nurse	Acute general medical ward	Screening theory and practical skills assessed	In house
12 (not used)	Staff Nurse	Acute general medical ward	Screening theory	In house

SLT

Name	Designation	Location	Level of Dysphagia training	Type of training
1	Senior Specialist SLT Acquired Brain Injury	Acute and rehabilitation wards, community	Post-graduate training and advanced post-graduate training	Nationally accredited courses
2	Generalist SLT	Rehabilitation wards and day hospital	Undergraduate training Screening theory and practical skills assessed	University In house
3	Senior SLT Stroke	Acute and rehabilitation wards, community	Undergraduate training Post-graduate theory and practical skills assessed	University In house
4	Generalist SLT	Rehabilitation wards and day hospital	Undergraduate training Screening theory and practical skills assessed	University In house
5	Senior SLT	Acute and rehabilitation wards, community	Undergraduate training Post-graduate theory and practical skills assessed	University In house
6	Senior Specialist SLT	Acute and rehabilitation wards, community	Undergraduate & Post-graduate training and advanced post-graduate training	University Nationally accredited courses
7	Generalist SLT	Rehabilitation wards and day hospital	Undergraduate training Screening theory and practical skills assessed	University In house
8	Generalist SLT	Rehabilitation wards and day hospital	Undergraduate training Screening theory and practical skills assessed	University In house

APPENDIX 17

Nurse Interviews - Pilot Questionnaire

1. Staff nurse

- I First of all, can I just ask you about the title? Did that adequately explain to you what was going to be involved?
- R I think that was really clear, yes
- I Okay, excellent. And the letter?
- R The letter I thought was really good at explaining it. I thought it was very clear, and I didn't have a problem with it.
- I Did it take you 5 minutes or did it take you longer?
- R Because I only filled part of it in, it only took me 5 minutes. I think it would probably have taken me longer if I was filling all of it in, like a speech therapist or something.
- I And the example, was that helpful?
- R I think that was really good, yes. A lot of times when I get questionnaires, I think, what do they really mean, but if you show me, then I feel much better so I think that was good yes.
- I Okay, so under the different sections, were the questions that came under section 1 adequately reflected by the title, in that introductory passage?
- R Yes
- I Yes? Okay and question 1?
- R Question 1, I just didn't know whether you meant me as a person or us as a department, or it was just nursing staff who just do you know. Perhaps, if you'd have said, does your work, you know, or your department, or does it mean you personally (laughter)
- I It's unclear isn't it?
- R That's the only thing I could think. I was just unsure which way to answer it, whether it was myself or whether it was the department.
- I What about question 2?
- R No, I don't think they. A lot are seen on the wards before they come here, but I think if we get a stroke that has come to us out of the blue, we only ask for them to be seen if we have a problem.
- I Okay, number 3?
- R Yes, we refer to the speech therapist

I The question was clear

R Yes that were fine

I Number 4?

R Yes because we don't do number 4

I Okay ongoing management?

R I didn't go any further, so I said no so I didn't go any further.

I Right, so you stopped at 4?

R I stopped at 4, yes?

I If you had have gone on how would you have answered ongoing management? Because you do the thickening drinks don't you?

R Yes

I Would you have interpreted that as ongoing management or you making actually making the management decisions?

R Well, I would have thought it was the speech therapist saying that they needed it, and me doing

I and you implementing the care plans?

R Yes

I Perhaps that needs to be clearer then

R Is that not what you mean? Should we be saying yes to that one?

I I'm not sure myself!

R Like you are saying, we do if you're classing drinks and do diet

I That's what I'm thinking!

R Yes

I Okay, that's brilliant

R Okay

I Excellent

R Jolly good

I Would you know where to send it back to?

R Yes

I Thank you very much.

2. Stroke Nurse

- I Okay, can I just ask you about the front sheet. Does the title adequately explain to you what was going to come in the set of questions following?
- R Yes
- I Yes?
- R Yes
- I Okay next page. Now the letter, did that explain the survey more? Was it helpful, or should it be taken out?
- R No, include that one
- I It said in there it should take 5 minutes. Did it actually take 5 minutes or did it take longer?
- R No, it actually took 5 minutes
- I That was just an example, was it helpful?
- R Yes it was.
- I Okay, told you it wouldn't take long. This is the questionnaire itself, section 1. This little explanation here, did it help to explain what the questions were about?
- R Yes it did
- I Yes, you were happy with that?
- R Yes
- I And what about question 1 itself? Did you understand how to answer it and where to answer it?
- R Yes
- I Yes, wasn't an issue?
- R No
- I Was there enough space?
- R Could have done with more space for the comments
- I That was all?
- R Yes
- I Alright. Question 2? Happy with that?
- R Fine

I And question 3?

R That was fine

I Number 4?

R Fine

I Five

R Fine

I Did you need more space?

R Yes, just a bit (laughter)

I Did you need more space on all of them?

R I think so, if you want to explain yourself, why you've answered the question in the way that you have

I Okay that's fine. Number 6? Oh it's section 2 first, was that helpful or do you think that needs expanding?

R No, that's fine, that's quite simple

I Okay, number 6? Was that easy to

R It was, er I just think that was a bit loose.

I In what, were you unsure what to write

R Well, I think you shouldn't have given an example.

I Right

R Like drink, you should have just said, what drink, food, consistency because if you're doing dysphagia screening, you should know that anyway, you should know what drinks you're using, what textures, what consistencies, you shouldn't need to be giving people pointers.

I Right, okay, that's fine. With the consistencies, do you think that should be consistencies, or would you use the word textures?

R Textures more than consistencies

I Okay. Section 3. Did that explain what was about to come?

R Yes

I Yep and number 7. Did you understand the question?

R I did

I Wasn't difficult to answer?

R No it wasn't

I Number 8?

R Fine

I Number 9?

R Fine

I Okay, Number 10

R That was fine aswell

I No problems at all

R Nothing at all

I Okay, number 11?

R I didn't actually put any comments. The comments I was going to put was you know about the drinks. Em that was all. The rest was fine

I And you know who to send it back to?

R Yes, Liz Boaden!

I That's the one! Okay, thank you very much

3. Nurse Ward Manager

I Can I ask you first of all about the first page? Do you think the title of the document adequately explains what you've been asked to do?

R Yes it does

I This letter does that explain in more detail

R It did, it allows you to put your brain in sync

I Did it take you 5 minutes or did it take you longer?

R No it takes about 5 minutes, the questions aren't hard and its yes/no all the way through

I Was the example useful?

R It was useful, it gave you an overall view of what the questions were going to involve

I Okay can we go onto the next section. Did the section heading adequately explain what kind of questions were to follow or

R Yes, it was self-explanatory. Again it told you what to expect in the questionnaire

- I Okay, question 1 are you happy with that?
- R Yes I am and question 2.
- I Great, and question 3?
- R I didn't have any problems with any of the questions, they were straight forward, you could easily apply a 'yes' or a 'no' answer. It wasn't an open- ended question but there is room there if you feel there is something you wanted to say
- I And was there enough room to write on?
- R Well I don't have particularly large writing and I have been known to scribble down the edges. No because you wouldn't be embroidering too much, it's not that type of questionnaire.
- I So that's section 2-was that easy to do or did you want to write consistencies rather than foods
- R No, I think in foods, yoghurt, custard, syrup, rather than thinking about your thick and easy, its looking at your thick and easy and thinking 'what kind of food is it. And I don't always start with thickened fluids. Sometimes I start with a yoghurt, if I know my patient well and I know she's developing or obviously if it's a first dysphagia screening, you follow the protocol, but if the patient is progressing you'd go for the porridge, or the weetabix, yoghurt or make up that type of consistency.
- I Section 3 again, did that explain the types of questions that were going to be asked?
- R Yes very well
- I Question 7 okay
- R Yes straight forward
- I What about the last one?
- R Well I read that through very carefully, and I do think it's some time now since I did my dysphagia training, competency, and it included everything that I still do today. There was nothing I felt was left out of this list.
- I Good, in the comments box, is that enough space or do you think it should be a full page.
- R I think we do tend to bullet point when were documenting as professionals so I think there's enough room
- I Would you know where to send it back to?
- R Yes
- I Any questions you think were missing that should have been asked?
- R No, it's very clear and concise. I can't think of anything else to say.

I okay, thank you very much

4. Staff nurse

I Okay, first of all, does the title adequately describe to you what is in the document?

R Yes

I This letter, was is helpful?

R Yes it was. It gave you the reason for the questionnaire and why you want it and what you're going to do with it.

I Okay, did it take you 5 minutes or did it take you longer?

R em, no it wasn't longer because I stopped half way through you know where it says 'if it's no, don't carry on'

I Okay, that's fine. Is there anything missing from there that would help explain the questionnaire further

R No

I Was the example helpful?

R Yes it was, I like examples. Well you see that you are writing the right things then.

I Okay, the section heading, did that help to tell you what questions were coming?

R Yes

I Useful?

R Yes, yes definitely keep that in

I Okay, Question 1, any difficulties?

R The only problem I thought was em it sounds like, I didn't know whether it was me as a person or as a department, so I took it as the department. That was the only little bit of thing that stopped me answering it right away

I Okay, question 2

R Yes that's fine, well the answer obviously is no because all our stroke patients are seen elsewhere before they come to here anyway, so some will have been screened previously anyway, so if there's no problems then they are not screened here again.

I Do you think there should be some more room there then

R Yes probably, well if you've got the space on the sheet, you might as well.

I Yes

R It will balance it out as well

I Okay, question 3?

R That's straight forward I think

I Question 4?

R Straight forward again. That I took straight away as being me personally

I Question 5?

R Well it says if you tick no, don't answer any further questions so I didn't look at anything else

I Excellent

R Is that right?

I Yes, I'm just wondering if you need to be directed to 11?

R Yes you see I wouldn't have looked at that, because I didn't go any further
So maybe it should say, 'if no, go to question 11

I Excellent. And you'd know who to send it back to?

R I would now

I Yes, yes it's a good point

R Because I just stopped there and that was it

I Were there any other questions you felt should have been asked?

R No, it's all pretty straight forward really and self-explanatory on where to go

I Okay, brilliant, thank you very much

R You're welcome

APPENDIX 18

Nurses Collated Interview Responses

Title page

I think that was really clear, yes
Yes
Yes it does
Yes

Letter of introduction

The letter I thought was really good at explaining it. I thought it was very clear, and I didn't have a problem with it.
Because I only filled part of it in, it only took me 5 minutes
I think that was really good, yes. A lot of times when I get questionnaires, I think, what do they really mean, but if you show me, then I feel much better so I think that was good yes.
It actually took 5 minutes
No it takes about 5 minutes, the questions aren't hard and its yes/no all the way through
It was useful, it gave you an overall view of what the questions were going to involve I like examples. Well you see that you are writing the right things then.

Section heading 1

Yes
Yes, it was self explanatory. Again it told you what to expect in the questionnaire
Yes definitely keep that in

Question 1

Question 1, I just didn't know whether you meant me as a person or us as a department, or it was just nursing staff who just do you know. Perhaps, if you'd have said, does your work, you know, or your department, or does it mean you personally (laughter)
Could have done with more space for the comments
The only problem I thought was em it sounds like, I didn't know whether it was me as a person or as a department, so I took it as the department. That was the only little bit of thing that stopped me answering it right away

Question 2

I don't think they. A lot are seen on the wards before they come here, but I think if we get a stroke that has come to us out of the blue, we only ask for them to be seen if we have a problem.
Yes that's fine, well the answer obviously is no because all our stroke patients are seen elsewhere before they come to here anyway, so some will have been screened previously anyway, so if there's no problems then they are not screened here again.
Yes probably, well if you've got the space on the sheet, you might as well.

Question 3

That's straight forward I think

I didn't have any problems with any of the questions, they were straight forward, you could easily apply a 'yes' or a 'no' answer. It wasn't an open- ended question but there is room there if you feel there is something you wanted to say
That was fine
That was fine

Question 4

Straight forward again. That I took straight away as being me personally
Well I don't have particularly large writing and I have been known to scribble down the edges. No because you wouldn't be embroidering too much, it's not that type of questionnaire.
Fine
Yes because we don't do number 4. I didn't go any further, so I said no so I didn't go any further.

Section 2

Well it says if you tick no, don't answer any further questions so I didn't look at anything else. Yes you see I wouldn't have looked at that, because I didn't go any further. So maybe it should say, 'if no, go to question 11'. (I: And you'd know who to send it back to?) I would now

Question 5

Fine
Yes you see I wouldn't have looked at that, because I didn't go any further. So maybe it should say, 'if no, go to question 11'.
No, I think in foods, yoghurt, custard, syrup, rather than thinking about your think and easy, its looking at your think and easy and thinking 'what kind of food is it. And I don't always start with thickenened fluids. Sometimes I start with a yoghurt, if I know my patient well and I know she's developing or obviously if it's a first dysphagia screening, you follow the protocol, but if the patient is progressing you'd go for the porridge, or the weetabix, yoghurt or make up that type of consistency.

Question 6

Fine
Well, I would have thought it was the speech therapist saying that they needed it, and me doing Perhaps that needs to be clearer then
I think you shouldn't have given an example. Textures more than consistencies

Section 3

Yes very well

Question 7

Yes straight forward
(I: What about the last one?) Well I read that through very carefully, and I do think it's some time now since I did my dysphagia training, competency, and it included everything that I still do today. There was nothing I felt was left out of this list.
(I: Wasn't difficult to answer?) No it wasn't.

Question 8

Fine

Number 9

Fine

Number 10

That was fine aswell
No problems at all
Nothing at all

Number 11

I didn't actually put any comments.
The comments I was going to put was you know about the drinks. Em that was all.
The rest was fine

Summary

(!:)And you know who to send it back to?) Yes, Liz Boaden!
No, it's very clear and concise.
I can't think of anything else to say.

APPENDIX 19

SLT Interviews for the Pilot Questionnaire

1. Senior specialist SLT

- I Did the title on the front of the sheet tell you exactly what was contained within the document?
- R Yes
- I Okay, so you are happy with that?
- R Yes
- I Next page! Right, the letter. Did that explain in more detail what the purpose of the questions were for?
- R Yes it gave some background as to where it was going
- I Okay, any queries, questions?
- R My only queries were regarding the date, whether you are going to make the results available to those people who have done the questionnaire?
- I That's a good point, thank you for that. Okay next page. Did the example help at all giving an overview of the sort of questions you were going to be asked?
- R Yes, because it already introduces you as to what is going to be asked of you, where the questionnaire is going to so you can start thinking about it even before you start it. And the example of the comment is going to define what kind of comments you are looking for. So yes.
- I Thank you, we'll just go through the questions one by one. Firstly, the section heading, did that adequately explain what was going to be asked in the next section.
- R Yes definitely
- I And were there any questions in there that surprised you?
- R No
- I Okay, so question 1 was that easy to complete?
- R Okay nothing a problem?
- I Okay, question 2?
- R Straight forward.
- I Question 3?

R yes that was fine, yes

I Question 4?

R Again straight forward

I Question 5?

R Yes, I think that it's good having the comments at the side of that question to expand, helped on that one, yes

I Section 2 paragraph heading, was that acceptable?

R Definitely

I Okay, so number 6?

R I was fine with the drinks bit , but the food bit, I needed to check whether putting normal diet was acceptable, so I don't know whether you would want to include rather than modified choices, whereas you've got 'water, tea' as 2 normals, you've got 2 slightly not normal, or what could be perceived as 'modified diet'. That's how I took that, so you could have one of the examples as 'normal diet'

I okay, yea there isn't a solid in there is there?

R No, and the same with the consistencies, they're all modified in some way so I've just added on 'normal textures'

I Okay, thank you, number 7?

R I had to think about this one a bit more. I've put in brackets after 'I don't know' and I've done that for the next few questions to be honest, because where it says 'use only the drinks that you personally advise', I can only assume that they do, I suspect from other things that they don't-that's what the 'don't know' is there for

I yes perhaps we should put some lines in for comment?

R Yes I think so

I Okay that's fine. Is that the same for number 8 and 9 then?

R Yes

I Section 3 Again does that explain the types of questions that are to come?

R Yes, very much so

I Okay, number 10?

R Yes very straight forward

I 11?

R Again straight forward, no uncertainties at all

I Question 12?

R Very clear

I Question 13?

R It's very helpful to have that list that you just tick down, rather than thinking of it off the top of your head

I Was there anything missing do you think?

R Well you've got that space there and I've not added anything, so no

I Okay, and number 14?

R I couldn't think of any other comments that I haven't put down as I've gone along.

I And would you know where to send it back to?

R yes that's very clear

I And finally was there any question that you thought should have been included?

R No, I think you've gone through it all in the right stages, I don't think there's anything that you've missed, no

I Formatting clear, you knew where the questions were directing you?

R Yes, very clear

I Okay thank you very much

2. Specialist SLT

I First of all did the title on the front sheet clearly inform you of what the survey was going to be about?

R em, Well it didn't suggest that it was going to be, it didn't have questionnaire on the front. You're not aware of that until you read further into it. It actually doesn't, I don't think it portrays very well what it actually, the document is about.

I Okay, anything else?

R No

I Okay, what about the letter on the next page? Did you understand it? Did you understand what was required of you from reading that?

R Yes that's fine, that explains it fine.

I Did it actually take you 5 minutes to complete it or did it take you longer?

R It took me longer.

I How long did it take?

R em, I'd say between 10 and 15 minutes.

I Okay, about the questionnaire, did that explain how to fill it in?

R Yes

I Yes?

R Yes

I Was the example useful?

R Yes

I Okay, Can we go through this section by section? Section 1 Did the explanation adequately portray to you what was going to be involved in that section?

R Yes that's fine

I Okay, Now question 1. Any comments about that question? Did you fill it in easily enough?

R Yes, found that easy enough for me to fill in. Em-if a nurse was filling it in, they may not be aware that it's about them personally, they may feel that it's more to do with the establishment. So you might need to change that to, 'Do you personally offer a dysphagia service to stroke patients', or something along those lines.

I Okay and question 2?

R I've put I don't know. It's difficult that one because, because, they are referred to the Speech and Language Department, you're unsure as to how many people slip through the net. I'm not sure if that question

I There isn't a systematic screening review, there isn't a protocol that says 'All stroke patients are

R No, no

I are screened

R No, so I just put that in the comments box

I Okay that's lovely. Question 3?

R Yes that's okay

I Lovely, question 4?

R Yes that's okay

I Question 5?

R Yes that's fine. I've just written in the comments box

- I and was there enough room to fit your comments in?
- R Yes just
- I Okay, section 2. At the top did that explain what was going to be covered in the next section?
- R Yes that's fine
- I Okay and question 6?
- R Right I've put here on where it says, 'What do you personally advise them to use as part of the dysphagia screening?' and it list the different drinks and food. I wasn't sure whether you wanted actual measurements of what you'd advise to be used or just the actual drinks themselves.
- I Okay so whether it was just the textures or the actual quantities aswell?
- R yes, but other than that, that's okay
- I And question 7?
- R em, the next three were a little difficult because
- I Because?
- R I think I found it hard to know exactly what the questions were trying to get from you?
- I So what did you think they were trying to get from you? Because you've answered it there, I can see you've filled it in.
- R Yes, em, personally, I'd advise them to use all sorts of different consistencies depending on what the patient presents like, so you can't just single that down to one question
- I I think the idea is that there is a screening tool that they should follow so they should only be trying this particular texture. Some nurses think oh I'll just try this because it's nearby and not give the texture or the consistency, or the actual oral intake that you've asked them to. Did you get that from the question? It doesn't ask you to make a value judgement as to whether that's right or wrong, it just as to whether that happens, and some people might not know whether that happens because the nurses might always say, 'Oh yes I tried them on, and they haven't', and you'll never know. I think that's what the question is trying to get at. Is that what you understood by that question?
- R em
- I Okay, go to number 8, which is similar isn't it asking about food rather than drinks.
- R Again, number 8 and number 9 are just the same and I've written 'as above'. I don't know, I just feel that the nurses would just use whatever they felt appropriate. As to their level of competence, and I would encourage them to do that, so, but I don't know what they would use as actually part of their screening tool, what they've been actually told, because I would personally advise them to

use whatever they felt confident trying. They would try things that they thought they could manage, and that might not be something that they've been told to do.

I Okay. Section 3. Does that adequately explain what the next section is about?

R Yes

I Question 10?

R Yes

I Question 11?

R That's okay

I Question 12?

R That's fine

I Question 13?

R That's fine

I Question 14?

R That's fine

I And would you know where to send it back to?

R Yes its at the bottom here

I Okay, was there anything major that you thought was going to be asked next and the question never happened.

R Nothing I can immediately think of

I Okay, thank you

3. Generalist SLT

I Okay can I just ask you about the front sheet first? Do you think the title on the front sheet adequately explains what is to follow?

R Yes it is from a Speech Therapists point of view.

I Did the letter explain what we were trying to get at and why we were doing it?

R Em, yes I think so

I Yes. How long did it take to fill it in?

R em

I approximately?

R em, about 15 minutes

I yes, it will need changing, that's fine

R Yes

I Was the example useful?

R Yes

I Okay, in section 1 did this little paragraph at the top actually explain what questions were going to be asked of you?

R em, yes it did

I And what did you think of question 1?

R em I understood it yes

I You don't sound convinced?

R I was just thinking generally about Speech therapists filling that in, I don't know, don't know, I was just thinking if they offer a service to stroke, would there be enough room for them to put in details about their service, and I'm not sure whether the comments are related to the yes or no box

I Yes, I think it's just open for any comments people want to make. You think it needs more space for comments

R I suppose it's just an open line there isn't it? Is it there for yes and no? So I suppose you could put comments about your stroke service

I Yes I suppose they could say yes we provide a service on the stroke unit but not on the acute or general wards

R Yes

I Okay question 2

R Yes that's okay

I Question 3

R Yes

I Number 4?

R Yes

I Number 5?

R Yes I'm happy with that aswell

I Its got section 2. Does section 2 adequately explain the next questions?

R Yes it does, and I think its quite good that it says you personally underlined because you may not have written guidelines on what to suggest and each Speech Therapist may mention something different.

I Do you think that needs more room in for people to comment or do you think its adequate.

R Yes that's fine

I Number 7?

R Yes that's fine. It's good you've got a 'don't know' option because it might be difficult to know the answer to that

I Do you think it needs a comments box?

R Possibly, yes possibly a comments box or maybe a 'don't know' there

I Okay what about question 8?

R em, there's a few lines there for the detail, and there's a 'don't know' so that's fine

I number 9?

R Yes that's fine

I Okay. Section 3 does that explain the next set of questions?

R Yes

I Question 10?

R Yes that's good

I Question 11?

R Yes

I Number 12?

R Yes

I Number 13?

R Yes

I Number 14?

R Yes

I And would you know where to send it?

R It's at the bottom-yes

I Are there any questions that you feel have been missed?

R No, I don't think so. I think they've got that opportunity to add anything in the comments box

I Okay thank you very much

4. Generalist SLT

I Okay, the front sheet, does the title adequately explain what is going to follow as in the contents of the document?

R em, yes

I Yes, you're happy with this?

R Yes, I'm looking at this, but I'm looking at down here (at the footer) in order to know it's a survey

I Okay, the letter, was it useful?

R Yes,

I Did the survey take 5 minutes or did it take longer?

R It took about 5 minutes I think

I Okay, is there anything else not mentioned that you think would have been useful to know before starting the questionnaire?

R em, no, I don't think so, you explained why you were doing it and what you had to do, so good.

I The example, what did you think of that

R em, it showed me how to answer the question properly

I Was it useful having it in or would it have been okay having it out?

R It would have been okay without, I think

I Okay, next page? First I want to ask you about the section heading and this description here. Did you think it adequately represented the questions that followed?

R Yes, very good

I Question1, was that easy enough to answer?

R Yes, I can cope with yes and no questions

I What about question 2?

R It was easy enough to answer. The question was easy to answer, but I didn't actually know what the answer was, if that was the case here or not. But the question was easy enough to understand

I Okay, so should the comments box have been bigger then so that if people want to elaborate they can do?

R Yes, yes

I Okay, question 3, fine with that one?

R Yes

I Number 4?

R Yes that was fine, the only thing with that was, I assume it just means you working directly with contact on the wards, not just nurses working in the same setting over all

I So working with you personally?

R Yes

I In the wards rather than just somewhere in the hospital?

R Yes rather than just in the setting, yes,yes

I Alright, I've got it. Number 5?

R I didn't know what the answer was. The question was clear enough. If I had known the answer the question would have been fine.

I Yes I see what you mean, that's fine. Section 2, does that explain what questions are going to be involved?

R Yes

I Yes

R Yes

I Okay and question 6?

R There wasn't an option for if I don't personally advise nurses in dysphagia screening

I Right

R I kind of had to write through all of them, that I don't advise them personally to do, so a kind of 'not applicable' box

I That's fine. Is that for 6, 7 and 8?

R Yes

I okay

R oh and 9 aswell

I Okay and 9

R yes

I Brilliant, okay, thank you. Section 3, does that adequately explain the next set of questions?

R Yes it does, I was thinking that that might have been a bit more useful if that section was before section 2 because then you would have already answered whether they were using them or not and then, go on to explain how

I Okay, so switch section 2 and 3 around?

R em

I That the whole section or just those 2 sections?

R em, lets look at it, no I think the whole section, then you as a marker of these would have known from this whether I knew what the nurses knew.

I So but question 10 and 11 were fine to answer. Yes

R So you missed out question 12 and 13 because you wouldn't know about it

I Yes that's fine, and you're directed to go to 14?

R Yes that's right, I was

I And you knew where to send it to when you'd finished

R I knew exactly where to send it to when I'd finished

I Is there anything wrong with the format that could have helped to make it clearer?

R No, I don't think so

I Excuse me

R Bless you

I Were there any questions missing do you think?

R No, it was all very clear and I don't think there were any missing

I Okay, Thank you

APPENDIX 20

SLT Collated Interview Responses

Title	
I	Did the title on the front of the sheet tell you exactly what was contained within the document?
R:	Yes I: Okay, so you are happy with that? R: Yes
R	Yes it is from a Speech Therapists point of view.
R	em, Well it didn't suggest that it was going to be, it didn't have questionnaire on the front. You're not aware of that until you read further into it. It actually doesn't, I don't think it portrays very well what it actually, the document is about.
R	Yes, I'm looking at this, but I'm looking at down here (at the footer) in order to know it's a survey

Letter	
R	My only queries were regarding the date, whether you are going to make the results available to those people who have done the questionnaire?
I	How long did it take to fill it in?
R	em, em, about 15 minutes
R	It took me longer. em, I'd say between 10 and 15 minutes
R	It took about 5 minutes I think

Example	
I	Was the example useful?
R	Yes, because it already introduces you as to what is going to be asked of you, where the questionnaire is going to so you can start thinking about it even before you start it. And the example of the comment is going to define what kind of comments you are looking for. So yes.
R	Yes
R	Yes
R	It would have been okay without, I think

Section 1	
I	Firstly, the section heading, did that adequately explain what was going to be asked in the next section.
R	Yes definitely
R	yes it did

R	Yes that's fine
R	Yes, very good

Question 1	
I	Okay, so question 1 was that easy to complete?
R	Okay nothing a problem?
R	I was just thinking generally about Speech therapists filling that in, I don't know, don't know, I was just thinking if they offer a service to stroke, would there be enough room for them to put in details about their service, and I'm not sure whether the comments are related to the yes or no box.
I:	Yes, I think it's just open for any comments people want to make. You think it needs more space for comments?
R:	I suppose it's just an open line there isn't it? Is it there for yes and no? So I suppose you could put comments about your stroke service.
I	Yes I suppose they could say yes we provide a service on the stroke unit but not on the acute or general wards
R	Yes, found that easy enough for me to fill in. Em, If a nurse was filling it in, they may not be aware that it's about them personally, they may feel that it's more to do with the establishment. So you might need to change that to, 'Do you personally offer a dysphagia service to stroke patients', or something along those lines.
R	Yes, I can cope with yes and no questions

Question 2	
R	Straight forward.
R	Yes that's okay
R	I've put I don't know. It's difficult that one because, because, they are referred to the Speech and Language Department, you're unsure as to how many people slip through the net. I'm not sure if that question
I	There isn't a systematic screening review, there isn't a protocol that says 'All stroke patients are. R: No, no. I: are screened. R No, so I just put that in the comments box
R	It was easy enough to answer. The question was easy to answer, but I didn't actually know what the answer was, if that was the case here or not. But the question was easy enough to understand. I Okay, so should the comments box have been bigger then so that if people want to elaborate they can do? R:Yes, yes

Question 3	
I	Question 3. R yes that was fine, yes
R	Yes
R	Yes that's okay
R	Yes

Question 4	
I	Number 4? R Yes
R	Again straight forward
R	Yes that's okay
R	Yes that was fine, the only thing with that was, I assume it just means you working directly with contact on the wards, not just nurses working in the

same setting over all

Question 5

- R Yes, I think that it's good having the comments at the side of that question to expand, helped on that one, yes
- R Yes I'm happy with that aswell
- R Yes that's fine. I've just written in the comments box. I: and was there enough room to fit your comments in? R: Yes just
- R I didn't know what the answer was. The question was clear enough. If I had known the answer the question would have been fine.

Section 2

- R Definitely
- R Yes it does,
- R Yes that's fine
- R Yes

Question 6

- R I was fine with the drinks bit , but the food bit, I needed to check whether putting normal diet was acceptable, so I don't know whether you would want to include rather than modified choices, whereas you've got 'water, tea' as 2 normals, you've got 2 slightly not normal, or what could be perceived as 'modified diet'. That's how I took that, so you could have one of the examples as 'normal diet' I okay, yea there isn't a solid in there is there?
- R No, and the same with the consistencies, they're all modified in some way so I've just added on 'normal textures'
- R: I think its quite good that it says you personally underlined because you may not have written guidelines on what to suggest and each Speech Therapist may mention something different.
- I: Do you think that needs more room in for people to comment or do you think its adequate.
- R Yes that's fine
- R Right I've put here on where it says, 'What do you personally advise them to use as part of the dysphagia screening?' and it list the different drinks and food. I wasn't sure whether you wanted actual measurements of what you'd advise to be used or just the actual drinks themselves.
- R There wasn't an option for if I don't personally advise nurses in dysphagia screening.
- R I kind of had to write through all of them, that I don't advise them personally to do, so a kind of 'not applicable' box

Question 7

- R I had to think about this one a bit more. I've put in brackets after 'I don't know' and I've done that for the next few questions to be honest, because where it says 'use only the drinks that you personally advise', I can only assume that they do, I suspect from other things that they don't-that's what the 'don't know' is there for.
- I Yes perhaps we should put some lines in for comment?
- R Yes I think so
- R Yes that's fine. It's good you've got a 'don't know' option because it might be

difficult to know the answer to that.

I Do you think it needs a comments box?

R Possibly, yes possibly a comments box or maybe a 'don't know' there.

R Yes, em, personally, I'd advise them to use all sorts of different consistencies depending on what the patient presents like, so you can't just single that down to one question

R I kind of had to write through all of them, that I don't advise them personally to do, so a kind of 'not applicable' box

Question 8

R I had to think about this one a bit more. I've put in brackets after 'I don't know' and I've done that for the next few questions to be honest, because where it says 'use only the drinks that you personally advise', I can only assume that they do, I suspect from other things that they don't-that's what the 'don't know' is there for

I yes perhaps we should put some lines in for comment?

R Yes I think so

R em, there's a few lines there for the detail, and there's a 'don't know' so that's fine

R Again, number 8 and number 9 are just the same and I've written 'as above'. I don't know, I just feel that the nurses would just use whatever they felt appropriate. As to their level of competence, and I would encourage them to do that, so, but I don't know what they would use as actually part of their screening tool, what they've been actually told, because I would personally advise them to use whatever they felt confident trying. They would try things that they thought they could manage, and that might not be something that they've been told to do.

R I kind of had to write through all of them, that I don't advise them personally to do, so a kind of 'not applicable' box

Question 9

R Yes that's fine

R Again, number 8 and number 9 are just the same and I've written 'as above'. I don't know, I just feel that the nurses would just use whatever they felt appropriate. As to their level of competence, and I would encourage them to do that, so, but I don't know what they would use as actually part of their screening tool, what they've been actually told, because I would personally advise them to use whatever they felt confident trying. They would try things that they thought they could manage, and that might not be something that they've been told to do.

R I had to think about this one a bit more. I've put in brackets after 'I don't know' and I've done that for the next few questions to be honest, because where it says 'use only the drinks that you personally advise', I can only assume that they do, I suspect from other things that they don't-that's what the 'don't know' is there for.

I yes perhaps we should put some lines in for comment?

R Yes I think so

R I kind of had to write through all of them, that I don't advise them personally to do, so a kind of 'not applicable' box

Section 3	
I	Section 3 Again does that explain the types of questions that are to come?
R	Yes
R	Yes
R	Yes, very much so
R	Yes it does, I was thinking that that might have been a bit more useful if that section was before section 2 because then you would have already answered whether they were using them or not and then, go on to explain how.
I	Okay, so switch section 2 and 3 around? That the whole section or just those 2 sections?
R	em, lets look at it, no I think the whole section, then you as a marker of these would have known from this whether I knew what the nurses knew.

Question 10	
R	Yes very straight forward
R	Yes that's good
R	Yes
I	So but question 10 and 11 were fine to answer.
R	Yes

Question 11	
R	Again straight forward, no uncertainties at all
R	Yes
I	So but question 10 and 11 were fine to answer.
R	Yes
R	That's okay

Question 12	
R	Very clear
R	Yes
R	That's fine

Question 13	
R	That's fine
R	Yes
R	It's very helpful to have that list that you just tick down, rather than thinking of it off the top of your head

Question 14	
R	That's fine
R	Yes
R	I couldn't think of any other comments that I haven't put down as I've gone along.

R	Yes that's right, I was
---	-------------------------

Where to return survey to?	
R	It's at the bottom-yes
R	yes that's very clear
R	Yes its at the bottom here
R	I knew exactly where to send it to when I'd finished

Other comments	
R	No, I don't think so. I think they've got that opportunity to add anything in the comments box
R	Nothing I can immediately think of

APPENDIX 21

SLT and Nurse Final Questionnaires

SLT Final Questionnaire

***DYSPHAGIA SCREENING
AND
ASSESSMENT
SURVEY***

Elizabeth Boaden
Principal Speech and Language Therapist

Clinical Practice Research Unit
Vernon 77
Department of Nursing
Faculty of Health
University of Central Lancashire
Preston
PR1 2HE

Dear Colleague,

I am working with the University of Central Lancashire to develop a standardised dysphagia screening tool for nurses to use with stroke patients. To date no studies have examined the relative safety of materials aspirated onto the lungs. I would like to establish which drinks, food and consistencies you advise nurses to offer patients in their dysphagia screen.

The questionnaire should take no longer than 10-15 minutes to complete.

Your name and contact details were accessed from the North West Regional Stroke Taskforce Database as a Speech and Language Therapist/nurse with a specialist interest in stroke. If you have colleagues that would be interested in completing the questionnaire please contact me directly for further copies.

Each questionnaire has a unique numerical identifier in the top right hand corner. This will be used to identify which questionnaires have been returned. It is important for me to collate information from as many questionnaires as I can and we will therefore contact all those who do not return the questionnaire. Following this anonymity will be guaranteed by removal of the identifier.

I would be grateful if you would return the completed questionnaire and consent in the stamped addressed envelope provided by Monday 28th February 2005.

If you have any queries regarding the project or would like to be involved further, please do not hesitate to contact me at the address below.

Thank you for your time

Yours sincerely,

Elizabeth Boaden
Principal Speech and Language Therapist

Postal contact address: c/o Clinical Practice Research Unit, Vernon 77,
Department of Nursing, Faculty of Health, University of Central Lancashire
Preston. PR1 2HE

E:mail address: liz.boaden@chorley-pct.nhs.uk

Contact telephone number: 01257 245290

RESULTS

It is proposed to present the results of the survey at a forum organised for June 2005. The meeting date will be subject to change. If you would be interested in attending the event, please indicate so by returning this page to the following address:

Elizabeth Boaden,
Principal Speech and Language Therapist
c/o Clinical Practice Research Unit, Vernon 77,
Department of Nursing, Faculty of Health,
University of Central Lancashire
Preston. PR1 2HE

I _____ would like to attend the forum designed to present the results of the Dysphagia Screening and Assessment Survey.

Contact address:

E:mail address:

About this Questionnaire

The questionnaire is divided into four sections, each concerning a different issue:

Section 1 asks about the nature of the dysphagia service provided to stroke patients that you care for, for example: which disciplines are involved, who performs the screen and who provides ongoing management decisions.

Section 2 asks about which drinks, food and consistencies are used as part of a dysphagia screen.

Section 3 asks about screening tools used, and provision of training to use these.

Section 4 gives you the opportunity to provide further information.

The questions follow a set formula. You are asked to tick the appropriate box to indicate your answer and are given an opportunity to elaborate or clarify your answer in the comments section of each question.

An example is shown below:

Are you involved in the delivery of care to stroke patients?	
<input checked="" type="checkbox"/>	Yes
<input type="checkbox"/>	No
Comments	<u>I work in the community, providing a domiciliary</u> <u>rehabilitation service as part of a multi-disciplinary team</u> <u>_____</u>

Dysphagia Assessment and Screening

Section 1: This section contains a series of questions about the dysphagia service offered to stroke patients and the responsibilities of different professionals in dysphagia screening and assessment. For the purpose of this survey, 'screening' is defined as a quick check of the patient's ability to swallow. Please tick the boxes that apply to you. A comments section is available at the end of the questionnaire for any additional information you may wish to give.

1. Do you personally offer a dysphagia service to stroke patients?

(Please tick the appropriate boxes)

Yes

If you ticked "yes" which setting do you work in?

Hospital

Community

Both

No

Comments _____

If you answered *Yes* please continue.

If you answered *No* to this question please return the questionnaire without answering further questions. Thank you.

2. Are all stroke patients routinely screened for dysphagia by a Speech and Language Therapist?

(Please tick the appropriate box)

Yes

No

Don't know

Comments _____

3. Do any nurses refer to Speech and Language therapy for a dysphagia assessment?
(Please tick the appropriate box)

- Yes
- No
- Don't know

Comments _____

4. Do any nurses working with you do dysphagia screening?
(Please tick the appropriate box and include further explanation if you ticked don't know)

- Yes
- No
- Don't know

Comments _____

If you answered 'Yes' please continue.

If you answered 'No' to this question please return the questionnaire without answering further questions. Thank you.

5. Do any nurses working with you do ongoing dysphagia management?
(Please tick the appropriate box and include further explanation)

Yes (please give details) _____

No (please give details) _____

Don't know

Comments _____

Section 2:

This section asks about which drinks, food types and consistencies are offered to patients as part of dysphagia screening. Please tick the box that applies to you. A comment section is available at the end of the questionnaire for any additional information you may wish to give.

6. What drink, food, consistencies and quantities do you personally/ your department advise nurses to use as part of their dysphagia screening?

Drinks eg: 10ml water, 3 teaspoons tea

Food eg: 10 teaspoons weetabix, one biscuit

Consistencies eg: 50 mls thin fluid, 5mls syrup, 20mg puree, 100mg soft mashed

7. Do nurses use ONLY the drinks that they have been advised to use as part of their dysphagia screening?

(Please tick the appropriate box)

- Yes
- No (please give details)

Don't know

Comments

8. Do nurses use only the food that they have been advised to use as part of their dysphagia screening?

(Please tick the appropriate box)

Yes

No (please give details) _____

Don't know

Comments _____

9. Do nurses use only the consistencies that they have been advised to use as part of their dysphagia screening?

(Please tick the appropriate box)

Yes

No (please give details) _____

Don't know

Comments _____

Section 3:

The questions in this section relate to nurses use of formal and informal dysphagia screening tools, which tools are used, and what training nurses have received in the use of the tool. Please tick the box that applies to you. A comments section is available at the end of the questionnaire for any additional information you may wish to give.

10. Do any nurses working with you use a dysphagia screening tool?

(Please tick the appropriate box and include further explanation if appropriate)

Yes

(please give details of the tool) _____

Published (please specify) _____

Devised locally _____

(enclose a copy if you have one)

No

11. Have any nurses working with you received training on how to use a dysphagia screening tool?

(Please tick the box that applies)

Yes

No (please go to question 14)

Don't know (please go to question 14)

12 Who provided the training?

(Please tick the appropriate box and include further explanation if you ticked other)

Speech and Language Therapist

Nurse

Other (please specify) _____

Don't know

13. Do you know what was included in the training?

(please tick all that apply and add further comments if appropriate)

No (please go to question 14)

Yes (please tick all the boxes that apply)

Anatomy of the swallow

How the normal swallow works

The screening tool

The signs of aspiration

Documentation

How to thicken drinks

How to refer to speech and language therapy for a further assessment

Hands on practical session

Observation of the trainer

Supervision by the trainer

Assessment by the trainer

Other (please specify) _____

Section 4:

14. Please use this box for any other comments you may wish to add

Please tick this box if you do not wish to be contacted again with regard to this project.

Thank you for taking time to complete this questionnaire

Please place completed questionnaire in the reply paid envelope and return to :

Elizabeth Boaden,
Speech and Language Therapist,
c/o Clinical Practice Research Unit, Department of Nursing, Vernon 77,
Faculty of Health, University of Central Lancashire, Preston
PR1 2HE

***DYSPHAGIA SCREENING
AND
ASSESSMENT
SURVEY***

Elizabeth Boaden
Principal Speech and Language Therapist

Clinical Practice Research Unit
Vernon 77
Department of Nursing
Faculty of Health
University of Central Lancashire
Preston
PR1 2HE

Dear Colleague,

I am working with the University of Central Lancashire to develop a standardised dysphagia screening tool for nurses to use with stroke patients. To date no studies have examined the relative safety of materials aspirated onto the lungs. I would like to establish which drinks, food and consistencies you advise nurses to offer patients in their dysphagia screen.

The questionnaire should take no longer than 10-15 minutes to complete.

Your name and contact details were accessed from the North West Regional Stroke Taskforce Database as a Speech and Language Therapist/nurse with a specialist interest in stroke. If you have colleagues that would be interested in completing the questionnaire please contact me directly for further copies.

Each questionnaire has a unique numerical identifier in the top right hand corner. This will be used to identify which questionnaires have been returned. It is important for me to collate information from as many questionnaires as I can and we will therefore contact all those who do not return the questionnaire. Following this anonymity will be guaranteed by removal of the identifier.

I would be grateful if you would return the completed questionnaire and consent in the stamped addressed envelope provided by Monday 28th February 2005.

If you have any queries regarding the project or would like to be involved further, please do not hesitate to contact me at the address below.

Thank you for your time

Yours sincerely,

Elizabeth Boaden
Principal Speech and Language Therapist

Postal contact address: c/o Clinical Practice Research Unit, Vernon 77,
Department of Nursing, Faculty of Health, University of Central Lancashire
Preston. PR1 2HE

E:mail address: liz.boaden@chorley-pct.nhs.uk

Contact telephone number: 01257 245290

RESULTS

It is proposed to present the results of the survey at a forum organised for June 2005. The meeting date will be subject to change. If you would be interested in attending the event, please indicate so by returning this page to the following address:

Elizabeth Boaden,
Principal Speech and Language Therapist
c/o Clinical Practice Research Unit, Vernon 77,
Department of Nursing, Faculty of Health,
University of Central Lancashire
Preston. PR1 2HE

I _____ would like to attend the forum designed to present the results of the Dysphagia Screening and Assessment Survey.

Contact address:

E:mail address:

About this Questionnaire

The questionnaire is divided into four sections, each concerning a different issue:

Section 1 asks about the nature of the dysphagia service provided to stroke patients that you care for, for example: which disciplines are involved, who performs the screen and who provides ongoing management decisions.

Section 2 asks about which drinks, food and consistencies are used as part of a dysphagia screen.

Section 3 asks about screening tools used, and provision of training to use these.

Section 4 gives you the opportunity to provide further information.

The questions follow a set formula. You are asked to tick the appropriate box to indicate your answer and are given an opportunity to elaborate or clarify your answer in the comments section of each question.

An example is shown below:

Are you involved in the delivery of care to stroke patients?	
<input checked="" type="checkbox"/>	Yes
<input type="checkbox"/>	No
Comments	<u>I work in the community, providing a domiciliary</u> <u>rehabilitation service as part of a multi-disciplinary team</u> <u>_____</u> <u>_____</u>

Dysphagia Screening and Assessment

Section 1:

This section contains a series of questions about the dysphagia service offered to stroke patients and the responsibilities of different professionals in dysphagia screening and assessment. For the purpose of this survey, 'screening' is defined as a quick check of the patient's ability to swallow. Please tick the boxes that apply to you. A comments section is available at the end of the questionnaire for any additional information you may wish to give.

1. Do you personally offer a dysphagia service to stroke patients?

(Please tick the appropriate boxes)

Yes

If you ticked 'yes' which setting do you work in?

Hospital

Community

Both

No

Comments: _____

If you answered '**Yes**' please continue.

If you answered '**No**' to this question please return the questionnaire without answering further questions. Thank you.

2. Are all stroke patients routinely screened for dysphagia by a Speech and Language Therapist?

(Please tick the appropriate box)

Yes

No

Don't know

Comments: _____

3. Do you refer to the Speech and Language Therapists for dysphagia assessments?
(Please tick the appropriate box and include further explanation if appropriate)

Yes

No

Other (please specify) _____

4. Do you personally do dysphagia screening?

(Please tick the appropriate box and include further explanation if appropriate)

Yes

No

Other (please specify) _____

If you answered '*Yes*' please continue.

If you answered '*No*' to this question please go to question 11.

5. Do you personally decide the ongoing management plan of dysphagia following your screen?

(Please tick the appropriate box and include further explanation if appropriate)

Yes (please give details) _____

No

Section 2:

This section asks about which drinks, food types and consistencies are offered to patients as part of a dysphagia screening tool. Please tick the box that applies to you. A comments section is available at the end of the questionnaire for any additional information you may wish to give.

6. What drink, food, consistencies and quantities do you use as part of your dysphagia screening?

Drinks eg: 10ml water, 3 teaspoons tea _____

Food eg: 10 teaspoons weetabix, one biscuit _____

Consistencies eg: 50 mls thin fluid, 5mls syrup, 20mg puree, 100mg soft mashed _____

Section 3:

The questions in this section relate to use of formal and informal dysphagia screening tools, which tools are used, and what training you have received in the use of the tool. Please tick the box that applies to you. A comments section is available at the end of the questionnaire for any additional information you may wish to give.

<p>7. Do you use a dysphagia screening tool? <i>(Please tick the appropriate box and include further explanation if appropriate)</i></p> <p><input type="checkbox"/> Yes (please give details of the tool) _____ _____</p> <p><input type="checkbox"/> Is the tool you use published (please specify)</p> <p><input type="checkbox"/> Devised locally _____</p> <p>(enclose a copy if you have one)</p> <p><input type="checkbox"/> No (please go to question 11)</p>
<p>8. Have you received training on how to use a dysphagia screening tool? <i>(Please tick the box that applies)</i></p> <p><input type="checkbox"/> Yes (please specify)</p> <p><input type="checkbox"/> No (please go to question 11)</p> <p><input type="checkbox"/> Don't know (please go to question 11)</p>
<p>9. Who provided the training? <i>(Please tick the appropriate box and include further explanation if you ticked other)</i></p> <p><input type="checkbox"/> Speech and Language Therapist</p> <p><input type="checkbox"/> Nurse</p> <p><input type="checkbox"/> Other (please specify) _____ _____ _____</p> <p><input type="checkbox"/> Don't know</p>

10. Do you know what was included in the training?

(please tick all that apply and add further comments if appropriate)

- No (please go to question 11)

- Yes (please tick all the boxes that apply)
 - Anatomy of the swallow
 - How the normal swallow works
 - The screening tool
 - The signs of aspiration
 - Documentation
 - How to thicken drinks
 - How to refer to speech and language therapy for a further assessment
 - Hands on practical session
 - Observation of the trainer
 - Supervision by the trainer
 - Assessment by the trainer
 - Other (please specify)

Section 4:

11. Please use this box for any further comments you may wish to add

Please tick this box if you do not wish to be contacted again with regard to this project.

Thank you for taking time to complete this questionnaire

Please place completed questionnaire in the reply paid envelope and return to:

Elizabeth Boaden,
Speech and Language Therapist,
c/o Clinical Practice Research Unit, Department of Nursing,
Faculty of Health,
Vernon 77,
University of Central Lancashire,
Preston
PR1 2HE

APPENDIX 22

Nurse Interviews for Questionnaire – Second Iteration

1. Ward manager

- R Hello
- I Okay, the first title on the first page, does that adequately explain the questions that you think you are going to be asked?
- R Yes
- I Okay, next page. If you read through that letter, does that explain in more detail the sorts of things you are going to be asked?
- R Yes
- I Did the different contact addresses on the bottom of the page: was that confusing?
- R No
- I Okay next page. So on the results page, what does that ask you to do; tell me what you think you have to do to fill that in?
- R To attend the forum to get the results of the survey
- I Okay that's fine, okay next page. Is the example useful in explaining to you what sorts of things we are looking for in the questionnaire
- R Yes
- I In Section 1, in that section heading, did it adequately explain what the questions were going to be in that section?
- R Yes
- I So question 1, was it difficult to answer?
- R No
- I What about question 2?
- R No, not difficult to answer, good, easy to answer
- I Question 3
- R Was easy to answer
- I 4
- R Depending on what you define as dysphagia screen
- I Okay, Was that not defined in the section there?
- R Yes, well, no I probably missed, well, yes it might have been me, sorry okay?
- I Yes fine, Okay question 5

R I've answered yes to that, but I wouldn't personally do anything else apart from putting them Nil By Mouth and contact you

I That's fine, okay, section 2 did the paragraph at the top adequately explain what the questions were going to be?

R Yes it did

I And question 6 was that easy to answer?

R Yes

I You understood what was required

R Yes I did

I Section 3 did that adequately explain the questions that were to follow?

R Yes

I Okay question 7?

R Yes well it was easy yes, I've ticked the box

I And then went to...

R Question 11, do not pass go

I And were there any further comments you wanted to make?

R No, because it was fairly easy

I Would you know where to send it back to?

R Yes because you've put your address at the bottom

I Thank you very much

2 Ward manager

I Does the title on the front sheet adequately explain what is to come? Would you think that was a survey about screening and assessment asking you questions about it?

R I don't know

I Okay, so are you happy with the title?

R I think so

I Okay next page. So, the second page which is the letter. Are you happy with the letter?

R Yes

I And the contact addresses at the bottom. Is that confusing having different contact addresses at the bottom?

R No

I That's fine. With the results page are you happy that you have to fill this page in and return it in order to attend and get the results of the survey?

R That's fine, no problem

I So do you have any problems with the following sheet titled 'About this questionnaire'?

R No, no problems at all

I And the example is still helpful?

R It is yes

I Okay, So in Section one does this adequately explain what you are required to do in this section?

R Yes

I And are you happy with the definition of the word screening?

R Yes, check of the patient's ability to swallow. I don't know whether it should say it's a quick check. I don't know, but yes it's a check of the swallowing ability to swallow. Yes in the hospital setting.

I So question 1 easy to understand?

R Yes

I Yes, So question 2

R The question is understandable but I would say that not all stroke patients are routinely screened for dysphagia by a Speech and Language Therapist

I That's fine, and question 3

R Yes I do refer patients for, to Speech and Language Therapists for a dysphagia assessment.

I And the question is easy to understand?

R And the question is easy to understand

I And question 4?

R I do personally do dysphagia screening, I attended the training day

I And do you understand the question?

R Yes

I And question 5?

R Yes I do but in , I find that if I have some problems, I know that I can always ring the Speech and Language Therapists

I That's wonderful, okay, next page, so section 2, is that okay

R Section 2 is self-explanatory

I And question 6, what consistencies do you-

R I tend to use water as the liquid and for the food for the swallowing assessment, I tend to use yoghurt as the

I Okay, and what consistency would you use?

R The normal thin fluids and we use syrup fluids or yoghurt or custard consistency
I Okay and what quantities would you use or do you not worry about quantities?
Do you just keep going till you think it's okay?
R Yes
I Yes?
R Yes
I Okay and section 3. So section 3 are you happy with the paragraph at the top?
Does it adequately describe this section?
R Yes
I And question 7?
R Yes, do you use dysphagia screening tool, water and thickened textures. And
the tool's been devised locally.
I Okay so question 8?
R Yes
I Okay and 9?
R Well it was the Speech and language Therapist, yes, I went to a training day. It
was a dysphagia training day
I Okay, next one
R And question 10, that's fine.
I You ticked all of those. So it was easy to understand?
R Yes, yes that question 10 is easy to understand and everything is covered
I Wonderful. And the last question? Did you have any comments for Section 4?
R I attended the dysphagia day for nurses and enjoyed the course. I keep up with
the assessment of patients and if I am in any doubt, I contact the Speech and
Language Therapists for advice at the earliest opportunity. Their support is
always on hand.
I Marvellous, thank you very much. And you'd know where to send it back to?
R I do, I do
I Thank you

3 Staff Nurse

I Okay so the first page, does the title now adequately explain what the survey is
about?
R Yes

I Marvellous, next page. Okay, now you've got the letter there, now the contact details, would that confuse you? Would you know where to contact if you needed to? Would that confuse you having different contact addresses?

R No. That's clear

I Lovely. First page. Can I just ask you about the results page? Is that self explanatory what you have to do there?

R It is yes. And it's nice to have the option to attend a forum

I I think that next sheet stays the same, explaining the different sections and giving an example. Is that okay?

R That's fine, yes.

I And section 1, is that okay?

R Yes

I I've put in there a definition of screening. Are you happy with that definition of what a screen is?

R Yes

I Yes?

R Yes

I Question 1, was that easy to understand?

R Yes, very easy

I Question 2?

R Yes that was easy to understand as well

I Question 3?

R Yes self explanatory yes

I Number 4?

R Yes

I And number 5?

R No, well its explanatory, yes, you're asking if you personally decide the ongoing management

I Okay! Section 2? Did you understand section 2, the description at the top?

R Yes

I Okay, and question 6?

R Now there was a query

I Yes? Question 6? Are you happy with it?

R Yes, water

I And what would you put for food?

R Yoghurt, I would use yoghurt

I And what consistency would you use?

R To start with, I'd use water, I would then use syrup and then titrate up

I And what quantities would you use? Would you use specific quantities or would you just keep going until you felt happy?

R Just keep using a teaspoon at a time

I Wonderful. And section 3 was that okay, the description?

R Yes

I And question 7 okay?

R Yes

I Question 8?

R Yes

I Question 9?

R Speech and Language, yes, and other. It was very good my training, I had that gentlemen, I can't remember his name? He was a specialist nurse, one of a few and he was excellent

I Good. Number 10

R That was all included in my training

I Is there anything else that you feel now as an experienced dysphagia practitioner that you would want to know?

R No, no, I think it covered everything. We even watched a fluoroscopy.

I What about section 4? Are you happy with that?

R Yes, its there to be used if you wish

I And you would know who to reply to?

R Yes

4. Staff Nurse

I Does the title on the front explain to you what sort of questions you are going to be asked?

R Yes it does

I Okay, next page. Does the letter explain in more detail?

R Yes it does

I And did it take you longer than 10-15 minutes to complete

R No, definitely not

I Would the contact details at the bottom confuse you because they are different contact addresses

R Not if you read it carefully, no you'd be fine

I Okay that's great. Now this is about disseminating the results. So if you filled that in, what do you think you'd be required to do?

R Well they'd just get in touch with you, wouldn't they. If I wanted to attend, if I was interested in attending you'd have to complete this and then contact yourself to arrange. Then I'd have to attend

I Okay did the example help to show what we were looking for

R Yes it did yes

I Okay, section did that adequately explain the questions you were going to be asked in that section?

R Yes it did

I Question 1 easy enough to answer?

R Yes very clear

I Question 2?

R Yes that's very clear as well

I Question 3?

R Yes

I And question 4?

R Yes, I went from 4 onto question 7, lets have a look. That was quite specific as well

I Okay did you read Section 3 at the top?

R I don't think I did when I was doing it with you, no, but if I was given it to do on my own, I would sit down and read it carefully

I Perhaps the previous question should say go to Section 3

R Yes

I Then you answered no to that,

R Which means go to question 11

I Which is okay?

R em

I And would you know where to return it to?

R yes

I marvellous, thank you very much

APPENDIX 23

SLT Interviews for Questionnaire – Second Iteration

1. Specialist SLT

- I The front sheet, the front sheet. Do you think the title adequately explains what the purpose of the survey is?
- R Yes
- I Okay, can we turn the page, looking at the letter, did that explain to you further what the purpose of the study is?
- R Yes it's fine
- I And can I ask you, did it actually take you 10-15 minutes to complete or did it take longer?
- R 10-15 minutes
- I Thank you, was the different contact addresses at the bottom of the page confusing?
- R No
- I Okay next page please, the research page, did you understand the purpose of that, can you explain to me the purpose?
- R Yes its to see if you want to attend the forum for the results of the survey.
- I Thank you, next page. About this questionnaire, that talks about the sections and was the example helpful?
- R Yes
- I Next page please. Okay, section 1. Did the description of section 1 adequately explain the questions that were to follow?
- R Yes it was quite clear
- I And question 1, was there any confusion about the way question 1 was worded?
- R No confusion
- I And question 2?
- R No confusion there either
- I Question 3
- R That was also fine
- I And question 4?
- R Fine aswell
- I Question 5
- R Yes that was okay

I Question 6
R Yes that was clear, that was fine
I Section 2 heading, was that okay, was that descriptive enough or do you think there was more needed?
R No that was adequate
I And question 6, some people were confused as to where consistencies differed from food types, did you find that confusing?
R No, I think they are labelled clearly enough
I Question 7
R That was fine
I Okay, turn over to question 8
R Yes no problems there
I Question 9
R That was okay
I And section 3, did that adequately explain the last paragraph?
R It did yes
I Question 10
R That was okay
I Question 11
R Yes that was fine
I Question 12
R Also fine
I Question 13
R Yes no problems there
I Okay next page. You haven't written anything on the back page, does that mean there was enough information or room on previous questions in order to put down anything else you needed to add
R em yes I put some information down in other comments boxes, I felt I didn't need to use anymore space in this comments box
I And did you know where to send it back to?
R I did yes
I Okay, thank you very much

2. Specialist SLT

I Okay, looking at the title of this would you think that was an acceptable title? Does that reflect the questions that are going to follow?
R Yes, I think it does, yes
I This letter, does it explain in more detail what you are expected to do?

R Yes it does, it does

I Did it actually take 10-15 minutes to complete or did it take longer?

R It took less time, about 5-10

I Okay, would the contact details, different contact addresses confuse you at all?

R No

I You'd know where to contact?

R Yes

I Okay, wonderful. Now, can you explain to me what you have to do? What the results page is about.

R Em, its if you want to hear the results of it, you've got to contact, you've got to fill in this form and either send it to the address on the previous page, or contact Liz Boaden at the address in order to get the information

I Fantastic. On this page 'About this questionnaire' Did the sections outline what was going to be asked later on in the questionnaire?

R Yes

I And was the example useful?

R Yes

I Go onto the actual survey itself, on section 1, did that adequately explain the questions in that section?

R Yes

I Question 1, did you understand it?

R Yes

I Easy to fill in?

R Yes

I Question 2?

R Yes, no problem

I Question 3?

R Yes

I Question 4?

R Yes

I Yes?

R Yes

I It was easy to fill in?

R It was easy to fill in

I Question 5?

R I was a bit confused as to what dysphagia management might be defined as for that whether it would be ongoing like reassessment or whether it would be just

reinforcing what the therapist had advised as part of the, as a result of their assessment

I If you were asking for both, would you think you would be able to get the information in the section, please give the details?

R Yes

I Yes?

R Yes

I So do you think that needs changing or do you think people would

R em, I think, I think it might be a bit clearer if it was changed or if there was somewhere in the introduction, a definition of what was meant by management.

I Okay. Thank you. And Section 2 did that paragraph explain what was coming next?

R em, yes it did but then it talks about em, at first I thought it was about what the speech therapist would do as part of the screen but then the questions were more about what the nurses are doing. Whereas this is-it sounded more like it was what you would do.

I So you would need a 'not applicable' box

R Yes

I and the same with 7

R yes

I well you've got a 'No' for that one have you

R But that's what you would advise if you are doing the screening, and if you're not doing the screening, its not a No

I Okay, 8 and 9 we've covered

R Yes

I So section 3. Does that explain the questions that follow?

R Yes definitely

I Question 10 was easy to understand?

R Yes

I 11

R yes

I 12

R yes

I 13

R yes

I 14

R yes

I was there anything else that you thought should be in there that was missing or are surprised that you weren't asked about?

R No, No

I And you'd know who to send it back to?

R Yes

I Wonderful. Thank you very much.

3: Generalist SLT

I Okay the front sheet, is that okay having survey written on the front?

R Yes

I And the letter was that clear?

R Yes I thought that was clear

I And did it take you 10-15 minutes?

R em, maybe about 15, yes I'd say

I Okay. Did the different contact addresses confuse the issue?

R em, no they didn't

I Okay, now the results page, what did you understand you would be required to do in order to receive the results of this project?

R em, to fill in my contact details, e:mail address and things like that, and to return that page to the address

I okay, and that would signal that you had a place on the course?

R yes

I The section describing the questionnaire and the example is that clear enough?

R emhum

I And section 1 did you understand that?

R Yes

I Did it explain what was going to come? What questions you were going to be asked?

R Yes

I And question 1, easy to answer?

R Yes

I And question 2?

R Yes

I What about question 3?

R Yes that's fine

I Question 4?
R em, yes fine
I Question 5
R Fine
I Section 2, did that explain to you what was going to be asked in the next section?
R Yes
I Question 6
R Yes I think that was clear, the way it was split out. But I think the first part was indicating to put the amount that you drink, that you drink in the screening, which I kind of got from the example, but I didn't know whether drinks was, whether you could have drink, quantities or something, I don't know. I still got it from the example anyway
I Okay, so it should say drinks, specify drink type and amount
R Maybe yes
I And the same with food
R Yes
I Okay, question 7
R I had to read that a couple of times to get that, but then it was okay.
I Okay, Question 8
R Yes, I kind of was fine with that because it's similar to question 7 but with food
I Question 9
R Yes
I Section 3
R Yes, all seemed clear
I Question 10
R Yes
I Question 11
R emhum
I Question 12 and 13 you didn't fill in
R No I went to 14
I Because in question 11 you answered 'Don't know'
R Yes
I And then you knew what to do from there?
R emhum
I And you knew who to send it back to?
R Yes
I Fantastic. Anything else?

R em, no
I Okay, thank you.

4 Generalist SLT

I Okay, thank you for doing this. Did you understand the title? Did that adequately explain to you what was to follow?

R Yes, okay, next page

I Okay, next page, did the letter make things more clear? Was there anything there that confused you?

R No, it was quite clear

I And did it take you 10-15 minutes to complete

R About 15-20, I would say

I And would you have got confused with the different contact addresses at the bottom?

R No, don't think so

I Okay, with the results page was it clear what I was suggesting would be made available to people?

R yes

I That they would be required to attend a meeting and the results would be made available at the meeting, if they requested the results

R em, I didn't get that.

I What did you get?

R I got that you could go along to a meeting and that would be optional. Is that right?

I Yes

R Oh good

I There was enough room to fill it in?

R yes

I Okay, next page, so this was just summarising the questionnaire and giving an example of what questions you are going to be asked. Was there anything there that was confusing?

R No

I It's clear enough?

R em.

I The actual screening tool itself, section one, did that adequately explain what questions would be asked in that section?

R Yeah

I And question one, was that easy to understand?

R Yes.

I Okay, question two?

R Yeah

I No problem?

R No.

I Okay. Question three was that easy to understand? Easy to answer?

R Yeah I think so.

I Question four?

R yes

I And question five?

R em, I wasn't sure if it meant kind of management for re-assessment or if they give that all to the speech therapist, is that what it meant?

I yes

R Do I make sense? Cos I took it as that

I Took it as which one?

R On going management meant, kind of, re-assessing and modification.

I Yeah. So if I put, if I underlined you, oh any nurses, that one

R I think it does make sense, I think it might just be my brain

I Okay that's fine. Okay section two, does that explain what was coming next?

R yeah

I okay And question six, was that confusing?

R er a little bit, I think it wasn't clear, well the examples gave an amount, but I think it might need to be in that bit, the drinking amount, maybe

I okay

R Clearer.

I Was there some confusion about food type and consistencies? Cos the thickened water is both a consistency and a drink, that's where the confusion lay?

R yeah, and food.

I Okay, right. Number seven?

R Yeah that made sense.

I Okay question eight?

R Yeah

I No problem?

R No.

I Number nine, easy to understand?

R Yes.

I Section three.

R Yeah. Introduction made sense.

I And number ten

R Yeah

I Yeah, easy to understand?

R yes.

I Okay number eleven?

R Yes

I Question twelve

R Yes

I And thirteen?

R yes.

I And section four

R Yeah that made sense.

I And did you know where to send it back to?

R Yes.

I Wonderful. And the only other question I want to ask you was the definition of screening did that adequately explain what screening was defined as?

R Yeah.

APPENDIX 24

Ethical Approval – Substantial Amendments Questionnaire

APPENDIX 25

Nurse and SLT Interview Data on BESST Pre-pilot Version

Nurse 1: BESST pre-pilot version

I Can I ask you what you think about the form?

R Yes I thought it was very good

I What did you like about it?

R Well it seems to be clear and I like it because it all fits onto one sheet

I OK, yes that's important isn't it. Can I ask you specifically about the form?

R Yes

I What do you think about the boxes at the top. The patient details and the assessors details?

R Well em you can just put a patient sticker there so that wouldn't be too difficult but would you need staff grade on the assessors bit?

I That's a good idea – anything else?

R No I don't think so

I OK what do you think about the pre-screening...

R Well, do you just tick it or do you circle it or do

I Well you tick the box if you have done it or notice it.

R Well it looks straight forward but there's quite a lot of information needed like number in 12 months and I wondered if that would put people off filling it in because they wouldn't particularly know that and they'd have to look at the notes. I don't know if you would write that on the form because there's no room is there?

I No, so you think that would put people off filling it.

R Yes, well if I'm honest it would put me off

I Yes I see your point, thank you

R Well, and I don't know what these things are, well I could ask to make sure or is there a definition that I could look at

I Which words are causing you problems?

R Well what do you consider a clear voice quality? I don't know what that one is

I Oh OK well yes, its like a voice that is not wet and gargly

R Oh, so would I fill that in there?

I Yes

R And what would happen if they didn't clear their throat when I saw them but they did later?

I Well I think you would have to ask them if they can clear their throat to see if they can cough sort of thing

R Oh right. Then what would I do when I did that? Do I just write it on the form?

I Yes

R OK. Right.

I So can you just look at the rest of the form

R Yes This is what I give them is it?

I Yes

R And then if I notice these things I tick it again like at the top. Yes I see so would you have to feel the throat for that? I'm not sure I have done that before. What's a DNS?

I A dysphagia nurse specialist

R Oh

I Oh we don't have them in this hospital but other places have them. So yes I think that needs changing. Good, thank you for that.

R I think some people have done some dysphagia training

I Yes I've given some talks but I think probably more need doing, its finding the time, like everything

R Yes that would be good

I Anyway are there any other abbreviations that you wouldn't be aware of?

R No the rest are OK. Yes, so you would then want me to put up bed signs?

I Yes

R I don't write in the medical notes, I would just write in the nurses' cardex

I Oh yes I think that's what most of the nurses do don't they?

R Yes

I OK that's really good thank you.

R Oh I thought it was good, quite simple really. The thing is just the time it takes to read through it but I suppose it's like everything and if you did enough you

would just get used to it wouldn't you? I suppose... yes... yes... if you did it all the time... we have quite a few people on our ward but the Speech and Language just comes and sorts it really... so we would start doing this on everyone that's the idea?

I Yes

R Well it seems to be clear its just getting used to it really I suppose you just do it don't you?

I Yes, is there anything else about the form you want to comment on. You are happy with the terminology and the spacing and you think you'd know what to do and how to fill it in?

R Well I think you'd get used to it but you would have to see how it goes but it looks straight forward.

I OK Thank you

Nurse 2: BESST pre-pilot version

I OK Thank you for doing this

R Oh it's OK

I Well what do you think about the forms then?

R Well yes I think it's good, I mean its quite clear, I think its clear what you have to do. Would there be training to go with it?

I No the idea is for people to read it and become familiar with it so they can do it on everyone who comes in with a stroke really.

R Oh right well I think yes.. yes.. it would be all right I think yes I think once your got used to it.. yes

I Good, so there is nothing on there that you would be concerned about?

R No not really no I think it would be OK yes I think so

I OK Good. Right, what do you think about the other form

R This one yes well I think that its quite detailed isn't it but it looks OK. Its just do you think that it should have the NHS number or hospital number or something on it so

I Well I was thinking that you could put a patient sticker on there so

R Yes but if you didn't have one it might be good to put that information you need there like the name address and the date of birth or something

I Yes I can see what you mean it would make it clearer

R Just so people would know what you mean that's all

I No that's a good idea no that's great thanks. What do you think about the pre-screening box?

R Well a lot of ours wouldn't be able to give you consent so I don't know that I could fill that in a lot of the time. Would that matter for your thing? It's just that some of them can't really let you know what they think really so you wouldn't be able to get their consent really, you'd just do it for them

I Yes I know what you mean you'd have to do it in their best interests sort of thing

R Yes

I Yes that's a good point, no this is good really carry on

R Right well, I don't really know what that would sound like

I Clear voice?

R Yes

I Right well I suppose that's a Speech therapy thing really, it means that the voice isn't wet or gurgly, nice and clear. It just shows that the voice box isn't working properly during swallowing

R Oh right well I wouldn't know about that really

I OK that's good, is there anything else in there that is a problem?

R Well would you do anything then just note it down, not do anything?

I No that's all you would do and then carry on with the assessment

R Right

I What about the rest of the form?

R Well I would give them all of this? And then yes I have to notice all of them. Yes I think that's a bit confusing so you go down these arrows here but then you go across aswell...I think that needs to be a bit clearer so that you have to carry on or not because these arrows make you think to carry on but these tell you to stop and put them nil by mouth. Is that right?

I Yes I can see that's confusing perhaps we need to take out these arrows down the side so people are then told what to do in this end box

R Yes I think that would be clearer so you know what to do if you notice these signs here

I Yes the aspiration signs. Do you think they are clear enough? You know what they are?

R Yes I think so. What is a DNS?

I Oh yes that's something they have in some places, its like a well it's a dysphagia nurse specialist. In some hospitals they have them like other specialist nurses

R Oh right

I yes I think that needs to come out as we don't really have them in this hospital

R No I think that's it. Would it just go in the nurses cardex when we have done it or do we send it to you.

I No you can put it in the nursing cardex we could see it when we come up to the ward

R Right

I Is there anything else about the form that you find confusing?

R No I think that's it

I Happy you'd know how to fill it all in?

R Yes that's OK

I And you are happy with the action box?

R Yes its just the DNS again there

I Yes I think I have to take that out. OK thank you

Nurse 3: BESST pre-pilot version

I OK Can I ask you about the form?

R Yes I liked it, it was very clear

I What did you like?

R Well it seems to be very clear what you have to do and what you are looking at. I don't think you could do this on everyone though really because some of them are really out of it!

I Well yes but perhaps when they came round a bit it would be OK to use?

R Yes you'd have to do it later on

I OK, yes that's great thanks so I want you to look at the yes, no boxes at the top first if that's OK?

R Ok yes that seems to be clear as well

I Good, the terminology is clear

R Yes no problem, yes its OK

I Right can I ask you about the rest of the form?

R Yes

I What do you think about the boxes at the top. The patient box and the assessors box?

R Yes that's OK

I All right what do you think about the pre-screening box?

R Well yes its OK. I think I might not know about the recurrent pneumonia. If they were readmitted quite soon then you would remember or if the doctors had recorded it in handover or something but otherwise I wouldn't know about that really

I No that's fair comment I think. But sometimes you would be able to have that information, its just extra, it just helps that's all with the assessment when you refer to Speech Therapy that's all it helps with our assessment.

R Oh right OK that's OK

I OK what do you think about the pre-screening box, is it clear what you need to fill in?

R Well, yes I might get a bit stuck on things like that clear voice? I'm not sure what you want me to do about that?

I Well you tick the box if you notice they have a strange voice or its gargly or something.

R Right

I Is that OK?

R Yes

I Anything else in that box that you wouldn't get?

R No I think that's OK

I All right what about the rest of the form

R Yes

I Are you happy with what you have to do?

R Yes. Yes these boxes are what you give them is that right? Yes and this is what they do?

I Well yes if they don't do any of those aspiration symptoms then you just carry on and go down this column here so they end up on normal diet and thin drinks

R OK. And then yes if they do do those things then you put them on these boxes here. Yes that's fine. I think it's confusing at first but then if you follow it it would be fine.

I Yes?

R Yes

I And the boxes at the end are OK?

R Yes

I Some people have had some problems with the term DNS

R Yes it is a bit confusing

I It's a dysphagia nurse specialist

R Oh

I yes I think I'm going to have to change that as a few people have mentioned it

I Is there anything else in those boxes that you think might be confusing?

R Yes, well I'm not sure that everyone would know what semi-solid consistency would be from this. Would you put that on the Information Sheet?

I No that's a good point. It means thickened fluids but perhaps we need to be more specific how thick that needs to be.

R I wouldn't write in the medical notes

I Yes I think that will have to come out as well yes thanks

R So would you do this all the time if they failed it the first time or would you just do it and then send it to you

I Well I think you would put it in the nursing cardex and Speech therapy could look at it when they came on the ward. At least the other nurses would know it and been done and you were waiting for Speech therapy to come.

R Yes it's a good idea.

I OK that's really good thank you. Is there anything else you think needs addressing?

R No I think that's it

I OK Thank you

SLT 1: BESST pre-pilot version

I OK Can you just give me your initial impressions regarding the screening tool?

R Just initial, overall impressions?

I Yes.

R er Yes, it looks quite clear, er, and seemingly easy to fill in at first.

I OK. If we go through each box at a time. The patient details box, is there anything missing from there?

R That's fine if you are just going to use one of the stickers, one of the patient detail stickers to put over there because that's got all the detail on, however, if they're not available then someone might not know all the details to put on. And it might be useful to have things like GP on there as well.

I Assessment box? Assessment details box?

R Yes that's fine.

I You don't think there's anything else that should be in there?

R The only other thing that could be in, again, it depends on the way it's used, is the location of where that patient is, so, the ward, for example, or if you were an Out Patient or something. That could be on there as well.

I OK, Thank you. What about the pre-screening information?

R The first one, introduction, consent. Does that just mean that consent has been obtained?

I Yes

R Right. Well I think that could just do with being a bit more clear. That it's just referring to have you got consent from the patient? And then at the other side of all the tick boxes, are you just meant to tick the box, if they've had any of those, that list?

I Yes

R And then circle the other ones?

I Yes

R Perhaps that could be a little more clear.

I Right

R A tick then circle

I OK

R Would that be OK?

I Yes. Is there any more information that you feel that you would need? Are there any other parameters that you would assess?

R I might look more at the medical history, there's not a lot of room for medical history. It depends what you do I think. If you are giving it to somebody and saying this is prior to a Speech and Language Therapist doing an assessment, it's probably be enough. But if you are saying you're just giving this, and there might not be, as a result of doing this screen, there might not be any other SLT involvement, then it probably could do with having a bit more history, any relating medical history, to a swallowing problem.

I Anything else in there?

R Again the only thing I say is if you are giving this to for example nurses who don't have a lot of knowledge of the terminology used within Speech Therapy, some of the pre-screening things like voice quality, might throw them a little bit, and you don't know also from looking at this whether to fill in every box, whether you've got to put something by every box or whether its just if you are having problems in that area.

I Ok anything in that box you feel should be in apart from medical history?
Anything else?

TAPE TURNED OVER

I Sorry about that. Anything else in that pre-screening box?

R I think the other thing that I'd just say is that you're not sure, following, following ticking those boxes and filling in that information in that pre-screening box, what you would then do? What your action would be?
For example if someone had recurrent pneumonia, if they weren't alert, em if they did have wet voice, its not clear what action, em, you would need to take following that box

I OK

R I'm not sure how much training they would have prior to this anyway. So

I OK, OK. So the main screening box, do you want to go down the texture column first? Anything in that texture column that you want to talk about?

R Right in the texture column. Firstly, I don't know if I'd know, personally, me, other people might be OK, but I don't think I'd know what a 100mg was in terms of what it is on a teaspoon.

I Right Ok

R I would be happy with mls, 5mls, 50mls. But it would be a bit of a guess as to that, it wouldn't be specific, probably guess those OK but I wouldn't with a 100mg. Again, I don't know what training they'd have prior to doing this, but from experience I know that even if you get people to mix up thick and easy, say, to a semi-solid texture, they'd still struggle. What is a semi-solid texture? That might find that a bit difficult, unless they have had a bit of planned training. Other than that I think that's OK

I What about the aspiration signs column?

R I'm not sure that some people would know how to look for some of these signs, like reduced laryngeal elevation, I don't know if they'd know what that meant and then how to go about testing for that em, again just things like, would they know how to test for multiple swallows, without feeling for those swallows. Would they know how to correctly feel for those swallows? And then it just says 'breath sounds' but again, you're unsure what exactly are you listening for, specifically, on 'breath sounds. That's not clear. So some of those would be OK if there was prior training, but if not, then they would need a bit more clarification. And that just goes down all the aspiration signs, doesn't it because they're all the same.
When you are moving from aspiration signs to action, again its just a bit unclear if just one tick in that box of 6 items, does one tick mean that you go straight to

the action, so, so if that box is completely clear do you just move down your texture list? OK. All right well that's OK for aspiration signs.

Action, first three, I feel that's quite easy to follow. Yes the rest of it feels, is OK actually.

I OK, What about the action box at the bottom?

R em that's OK, yes

I OK any other comments?

R No

I Any problems with the terminology?

R em other than what I've pointed out no

I OK

R Just in terms of terminology, another thing I'm not sure everybody would know what, when it says, 'refer to SLT/DNS'. I'm not sure everybody would know what DNS meant. That's it

SLT 2: BESST pre-pilot version

I Ok we'll go through it. First of all, what's your first impression of the form?

R It's easy to follow and not too much information

I OK right can we go through each box in detail. So the Patient detail box. What do you think of that box?

R em. I'm not quite sure of what else you would put in that box apart from their name and their date of birth. I don't know how much more specific you would need to be. I don't know how much training you would be expected to receive with this.

I Well possibly nothing. So what would you expect to see in this box?

R Well name, date of birth and what they had been admitted for, any relevant medical history that I could put in.

I Sorry this would actually be used on stroke patients. So they would have a stroke. Anything else on there?

R Not on that bit no.

I What about the location?

R Where the patient is?

I So which ward

R Which ward yes

I What about the assessment details box?

R Yes I think. I can't think of anything else you would need for it.

I What about the pre-screening box-the pre-screening information box?

R I think it covers everything, I just wasn't sure whether it came with extra information, like a sheet saying what 'clear voice' is or whether that knowledge is, hopefully, trained or

I So like a glossary of terms on the back or something?

R Yes. Coz it's got like things you can circle: you can choose one of the descriptions

I OK What about the actual swallowing screen?

R I think I wouldn't be sure what a semi-solid is. I don't know what a DNS is
I Right a dysphagia nurse specialist

R em I don't know what else to say.

I So you're happy with the textures down that side?

R Yes

I Happy wit the aspiration signs?

R Yes. I'd probably need training to work out what it means by reduced laryngeal elevation

I So that would need to be part of the training?

R Yes

I What about your action column?

R When it says refer to SLT or DNS or dietetics it doesn't mean all three it mean and/or does it?

I What about the action box at the end?

R Yes em I suppose as well training on how to remove the bolus if it got stuck

I So suctioning advice? So where would you put that? In the action box?

R Yes that would go in the action box as well

I So it's all in a logical order?

R Yes

I Simple enough?

R Yes One last thing, on the semi-solid texture, just knowing how I would know that I had 100mg. Thank you.

SLT 3: BESST pre-pilot version

- I What are your first impressions when you see the form?
- R It looks quite straightforward as well
- I Can we just discuss each box in turn? The patient details box. What do you think about that one?
- R I think its fine as it is. I think there's enough space for a sticker.
- I Do you think it needs to be detailed more fully because you may not have a sticker available?
- R You could put 'Place sticker there'
- I OK. What do you think about the assessment details box?
- R Its quite straight forward
- I Would you need anymore information than that?
- R Maybe who you are. Who's doing it?
- I The assessor's name
- R Position, a nurse or whatever.
- I Their job?
- R Yes
- I OK. What do you think of the pre-screening information box?
- R I don't know. Are you supposed to tick those boxes? They could be a bit bigger. I don't know, maybe join up that with that because it doesn't look like it belongs with it.
- I So maybe have some kind of arrows
- R I don't know. Or have little dots.
- I Dots between the pre-screening information and the action?
- R Possibly
- I OK Are there any other things you would look at when you're observing the patient or getting information.
- R I don't think so.....history of dysphagia?
- I OK But other than that, that's OK?
- R Yes

I If you were following that, is there any point at which you would say I don't want to carry on with this assessment?

R What, just in that box? No, I don't think so.

I Does that reflect real life situations?

R Yes. I would look at chest, not just pneumonia?

I OK Chest status, OK. What do you actually think of the swallow screen?

R I didn't really know what semi-solid was so I'd just make that up.

I Right. What would you put instead of semi-solids?

R I may just put eg: yoghurt

I OK

R And what does DNS mean?

I Dysphagia nurse specialist

R And is this a question mark or a dash?

I Right, dash, yep

R That was it.

I So you're happy with the textures, if that was given an example?

R Yes

I Would you check for any different things on the screening tool?

R em

I Aspiration signs. Would you identify any other aspiration signs?

R I don't think so

I And the boxes you'd want bigger again?

R Yes. Making it obvious you've got to tick it because they could look like bullet points.

I OK and what about the actions? Are they the appropriate actions?

R Yes

I And what about the action box at the bottom?

R Is that again linked to that? Or should you have little boxes there?

I OK. Is there any other action you would take during a screen?

- R No, I don't think so. When you say others is that going to be family or medical staff?
- I OK so that needs more detail there
- R Then that's fine. Bed signs would that be one that they'd have or would they have to make it up?
- I OK Thank you

APPENDIX 26

Nurse and SLT Interview Data on BESST Pilot Version – Second Iteration

Nurse 1: BESST pilot version

- I OK Thank you for your time. Can I ask you about the swallow screening tool and whether you understand everything on the information sheet?
- R Yes, I understood everything on the information sheet.
- I Was it clear?
- R I thought it was very clear yes
- I So you would be able to do that if you just read that and had no further training or anything?
- R I think I would, yes
- I That's fine
- R Yes
- I So on this sheet here. Ignore the bits at the top because they are different things. On the pre-screening information box, was that clear, was there any wording in there that was confusing or anything?
- R No I found that clear on pre-screening yes.
- I So you'd know to tick the box
- R Yes
- I And if there was anything here you'd go to the action box?
- R Yes
- I So the oral intake column down here
- R Yes
- I Is there anything that is confusing in that terminology like an unspouted cup or a hundred mls of puree. Would you know how much that was?
- R None of terminology confused me. The thing I found confusing was like that arrow there. You could easily think like I did, you went there and then you went to there and then you went to there and you'd done them all, whereas without that arrow I think it would, sort of make that clearer. Do you know what I do you see what I mean?
- I Yes so going from box A to box B to remove the arrow
- R That would have made it clearer to me I think yes

I Okay, Yes?

R Yes

I Right

R Yes, I think it was just that one that confused me, yeah

I Okay. What about the aspiration signs, would you know what all those were?

R Yes, after reading my information sheet yes, I would know what they were

I Someone mentioned about incomplete up and forward, would you know what incomplete was, or would it be better to just put weak?

R For somebody like me, just weak I think

I Okay

R Yes

I And then was the rest of it clear?

R The rest of it I would just thought it would have been clearer if you'd have put try puree instead of trial puree

I Okay

R Apart from that I thought everything else was fine

I If it was colour-coded, that would make it

R Yes and colour code it

I Yes

R Then I could follow that

I Okay

R Okay

I Thank you very much

Nurse 2: BESST pilot version

I Looking at the information sheet what did you think.

R I thought the information sheet was very clear and easy to follow

I Right

R Self-explanatory

I Good

R That was quite good, I liked that bit

I There was no terminology in there that you didn't understand?

R No

I Or think what's she talking about?

R No

I Excellent. What did you think of the pictures?

R Quite clear really, yes, they do make sense, yes

I Obviously they'd be better if they were bigger, but it's a case of fitting them on there

R Oh no, I thought that was very good. No problems at all with that bit

I Okay. Taking the dysphagia screening tool, what did you think about the pre-screening information box first of all? Ignore the top bit that just to do with the study. But these, that box there. Was that understandable and clear?

R Yes that was easy to follow. Yes it quite clearly says if there's any 'no' don't continue, follow action 4, which is down here, so that's quite easy to follow.

I Good, okay, now, what did you think

R This bit I find a bit busy.

I Yes

R But my head's very busy at the moment anyway, so it's trying to catch one thing and sit down and study it. When you look at it it does become clearer, but I find. This bit here is quite clear, 5mls of water from unspouted cup times 3, and then you follow, if nothing, I understand that you follow, you go down. If arrow would indicate to go over there, well it's a case of, I think I'd wonder a little bit, if it was just one of those rather than how many, I mean it might be better to be clear, like if any of the indications any indications of aspiration, move onto the action box.

I Action box

R Action box. Because I think it might be a bit confusing if, maybe a hint of one, when you would you would continue or not. Which could be

I Good idea

R This bit going down is quite easy to follow, this arrow here I think is a bit misleading, because its NAD and then go over there. It tend to make you think NAD and then over there.

I It's not been formatted right that's all.

R That's the only thing that I can think of really

- I Okay. What about the boxes at the bottom.
- R I think they could do somehow to stand out a little bit more. I think when you said colour coding them, that would be a good idea. Colour code them. That would make it easy to follow.
- I Let me think
- R It's very good really
- I The incomplete up and forward, someone said about the incomplete up and forward movement, would it be better to just say the weak up and forward movement?
- R I don't know with that really. If you knock the weak off, incomplete up and forward, I suppose it's more specific isn't it?
- I Or if you say weak up and forward movement, or should you have both?
- R I think you would em-let me just have a think about it. I mean if it is poor, if it is weak, but you manage to do it, if you identify that there is a weakness there, there's a risk of it becoming incomplete, for me if it's difficult for them to do it, but they have managed, so weak could go somewhere, but I don't know where you'd put it to make it
- I What about just crossing the incomplete off? Weak up and...
- R Yeah that would probably be better
- I Okay. Thank you

Nurse 3: BESST pilot version

- I So, if you just have a look at the information sheet first, sorry. Is there anything on the information sheet you don't understand?
- R No, I think that's quite clear, the information sheet
- I So the wording was okay?
- R There's just a little 'be' missed out there but that's nothing really
- I No I've got a couple of those actually. No I've got a couple of those
- R No the information was quite clear
- I And did you realise that they related to those?
- R Yes
- I The boxes, okay? And is this, these pictures clear where you put your finger? Okay, lovely. What did you think of the screening tool? Just do the first box first.
- R I thought the first box is, is clear, that was easy to understand

I And you understand the terminology?

R Yes

I That's okay then.

R Oh right

I For stroke

R No that was easy enough to understand and if the patient scores there fair enough. No that's easy to understand, that's straight forward.

I Okay. If you go down the oral intake column

R Um

I Would you understand how to do all that?

R The boxes that follow on from the oral intake from 5 mls water for example down to NAD, I think that's quite straight forward. I just had problems with the aspiration signs, the arrows moving across. I thought it may be better if there was, I don't know how you'd do it if there was something to say 'if any of these' because its not really quite clear if it should be them all, how many, one. If there's one sign of that then go to

I Good point

R Go straight over

I Yes

R So I wasn't too sure on that. I think there's a lot of information kind of close together. I don't know whether that, that puts you off a bit as well. Em,

I What do you think?

R Yes I think it was just the point of you know whether if one of those, if two of those, or if all of those, that might be better. Then move onto the box C Puree

I That's a good point

R Em and then the only other thing. I think that's similar with each one as well, going from each of those boxes, whether it should be one or whatever

I Yes

R Em, I just got a bit confused with action 1 and action 2.

I Okay

R Is, is action 2 if you can't demonstrate up and jaw

I Yes

R Yes, if not thenbut that's all really

I Okay

R I understood those that's fine. That was it.

I Yes

R Yes

I Do you think you'd be able to follow that

R Yes, yes, I'm, as I say that's really straight forward, it's just that distinguishing when you go off the line type thing if you will if that's the right word to use.

I Do you think the aspiration signs were clear enough?

R Yes I think the wording and the signs are all very clear.

SLT 1: BESST pilot version

I So, what do you think of the pre screening box?

R I think it's clear and easy to follow, and it's important that the 'do not' bit is in bold and underlined, to just make sure that people follow that em

I Is there anything else that you feel should be in there?

R I don't think there is anything else

I And the terminology is clear

R Yes

I And you'd know what to do

R Yes

I Okay, what do you think of the oral intake column?

R I think that's clear and easy to follow

I And would you understand the terminology?

R Yes I think that NAD has been put in full terminology in the first bit, but yes I think the terminology is fine

I Okay. Can I ask you about the aspiration signs? Anything there you'd have problems with?

R em no there isn't really, I think, I suppose it depends what training goes along with it aswell, like how much time people give to make sure they fully observe all those things.

I Okay. Do you understand the action column?

R Yes I think it would be helpful if it was colour coded, em to make it clearer and then with the action link up with the number as well em maybe on action 2 and 4, I wasn't sure, just putting on refer to Speech and Language Therapy, because they'll have a modified diet for that, so, em yes I think it's clear.

I Terminology on sub-cut is okay?

R Em, I don't know much about IV fluids, but I think if you did, you might be okay. Don't know

I Okay, Is that alright?

R Yes

I Okay. Can I ask you about the information sheet? Do you think the lay out is clear enough?

R Yes

I And what about the actual instructions?

R em, I think they're clear and easy to understand. I think that they're in boxes as well that correspond to each stage in the right kind of order and I think the pictures are obviously quite helpful. I think yes that answers all the questions that I would have wanted to know before doing the questions filling in the assessment form

I Okay, Thank you

SLT 2: BESST pilot version

I So what do you think about the pre-screening information box?

R It's fine

I Do you have any problems with the terminology?

R No

I Do you think people would know what they have to do?

R Yes

I Okay thank you, what do you think about the oral intake column?

R The only thing I've got to say is I'm not sure if everyone would be sure what is 100mls puree diet from a spoon. What exactly that amount is, other than that fine.

I Okay, and what do you think about the aspirations sign box, the aspiration signs column

R Is fine. They would need some amount of training in that but you can understand the terminology, that's absolutely fine

I Okay what about the action box and column is that clear what you have to do?
R Yes
I Is there any terminology that you wouldn't understand from there?
R No
I Okay Is that is
R Yes that's fine
I Okay thank you

SLT 3: BESST pilot version

I So, could you look at the pre-screening information box, is there anything in there that you disagree with at all?
R No
I Is there anything extra that you would want to put in there or be aware of?
R No
I Think the terminology is okay?
R Yes
I Anybody would understand the terminology?
R Anyone as in like nurses?
I Nursing and Speech and Language Therapy?
R Yes, yes
I And the action what you are required to do is clear?
R Yes, very clear
I So if you have a look at the oral intake column and work your way through that. Is there anything, is it clear what you are meant to do?
R Em, yes, deliver 5mls of water, from an unspouted cup times 3, so 3 times three swallows at that, if there's no problem, move onto the next box and so on, yep
I Is there any terminology in there that you wouldn't be sure about?
R No, not me personally and I can't see nurses being unsure about it, no.
I Do you have any concerns with it being delivered by cup rather than traditionally by teaspoons?
R No it's most functional

I Alright, looking at the aspiration signs box, obviously the boxes are all the same, is there anything in there that is difficult to understand or the layout or the terminology?

R I suppose the word incomplete without any prior information, just looking at this, perhaps some nurses or some other MDT staff might not know what we mean incomplete laryngeal movement would be.

I Good point. Is there anything else you would think of? Would you just say weak up and forward movement?

R Yes I think I probably would actually.

I Right. Is there anything else that you would put in there?

R No, no.

I Is it, in the action box, is it clear what you are being asked to do and where you need to go to next?

R Yes I think with the aid of colour you would solve that problem. Just going back to this, I don't know whether, would facial colour come into it, you know any facial signs of turning blue, red, I don't know

I em

R I don't know, I know that on it's own it's not really very reliable but

I em I thought of delayed swallow, then I thought no because they'd have to stop

R em

I Okay, are the actions at the bottom clear on what you have to do? Is there anything else you would add?

R No other than, referring on to SLT in some of these boxes.

I Box 2 and box 4?

R Yes, Yes

I Yes? Okay

R Yes that's fine.

I What did you think of the information sheet?

R Yes I thought it was very clear. Yes, I think the language was really good. Not too much, I think it was very precise, succinct

I Okay

R Yes

I Anything else you would wish to add?

- R No, I don't think so, not that I can think of.
- I Okay, would you think that nurses would be able to do this if they, if they didn't have any personal training? Do you think they would be able to read it and follow the instructions from there?
- R I think they would. They might just need to be aware of maybe what we would consider to be kind of gargly or wet or you may just need to say like a frog in your throat type sound or something like that. Without any other kind of background information that would be the only thing. Other than that, yes, they should be able to read through and understand what to do, should do, yes
- I Alright, thank you.

APPENDIX 27

Ethical Approval

APPENDIX 28

Commensurate Decision Making Comments: BESST – Feasibility Study

Pre-screening information seemed okay to follow, very easy therefore continued with assessment patient seemed very cautious as he was taking fluids any fluids at all during the assessment. Took first three lots of 5mls of water with no problem at all therefore carried on to B gave him 50ml's of water from a spouted cup where he cleared his throat on numerous occasions during swallowing water patient seemed to feel that he had to drink it all down in one big go. Did explain that he could take it in as many sips as he required. Flow to next stage one teaspoon of puree seemed to manage first teaspoon of puree okay patient was not keen on puree, continued to 100mls of puree from spoon patient coughed and sorry patient throat cleared throughout drinking the 100mls of puree finding it very difficult patient describing that for a while he had been having the feeling of things sticking in his throat and describes a flap in his throat therefore based on actual screening tool followed action 4. I would follow action 4.

Pre screening on the form information that was fine, I had no problems filling that in. He answered yes to all of those. I then proceeded to give him the 5mls of water and I gave him that 3 times. In the aspiration signs box I was a bit confused about "cough stroke throat clear" and the patient, I did tick this box but the patient didn't cough and I thought it assumed that his throat was clear so I was wrong there and also the multiple swallows, I ticked this box because he took 2 swallows but I still wasn't sure whether multiple swallows was three or more swallows therefore with only doing two swallows I continued to the next stage and then I gave him 50mls of water, again we had the same problem with the swallows and I ticked that box so we continued with the pureed water and again there was multiple swallows which was taking two swallows to clear his throat all the time and the last D box we gave 100ml and again we had the same problem he was swallowing twice to clear one mouth full of fluid. So in view of this I would have taken action 4 and placed a nil by mouth sign even though I did go through all the stages of the aspiration signs because of the multiple swallows that was confusing me.

Oral intake 5mls of water times 3 the patient was fine. We then continued to box B we gave him 50mls of water, there was multiple swallows taking the 50mls but then again I wasn't sure whether the patient should take it all at once or whether they should stop. However he took all 50mls in one but there was multiple swallows so then I proceeded to box C I gave the patient then one teaspoon of puree which again was multiple swallows at least three I counted and then I went to action 4 which is placing nil by mouth over bed and refer to the dieticians, felt a bit better today about doing the test a second time the only thing I'm still a bit confused about is taking either the 50mls all in one gulp or the 100mls of puree from feeding it from a spoon.

Pre-screening information passed fine no problems there. Patient still describing like yesterday, feeling of flap and difficulty with swallowing things, feeling things are getting stuck in his throat, did multiple swallow today 4 or 5 times with the ordinary water. Also I'm, testing with the first teaspoon of puree patient did multiple swallow and therefore I've gone again with action 4 and will place the patient nil by mouth according to this actual screening tool. If I could just make a couple of comments about the form itself the pre screening information seems

fine but obviously with using a new form it can take few times to actually get used to using how its all laid out, one thing that I find a bit unclear is the bit that says "cough stroke throat clear" having spoken to the speech therapist I believe that it means clearing of the throat which can be termed differently from throat being clear I think that might need just clarifying on the actual form. I'm also finding the sections A, B, C and D having quite a lot of information in them and can be quite easy to go wrong when following through like A and then going to box C and then A, B, C and D are not clearly standing out initially.

Pre-screening information fine, again no problems with that section 5mls of water from un-spouted cup managed, no problems. Having taken the 50mls of water she started to cough patient did report that she does cough quite frequently when she is drinking but she doesn't think that it is anything to particularly worry about says she has had a cough for the last few weeks. Continued to the 1 teaspoon of puree at which point she took the one teaspoon of puree and swallowed it fine accept it then made her poor and she refused to have any further puree so unable to complete assessment therefore would have to action 4 again. Form appearing to be a little clearer now that I have completed it but the middle section does appear to be a little sort of more fiddly especially when you get to the different actions that you are supposed to go to.

Done the dysphagia screening tool and no problems the patient passed stage A, B, C and D and therefore can eat and drink as normal.

Patient managed to take oral intake 5mls times 3 with no problems and then we proceeded to the 50mls of water and that was okay and then we went on to the one teaspoon of puree, he was alright with that but I felt as though he was munching round first with his mouth and then he swallowed it so I give him the benefit of the doubt and I went on to the 100mls of Puree from the spoon and again each time he went in he sort of munched it but took it down with one swallow. Even though it was quite clear he doesn't have any rough voice or any multiple swallows so I've taken action 1 and put oral intake on the chart and monitor his checked status I've gone with a little bit of benefit of doubt because he was munching around with his mouth the thickened puree.

This patient refused to take any water even though she's alert and everything she's answered yes to the first pre screening information and there's no tick box really to say patient refused or un-cooperated so in view of that on to action 4.

Pre-screening information agreed yes for everything the patient has consented. Following the actual assessment tool managing normal water fine and no problems but the patient refuses to continue with different fluids test, therefore I would have to action 4 according to this chart

Pre-screening information no problems with that again, patient is reluctant to take the fluids but has agreed to try them for the reasons of this study. No problems taking 5mls of water three times from a cup so proceeded on to the 50mls of water from the cup. Tolerated fine by the patient no signs of aspiration. Initially however started trying to talk straight afterwards and coughed repeatedly did throat clear but then settled himself down again so therefore repeated the 50mls of water from the cup no problems on repeating water testing, tolerated one teaspoon of puree no problems and also tolerated the 100mls of puree from the spoon with no problems either would therefore go for normal diet and thin fluids and action 1. Not sure whether I should have repeated at stage B but taking into account the fact that the gentleman had tolerated thing so far at that point I felt it wise to give him a second chance which was okay

Patient managed to take all of his fluids and then I went for action 1 he was NAD on A, B, C, D, and can demonstrate up and down jaw movement etc. I've ticked thin fluid normal diet and monitor chest status doesn't actually say on the chart whether I tick one or none really or just tick action 1 so that's what I was a little unsure off there.

Tried him with teaspoons of water because he didn't cough on the first one second one he did, he does have initiation problems I mean his larynx movement is weak but there is problems there as is with the pureed that was really a weird sort of swallow wasn't multiple incomplete if you like and coughing so I'm probably going to keep him nil by mouth, okay

Coughed on the first teaspoon of water so went to C same old initiation problems he did complain of the bolus sticking in his larynx he pointed to the top of his larynx really and again he coughed on that so put him nil by mouth, okay

I've suggested that he have thin fluids and normal diet however he didn't take the full amount of pureed diet because he didn't like it but I felt I'd seen enough to demonstrate his abilities.

Patient was successful in all pre screening information and went on to assess the patient with 5mls of water from an un spouted cup 3 times, stopped that assessment on the third time because patient is breathless with the water, don't seem to be able to find the aspiration sign of breathlessness on there, on the chart but she was quite breathless she was also trying to clear her throat so I went on to box C and gave a teaspoon of pureed, on the one teaspoon of pureed she was struggling to swallow it and used multiple swallows and was complaining of it sticking in her throat and I wasn't actually happy to continue with it any further, so therefore action 4 and nil by mouth.

This patient took 5mls of water, we done that three times and we had a cough and multiple swallows so we went on to box C where she had one teaspoon full of pureed, she passed that fine no problems we then went on to box D 100mls of puree which I don't think that she passed very well she took multiple swallows. Box D then tells me to go to action 4 if she's failed but that says she fails on A, B, C and D which she didn't she failed on A we didn't do B and then we went to D so she was fine on C so a little bit confused really but I've gone for action 4 although she didn't actually fail on C. Also the pre-screening information clear voice quality wasn't actually 100 percent sure on this exactly what a clear voice quality is because this lady is quite aphasic although she can make a sound so I gave her the benefit of the doubt really and continued with the test. Also on box D the wet voice was a little bit difficult to try and detect because she is aphasic.

Pre-screening information managed successfully again, part A difficulty swallowing 3 lots of 5mls of water, coughing and had a weak movement upper forward of the larynx also she was drooling fluid from the right side of her face because of a facial weakness so I wasn't happy with that either so I went on to give her a teaspoon of puree which she seemed to manage okay, I was a little bit unsure about it but she didn't seem to have any major significant problems at that stage so I went on to give her another teaspoon of pureed at which point she was weak again and 2was multiple swallowing, so therefore went to action 4. the only other thing that I would like to say is following actions 1, 2, 3 and 4 is really complicated when you are looking for NAD's at various things and whether or not they've got up or down jaw movements it does get quite difficult and you really do have to think quite carefully about it, its not actually very simple really from my point of view.

Similar problems as to yesterday, coughing after second teaspoon of normal water therefore stopped and went to box C she's also drooling from the right side of the face as well. With the teaspoon of puree she seemed to manage it okay but its very difficult to get your fingers in the correct position with this lady just because of the way that she is actually holding her head but she did seem to manage that teaspoon okay, I proceeded to the next one to give her some more thickened fluids and wasn't happy, she seemed to have a significant delay then and drooling from the right side of the face again although she wasn't coughing and no multiple swallows, okay, thanks.

This patient, decided the patient was action 1, in the end straight forward assessment today, the only one point I would like to make is that I'm very, the back of the form says 100mls of puree is equivalent to 3 tablespoons which didn't seem right

Pre-screening information no problems with that again doing the actual assessment the lady managed to deal with the three separate 5mls of water with no problems what so ever however, on giving her approximately 50mls of water towards the end she started to cough and she looked as though she was having a bit of problems with some mild breathlessness at that point so I actually went to box C from there. I gave the teaspoon of pureed which she seemed to manage fine and then when I was giving her the 100mls of pureed from a spoon I have had a little bit of difficulty really deciding what the actual problem was with this lady and I think that it was more that she was swallowing once or twice which is fine but she seems to be doing an awful lot of lip smacking when she was taking the fluid so I wasn't to sure which action to follow with this lady because she's not actually showing any of the aspiration signs that were actually listed on the form I just want to make a note of the fact that she was lip smacking and I would actually have gone for with great difficulty actually deciding this but I would have gone for action 3, so she would have gone for no fluids orally, thickened fluids to pureed consistency and a soft and pureed diet just like to make a note on that as well that action 3 in just in the way that they're categorized it's a little bit contradictory it says no fluids orally and then in the next sentence your saying thickened fluids to pureed consistency because you do give thickened fluids orally so I don't know whether it should actually be no thin fluids orally.

What can I say she was sleeping first but we were able to wake her up she was a little bit drowsy but was rousable I'd say I had to put nil by mouth because she coughed both on the water and the pureed it was quite self explanatory sort of weak laryngeal elevation wet breath sounds, coughing, yes, alright then thank you, bye.

Hi I gave the patient two teaspoons of water he had a strange intake of breath after each but I thought I'd carry on with the second one then he had a delayed, it was a delayed swallow then a throat clear so I stopped went on to pureed he had three teaspoons and it was a delayed cough and a delayed swallow so I'll probably put him nil by mouth.

This gentleman coughed on a teaspoon of water but I felt it was a dry cough so we kept giving it to him and he managed the entire cup of normal and then managed more than 100mls of puree but then had a cough, a delayed cough after the puree. I have put him down as nil by mouth following the screen but maybe wouldn't have done this otherwise.

Tried him with the water times by 3 teaspoons initially it was a bit confusing for him I think that because I asked him to cough to see what his voluntary cough was and then when I gave him a spoonful he swallowed it down fine and then

coughed again but I think that he thought that I wanted him to cough every time he wanted to drink so I had to explain that that wasn't what we where doing so we started again after that, I don't know if that's going to affect the results or not but yes so we started again so I gave him three spoons and I gave him half a cup of water he didn't really cough, throat clear or anything he just sounded a little bit, he was taking big intakes of breath but I wouldn't say they were short intakes of breath and there was a little bit of a wet voice and I wasn't sure so I just discontinued. With the puree I took 2 teaspoons and coughed shortly after that really and he said "oh that tickles" so it tickled his throat a bit I guess but from the assessment I've just put him nil by mouth.

APPENDIX 29

Ethical Approval – Substantial Amendments for Clinical Study

APPENDIX 30

Dysphagia Screening Tool - Data Decision Sheet

APPENDIX 31

Main Study Reported Bias

47 comments that the raters highlighted as potential could have influenced their decision whilst undertaking the swallow screen. Of these, 16 (34%) actions could be interpreted as having been influenced by the observation at bedside.

Observation	Action
Patient still coughing from 1 st assessor	Modified diet
Roominating fluid but one swallow per spoonful	Normal
Patient appears anxious said she was waiting to see a doctor	Normal
Yes, known on modified diet and fluids (GS)	Modified diet
Patient know to be on thickened fluid and puree diet (GS)	GS modified diet. Both nurses put the patient NBM
Known to me previously OK on normal fluids. Reports occasional cough on water?? Significant as pretty fit/mobile	GS modified diet
Sign above bed (GS)	NBM
Did appear to swallow water with 3 multiple swallows therefore I would closely monitor and refer to SLT	Normal
Voice quality debatable whether wet or chesty. Gave him benefit of doubt & continued. Several swallows with water but OK with thickened fluid.	Modified diet
Known previously OK, but stroke evolving. GC down respiratory sounds up	GS NBM
O2 mask, IVI	GS NBM
Known to have limited amounts of thickened fluid and puree pre admission	All raters modified diet
Known to be eating and drinking	Normal
Known to be on action 2 from 1 st assessment yesterday	GS modified diet
Known to GS previously NBM	GS modified diet
Assessment abandoned as patient was sick after the 2 nd sip	
Sign above bed for thickened fluids	Rater NBM
Known normal	GS normal
Had to demonstrate cough as didn't do it to command language problems refer to SLT	All raters normal
Known NBM	GS modified diet

Appears to have a rough voice therefore difficult to assess would choose 1	Normal diet and refer to SLT
Known to GS as eating and drinking normally	GS normal
Has a cold-slightly difficult to assess voice action 1 but would refer to SLT	
Known to GS as recovered dysphagia	GS modified diet
NBM by bed IVI insitu	All raters normal diet
NBM sign	All raters NBM
Eating and drinking on arrival	GS ignored wet voice as only tiny-normal, nurse 1 modified diet, nurse 2 NBM
Patient still coughing from 1st assessor	NBM
Known dysphagia to GS	All raters NBM
NBM sign	NBM
Fine bore NG nasal specs	All raters NBM
Food and drink at bedside, tablets on table	Normal
NG tube	All raters NBM
Patient said 'I'm not supposed to drink'	GS and nurse 1 NBM Nurse 2 normal
Had a jug of water on the table	GS small sips Nurse raters NBM
Voice sounded hoarse and harsh but not wet I would monitor closely	All raters normal
Drinks and sweets on the table	All raters normal
Fluids on table	All raters normal
Sign above bed oral fluids and soft diet	All raters normal
Food and drink by bedside	Rater 1 NBM, GS & Rater 3 Normal
Thickened fluids and puree diet sign above bed	Rater 3 NBM even though breakfast brought while rater 3 assessing
Water jug on locker	All raters normal
Patient held lip whilst drinking water as she said otherwise her lip droops and the water would fall out	All raters normal
Patient roominating	Normal but would refer to SLT

O2 via nasal specs	Normal
Translator present to explain study	
Normal breakfast at bedside	Rater 1 normal, GS and Rater 3 modified diet