

Bedside Assessment of Swallowing: A Useful Screening Tool for Dysphagia in an Acute Geriatric Ward

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ABSTRACT

Aim: Dysphagia is common in the elderly and is associated with increased morbidity and mortality. We undertook a prospective study to determine the usefulness of a simple bedside swallowing test in terms of (1) detecting previously undiagnosed dysphagia, (2) agreement of the doctor's assessment with that of the speech therapist, (3) impact on subsequent feeding modality, (4) predicting risk of subsequent pneumonia.

Method: Patients in an acute geriatric ward who had no contra-indications to oral feeding were subjected to a bedside swallowing assessment by a geriatrician within 24 hours of admission. All patients found to be dysphagic were subsequently re-assessed by a speech therapist within 48 hours. In addition, every fifth patient deemed to have normal swallowing by the doctor was assessed by the speech therapist.

Results: Sixty-five patients were studied. The doctor's assessment was in very good agreement with the assessment of the speech therapist ($\kappa = 0.87$). Patients found to have dysphagia using the doctor's assessment protocol had an increased risk of developing pneumonia during their hospitalization (relative risk R.R.: 9.9 confidence interval C.I.: 1.2 - 81.2). Cough on swallowing and delayed swallowing were both found to be associated with an increased risk of developing pneumonia during the period of hospitalization (R.R.: 4.2, C.I.: 1.2 - 14.4; R.R.: 5.3, C.I.: 1.1 - 26.3 respectively).

Conclusion: A simple bedside swallowing test can be used as an effective screening tool in detecting hitherto undiagnosed dysphagia. The validity of this tool in the diagnosis of aspiration requires further investigation.

Keywords: dysphagia, bedside swallowing assessment, screening tool, geriatrics

INTRODUCTION

Swallowing dysfunction is a common problem in the elderly. Estimates of the prevalence of dysphagia vary from between 25% to 45% of all patients in the acute care setting, to 60% amongst the institutionalized elderly^(1,2,3,4). The high prevalence of dysphagia in the older population may be due, in part, to the increased prevalence with age of neurological conditions that can cause swallowing dysfunction⁽⁵⁾. These include stroke disease⁽⁶⁻⁹⁾, Parkinson's disease^(5,10) and dementia⁽¹¹⁻¹⁴⁾. In addition, ageing is known to be associated with physiological and structural changes that affect the process of swallowing^(1,7,15-17).

Dysphagia is an important cause of mortality and morbidity in the elderly^(1,18). In particular, dysphagia is known to be an important risk factor for the development of aspiration pneumonia⁽¹⁹⁻²¹⁾, which in itself is associated with a mortality rate of 45% amongst hospitalized elderly patients⁽²²⁾. The management and prevention of aspiration and its medical complications are paramount in the treatment of patients with dysphagia⁽¹⁹⁾. Hence it is important, at an early stage of hospitalization, to identify patients with swallowing difficulties.

Clinical bedside assessment of swallowing is commonly used as a screening tool for swallowing dysfunction^(23,24). While some authors have reported the usefulness of clinical indices^(6,24,25), others have criticized its lack of sensitivity and specificity^(11,23,26,27). The literature thus far, has however, been largely confined to two specific groups of patients: (1) patients with recent strokes and (2) patients who are in long-term care facilities. To our knowledge, there have been no published papers on the problem of dysphagia amongst older individuals who have taken ill acutely.

Furthermore, apart from clinicians who have a special interest in dysphagia, the problem of swallowing dysfunction is usually not addressed by internists who are involved in the care of hospitalized elderly patients. This may be due partly to the lack of a simple clinical tool that can be easily applied by the clinician for the detection of dysphagia in the general ward setting.

We conducted a prospective study to determine the

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usefulness of a simple bedside swallowing assessment, which can be applied by a junior doctor with minimal training in dysphagia assessment, in detecting swallowing dysfunction amongst acutely ill, hospitalized elderly patients with no previous history of dysphagia. We sought also to compare our diagnosis of dysphagia using our assessment protocol with the diagnosis made by the speech therapists based on their more thorough clinical assessment. The choice of feeding modality assigned for these patients by the doctor was compared with the recommendations of the speech therapist. Lastly, the usefulness of the assessment protocol in predicting the risk of these patients acquiring pneumonia during their hospitalization was evaluated.

METHODOLOGY

Study Design

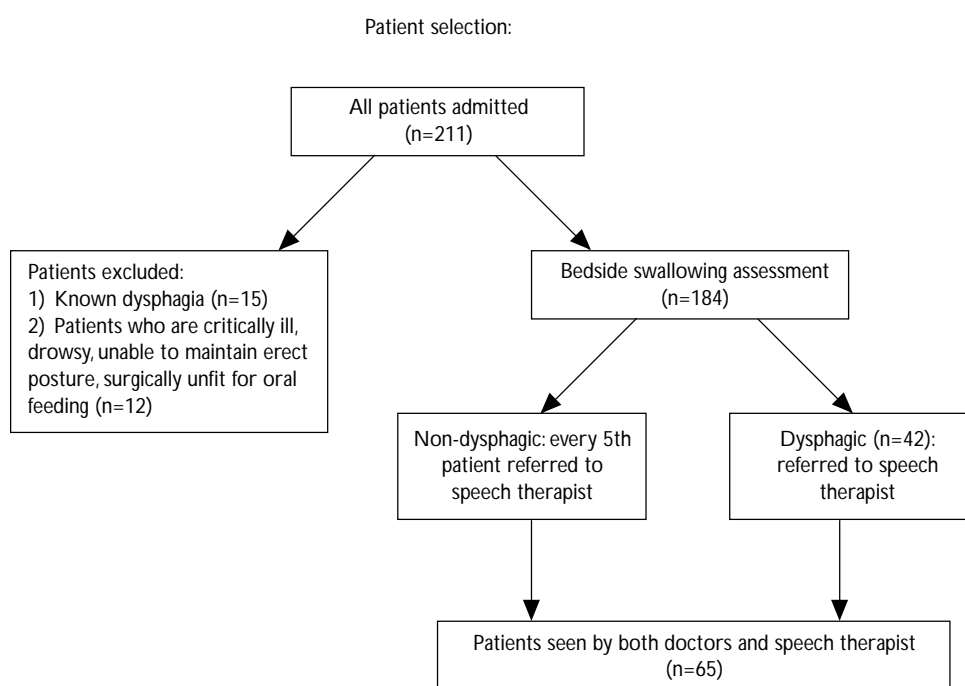
The Department of Geriatric Medicine, Tan Tock Seng Hospital, is a 64-bedded facility catering to the care of the acutely ill elderly patient. We function within a 1,131-bedded university-affiliated general hospital that is served by a total of 4 speech therapists. The scarcity of trained therapists makes it impractical for them to screen all elderly patients for possible dysphagia and thus identify those who may be at risk of aspiration.

A total of 211 patients were admitted to our department during the period from 21 July 97 to 21 October 97, of which 15 had a known history of dysphagia and were already on modified feeding programmes. In addition, patients who were critically ill, drowsy, unable to maintain an erect posture, or who had surgical conditions that precluded oral feeding were

excluded from the study (n=12). The remaining patients were subjected to a simple bedside assessment of swallowing by a geriatrician (A.L. or Y.Y.S.) within 24 hours of their admission. Consent was obtained from the patients, or their caregivers (for patients who were unable to give consent because of impaired cognition), prior to testing. A total of 184 patients were assessed, of which 42 were deemed to have swallowing dysfunction. These 42 patients were then referred to a speech therapist (S.Y.P.) for a more thorough assessment. In addition, every fifth patient who was not deemed to have swallowing dysfunction by our bedside assessment (n=23) was referred for further assessment by the same speech therapist (Fig. 1). The speech therapist was blinded to the results of the doctor's assessment. While we recognize that it would have been ideal for the speech therapist to assess every patient subjected to the doctor's bedside swallowing assessment, the scarcity of manpower in our hospital made this impractical. Based on their respective swallowing assessments (*vide infra*), both the clinicians and speech therapist would determine whether dysphagia was present and if so, recommend the appropriate feeding modality for the patient. The final assignment of feeding modality, however, adhered to the recommendations of the speech therapist.

The development of nosocomial pneumonia in our study patients was documented. The diagnosis of nosocomial pneumonia was based on the presence of new infiltrates on the chest radiographs or, alternatively, when three or more of the following features were present: (1) fever, with temperature higher than 37.5°C; (2) the presence of rales or rhonchi; (3) leukocytosis;

Fig. 1 Study Design.



(4) Gram stain of sputum showing many leukocytes; and (5) sputum culture showing respiratory pathogen^(14,19), with the onset being more than 72 hours after the time of admission.

Swallowing Assessment and Feeding Recommendations

Our bedside swallowing assessment protocol was designed by one of the geriatricians (A.L.) and was used on consenting patients within 24 hours of their admission. This protocol took into consideration age-related changes in swallowing physiology (delayed swallowing^(12,28)), as well as indices that were associated with increased risk of aspiration (cough on swallowing^(5,24,25), drooling^(5,29) and dysphonia^(5,17)).

The assessment protocol required the patient to drink 30 ml of water while seated in an upright position, following which observations were made for: (1) delayed swallowing, (2) the presence of drooling, (3) cough during or within 1 minute of swallowing and (4) dysphonia. A 30-ml swallowing test was used instead of the 3-oz (90-ml) swallowing test advocated by DePippo et al⁽²⁵⁾ because the former reflected the capacity of a disposable medication cup that was easily available within our wards. Based on the bedside swallowing assessment, a patient would be diagnosed by the clinician to have dysphagia if any one of these four observations were present.

Delayed swallowing was deemed to be present if the oropharyngeal transit time exceeded 2 seconds⁽¹⁰⁾. The oropharyngeal transit time was defined as the time from the introduction of the water bolus to the oral cavity, to the point of initiation of the pharyngeal swallow. The initiation of the pharyngeal swallow is manifested by the first palpable elevation of the hyoid after the water intake⁽⁷⁾. This definition of oropharyngeal transit time is similar to that stated by Nilsson et al in their studies on the quantitative aspects of swallowing^(6,15). Drooling was defined as the inability to retain the drink within the oral cavity together with pooling within the mouth and spillage from the corner of the mouth. Dysphonia was defined by the presence of a post-swallow wet or hoarse voice quality⁽⁵⁾.

Based on the doctor's assessments, patients were classified into three categories: (1) normal swallowing function – no abnormalities found on assessment, (2) mild swallowing impairment – single abnormality on bedside assessment (patients who demonstrated delayed swallowing with no other abnormalities were deemed to have mild swallowing impairment if their oropharyngeal transit time was between two and three seconds), (3) severe swallowing impairment – patients with two or more abnormalities on bedside assessment, or patients who had a significant delay in the initiation of swallow (arbitrarily defined as a delay of 3 seconds

or more). Patients with normal swallowing function were placed on their regular diet regimes while patients deemed to have mild swallowing impairment were started on a modified diet of blended consistency with thickened fluids. Enteral feeding was commenced for patients deemed to have severe swallowing impairment.

Practice sessions were conducted by the two geriatricians (A.L. and Y.Y.S.) involved in the bedside assessment of swallowing, over a two-week period prior to the start of the study, so as to allow for consistency in assessment. These sessions were divided into three phases: (1) joint assessments by the two doctors to ensure uniformity in assessment technique, (2) observation of assessments by the respective doctors to allow for refinement of the assessment tool, and (3) independent assessments to allow for familiarization with the assessment process.

The speech therapist's assessment included assessment of the adequacy of postural and head control, assessment of the lower cranial nerves, as well as the ability to swallow ice-chips, teaspoons of water, and food and fluids of different consistencies.

Statistical Analysis

Statistical analyses were done using Statistical Program for Social Sciences (version 7.5). The degree of agreement between the doctor's diagnosis of dysphagia and that of the speech therapist was ascertained using the Kappa coefficient. The χ^2 test or Fisher's exact test was used to determine if there were statistically significant relationships between the individual components of our bedside assessment and the subsequent development of pneumonia, and the magnitude of these relationships were ascertained with relative risk ratios. The positive and negative predictive values of the bedside swallowing assessment versus subsequent pneumonia were also calculated and compared with the corresponding values based on the speech therapist's diagnosis of dysphagia.

RESULTS

Baseline Characteristics

Sixty-five patients were referred to the speech therapist following the initial assessment of the doctors using the bedside assessment tool. This included 32 males and 33 females, with age ranging from a minimum of 64 to a maximum of 96. The mean age was 81.4 years (standard deviation = 7.0 years) and the median age was 82.0 years. The principal medical conditions leading to the admission of these patients included pneumonia, urinary tract infections and congestive cardiac failure. Although 34 of these patients had a history of previous cerebrovascular accidents, none had previously been diagnosed to have dysphagia.

Detection of Swallowing Dysfunction

Within the study cohort of 65 patients, a total of 42 patients had been identified to have swallowing dysfunction using the doctor's bedside assessment tool. The speech therapist, on the other hand, diagnosed dysphagia in 40 patients from the study cohort. None of the patients who were assessed to have normal swallowing function by the doctor were found to have dysphagia by the speech therapist. The doctor's diagnosis of dysphagia was found to have very good agreement with that of our speech therapist ($\kappa = 0.87$, 95% confidence interval C.I.: 0.75 - 0.99).

In our study, 17 (26.2%) of the patients coughed on swallowing, 39 (60.0%) had delayed swallowing and 20 (30.8%) demonstrated drooling. Dysphonia is known to be a sign of swallowing dysfunction⁽⁵⁾ and has been reported to be associated with aspiration^(16,30). However, we encountered great difficulty in assessing the voice quality of our patients – 17 (26.2%) of the 65 patients were unable to cooperate with this part of the examination and voice quality could not be assessed. Possible reasons for this include the presence of dementing illness, depression as well as confusion. This variable was thus omitted from our final analysis.

Management of Dysphagia

Using the doctor's assessment protocol, 19 patients were put on blended diet and thickened fluids. Of these, the speech therapist found that 2 were able to take normal diet while 2 actually required enteral feeding. Of the 23 patients placed on enteral feeding by the doctor, 11 were deemed to be safe for oral diet consisting of modified consistencies. The assignment of feeding modality (dichotomous variable: thickened feeds and blended diet versus enteral feeds) by the doctor and the speech therapist only had good agreement ($\kappa = 0.61$, 95% C.I.: 0.45 - 0.77).

Risk of chest infection

Fourteen of the 65 patients (21.5%) studied acquired nosocomial pneumonias during their hospitalization. Of the 14 patients with nosocomial pneumonias, 13 were deemed to have swallowing dysfunction using the doctor's bedside swallowing assessment.

The presence of cough on swallowing, and delayed swallow, but not drooling, had a statistically significant relationship with the development of pneumonia during hospitalization ($p = 0.03$ for both). The relative risk (R.R.) of cough on swallowing for the subsequent development of pneumonia was 4.2 (95% C.I.: 1.2 - 14.4). The parallel figures for delayed swallowing was 5.3 (C.I.: 1.1 - 26.3). Patients who were positive for both parameters (i.e. cough on swallowing and delayed

Table I. Risk of Pneumonia in relation to Bedside Swallowing Assessment

Event	Relative Risk	95% Confidence Intervals
Diagnosis of dysphagia using the doctor's bedside swallowing assessment	9.9	1.2 - 81.2
Cough on swallowing	4.1	1.2 - 14.4
Drooling	0.9	0.2 - 3.2
Delayed swallow	5.3	1.1 - 26.3
Cough on swallow and Delayed swallow	6.3	1.7 - 23.5

swallow) had an even higher risk for the subsequent development of pneumonia (R.R.: 6.3, C.I.: 1.7 - 23.5). The combination of cough and drooling or delayed swallow and drooling did not result in an increased risk of subsequent pneumonia. Overall, patients identified to have dysphagia by the bedside assessment method had a R.R. of 9.9 (C.I.: 1.2 - 81.2) for the subsequent development of pneumonia (Table I).

While the negative predictive value (NPV) of the bedside method for patients developing pneumonia was high (95.7%), its positive predictive value (PPV) was comparatively low (31%). These figures were comparable to the predictive values of the speech therapist's assessment (NPV = 100%, PPV = 35%).

DISCUSSION

Dysphagia is an important cause of morbidity and mortality^(1,18) in the elderly population. One of the more obvious reasons for the poor prognosis seen in the dysphagic older patient is the heightened risk of aspiration pneumonia seen in this population^(12,19,31,32). In addition, dysphagia often results in malnutrition, dehydration and an impaired quality of life⁽¹²⁾.

Detection of dysphagia requires a high index of suspicion as well as an understanding of the mechanisms of swallowing. While bedside swallowing evaluation has long been criticized for its lack of accuracy in identifying aspirating patients⁽²⁵⁾, the scarcity of trained speech therapists in many centres highlights the need for a simple clinical tool which will allow clinicians to easily identify patients at risk of aspiration.

Our bedside swallowing assessment incorporated indices known to be associated with increased risks of aspiration: cough on swallowing, delayed swallowing and drooling^(5,12,25,28,29).

The implementation of a simple bedside assessment of swallowing allowed us to identify swallowing problems in 42 acutely ill elderly patients who had no prior history of dysphagia. This resulted in an alteration of feeding modality in these patients within 24 hours of their admission. The diversity of medical conditions

resulting in the admission of these patients suggests that swallowing dysfunction can occur in elderly patients, in the absence of new neurological insults, when there are no new risk factors for dysphagia. This further highlights the importance of having a simple screening tool for dysphagia that can be easily applied by physicians involved in the care of older patients.

The doctor's clinical diagnosis of dysphagia was in very good agreement with the subsequent assessment by our speech therapist. However, the doctor's assignment of feeding modality only had good agreement with the recommendations of the speech therapist, with the doctor's recommendations being more conservative. Patient's found to have dysphagia by the doctor's bedside assessment protocol had an increased risk of developing pneumonia during their period of hospitalization.

The degree of agreement between the doctor's diagnosis of dysphagia and the diagnosis made by the speech therapist suggests that a simple bedside swallowing assessment which includes the finding of (1) cough on swallowing and (2) delayed swallowing will be useful as a screening tool for swallowing dysfunction in the hospitalized elderly patient.

There are however limitations in our study which are worthy of discussion. Firstly, the lack of video-fluoroscopic or endoscopic confirmation of our clinical diagnosis of dysphagia means that we were not able to confirm the presence of aspiration in our patients. Indeed, it is well known that clinical indices have limited sensitivity in diagnosing true aspiration – Holas et al⁽³¹⁾ reported that 38.6% of post-stroke patients aspirated silently on video-fluoroscopic examination (i.e. patients did not cough when aspiration occurred). However, our bedside assessment tool is intended solely as a screening instrument to be used by physicians for identifying patients who had swallowing dysfunction and were at risk of aspiration. These patients, once identified, would then require more thorough evaluation by clinicians trained in the management of dysphagia. We made no attempt to identify the specific causes of dysphagia within our study population because of the large degree of overlap in the pathophysiology of swallowing dysfunction in this heterogeneous cohort of patients being studied. Our study population included 34 patients with past history of cerebrovascular accidents, 6 patients with new cerebrovascular disease as well as 13 patients who were known to have Parkinson's disease. Furthermore, in their study of 189 elderly patients with aspiration pneumonia, Langmore et al demonstrated that conditions as diverse as chronic obstructive lung disease, gastro-intestinal disorders and congestive cardiac failure were all independent risk factors for the development of aspiration pneumonia⁽¹⁹⁾.

In terms of dysphagia management, the corrective measures that can be introduced, based on our bedside assessment, will be limited in efficacy because our simple assessment tool does not allow us to identify the exact breakdown in swallowing function. One of the chief priorities in dysphagia management is the introduction of measures that will lower the risk of aspiration. Modifications in dietary consistencies and feeding methods constitute part of the many facets of dysphagia management. Behavioral modifications, postural adjustments and training of caregivers in feeding techniques are equally important in the management of the dysphagic patient^(11,34). In our study, the doctor's recommendations regarding feeding modality in patients diagnosed to have unsafe swallows were based on the assumption that the degree of swallowing dysfunction (and the corresponding risk of aspiration) were reflected by the number of abnormal findings found in our bedside assessment. In comparison, the speech therapist's recommendations also took into consideration other factors such as the phase of swallowing affected in dysphagia, the patient's ability to comprehend instructions and the patient's ability to participate in behavioral and postural modifications. It was thus not surprising that the recommendations of the doctor and the speech therapist regarding feeding modality showed only good agreement, with the doctor's recommendations being more conservative. We therefore see the need to conduct more studies using this protocol, which may include correlating the assessment protocol with findings on video-fluoroscopy or fibre-optic endoscopic examination of swallowing (FEES). Such studies will hopefully further refine the diagnostic accuracy of the assessment protocol in identifying dysphagia and allow us to fine-tune the subsequent feeding recommendations.

Thirdly, although we were able to demonstrate a statistically significant relationship between our diagnoses of dysphagia and the occurrence of nosocomial pneumonia, we were unable to establish a causal link between the occurrence of pneumonia and dysphagia. However, this does not negate the usefulness of our swallowing assessment instrument for the following reasons: (1) increasing age and dysphagia are both important risk factors for nosocomial pneumonias⁽³³⁾, (2) dysphagia remains a potentially modifiable risk factor in the frail elderly at risk of developing chest infections. In our study, the bedside swallowing assessment protocol had a PPV of 31.0% for patients who developed nosocomial pneumonia. In comparison, DePippo et al, in their studies on the Burke Dysphagia Screening Test (BDST)^(24,25), found that 11 out of 82 post-stroke patients diagnosed to have dysphagia using the BDST developed respiratory

complications resulting from aspiration during their inpatient rehabilitation stay (PPV = 13.4%). In both instances, patients developed pneumonia in spite of intervention introduced by speech therapists. This highlights the fact that dysphagia is but one of the many risk factors associated with the development of pneumonia in the elderly. Other factors shown to be important include feeding dependency, poor oral hygiene, impaired immune status and impaired airway clearance^(19,33,35). Undoubtedly, the incidence rate of pneumonia (as well as the PPVs of the dysphagia screening methods) would have been higher in the absence of such interventions.

CONCLUSION

We have shown that a simple assessment protocol for swallowing which incorporates the following indices: (1) delayed swallow, and (2) cough on swallowing, can be used as a quick screening tool for dysphagia in hospitalized elderly patients. We have found it to be useful in helping to identify patients with swallowing dysfunction, and also in identifying patients who may be at increased risk of developing chest infection early on in their admission. Its diagnostic performance for dysphagia as well as its related feeding recommendations is in close agreement with the analogous decisions a speech therapist will make. We recommend that further studies be done to refine this assessment protocol.

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