

# A Validated Swallow Screener for Dysphagia and Aspiration in Patients with Stroke

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*Background:* Early detection of dysphagia is critical to reducing hospital complications and length of stay in patients with various types of strokes. The aim of this study was to develop and evaluate the DePaul Hospital Swallow Screener (DHSS) tool to assess for dysphagia in patients with stroke. *Methods:* This prospective observational study investigated patients admitted to a comprehensive stroke center. The DHSS is composed of a questionnaire containing 8 nonswallow items and a water swallow test. All patients admitted under a standard stroke protocol are screened by the nursing staff using the DHSS and then objectively evaluated by a speech-language pathologist using the Mann Assessment of Swallowing Ability (MASA). Validity measures and reliability through Cohen's  $\kappa$ -coefficient with associated 95% confidence intervals were calculated. *Results:* A total of 224 patients completed the DHSS and had at least 1 MASA score. The overall Content Validity Index score for the DHSS was .92. Compared with the MASA dysphagia cutoff value, the DHSS had a specificity of 93% and a sensitivity of 69%, and compared with the MASA aspiration risk cutoff value, the DHSS had a specificity of 90% and a sensitivity of 70%. Stratified analysis for those with any documented stroke (ischemic or hemorrhagic) compared with those admitted with transient ischemic attack or no stroke yielded similar sensitivity and specificity in both dysphagia and aspiration risk. *Conclusion:* The DHSS is a valid and reliable swallow screening tool with moderate agreement, high specificity, and reliable predictive values when compared with the MASA. **Key Words:** Dysphagia—questionnaire—aspiration—nursing.  
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## Introduction

According to the American Stroke Association, stroke is the leading neurological cause of dysphagia or diffi-

culty in swallowing.<sup>1</sup> Dysphagia after stroke may occur in 42%-67% of patients within the first 3 days.<sup>1,2</sup> Early detection and treatment of dysphagia and/or risk of aspiration is critical in improving swallowing function during a patient's hospital course. Aspiration pneumonia, a severe risk of undiagnosed or untreated aspiration, can compromise the patient's health and increase morbidity, hospital costs, and length of stay.<sup>3-5</sup> The American Stroke Association and other societies such as the American Speech-Language-Hearing Association and the Veteran's Health Administration recommend screening for dysphagia in patients with stroke prior to oral consumption of food, liquid, and/or medications.<sup>6</sup> Therefore, a swallow screen is an essential step in the management of stroke patients and to assist in predicting dysphagia and determining the immediate risk of aspiration.<sup>7</sup> Early detection of

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dysphagia and risk of aspiration can increase patient safety by allowing for the timely and safe administration of oral medications.

Hospitals using mandatory and formal dysphagia screening tools have lower rates of aspiration pneumonia than those who do not.<sup>4</sup> A valid, reliable, and feasible swallow-screening tool is essential in today's health-care environments, as the demands for better outcomes and cost-effective hospitalization are warranted. Various tools have been utilized, most of which are self-designed. These tools include a combination of nonswallowing and swallowing components, which are the best predictors for aspiration.<sup>8</sup> Clinical predictors of dysphagia and aspiration include poor nutrition, tube feeding on admission, tongue and cough strength, secretion management (including the need for frequent suctioning), and the presence of dysphonia and/or dysarthria.<sup>9</sup> Rosenbek et al also identified spontaneous cough and wet voice after the water swallow test were significant predictors of dysphagia and aspiration.<sup>9</sup> Lastly, incomplete lingual range of motion and facial asymmetry were associated with a higher risk of aspiration.<sup>10</sup> In this study, we designed and validated a bedside tool, the DePaul Hospital Swallow Screener (DHSS), that assesses the presence of dysphagia and risk of aspiration in patients with stroke and/or stroke-like symptoms.

## Methods

### *DHSS and Validation Method*

The authors designed a clear, concise, and specific tool that includes a combination of nonswallow and swallow items (Table 1). The nonswallow items were selected on the basis of relevance to dysphagia, aspiration risk, neurological status, and importance to subject matter experts (SMEs). The 8 nonswallowing items chosen for the DHSS include alertness, presence of a feeding tube, presence of a tracheostomy tube, presence of drooling, facial asymmetry, abnormal tongue movement, abnormal vocal quality, and abnormal voluntary cough.<sup>8-10</sup> The swallow item chosen for our measure was the 3-oz water swallow test (WST).<sup>11,12</sup> Education on the DHSS was carried out in daily nursing huddles for all nurses directly involved in the care of stroke patients. All nursing staff performing the DHSS completed competencies to validate the correct administration of the tool.

The DHSS content validity was evaluated to assess the importance and applicability of the newly developed items when applied to patients admitted with the diagnosis of stroke under the stroke protocol. The content validity of the nonswallow items was evaluated by 6 SMEs and calculated using the Content Validity Index (CVI) method; the SMEs included speech-language pathologists (SLPs), nursing administrators, and physicians. The SMEs, which comprised vital members of the interdisciplinary team, were chosen based on their expertise in the daily treat-

ment of stroke patients. The DHSS content validity was quantitatively evaluated by the CVI method: the individual-item method (I-CVI) and the total score averaging method (S-CVI/Ave).<sup>13</sup> The CVI<sup>14</sup> assessment was executed using a 4-level rating scale (1 = not important; 2 = somewhat important; 3 = very important; 4 = essential) to score each of the 8 total items of the DHSS. The I-CVI for each item was calculated by dividing the number of SMEs that rated the item as important (SME designation 3 or 4) over the total number of SMEs.<sup>13</sup> The S-CVI/Ave of the entire DHSS was calculated by finding the mean of the I-CVI scores.<sup>13</sup> An S-CVI/Ave greater than or equal to .90 was considered excellent.<sup>15</sup>

### *Study Protocol and Variable Selection*

This prospective observational study was performed at SSM Health DePaul Hospital in St. Louis, Missouri, a designated comprehensive stroke center. The Institutional Review Board at SSM Health DePaul Hospital approved the study protocol. All patients included in this study were evaluated under a standard stroke protocol for the period of July 1, 2016 to November 30, 2016. The stroke protocol includes the completion of a swallowing screen performed by the nursing staff using the DHSS. The nonswallow and swallow items were used in combination with each other to achieve higher specificity. If the total score of the DHSS was equal or less than 5, the patient was considered to have passed the nonswallow items and underwent the WST. If the patient completed the WST without clinical signs of aspiration, defined as cough, throat clearing, change in respirations, and/or wet or gurgled vocal quality, the patient passed the DHSS and was placed on a regular consistency diet. If the patient demonstrated clinical signs of aspiration during or after the WST, the patient failed the DHSS and was kept nil by mouth. If the total score of the DHSS was equal or greater than 6, the patient was considered to have failed and was kept nil by mouth (or NPO). In all failed instances, whether during the questionnaire or WST, the patient was kept nil by mouth until evaluated by SLPs. In addition, all patients were objectively evaluated by SLPs using the Mann Assessment of Swallowing Ability (MASA).<sup>16</sup> The MASA is a clinical bedside evaluation tool for stroke patients that has been validated against the modified barium swallow and provides a clear operational definition for both dysphagia and aspiration risk.<sup>16</sup> A MASA score of 178-200 is considered to be the range for the absence of dysphagia, and a MASA score of 170-200 is considered the range for the absence of aspiration risk.<sup>16</sup>

Sociodemographic characteristics and variables related to stroke were selected based on clinical significance. These data items included age, gender, stroke-related comorbidities (hypertension, diabetes mellitus, hyperlipidemia, coronary artery disease, and smoking status), National Institutes of Health Stroke Scale (NIHSS)

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