A Feasibility Study of the Sensitivity of Emergency Physician Dysphagia Screening in Acute Stroke Patients

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Study objective: To determine the sensitivity of dysphagia screening by emergency physicians on acute stroke patients.

Methods: To develop a 2-tiered dysphagia screen and performed it on a convenience sample of acute stroke patients. Tier 1 examined voice quality, swallowing complaints, facial asymmetry, and aphasia. Tier 2 involved a water swallow test, with evaluation for swallowing difficulty, voice quality compromise, and pulse oximetry desaturation (≥2%). We classified patients passing both tiers as "low risk" and compared the screen's sensitivity to a formal assessment by speech language pathologists. To assess reproducibility, we performed 2 consecutive, blinded ED screens on a convenience sample of 32 patients.

Results: During 16 months, we enrolled a convenience sample of 103 patients, excluding 19 patients from data analysis for lack of a stroke discharge diagnosis (n=11), an incomplete speech language pathologist evaluation within 24 hours (n=7), or pneumonia on emergency department (ED) chest radiography (n=1). Of the 84 remaining patients, speech language pathologists identified dysphagia in 48. The sensitivity of the ED dysphagia screen was 96% (95% confidence interval [CI] 85% to 99%), with a negative likelihood ratio of 0.08 (95% CI 0.02 to 0.3). Reproducibility testing yielded a κ for the overall screen result of 0.9 (95% CI 0.9-1.0) and a simple agreement of 97%.

Conclusion: Preliminary data on the sensitivity and reliability of our ED dysphagia screening tool are promising. The simple screen provides an easy way for emergency physicians to identify acute stroke patients eligible for early oral medications and nutrition. Further validation and refinement of our screen are needed before its widespread adoption. [Ann Emerg Med. 2009;54:344-348.]

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INTRODUCTION

Dysphagia occurs in up to 67% of patients presenting with an acute stroke.[1,2] It is an independent predictor of poor outcome,[3-5] prolongs recovery, and lengthens hospital stay after stroke.[4] Most important, dysphagia predisposes to aspiration, which can result in pneumonia, causing approximately 35% of deaths after acute stroke.[1]

Studies show that dysphagia screening after stroke reduces the incidence of pneumonia[1,5] and improves overall outcome. Because of this benefit, The Joint Commission (TJC) recommends that "patients with ischemic or hemorrhagic stroke. . .undergo an evidence-based bedside testing protocol approved by the hospital before being given any food, fluids, or medication by mouth."[6] However, data are lacking about the best screen to perform, the period within which it should be conducted, and the qualifications necessary to perform a screening. Nonetheless, the use of some screening tool to identify stroke patients at risk for dysphagia has been shown to decrease pneumonia risk and improve overall outcome.[7] Although many institutions defer dysphagia screening to an inpatient stroke unit, this is undermined when stroke patients are admitted to hospital units unfamiliar with the need to perform dysphagia screening. Performing the screen in the emergency department (ED) can facilitate early identification of patients with aspiration risk but also identify patients at low risk for aspiration, which may enable early administration of oral intake and medication, as well as improve patient satisfaction.

We designed this study to determine whether emergency physicians could accurately identify low risk for dysphagia in

Editor's Capsule Summary

What is already known on this topic

Aspiration is common in patients with acute stroke. Dysphagia screening improves clinical outcomes but is usually performed after admission. Waits for inpatient screening often cause long delays in feeding patients or giving oral medications.

What question this study addressed

Can emergency physicians accurately screen acute stroke patients for dysphagia, using a simple tool?

What this study adds to our knowledge

In a pilot study of a convenience sample of 84 stroke patients, a short, simple dysphagia screen appeared feasible and identified 46 of 48 cases identified by standard inpatient screening.

How this might change clinical practice

Emergency physicians may identify patients with acute stroke in the emergency department (ED) who do not have dysphagia, avoiding unnecessary delays in oral medications and nutrition.

acute stroke patients by using a simple, sensitive screening tool. We hypothesized that patients passing our ED screening would be deemed as low aspiration risk by formal assessment by speech language pathologists.

MATERIALS AND METHODS

Study Design and Setting

We conducted a prospective cohort study at our 850-bed, tertiary-care, TJC-certified, primary stroke center located in the southeast. Our urban ED treats approximately 105,000 patients per year. Our institutional review board approved and monitored the study.

Selection of Participants

Between November 2006 and February 2008, emergency medicine attending and resident physicians identified, consented, and enrolled a convenience sample of acute stroke patients presenting to the ED within 24 hours of symptom onset. Initial treating physicians made a presumptive stroke diagnosis based on neurologic signs and symptoms consistent with a sudden loss of function involving the brain supplied by a specific vascular territory. Additional inclusion criteria were age greater than or equal to 18 years, a Glasgow Coma Scale score greater than 12, and hospital admission. Exclusion criteria included a nonstroke diagnosis (based on admitting or consultant physician evaluation), a primary brain lesion as the stroke cause, intubation before completion of the ED screening or speech language pathologist evaluation, a history of dysphagia or modified feeding route (ie, gastric or jejunal feeding tube or parenteral nutrition), a preexisting neuromuscular disorder, a history of head and neck cancer or radiation, a preexisting pneumonia on ED chest radiography, or pregnancy. Admitting or consultant board-certified neurologists confirmed the diagnosis of stroke. To determine the number of total stroke patients discharged from the hospital during the study period, we performed a discharge database query on *International Classification of Diseases, Ninth Revision* codes 431, 433, and 434. We chose a sample size of 100 for this preliminary investigation because the incidence of dysphagia in our stroke population and the accuracy of our screen were unknown.

Interventions

Our ED bedside dysphagia screen consisted of a 2-tiered approach developed by our Department of Speech Pathology. It included known indicators of dysphagia (Figure). Emergency medicine resident or board-certified attending physicians caring for the patient conducted the screening. The only training physicians received on the screening consisted of an explanation of the screening by one of the study authors (D.E.T.-L.). Patients failed the first tier of the screening for the presence of any positive findings for swallowing complaints, abnormalities of voice quality, facial asymmetry, or either expressive or receptive aphasia. Patients successfully passing the first tier underwent a water swallow test by drinking approximately 10 mL of water from a Styrofoam cup without a straw, while seated in an upright position. Patients were deemed to have failed the water swallow test if they coughed or choked during the water drinking or had a change in voice quality after the swallow. Additionally, oxygen desaturation was monitored during and 120 seconds after the water swallow test. A pulse oximetry decrease of greater than or equal to 2% was considered a positive result, according to a calculated decrease between the baseline oxygen saturation and the minimum saturation during the 120 seconds after the water swallow test.

To assess interrater reliability for the overall result of the bedside screening, we performed 2 screenings on a subset convenience sample of 32 patients. An emergency medicine resident or board-certified attending physician, who was blinded to the results of the first screening, performed the second screening. For patient safety reasons, the convenience sample was enrolled when a study author was present within the ED, so that no patient failing one of the tier 1 screenings underwent a water swallow test.

Data Collection and Processing

A total of 45 physicians collected ED dysphagia screening results, including the time screenings were performed, on a standardized form, with entry later into an Excel database (Microsoft Inc., Redmond, WA). A study author (D.E.T.-L. or S.J.S.), blinded to ED and speech language pathologist results, collected demographic variables and clinical information from the medical record by using a coding book with detailed definitions. We entered these data onto a standardized form,

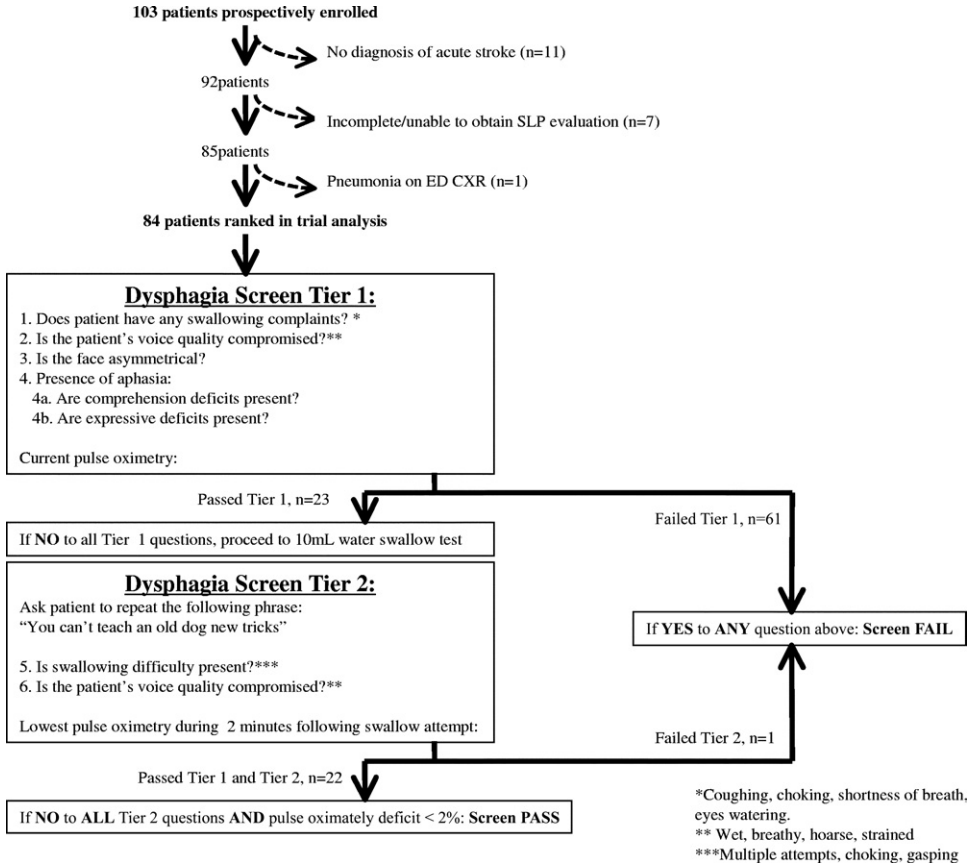

Figure. Patient enrollment and ED dysphagia screen. *SLP,* Speech language pathologist; *CXR,* chest radiograph.

with later entry into a Web-based data registry (TEMPO; Clinipace, Inc, Morrisville, NC). We conducted monthly meetings to review coding rules. We merged our 2 study databases by using a common unique identifier.

Outcome Measures

We compared overall results of the ED dysphagia screening to a standardized dysphagia assessment performed by a speech language pathologist within 24 hours of ED presentation (Figure E1, available online at http://www.annemergmed.com). Speech language pathologists were blinded to the results of the ED dysphagia screen. We considered any recommendation by a speech language pathologist for modification in the solid or liquid component of the patient's diet as our criterion standard for a failed dysphagia screening. Development of a clinically significant pneumonia was determined by 2 study authors (D.E.T.-L. and A.W.A.) according to review of each patient's discharge summary, chart progress notes, chest radiography, and sputum cultures.

Primary Data Analysis

We assessed the accuracy of the ED dysphagia screen by calculating sensitivity, specificity, and likelihood ratios, including 95% confidence intervals (CIs). We calculated agreement between the 2 screens by simple agreement and unweighted κ's coefficient. We used VassarStats Statistical Calculator for all analyses.[8]

RESULTS

During the 16-month study enrollment period, we prospectively enrolled 103 patients. During that same period, 727 stroke patients were discharged from our hospital. Among the 103 enrolled patients, we excluded 19 patients from the final data analysis for lack of a discharge diagnosis of acute stroke, an incomplete speech language pathologist evaluation within 24 hours, or pneumonia on initial ED chest radiography (Figure). We list the patient characteristics of the 84 patients included in the data analysis in Table 1. Table 2 summarizes the accuracy of the ED screening results compared with those of the speech language pathology evaluation. Twenty-three patients (27%) passed tier 1 of the screening, with only 1 patient failing tier 2 (Figure). Of the 6 patients receiving thrombolytic therapy, one failing the ED screen passed the speech language pathologist evaluation, which was completed 14.8 hours after the ED screening. We detected development of clinically significant pneumonia during hospitalization in 5 patients (6%). All 5 of these patients failed the first tier of the ED dysphagia screening and all had strictly modified speech language

Table 1. Patient characteristics.

Study Cohort	N=84
Average age, y	62 (SD 16.2)
Sex, %	
Male	56
Female	44
Race, %	
Caucasian	52
Black	43
Other	5
Stroke type, %	
Ischemic	69
Hemorrhagic	31
Comorbidities, %	
Diabetes	21
Hypertension	73
Atrial fibrillation	14
Dyslipidemia	31
Treated with thrombolytics	6
Median patient length of stay, days	6 (IQR 4, 8)
Discharge destination, %	
Home	37
Home health aid	10
Rehabilitation facility	37
Subacute nursing facility	7
Hospice	2
Dead	7

Table 2. Accuracy of ED dysphagia screen compared to speech language pathologist evaluation.*

ED Dysphagia Screen	Speech Language Pathologist Evaluation	
	Dysphagia Present	Dysphagia Absent
ED screen fail	46	16
ED screen pass	2	20
Test characteristics		
Sensitivity, %	96 (85, 99)	
Specificity, %	56 (38, 72)	
Positive likelihood ratio	2.2 (1.5, 3.1)	
Negative likelihood ratio	0.08 (0.02, 0.3)	

*Refers to the overall results of the ED screening.

pathologist–assigned diets, with 3 of 5 patients developing pneumonia despite being maintained nothing per mouth.

Emergency physicians performed their dysphagia evaluation a mean of 2.3 hours (interquartile range [IQR] 1.5, 3.3) after presentation to the ED. The mean interval from ED presentation to speech language pathology evaluation was 14.8 hours (IQR 7.7, 19.3). On a convenience sample of 32 patients undergoing dual ED screening completed an average of 17 minutes apart, the interrater reliability (Cohen's unweighted κ value) for the overall outcome of pass versus fail was 0.9 (95% CI 0.9 to 1.0), with a simple agreement of 97%.

LIMITATIONS

Despite our promising results, our study has several limitations. First, as a preliminary study, our investigation was not powered to definitively demonstrate the accuracy of ED dysphagia screening. We lacked enrollment of a consecutive cohort and did not measure stroke severity or anatomic location. Selection bias for patients with moderate to high stroke severity may exist in our study population because a considerable number of the patients were discharged to extended care facilities. Additionally, almost one third of patients enrolled in our study experienced a hemorrhagic versus an ischemic stroke, which suggests an overall high stroke severity in our patient cohort. This may falsely increase agreement between the ED screening results and the speech language pathologist evaluation, as well as interrater reliability. Our standard criterion evaluation was performed almost 14 hours after the ED screening, so some patients may have experienced worsening or improvement of dysphagia between evaluations.

DISCUSSION

The importance of dysphagia screening is underscored by TJC, who include dysphagia screening of all stroke patients as a monitored performance measure for certified stroke centers.[6] Although various dysphagia screening strategies have been described in the literature, none have described screening in the ED performed by emergency physicians.[3-5] Our study suggests that dysphagia screening performed by emergency physicians is a feasible strategy for dysphagia screening in stroke patients. Our screen was easily completed an average of 156 minutes after patient arrival and had good interperformer reliability. Although we did not collect specific data on the time required to complete the screen, tier 1 of the screen can be routinely performed in less than a minute, with tier 2 taking about 2 minutes for pulse oximetry monitoring. We chose to have physicians, rather than ED nurses or aids, perform the screening because emergency physicians represent a smaller and more consistent group of ED practitioners than nurses in most settings. Furthermore, given our experience that a majority of stroke patients will fail tier 1 and not undergo tier 2, the perceived burden on physicians for performing this screen is minimal.

More than 50% of acute stroke patients are unaware of their decreased ability to swallow and, if left without strict, specific diet orders, can be at risk for clinically significant aspiration.[9] Our screen had 96% sensitivity for detecting aspiration risk, with only 2 patients with false-negative results, both of whom had only minor modification to the liquid component of their diet and neither of whom developed clinically significant pneumonia. Of the 5 patients who developed pneumonia, none passed the first tier of the ED screening and all had significant modifications made to their initial diets by speech language pathologist.

Our screen included known subjective and objective indicators of dysphagia to quickly assess a patient's risk of dysphagia. We developed a 2-tiered screen, which included a water swallow coupled with oxygen desaturation monitoring, because this results in a more sensitive screening than the use of clinical signs alone.[2,5] Because water swallow tests alone may

miss "silent aspirators," we coupled oxygen desaturation with our swallow test, according to previous studies showing good correlation of dysphagia detection by oxygen desaturation with that obtained with videofluoroscopy.[5,10] Nonetheless, considering that only 4% (n=1/23; 95% CI 0.1% to 22.0%) of patients failed tier 2, the value of including tier 2 in the screen is unclear. According to the proportions we experienced, a sample size of approximately 1,000 patients would be needed to more definitively determine the relative value of tier 2 of the screen.

Our preliminary experience with the sensitivity and reliability of our ED dysphagia screening tool is promising. The simple screen provides an easy way for emergency physicians to identify which acute stroke patients can be allowed early oral medications and nutrition. Further validation and refinement of our screen, with a larger, consecutive, and more varied stroke patient population, is needed before its widespread adoption.

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Author contributions: DET-L and AWA conceived the study, designed the trial, and obtained research funding. DET-L, MP, MFP, and AWA supervised the conduct of the trial, patient enrollment, and data collection. DET-L and SJS performed chart review and some data collection. DET-L and AWA provided statistical advice. DET-L performed all data analyses. DET-L drafted the article, and AWA contributed substantially to its revision. DET-L and AWA take responsibility for the paper as a whole.

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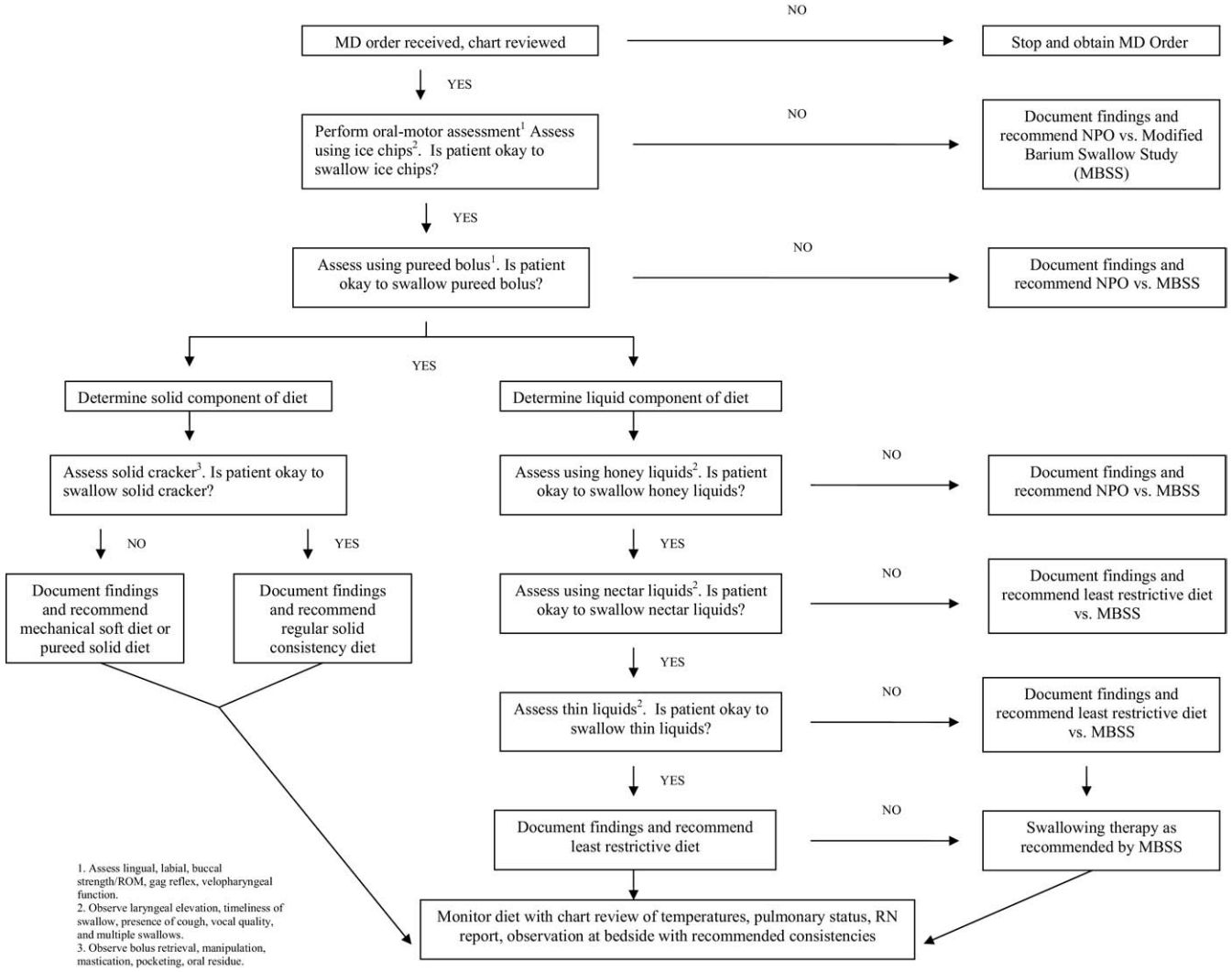

Figure E1. Speech language pathology standard criterion algorithm.