Detection of Eating Difficulties after Stroke – A Systematic Review

Albert Westergren, RN, PhD

Section of Gerontology and Caring Sciences, Department of Health Sciences, Lund University, Lund, Sweden

The Vårdal Institute, the Swedish Institute for Health Science, Lund University, Lund, Sweden

Department of Rehabilitation Medicine, Central Hospital Kristianstad, Northeast Skåne Health Care District, Kristianstad, Sweden

Address for correspondence

Albert Westergren
Department of Health Sciences
Faculty of Medicine

Lund University
P.O. Box 157
SE-221 00 Lund, Sweden.
E-mail: Albert.Westergren@med.lu.se
Telephone: +46 46 222 19 27

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ABSTRACT

Background: It is highly important in nursing care for persons with stroke to screen for, assess and manage eating difficulties. The impact on eating after stroke can be of different types, comprising dysphagia as well as eating difficulties in a larger perspective. Eating difficulties can cause complications such as malnutrition, dehydration, aspiration, suffocation, pneumonia and death. There is a lack of systematic reviews about methods to be used by nurses in their screening for eating difficulties.

Aim: This review aims at systematically capturing and evaluating current peer-reviewed published literature about non-instrumental (besides pulse oximetry) and non-invasive screening methods for bedside detection of eating difficulties among persons with stroke.

Method: A search was performed in Medline and 234 articles were obtained. After a selection process 17 articles remained, covering seven screening methods and including about 2000 patients.

Conclusion: Best nursing practice for detecting eating difficulties includes as the first step the Standardised Bedside Swallowing Assessment (SSA) to detect dysphagia (strong evidence). As the second step an observation should be made of eating including ingestion, deglutition and energy (moderate evidence). Applying pulse oximetry simultaneously to SSA can possibly add to the accuracy of aspiration detection, especially silent aspiration (limited evidence). The methods should be used as a complement to interviews.

Keywords: cerebrovascular disorders, deglutition disorders, eating difficulties, screening, systematic review, nursing

INTRODUCTION

Eating difficulties are a common consequence following stroke and can cause complications such as malnutrition, dehydration, aspiration, suffocation, pneumonia and death. Thus, it is of great importance to detect eating difficulties in order to take suitable actions to compensate for these. To be able to do so there is a need for simple bedside screening methods that nurses can administer in day-to-day clinical practice.

The ability to eat varies between patients and can be assessed through interviews and observations. It is important to ask the patient if (s)he experiences any eating difficulties, but this is not enough. There is a tendency for patients not to report or to underestimate their problems. This can be due to feelings of shame because of not being able to eat in a socially acceptable manner. It can also be due to a striving for independence (Axelsson 1988, Jacobsson 2000, Sidenvall 1995). It has also been shown that patients underestimate the severity of problems when compared to objective measures (Elmståhl et al. 1999). In addition, it has been found that patients with good awareness of their swallowing problems have safer patterns of intake of food and swallowing than those with poor awareness (Parker et al. 2004). Taken together, interviews about eating difficulties need to be complemented by systematic observations.

The difference between “screening” and “assessment” needs to be highlighted. For the purpose of this review screening of eating is regarded as a simple process aiming at identifying those having difficulties with eating and then undertaking the necessary comprehensive assessment and plan of care. Eating assessment is thus regarded as a more complex process involving the use of a multitude of parameters and sometimes invasive measures (such as testing of pharyngeal sensation and gag reflex) or instrumental procedures

(such as VFSS = Videofluoroscopic Study of Swallowing and FEES = Fiberoptic Endoscopic Examination of Swallowing) to determine functions with a focus on specific details. To detect eating difficulties an initial screening is necessary in order to judge the need for further assessment and to plan nutritional interventions.

Some recent review articles highlight the importance of systematic screening for dysphagia, but not for eating difficulties in general. Martino et al. (2000), in their review, focused on detection of oropharyngeal dysphagia, including the use of invasive methods. There were limitations in the methods employed as they generally used aspiration as the diagnostic marker for dysphagia, while this is actually a consequence of dysphagia. Thus, other clinically significant swallowing problems may inadvertently be missed (Martino et al. 2000). In another review Ramsey et al. (2003) focused on screening for dysphagia and detection of aspiration. They found that the screening methods were poor in detecting silent aspiration (aspiration without overt signs like coughing or wet-sounding voice after swallow). However, pulse oximetry in combination with bedside testing seemed to be useful in detecting silent aspiration as well. In a systematic review and analysis of programmes for evaluating swallowing in order to prevent aspiration pneumonia, (Doggett et al. 2001), there was evidence that implementation of dysphagia programmes, including screening, was accompanied by substantial reductions in pneumonia rates. The relative decrease in the pneumonia rate was 87%. In addition Doggett et al. stated that “aspiration must be considered an imperfect or surrogate marker of pneumonia risk” (p 294) because there is evidence that other factors, such as immunological status and oral hygiene, play significant roles in the aetiology of pneumonia (Langmore et al. 1998). In conclusion, previous reviews have not focused on non-invasive and non-instrumental screening methods to be used by nurses, nor have these focused on eating difficulties in general.

AIM

This review aims at systematically capturing and evaluating current peer-reviewed published literature about non-instrumental (besides pulse oximetry) and non-invasive screening methods for bedside detection of eating difficulties among persons with stroke.

MATERIALS AND METHODS

The literature search was done in Medline (1964 – October 2004) using the search string "(eating OR deglutition disorders) AND (assessment OR screening) AND (cerebrovascular accident OR stroke OR cerebrovascular disorders OR cerebrovascular disease)" limited to "All adult; 19+ years" and "English". The search and selection of studies was broad, so as not to exclude studies that may have contained screening methods pertinent to the aim.

The papers included in the review were to be primary research in which a scale had been described and tested. Thus papers describing secondary research (simple overview, systematic review) were not included, nor were abstracts or conference reports. In addition, a clear distinction was made between "assessment" (excluded) and "screening" (included), whether the scale was instrumental (excluded, besides pulse oximetry) or not (included), invasive (excluded) or not (included). In addition, it was critically reviewed whether the pertinent validity and reliability analysis was presented; if not, the article was excluded. Articles pertaining to pulse oximetry were retained as nurses can regard this method as practicable.

Altogether there were 234 references that were reviewed for their relevance in relation to the research question, resulting in a first exclusion of 123 papers. The remaining 111 papers went through a second review and during this process a further search through the reference lists of

the retrieved articles was made for relevant links, revealing 17 such links. Of the 128 (111+17) articles, 17 were retained for in-depth description and analysis. Of these, 13 dealt with dysphagia and four dealt with eating difficulties in general.

A quality assessment was performed based on selection bias, sample size and analysis resulting in a rating of the level of evidence as being strong, moderate or weak (Table 1). Based on the levels of evidence assigned to each study the recommendation could be graded from A—D (from strong to insufficient) (Table 2). It is important to note that the grade of recommendation relates only to the strength of the evidence on which the recommendation is based and does not reflect the clinical importance of the recommendation.

INSERT TABLE 1 & TABLE 2

RESULTS

The reviewed articles could be divided into: Screening for eating difficulties; Screening for dysphagia/aspiration using the Standardised bedside Swallowing Assessment (SSA); Combining pulse oximetry with water swallow test in screening for aspiration (Table 3); Screening for dysphagia using other methods than the SSA or pulse oximetry.

INSERT TABLE 3

Screening for eating difficulties

There were two methods described for screening of eating difficulties in general: the method of McLaren and Dickerson (2000) and that of Westergren et al. (2001, 2002a, 2002b). McLaren and Dickerson (2000), used partly the same eating observation items (communication, vision/perception, arm movement, posture, attention, chewing, lip closure,

reflex swallow) as those described by Westergren et al. (Ingestion; Sitting position, manipulating of food on the plate, transport of food to the mouth; Deglutition; opening and/or closing the mouth, manipulating the food in the mouth (leakage, hoarding, chewing difficulties), swallowing; Energy; eating three-quarters or less of served food, alertness, aberrant eating time (slow or forced)). In the study by McLaren and Dickerson (2000) an ordinal level of scoring for items was used while the studies by Westergren et al. (2001; 2002a; 2002b) used a nominal level of scoring.

McLaren and Dickerson (2000) based their instrument on research literature, in conjunction with mealtime observations. The method described by Westergren et al. (2002a) was initially developed in 1996 by Karin Axelsson, Department of Health Sciences, Luleå University of Technology, and further refined by Westergren et al. (2002a).

McLaren and Dickerson (2000) found a moderate to almost perfect interobserver reliability with Kappa ranging from 0.65 to 0.95 in observing patients with need for assisted eating. Westergren et al. (2001; 2002a; 2002b) did not test interrater reliability in their studies. However, in conjunction with the observation form a guide was developed that probably could minimise observer bias and thus provide a satisfactory interobserver reliability. In addition, internal consistency proved to be good, as Cronbach's alpha was above 0.70 and below 0.90. The internal consistency of the eating assessments, when used by registered nurses in patients at a stroke rehabilitation ward, was Cronbach's alpha 0.78 (Westergren et al. 2001).

Among patients with stroke and assisted eating (n=75), various eating difficulties were found to affect the ability to eat enough and thereby increased the likelihood of malnutrition

(McLaren and Dickerson 2000). The value of the instrument as a screening tool (aimed at uncovering latent need) is undermined by the fact that only those in need of assisted eating were included. The method described by Westergren et al. (2001; 2002a; 2002b) was found to predict the need for assisted eating, nutritional status, length of hospital stay as well as need for institutional care after discharge from hospital. Thus, both screening methods were shown to have importance for clinical outcomes, although the method by Westergren et al. had been tested more extensively in this respect. In addition, the method by Westergren et al. (2001) had been tested among all patients with stroke irrespective of whether they had assisted eating or not.

Screening for dysphagia/aspiration using the SSA

SSA has been designed to be used both as a research tool and as a simple dysphagia-screening test to be used by non-specialists. David G Smithard and Rosemary Wyatt initially developed the SSA with the aim of developing a single screening restricted to one side of a sheet. David Barer and John Ellul added further comments (Smithard et al. 1998).

SSA involves three stages: general assessment (conscious level, postural control, voluntary cough, voice quality and ability to swallow saliva), sipping water from a spoon, and if safe then proceeding to drink water from a glass. Specific clinical signs (e.g. voice quality, coughing) are recorded, and an overall judgement on swallowing safety is made. If no problems are present the patient can either be given a normal diet, and fluids under observation to ensure that there are no problems once swallowing a normal diet or given oral fluids and puréed diet and then reviewed after 24 hours. If the patient shows any problems

non-oral nutrition should be considered. In addition, referral to a speech therapist or a nurse specialising in dysphagia should be considered as well as videofluoroscopy.

Interobserver and intraobserver reliability levels for SSA vary between studies, with values of Kappa = 0.24 to 0.48 between doctors and SLTs, 0.50 between doctors, 0.79 between SLTs (Smithard et al. 1997; 1998) quoted. Nurses who completed an education and training programme achieved very good agreement (Kappa 0.88, exact agreement 94%) between screening and summative clinical judgement of swallowing function (n=68, Perry 2001b).

Using the SSA for detection of aspiration shows variable sensitivity (47% to 68%), specificity (67% to 86%), PPV (positive predictive value 38% to 50%) and NPV (negative PV 85% to 88%) when used by SLTs and doctors (Smithard et al., 1997, 1998). Using the SSA for detection of dysphagia ("summative clinical judgement") showed a sensitivity of 97%, specificity 90%, PPV 92% and NPV 96% and an accuracy of 86% when used by nurses (Perry 2001a). Thus, SSA is more specific for dysphagia in general than for aspiration specifically. SSA has been shown to be a stronger predictor of complication rates and functional outcome than the VFSS (Smithard et al. 1996).

In a quasi-experimental study including 200 patients pre-test and 200 patients post-test SSA was implemented; in addition there was a project leader, and an educational programme was provided to nursing and medical staff. With this intervention the length of time waiting for a swallowing assessment was reduced, as well as the time that patients with dysphagia had no oral feeding, and the 6-month incidence of chest infections and sepsis of unknown origin was reduced (Perry and McLaren 2000).

Combining pulse oximetry with water swallow test in screening for aspiration

Pulse oximetry provides a non-invasive method of bedside swallow testing. A desaturation of more than 2% from baseline has been found to relate to aspiration on VFSS (Smith et al. 2000) and on FEES (Lim et al. 2001; Chong et al. 2003). The best sensitivity and specificity was achieved when desaturation was combined with a bedside exam including water swallow test (sensitivity 73% to 100%, specificity 62% to 76%, PPV 55% to 84%, NPV 83% to 100%) (Chong et al. 2003; Lim et al. 2001; Smith et al. 2000). When a measure of desaturation was added to a Water Swallow Test (WST) the chance of detecting silent aspirators increased as compared to only using a WST (Lim et al. 2001).

Screening for dysphagia/aspiration using other methods than the SSA or pulse oximetry

These studies are not presented in detail (in text or table) due to the journal´s word limit and also due to that they could not form the basis for any clinical recommendations at this point. In one study a timed WST was used as a criterion for having dysphagia and the outcome was compared with intervention by SLTs (n=115, graded as “strong”, Hinds and Wiles 1998). In another study dysphagia was defined as complaints about or observation of swallowing difficulties (coughs or makes efforts when drinking processed sour milk and/or water). The outcome of the screening was compared with continuous observations and documentation (n=160, graded as “strong”, Westergren et al. 1999). One dysphagia-screening test (Burke Dysphagia Screening Test, BDST) was developed for use within stroke rehabilitation settings (n=139, graded as “strong”, DePippo et al. 1992; n=44, graded as “weak”, DePippo et al. 1994).

DISCUSSION

Based on the best evidence so far, a recommendation for an evidence-based practice can be put forward. The method described by Westergren et al. (2001; 2002a; 2002b) for detecting eating difficulties was regarded as reliable, including observation of nine eating difficulties in three categories, i.e. ingestion, deglutition and energy. There was one method that seemed particularly reliable in detection of dysphagia, including aspiration, namely the "Standardised Bedside Swallowing Assessment" (SSA), which includes a WST. Studies indicate that pulse oximetry can be an important complement to the water swallow test, especially as it is likely to increase the possibility of detecting silent aspiration.

It can be seen as a study limitation that the literature search only was performed in Medline. A further search through the reference lists of the retrieved articles was however made for relevant links decreasing the likelihood that important studies unintenionally was overlooked. The recommendations have importance for nurses within acute stroke care world-wide and are not likely to be limited due to local context besides that access to pulse oximetry might be limited in some facilities due to limited resources. Otherwise, the methods recommended can possibly be used in any facility.

It might be that the criteria used for quality assessment (Table 1) were too generous and caused a bias towards "strong evidence". However, this review was conducted in a systematic manner detailing its methodology to ensure a reproducible summary of the available literature on detection of eating difficulties after stroke. In addition, it must be recognized that many of today's nursing questions must be answered in the absence of strong evidence, and that failure to do so imposes several limitations on the practical applications of an evidence-based nursing.

To optimise the eating and nutritional situation for the patient with stroke it seems necessary for nurses not only to screen for dysphagia. Other aspects of eating need to be taken into account as well. If only dysphagia is screened for, the other eating difficulties can be overlooked and malnutrition may develop. The impact of various eating difficulties on nutritional status has not received great attention in research. It was however found in this systematic review that among patients with stroke and assisted eating (n=75), various eating difficulties affected the ability to eat enough and thereby increased the likelihood of malnutrition. For instance, impaired arm movement, lip closure and swallowing were found to be significant predictors of 24-hour energy intake in patients with stroke (McLaren and Dickerson 2000). In the study by Westergren et al. (2001) alertness, swallowing difficulties, amount of food eaten and eating speed were found to be significant predictors of nutritional status. However, the method described by McLaren and Dickerson has limitations in that only patients with assisted feeding were screened. It seems necessary to test this method among all patients with stroke, especially as eating difficulties have been found to occur among 62% of patients with stroke and without assisted feeding (Westergren et al. 2001). For nurses to be able to adapt nutritional and eating interventions one must consider eating problems in isolation as well as within the complexity of other coexisting difficulties, especially as one difficulty can negatively interfere with another difficulty.

Considering dysphagia, the screening method would cover dysphagia in general and aspiration specifically. In the reviewed studies dysphagia was most commonly defined as aspiration detected on VFSS or on FEES. This is in contrast with the view that dysphagia is an abnormal oropharyngeal swallow physiology and that aspiration is a consequence of dysphagia rather than a diagnostic marker. Martino et al. (2000) stated that a broader definition of dysphagia including not only aspiration but also abnormal physiological

parameters could possibly bring dysphagia screening tests to prominence. The studies indicate that the SSA method detects dysphagia rather than only aspiration as SSA was found to have better sensitivity and specificity in relation to summative clinical judgement than to aspiration. However, in the acute phase of stroke an important consideration is whether there is a risk of aspiration or not and thus if oral feeding is suitable. This would be possible to detect by doing a VFSS or FEES. Although a detailed examination of swallowing mechanisms may be desirable, it is usually difficult and unnecessary to subject patients to such procedures. They may have greater relevance in patients with persistent dysphagia, bearing in mind that swallow recovers in >80% of patients within 2 to 4 weeks of stroke onset (Gordon et al. 1987; Smithard et al. 1997). In addition, the clinical importance of doing VFSS or FEES in all patients can be questioned, as bedside signs of aspiration had greater predictability for later development of pneumonia than the VFSS had (Smithard et al. 1996). In addition dysphagia is an important risk for developing aspiration pneumonia, but generally not sufficient to cause pneumonia unless other risk factors are present as well (Langmore et al. 1998). For nurses to detect dysphagia the SSA method seems useful together with interviews. However, in the clinical setting this has to be done in conjunction with an overall assessment of the patient's health status including oral health.

Recommendation

Today's best evidence-based practice for detecting eating difficulties in acute stroke includes as the first step the SSA method to detect dysphagia and ensure safe swallowing (grade A, strong evidence). As the second step an observation of eating should be done as described by Westergren et al. (2002a) (grade B, moderate evidence). Applying pulse oximetry simultaneously to the water swallow test in SSA and two minutes after can possibly add to the accuracy of detecting aspiration, especially silent aspiration (grade C, limited evidence). In

patients with acute stroke nurses should use the above methods as a complement to interviews in order to ensure that eating difficulties are discovered and the necessity for further assessments and adapted interventions can be planned.

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Table 1. Quality assessment, components and ratings

Components	Strong	Moderate	Weak
Selection bias	Representative of the target population. Participation rate 80% or above.	Somewhat likely to be representative of the target population. Participation rate between 60% and 79%.	Not likely to be representative.
Sample size [1)]	Above 100	Between 50 and 100	Below 50
Analysis	Validity or reliability analysis performed. Well described.	Validity or reliability analysis performed. Well described.	Validity or reliability analysis performed. Partly described.

[1)] For intra- or interjudge reliability analysis

Table 2. Grades of recommendation

Grade	Scientific evidence	Strength of evidence
A	Strong	At least two independent studies with strong level of evidence.
B	Moderate	One study with strong level of evidence and at least two with moderate level of evidence
C	Limited	At least two studies with moderate level of evidence
D	Insufficient	Other than A—C.

Table 3. Screening for eating difficulties, dysphagia/aspiration using the SSA and combining oxygen desaturation with a WST in screening for aspiration.

Author(s)	Aims	Informants	Design, methods	Rating
EATING				
McLaren & Dickerson (2000)	To develop an ordinal scaled instrument, investigate influence on dietary intake	Phase I: n=60 Phase II: n=75 with stroke, acute, eating with assistance	Cross-sectional in two phases (I) instrument development, (II) assessing validity, reliability. Eight eating difficulties	Weak
Westergren *et al.* (2001)	To describe types and extent of eating difficulties	162 with stroke, rehabilitation, nine excluded due to internal dropout	Prospective, Consecutively included. Structured observations of nine eating difficulties. Nutritional assessment.	Strong
Westergren *et al.* (2002a)	To describe associations between eating difficulties and their associations to assisted eating and nutritional status	520 elderly patients within hospital rehabilitation (41% had stroke), 30 had been excluded due to reduced consciousness / did not eat orally	As above + factor analysis	Moderate
Westergren, Ohlsson & Hallberg (2002b)	To examine eating difficulties in relation to length of stay (LOS) and discharge to institutional care	108 with stroke and having at least one eating difficulty, rehabilitation	As above + longitudinal	Moderate
SSA				
Perry (2001b)	To compare SSA used by nurses with clinical summative judgement of swallowing function	68 complete screening episodes out of 165 assessable patients	SSA, clinical summative judgement. Training and education of nurses.	Weak
Perry (2001a)	To establish sensitivity and specificity of SSA for use by nurses	200, acute stroke of whom 35 were not assessable within the first 24 h. Of these 21 were designated TLC (Tender Loving Care)	SSA compared to a summative clinical judgement of dysphagia. Training programme for nurses.	Moderate
Perry & McLaren (2003)	To implement and evaluate evidence-based guidelines for nutrition support	Pre-test n=200, post-test n=200, acute stroke	Pre-test and post-test design. Implementation of evidence based guidelines for nutritional screening, assessment and support including the SSA.	Strong
Smithard *et al.* (1996)	To ascertain the relationship between dysphagia, outcome and complications	145, acute stroke, of these 28 had a reduced level of consciousness and were inaccessible.	Prospective, consecutive patients with acute stroke. VFSS blinded to BSE. Assessed by physician.	Strong
Smithard *et al.* (1997)	To compare BSE done by SLT and doctor with VFSS	121, acute stroke, of these 28 were not assessable during the study period.	Longitudinal study, patients were followed prospectively (6 months). BSE and VFSS. Assessed by doctor and SLT. Dysphagia defined as risk for aspiration.	Strong
Smithard *et al.* (1998)	To investigate the ability of a BSE to reliably exclude aspiration following stroke	94 patients undergoing SSA and VFSS, acute stroke, medical fit and conscious.	BSE and VFSS, assessed by doctor and SLT. Dysphagia defined as risk of aspiration.	Moderate
OXIMETRY				
Chong *et al.* (2003)	To assess the usefulness of a clinical	50 patients referred to SLT, 65+, hetero-	WST, 10 ml x 5 + oxygen desaturation ($\geq$ 2%) (during and up to 2 minutes	Weak

	screening tool for detecting dysphagia	geneous group (both acute and previous stroke)	after the swallow test) and combination of these – compared with aspiration on FEES. Dysphagia defined as aspiration on FEES.	
Lim *et al.* (2001)	To determine the accuracy of BSE compared with FEES	50, acute stroke patients, conscious, those with insufficient lip seal were excluded,	50 mL in 10-mL aliquots + oxygen desaturation (≥ 2%) (after a rest period of 10 minutes). Dysphagia defined as aspiration on FEES.	Moderate
Smith *et al.* (2000)	To assess the predictive value of pulse oximetry and SLT's BSE in detection of aspiration and penetration on VFSS	53, acute stroke, conscious	Double blinded observations, oxygen desaturation (≥ 2%) (during swallow test and 2 minutes thereafter), SLT, VFSS. Dysphagia defined as aspiration on and/or penetration on VFSS.	Moderate

BSE = Bedside swallowing examination, FEES = Fibre optic Endoscopic Examination of Swallowing, SLT = Speech language therapist, SSA = Standardised bedside Swallowing Assessment, VFSS = Videofluoroscopic Study of Swallowing, WST = Water Swallowing Test