

Spontaneous Swallow Frequency Compared with Clinical Screening in the Identification of Dysphagia in Acute Stroke

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Background: The aim of this study was to compare spontaneous swallow frequency analysis (SFA) with clinical screening protocols for identification of dysphagia in acute stroke. **Methods:** In all, 62 patients with acute stroke were evaluated for spontaneous swallow frequency rates using a validated acoustic analysis technique. Independent of SFA, these same patients received a routine nurse-administered clinical dysphagia screening as part of standard stroke care. Both screening tools were compared against a validated clinical assessment of dysphagia for acute stroke. In addition, psychometric properties of SFA were compared against published, validated clinical screening protocols. **Results:** Spontaneous SFA differentiates patients with versus without dysphagia after acute stroke. Using a previously identified cut point based on swallows per minute, spontaneous SFA demonstrated superior ability to identify dysphagia cases compared with a nurse-administered clinical screening tool. In addition, spontaneous SFA demonstrated equal or superior psychometric properties to 4 validated, published clinical dysphagia screening tools. **Conclusions:** Spontaneous SFA has high potential to identify dysphagia in acute stroke with psychometric properties equal or superior to clinical screening protocols. **Key Words:** Dysphagia—acute stroke—screening—swallow frequency. © 2014 by National Stroke Association

Dysphagia screening poststroke is related to reduced morbidity and mortality¹⁻³; specifically, pneumonia rates are lower among stroke patients who pass dysphagia screening.³ Dysphagia screening poststroke is intended

as a brief, valid, and reliable tool administered to all new stroke admissions that is both sensitive and specific to dysphagia risk in the acute poststroke period. Dysphagia screening is intended to be completed before the administration of any food, liquid, or medications by mouth.⁴⁻⁶ As a result, dysphagia screening tools have been employed in the emergency department, on admission to acute care stroke units, and even on admission to rehabilitation hospitals.⁷⁻⁹ Most dysphagia screening tools proposed for acute stroke incorporate some form of limited clinical examination plus/minus a test swallow of 1 or more materials.⁴⁻⁶ As a result, clinical screening protocols for dysphagia require available, trained personnel and some degree of cooperation from the patient. Furthermore, many proposed clinically based screening protocols suffer from limited psychometric properties,^{4,6} and no current consensus exists regarding which clinical items to include in dysphagia screening protocols.⁵ Collectively, these limitations may contribute to a reported low adherence rate for dysphagia screening in acute stroke.^{3,10} These practical considerations may have contributed to the action of the

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Joint Commission to retire dysphagia screening as a performance measure in 2010.³

An alternative to clinical dysphagia screening protocols may be the evaluation of spontaneous swallowing frequency. Spontaneous swallowing is one of a group of aerodigestive reflexes supporting airway protection.¹¹⁻¹⁵ Reduction in spontaneous swallowing frequency rate has been demonstrated as a sensitive index of dysphagia in various clinical populations including acute stroke.¹⁶⁻¹⁹ The current study compared psychometric properties of spontaneous swallow frequency analysis (SFA) with a clinical dysphagia screening protocol completed as the standard of care by stroke nurses in the identification of dysphagia in patients with acute stroke. In addition, we compared psychometric properties of spontaneous SFA to 4 published, validated clinical dysphagia screening protocols highlighted in a recent systematic review.⁶

Methods

Subjects

Between May and July 2012, consecutive stroke admissions were monitored and those meeting inclusion criteria were recruited for inclusion in this study. Inclusion criteria were age of 21 years or older with confirmation of acute stroke by neurologic examination and imaging study. Exclusion criteria were trauma or anatomical alteration to the head-neck region, pre-existing conditions contributing to dysphagia, intubation at the time of recruitment, and patient/proxy refusal to participate in this study. Patients with recurrent stroke were included as long as they did not meet any of the exclusion criteria. Each participant received all stroke and swallowing clinical examinations including both dysphagia screening protocols. The local institutional review board (IRB) approved the study, and all patients or their approved proxy signed an IRB-approved consent form.

Stroke Assessments

The primary metric of stroke severity was the National Institutes of Health Stroke Scale.^{20,21} The modified Rankin Scale^{22,23} was used as a metric of stroke impairment, and the modified Barthel Index^{24,25} was employed as a metric of functional impairment. Finally, the Glasgow Coma Scale²⁶ was used as an index of consciousness.

Swallowing/Dysphagia Assessments

The Mann Assessment of Swallowing Ability (MASA)²⁷ is a stroke-validated clinical assessment of swallowing. The MASA served as the criterion referent in this study. An MASA score of 178 or less (from a total of 200 possible points) indicates the presence of dysphagia. A second index of dysphagia, the Functional Oral Intake Scale (FOIS),²⁸ is a stroke-validated metric of functional oral intake of food and liquid.

Spontaneous Swallow Frequency Analysis

A previously validated approach was used for spontaneous SFA.²⁹ This approach uses the acoustic signature of swallowing to calculate the rate of spontaneous swallowing over a fixed time period as swallows per minute. Spontaneous swallow frequency was measured with an acoustic recording obtained via a miniature microphone (VT506; Voice Technologies, Zurich, Switzerland) connected to a digital voice recorder (Olympus DS-40). The microphone was adhered to the skin of the anterolateral neck just below the lateral cricoid cartilage in the area identified by Takahashi^{30,31} as optimal to record swallow sounds. Rycote was used to affix the microphone over the recording area (Rycote Microphone Windshields Ltd, Gloucestershire, UK). Recordings were obtained over a 30-minute interval with all patients resting quietly in bed. All recordings were analyzed off-line using an acoustic software program (TF 32; P. Milenkovic, Madison, WI), which displayed a visual trace of the recording simultaneously with the auditory signal. Two independent judges reviewed all recordings in 1-minute segments to identify the presence or absence of swallow activity. Judges were blinded to the clinical status of all acute stroke cases. Spontaneous swallowing frequency rate was calculated as swallows per minute for each 30-minute recording.

Independent Nurse Screening for Dysphagia in Acute Stroke

The care pathway for acute stroke in our facility incorporates a nurse-administered clinical screening for dysphagia. All stroke nurses in this certified primary stroke center have been trained to criterion on the use of this tool with adherence rates approaching 75% of all stroke admissions.³² This tool has not been psychometrically validated but is reflective of many dysphagia screening protocols currently in use.^{5,6} Clinical judgment of 6 items, alertness, voice, speech, coughing/choking, difficulty managing secretions, and patient/family report of present or prior dysphagia, is used to make a determination of dysphagia risk for each patient. Each item is presented as a yes/no question, and any "yes" response results in the patient being placed on no oral intake status and referred to the speech-language pathology (SLP) service for comprehensive swallowing evaluation. Thus, identification of dysphagia on this screening protocol was represented by a "yes" response to any item in the protocol with resulting referral to SLP for comprehensive dysphagia assessment.

Comparison of Swallow Frequency with Validated Clinical Dysphagia Screening Protocols

Schepp et al⁶ reviewed 35 dysphagia screening protocols for acute stroke and concluded that only 4 met basic psychometric quality criteria. Basic psychometric

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