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The Dysphagia Outcome and Severity Scale

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Abstract. The Dysphagia Outcome and Severity Scale (DOSS) is a simple, easy-to-use, 7-point scale developed to systematically rate the functional severity of dysphagia based on objective assessment and make recommendations for diet level, independence level, and type of nutrition. Intra- and interjudge reliabilities of the DOSS was established by four clinicians on 135 consecutive patients who underwent a modified barium swallow procedure at a large teaching hospital. Patients were assigned a severity level, independence level, and nutritional level based on three areas most associated with final recommendations: oral stage bolus transfer, pharyngeal stage retention, and airway protection. Results indicate high interrater (90%) and intrarater (93%) agreement with this scale. Implications are suggested for use of the DOSS in documenting functional outcomes of swallowing and diet status based on objective assessment.

Key words: Dysphagia — Severity — Scales — Outcome — Videofluoroscopy — Reliability — Deglutition — Deglutition disorders.

The demand for outcome data in dysphagia research has elevated in recent years with the expanding presence of managed care, and the rapidly changing Medicare environment. Clinicians are challenged by third-party payers and physicians to prove the validity and reliability of dysphagia assessments from which treatment recommendations are made. However, the consistency of documentation in evaluating dysphagia has not been encouragingly high in the dysphagia literature to date. Wilcox et al. [1] studied interjudge agreement of speech patholo-

gists on observation of swallow deficits on videofluoroscopic examination and agreement of treatment recommendations. They stated that “instances of high agreement among clinicians were not abundant” [1]. Ekberg et al. studied interrater reliability of radiologists on cineradiographic assessments and found that “interobserver variability in cineradiographic assessment of pharyngeal function seems to be a major function of observer experience” [2]. There is also significant demand to determine the efficacy, effectiveness, and cost benefit of swallowing therapy for large patient populations and within individual treatment facilities. Currently, there is a paucity of research to assuage these demands, and clinicians have few means of reliably documenting such functional outcomes.

Other areas in rehabilitation outcomes have been systematically and internationally studied with the functional independence measure (FIM) [3]. The FIM is “one of the most widely used methods of assessing basic quality of daily living in persons with disability” [4]. The FIM is a 7-point scale across 18 motor and cognitive/social areas which allows a patient's progress to be charted reliably “across a variety of settings, raters and patients,” as reviewed by Ottenbacher et al., with an interrater reliability of 89–99% [4]. Dysphagia is not currently an area on the FIM, but it is a common disability of stroke patients in rehabilitation settings and of nursing home residents. The occurrence of dysphagia following stroke has been estimated at approximately 25–45% [5–9]. Moreover, the incidence of dysphagia in nursing homes has been reported by Donner (1986) as 40% of the population [10]. To address the quality and efficacy of care in these patients across clinicians and settings, a reliable and uniform measure of dysphagia severity is necessary.

Currently there are scales available that clinicians can use to subjectively qualify the level of dysphagia in adult populations. However, reliability of these measures is unknown and there are no correlates to objective per-

formance. Cherney et al. described seven functional severity levels of dysphagia based on independence and nutritional level in the *RIC Clinical Evaluation of Dysphagia (CED)* manual [11]. ASHA is currently field testing the *ASHA Functional Communication Measure* swallowing subscale for reliability [12]. This 7-point scale also rates severity based on the patient's ability to meet nutritional needs and independence with compensatory strategies. These scales do not attempt to relate severity to objective measures; thus, it is difficult to establish consistency in the documentation of patient care or credibly claim significant changes in a patient's condition.

A few investigators have developed scales that relate dysphagia presentation on videofluoroscopic assessment to severity and have then tested agreement; however, they failed to incorporate functional levels of independence, diet, and nutrition, and reliability of these scales has not been especially high. Rosenbek et al. developed the Penetration-Aspiration Scale to describe penetration and aspiration events and found the interrater reliability to be 57–75% between judge pairs and overall intrajudge reliability to be 74% for agreement of the same judge regrading 75 swallows [13]. Ott et al. described four levels of severity (0–3) for a bedside swallowing assessment and modified barium swallow (MBS): (a) mild dysphagia “if bolus control and transport were delayed or if mild stasis occurred without laryngeal penetration,” (b) moderate dysphagia “included poor oral transport, pharyngeal stasis with all consistencies, laryngeal penetration or mild aspiration with only one consistency,” and (c) severe dysphagia was present when “substantial aspiration occurred” or if the patient failed to swallow [14]. They then determined agreement between the bedside and MBS severity ratings as 59% but did *not* present inter- or intrajudge reliabilities of the ratings or the videofluoroscopic examinations.

Daniels et al. developed a five-level severity scale based on the MBS procedure: 0 (normal), 1 (mild) with “no more than intermittent evidence of trace penetration into the laryngeal vestibule with immediate clearing,” 2 (moderate) as “consistent laryngeal penetration with vestibule stasis and/or 2 or fewer instances of aspiration with a single consistency,” 3 (moderate-severe) as “consistent aspiration of a single viscosity,” and 4 (severe) as “aspiration of more than one consistency” [15]. The interrater reliability of this scale was found to be 66%, and the intrarater reliability was 80%.

The purpose of this study was to develop an easily administered, seven-level functional scale that assigned severity with acceptable reliability based on results of the MBS procedure and allowed improved consistency in recommendations for nutrition level, diet, and independence.

Scale Development

A retrospective and informal analysis of all MBS reports from a single month showed significant variability across and within clinicians on what was documented as mild, moderate, or severe dysphagia. There was also notable inconsistency in the recommendations for supervision, diet consistency, and nutritional level based on the documented MBS findings. The Dysphagia Outcome and Severity Scale (DOSS) was developed by four clinicians in a large teaching hospital for the purpose of establishing a consistent method of documentation and improved quality of care in patients objectively diagnosed with dysphagia.

The first stage of development of the DOSS incorporated three factors previously identified in the literature that allow for comparison among a wide range of patients and changes within a single patient over time.

1. Level of independence. The scale was divided into seven independence levels based on the FIM model and linked to severity. The initial levels were 7 within normal limits, 6 (modified independence), 5 (distant supervision), 4 (intermittent supervision), 3 (total supervision), 2 (maximum assistance), and 1 (dependent/non-per-oral nutrition [NPO]).
2. Level of nutrition. The scale was then divided into the two possible recommendations for nutrition and were linked to severity level: levels 7–3 (full oral nutrition) and levels 2–1 (nonoral nutrition).
3. Diet level and diet modifications. Guidelines for diet modifications were then added for each severity level that allowed oral intake: levels 7–6 (normal diet consistency), level 5 (may need one diet consistency restriction), level 4 (one to two diet consistency restrictions), and level 3 (two or more diet consistency restrictions).

The next stage of development focused on objectively defining the characteristics of the impaired swallow and determining how the dysphagia would impact the patient's level of independence, nutrition, and diet recommendations. A careful review of 100 previous MBS studies was conducted to determine which factors dictated nutritional status. Of the 100 reports reviewed, 15% were NPO, 65% had recommendations for a modified diet, and 20% were allowed a normal diet as dictated by the factors of oral stage transfer, pharyngeal stage retention, and/or airway penetration/aspiration.

Oral Stage Transfer

Logemann summarized the oral stage as involving “intact labial musculature to prevent material from leaking

from the oral cavity, intact lingual movement to propel the bolus posteriorly, and intact buccal musculature to insure that material does not fall into the lateral sulci" [16]. Patients in the present study were clinically judged on the degree of bolus loss or oral retention (after the swallow) and the patient's ability to compensate with or without cueing. For example, if a patient is unable to move a bolus posteriorly into the oral cavity or loses the entire bolus due to poor labial closure, that patient will have difficulty meeting nutritional needs and would be considered more severe. However, if that patient is able to use strategies, verbal cues, or positions to compensate for that deficit and transfer the bolus through the oral cavity effectively, that would be considered less severe but with different levels of assistance needed.

Pharyngeal Stage Retention

Pharyngeal retention is defined as material that remains in the pharynx (valleculae and/or pyriform sinuses) after a swallow has been completed. As stated by Cherney et al., "residue may remain in the valleculae and/or pyriform sinuses; if particles fall into the airway, aspiration may occur after the swallow reflex" [11]. The impact of retention on severity of dysphagia was based on the relative amount of barium retained in the valleculae and/or pyriform sinuses (mild, moderate, or severe). Furthermore, it considers the patient's ability to either clear the retention automatically with a re-swallow or clear retained material with a re-swallow when cued (told to re-swallow). For example, if a patient swallows a bolus but a significant amount is left in pharynx after the swallow and no attempts to clear the material is made even with cues, the patient's ability to maintain nutrition safely is considered severely impaired. However, if that same patient is able to clear the retention spontaneously or with cued re-swallows or compensatory strategies, the impact of that retention is considered less severe.

Penetration–Aspiration

Airway penetration is defined as material that enters the airway into the laryngeal vestibule, above or to the level of the vocal cords. *Aspiration* is defined as material that goes into the trachea, below the level of the vocal cords. These terms were defined in a similar way by Rosenbek et al. [13]. The following factors were considered in determining diet recommendations: the number of consistencies penetrated or aspirated, the presence or absence of a reflexive and/or elicited cough to clear penetration or aspiration, and the level to which the material penetrated into the airway. If a patient aspirated on all consistencies and did not or could not cough to clear the aspirated material, this was considered very severe and

would impact that patient's ability to tolerate any consistency effectively. If that same patient was able to use a strategy to eliminate aspiration with at least one consistency, oral intake might be possible with assistance. The impact of that aspiration on nutrition, diet, and independence would be considered less severe. The severity of penetration–aspiration was based on retrospective report analysis and through the general framework proposed by Rosenbek et al. in their study on the penetration–aspiration scale [13].

Once the scale was fully outlined incorporating all these factors, it was piloted for approximately 1 month, with ongoing changes made until the final revision was completed (Table 1).

Subjects and Methods

The results of 135 consecutive patients in a 3-month period to undergo an MBS procedure at Hartford Hospital, representing a wide range of acuity and diagnoses (Table 2), were examined. Neurological diagnoses included stroke, neurosurgery, Parkinson's disease, dementia, encephalopathy and traumatic brain injury, muscular dystrophy, etc. General medical/surgical diagnoses included gastrointestinal disorders (gastrointestinal bleed, esophagi, small bowel obstruction, etc.), HIV, sepsis, renal and urological disorders, diabetes, dehydration, malnutrition, all general surgery (with the exception of cardiac and neurological), etc. Pulmonary patients included persons with pneumonia, chronic obstructive pulmonary disease, asthma, respiratory failure, pleural effusions, etc. Cardiac patients included patients who had a myocardial infarction, open heart surgery, congestive heart failure, coronary artery disease, carotid endarterectomy, heart transplant, etc. (without neurological event). Ear, nose, and throat (ENT) diagnoses included laryngeal cancer, vocal cord paralysis, and polyps. Other diagnoses were psychiatric.

The subject group included 57 women and 78 men and was a sample of acute care patients, outpatients, and acute rehabilitation patients. The patients' ages ranged from 21 to 95 years, with a mean age of 73 years. The DOSS was used to assign a severity level once the objective assessment had been determined by the speech pathologist and the radiologist. The videofluoroscopic swallowing assessments followed hospital protocol adapted from Logemann's procedures [7]. A full medical history was obtained prior to examination, and an oral–motor/voice examination was completed. Patients were given barium in thin, medium, thick, puree, and solid consistencies as per their ability to swallow. Review of the videotape was completed and documented on a report form according to department protocol (Table 3).

Once the report was completed and severity assigned, a copy was made of the contents (Table 3) for each patient. This copy was randomly given to one of the three other trained speech pathologists who then blindly assigned severity level based on the DOSS. The report was then given back to the original clinician for intrajudge rating after a period of 2–4 weeks, and a severity level was blindly assigned based on the contents presented in Table 3.

Training

All participating speech pathologists underwent training in using the DOSS. Specific instruction in the guidelines for use included careful attention to severity level head-

Table 1. Dysphagia outcome and severity scale—final revision

Full per-oral nutrition (P.O): Normal diet

Level 7: Normal in all situations
 Normal diet
 No strategies or extra time needed

Level 6: Within functional limits/modified independence
 Normal diet, functional swallow
 Patient may have mild oral or pharyngeal delay, retention or trace epiglottal undercoating but independently and spontaneously compensates/clears
 May need extra time for meal
 Have no aspiration or penetration across consistencies

Full P.O: Modified diet and/or independence

Level 5: Mild dysphagia: Distant supervision, may need one diet consistency restricted
 May exhibit one or more of the following
 Aspiration of thin liquids only but with strong reflexive cough to clear completely
 Airway penetration midway to cords with one or more consistency or to cords with one consistency but clears spontaneously
 Retention in pharynx that is cleared spontaneously
 Mild oral dysphagia with reduced mastication and/or oral retention that is cleared spontaneously

Level 4: Mild–moderate dysphagia: Intermittent supervision/cueing, one or two consistencies restricted
 May exhibit one or more of the following
 Retention in pharynx cleared with cue
 Retention in the oral cavity that is cleared with cue
 Aspiration with one consistency, with weak or no reflexive cough
 Or airway penetration to the level of the vocal cords with cough with two consistencies
 Or airway penetration to the level of the vocal cords without cough with one consistency

Level 3: Moderate dysphagia: Total assist, supervision, or strategies, two or more diet consistencies restricted
 May exhibit one or more of the following
 Moderate retention in pharynx, cleared with cue
 Moderate retention in oral cavity, cleared with cue
 Airway penetration to the level of the vocal cords without cough with two or more consistencies
 Or aspiration with two consistencies, with weak or no reflexive cough
 Or aspiration with one consistency, no cough and airway penetration to cords with one, no cough

Nonoral nutrition necessary

Level 2: Moderately severe dysphagia: Maximum assistance or use of strategies with partial P.O. only (tolerates at least one consistency safely with total use of strategies)
 May exhibit one or more of the following
 Severe retention in pharynx, unable to clear or needs multiple cues
 Severe oral stage bolus loss or retention, unable to clear or needs multiple cues
 Aspiration with two or more consistencies, no reflexive cough, weak volitional cough
 Or aspiration with one or more consistency, no cough and airway penetration to cords with one or more consistency, no cough

Level 1: Severe dysphagia: NPO: Unable to tolerate any P.O. safely
 May exhibit one or more of the following
 Severe retention in pharynx, unable to clear
 Severe oral stage bolus loss or retention, unable to clear
 Silent aspiration with two or more consistencies, nonfunctional volitional cough
 Or unable to achieve swallow

ings and discriminating factors to consider when deciding between levels (patient's environment, premorbid nutrition, cognition, acuity of dysphagia, current medical status). These factors are integral to a careful decision-making process for level of nutrition, diet, and independence and were assessed by chart review, history intake with the patient, and clinical bedside evaluation.

The patient's *environment* is defined as the

amount of supervision that is realistically available for that patient. For example, the speech pathologist can better decide between level 2 (nonoral intake) and level 3 (oral intake with total assistance for strategies) when accurate and realistic consideration of possible supervision is known. Premorbid nutrition is also very pertinent to making difficult decisions between recommending full oral intake versus nonoral intake. A patient's ability to

Table 2. Patient diagnoses

Diagnosis	Neurological	General medical/surgical	Pulmonary	Cardiac	ENT	Other
n (%)	81 (60)	32 (24)	10 (7)	8 (6)	3 (2)	1 (1)

Table 3. Report format

Medical summary: _____				Current diet: _____						
Mental status: Alert—Lethargic—Oriented—Confused—Cooperative—Uncooperative—Follows commands/spontaneously with cues—Does not follow commands										
Oral–motor	Intact	Impaired	Nonfunctional	Phase	Thin liquid	Nectar liquid	Honey liquid	Puree/ pudding	Soft solid	Hard solid
Swallow reflex				Oral						
Volitional cough				Leakage L/R lip						
Reflexive cough				Poor bolus formation						
Lip closure				Poor bolus propulsion						
Lateral tongue				Retention L/R sulcus						
Anterior tongue				Poor velopharyngeal closure						
Posterior tongue				Pharyngeal						
Mandible				Delayed pharyngeal swallow						
Voice				Reduced laryngeal elevation						
Dentition/dentures				Reduced epiglottal tilt						
				Reduced pharyngeal peristalsis						
				Cricopharyngeal dysfunction						
				Retention valleculae						
				Spontaneously cleared						
				Cleared with cue						
				Unable to clear						
				Retention pyriform						
				Spontaneously cleared						
				Cleared with cue						
				Unable to clear						
				Airway penetration						
				Midway to cords						
				To cords, spontaneous cough						
				To cords, no cough						
				Eliminated with compensatory strategy						
				Aspiration						
				Productive spontaneous cough						
				Nonproductive cough						
				No cough (silent)						
				Eliminated with compensatory strategy						

maintain oral nutrition before dysphagia will only become more problematic with the onset of difficulty in swallowing. Cognition also is important to consider when deciding whether a patient will quickly and spontaneously learn strategies (level 6) or need supervision due to poor memory (level 5 or below). *Acuity of dysphagia* refers to how acute the swallowing problem is to the patient, and *current medical status* refers to the relative acuity of the overall medical issues. These factors are critical in considering the risks that are considered with a given patient and may guide a clinician toward a

more conservative stance on a patient with multiple current medical concerns.

Following verbal instruction in the guidelines for use of the DOSS, a peer review of videotaped MBS studies with joint scorings was conducted. All discrepancies in scoring were discussed and resolved.

Results

Results are presented in Tables 4 and 5 and outline the different types of reliability established (interjudge or

between two judges and intrajudge or between two gradings by a single judge). Table 6 shows the number of patients for each severity level and the reliability figures for each severity level.

Of the 135 consecutive patients who underwent an MBS procedure, 10 (7%) were rated as severe and 17 (12.6%) were rated as moderately severe by the initial rater; all required nonoral nutrition according to recommendations. Twenty-one (15.6%) of the 135 patients had moderate dysphagia, 30 (22%) were rated as mild to moderate, and 28 (21%) were considered to have mild dysphagia; recommendations for these three groups allowed full oral nutrition but with a restricted diet and level of independence. A functional swallow was determined in 22 (16%) of the 135 patients, and seven (5%) were rated as normal; both groups were allowed a normal diet based on recommendations from the DOSS. (Table 6).

On overall interrater reliability, both judges agreed and assigned an exact match for 121 of 135 cases (90%). The four judges constituted three judge pairs, and the individual agreement between the two judges in each pair is outlined in Table 4. The scores that disagreed were off by one level on the scale in 13 of 14 instances of error, and all were within two severity levels. As cited in Table 6, interjudge agreement was good for rating all levels of the scale (82–100%), with the highest concordance on level 7/normal (100%), level 4/mild–moderate (93%), level 6/within functional limits (91%), and level 1/severe (90%).

Total intrajudge reliability was 93% (125 of 135) when the four judges reassigned the same severity level on the second grading. Table 5 summarizes the pattern of agreement for each individual judge. Reliability was good across all levels of the scale (86–100%). The second ratings that did not agree were off by only one severity level in six of nine cases, and all disagreements were within two severity levels (Table 5).

Discussion

The purpose of the present study was to develop a scale to rate the severity of dysphagia and functional level based on objective measures from the MBS procedure and to determine the reliability of the scale for an acceptable number of subjects. The scale was not intended to determine reliability of the MBS procedure itself. It was intended, however, to improve the consistency of documentation and recommendations across clinicians and within individual clinicians, provide a basis for comparing patients with each other and over time, and to introduce a possible measure of functional outcomes in dysphagia. The present results indicate that the DOSS

Table 4. Interjudge reliability by judge pair

	1–2	1–3	1–4	Total
Total rated	43	57	35	135
No. ratings agree	37	52	32	121
Reliability %	86	91	91	90
Scores that differed				
by 1 (%)	6/6 (100)	5/5 (100)	2/3 (66)	13 (93)
Scores that differed				
by 2 (%)	0	0	1/3 (33)	1 (7)

can be used by trained clinicians to better describe severity level of dysphagia with excellent reliability and to make more consistent recommendations for nutrition, diet, and independence.

Scale development and use are founded on strong documentation of MBS results on a detailed report format and training with discriminating factors critical to appropriate recommendations. These factors include the patients' premonitory nutrition level, acuity of dysphagia, current medical status, environment, and cognition. Use of this scale may improve and highlight clinical attention to important subtleties of assigning diagnosis and could also improve communication between clinicians and allow a smoother continuum of care for dysphagic patients across settings. This improved consistency of documentation and recommendations would serve this area of our profession well in a time that demands larger scale studies of efficacy, efficiency, and outcome.

However, the scale does not thoroughly define each parameter (i.e., what constitutes "mild retention") and therefore requires subjective clinical determination usually based on clinical experience. A clearer definition of what determines such parameters as "severe aspiration" or "severe retention" is also needed from future studies. Also, the present study assessed reliability by review of written report; therefore, reliability of the actual interpretation of the videotape and subsequent documentation was not determined. Further research is necessary to determine the reliability of clinician's interpretation and documentation of MBS results using more standardized report formats such as the one used in the present study.

The DOSS may be an excellent and thorough alternative to currently available scales to describe functional dysphagia severity. Existing scales have relied on too general and subjective descriptions per level, have failed to encompass all important dysphagia issues, or have not presented acceptable levels of reliability. Both the Cherney et al. scale [11] and the ASHA scale [12] are 7-point severity scales that assign severity based on nutritional and independence levels but do not associate each level with patients' dysphagia deficits

Table 5. Intrajudge reliability by judge

	1	2	3	4	Total (all judges)
Total rated	73	20	27	15	135
No. ratings agree	71	17	24	13	125
Reliability %	97	85	89	87	93
Scores that differed by 1 (%)	1/2 (50)	2/3 (66)	3/3 (100)	0	6 (60)
Scores that differed by two (%)	1/2 (50)	1/3 (33)	0	2/2 (100)	4 (40)

Table 6. Number of patients and reliability by severity level

	1	2	3	4	5	6	7
<i>n</i>	10	17	21	30	28	22	7
Interjudge reliability %	90	82	90	93	86	91	100
Intrajudge reliability %	100	88	90	97	93	86	100

that can be objectively and consistently measured. The aspiration–penetration scale by Rosenbek et al. [13] provides excellent delineation of severity of airway penetration. However, interrater reliability was only fair (57–75%), and it did not allow for overall functional severity of dysphagia as a whole or address regularity of diet, nutrition, or independence recommendations. Similarly, the scale by Daniels et al. [15] specifies the severity level in terms of penetration–aspiration with fair reliability (66%). However, it neglects other key components of both objective severity (retention, oral stage deficits) and functional parameters (independence, nutrition, diet).

This study has succeeded in presenting a more functionally holistic and objective DOSS that addresses all these areas. The DOSS can be used within 5 min by trained clinicians to determine severity of dysphagia based on objective measures. In addition, the DOSS was proven to have excellent interrater (90%) and intrarater (93%) reliabilities congruent with that of the internationally recognized FIM [3]. Given the high reliability of the DOSS, this tool could be valuable in objectively measuring the natural history and outcome of dysphagia across populations and in measuring efficacy of treatment. Further studies are still needed with larger groups of patients and longitudinally following patients across time.

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