

**CLINICAL PROTOCOL FOR THE ASSESSMENT OF
SWALLOWING IN ADULTS
(CP-ASA)**

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A Dissertation Submitted in Part Fulfillment of
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May, 2009

DEDICATED TO.....



MY APPU

You inspired me
into the medico
field and your
blessings guided
me through the
path

&

MY AMMA ACSAN

CERTIFICATE

This is to certify that this dissertation entitled “*Clinical protocol for the assessment of swallowing in adults (CP-ASA)*” is the bonafide work submitted in part fulfillment for the degree of Master of Science (Speech - Language Pathology) of the student with Register No. 07SLP010. This has been carried out under the guidance of a faculty of this institute and has not been submitted earlier to any other University for the award of any other Diploma or Degree.

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CERTIFICATE

This is to certify that this Dissertation entitled “*Clinical protocol for the assessment of swallowing in adults (CP-ASA)*” has been prepared under my supervision and guidance. It is also certified that this has not been submitted earlier to any other University for the award of Diploma or Degree.

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DECLARATION

I hereby declare that this dissertation entitled *Clinical protocol for the assessment of swallowing in adults (CP-ASA)*” is the result of my own study under the guidance of a faculty of this institute and has not been submitted earlier to any other University for the award of Diploma or Degree.

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“Education is not the amount of information
that is put in your brain and
runs riot there undigested....”

Swami Vivekananda

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INTRODUCTION

Breathing and eating are most basic physiologic functions that define life's beginning outside the mother's womb for newborn infant. Breathing is reflexive and life sustaining but provides no other intrinsic pleasure. Eating on the other hand is partly instinct and partly a learned response. It requires ingestion of foods, which in newborn must be provided by an outward source. Sucking and swallowing requires a complex series of events and coordination of the neurological, respiratory and gastrointestinal systems. Normal GI function must occur in digestion of foods to provide nutrients. All of this function occurs within the framework of developing physical and emotional maturity. The pleasure of eating extends beyond the feeling of satiety to the pleasure, gained through food ingested. Feeding requires a well functioning sensorimotor swallowing mechanism, overall adequate health (including respiratory, gastrointestinal and neurology), appropriate nutrition, central nervous integration and adequate musculoskeletal tone. The successful emergence of communication depends heavily on feeding and swallowing.

According to American gastroenterological association, (1999), Dysphagia, or difficulty in swallowing, is not a disease in itself but a condition that can be brought on by many different causes because swallowing is a delicate process, easily disturbed. Dysphagia is defined as a dysfunction or impairment of the stages of swallowing. It is defined by its clinical features because it is symptom, or collection of symptoms of one or a number of possible underlying disorders. In patients with

dysphagia, various aspects of the anatomy and neurophysiology in any or all of the stages in swallowing may be impaired, resulting in the diagnosis of swallowing disorder.

Some causes are minor and quickly treatable; others are serious, even life-threatening. There are two main subcategories of dysphagia: Oropharyngeal dysphagia, which causes a swallowing problem before the food or drink reaches the upper esophagus and Esophageal dysphagia, when the problem arises afterwards. Dysphagia can occur as a result of wide variety of medical conditions, such as cerebrovascular accident or gastroesophageal reflux disorders, or even as a side effect of medications (Speiker, 2000). The swallowing disorder can occur in all age groups, from newborn babies to elderly individuals and it is present in various acute (e.g.; Bell's palsy, traumatic brain injury); congenital (e.g. cerebral palsy, cleft palate); chronic (e.g.; static encephalopathy, gastroesophageal reflux disease) and degenerative (e.g.; myasthenia gravis, Parkinson's disease); neurological disorders (Lazarus & Logemann, 1987).

Dysphagia could be caused due to multiple etiological factors Table 1 shows some of the common causes of dysphagia in its various stages.

Table 1: Common causes of dysphagia

Types	Causes				
Oro pharyngeal dyspha-gia	Obstructive/ Mechanical	Neuro-genic	Neuro-muscular Junction	Muscular	Upper Esophageal Sphincter (UES)
Esophageal	Obstructive Lesion within the Esophagus	Obstructive Lesion Outside the Esophagus	Neurogenic	Neuromuscular	

Not all patients with dysphagia have an increased risk of aspiration and other swallowing related complications. The prognosis of patients with dysphagia as individuals is extremely variable; some have a remarkably benign prognosis and others a poor prognosis. As treatments for swallowing problems are available, some of which are safe and inexpensive (such as compensatory maneuvers), others are hazardous and expensive (such as nasogastric or gastrostomy insertion), it is important that patients with dysphagia at high (and low) risk of serious complications can be identified at initial assessment so that resource allocation can be better prescribed. Otherwise patients with dysphagia with extremely good prognosis for swallowing recovery may be exposed to inconvenient, costly and perhaps even risky treatments that will result in no long term benefit. Likewise, patients with poor prognosis may be denied treatments that may be more effective in reducing their risk of serious complications.

Assessment of nutrition should be considered when a patient's means of feeding has been altered, when such a change is anticipated, or when there are concerns about the amount and/or nutrition/hydration value of a patient's diet.

The reported high incidence of dysphagia following stroke and consequent risk associated emphasizes the need for early identification and evaluation of dysphagia in adult population. American stroke association (ASA) management guidelines, (2001) recommended the completion of a comprehensive clinical assessment for any patient suspected with dysphagia. Identifying patients at risk for developing dysphagia remains a difficult task.

Evaluation of swallowing difficulties / dysphagia in adults is hence a preferred practice for the professional speech - language pathologists. An extremely wide range of assessment techniques and procedures are employed by individual therapists and institutions for most of adult dysphagic clients, more so in India.

Several methods have been proposed for the evaluation of dysphagia. No consensus currently exists on a standard method of assessment. Regardless of method, an appropriate and valid assessment tool should be readily accessible for the assessment of adult dysphagic population and should demonstrate both inter and intra subject reliability. Majority of the specialized clinics which cater to the assessment and management of clients with dysphagia across the world base their clinical intervention on the data available through instrumental analysis, especially for the

assessment of pharyngeal and esophageal stages of swallow. The advantages of instrumental analysis are many, including the fact that specific information such as site of dysfunction during swallow, data related to duration in bolus transition and the response to different types of food consistencies are available to the clinician as first hand information, based on which a management program specific to the client's needs can be developed. Many clinics, especially so in India cannot afford to procure instruments which are often costly and also require professionals such as radiologists and gastroenterologists to help in interpretation of the data. Hence, most of the clinics adopt the subjective and behavioral analysis procedures for clients with dysphagia. This is very relevant to most of the speech clinics in India where adoption of instrumental procedures for assessment of swallowing is a far fetched goal at present due to lack of qualified manpower, financial constraints and cost effectiveness.

Even in those centers which adopt instrumental procedures, the common practice in assessment is that the oral phase of swallowing is most often assessed through direct observation as the structures are visible and accessible to the examiner. The abnormalities in the pharyngeal and esophageal phases of swallowing are often based on instrumental evaluation. However, the abnormalities in the pharyngeal and esophageal phases of swallowing can also be assessed based on the inferred observations made through information available from history and documenting the behavioral correlates of the process of swallowing as related to the function of pharynx and esophagus.

Matrino , Pron and Diamant, (2003) reported survey data which indicated that 71% of the respondent dysphagia clinicians (speech language pathologists) performed a complete evaluation of dysphagia. Conversely only 36% of these clinicians completed an instrumental swallowing examination. Moreover instrumental swallowing examinations were never completed in the absence of full clinical examination. Thus these results strongly suggest that clinical examination is the primary method of swallowing examination among the practicing clinicians.

The clinical examination of swallowing is designed to provide the clinician with the following data for use in diagnosis and treatment planning:

- information on the current medical diagnosis and medical history of the patients swallowing disorder, including the patients awareness of his/her swallowing disorder and indications of the localizations and nature of the disorder
- patients medical status, including nutritional and respiratory status (presence of nasogastric feeding tube or gastrostomy and placement of a cuffed or uncuffed tracheotomy tube)
- patients oral anatomy
- patients respiratory function and its relationship to swallow
- patients labial control, as this may affect keeping food in his/her mouth
- patients lingual control, as it may affect oral manipulation of food and posterior transit of food through the oral cavity

- patients palatal function. As it may affect entrance of food into his or her nose during the swallow
- patients pharyngeal wall contraction as it may affect movement of food through the pharynx and may cause aspiration after the swallow
- patients laryngeal control, as it may affect airway protection and aspiration during swallow
- patients general ability to follow directions and monitor and control his or her behavior
- patients reaction to oral sensory stimulation including taste, temperature and texture and
- patients reactions and symptoms during attempts to swallow

(Griffin, 1974).

The clinical swallowing examination allows a circumscribed exploration of patients muscle function, sensation and airway protective functions. The CSE allows the clinician to develop management program for the patient and to determine the necessity for further instrumental assessment.

The evaluation of swallowing encompasses the case history, the clinical or bedside swallow examination, and instrumental examination. Recently several patient self assessment tools has also been proposed to quantify quality of life and specific aspects related to swallowing symptoms. Each aspect of swallowing evaluation is designed to address the issues of: (1) swallow safety (2) nutritional status (3)

continuation or possible modification of present diet (4) need for specialized treatments (5) referrals for additional tests based on the results of the specific swallow evaluation or the patients general behavior and establishment of a medical diagnosis and /or pathogenesis for swallowing disorder or need for further assessment.

Assessment protocol should reflect an underlying explanatory theory of the pathological mechanism involved in the disorder. Although specific goals and methods of assessment with dysphagic patients may vary between cases the most important function of assessment is to enable the clinician to understand the physiological nature of the patients swallow in relation to medical history and thereby select appropriate treatment strategies. An ideal clinical dysphagia assessment should provide information to help define potential etiological factors and formulate a tentative hypothesis regarding the physiological nature of patients swallowing problem and the resultant level of breakdown in the neurophysiologic control system. It should facilitate development of the preliminary treatment plan and the fabrication of further question that need to be answered to complete the diagnostic work up. In addition, it should help determine the patient's suitability for further instrumental investigation.

Need for a assessment protocol in India

There are no formal protocols / tests / scales developed in the Indian context. Most of the centers which cater to the clientele with swallowing disorders have developed their own indigenous questionnaires and proformae to assess the

swallowing disorders in children as well as adults. However, it is known that the anatomical and physiological differences in the swallowing mechanism call for the use of different scales in children as compared to adults. Most of the clinical tools developed in India are not comprehensive, specifically in terms of testing with direct stimuli (different consistencies of solid, semi solid and liquid items and the quantity of the same) and indirect stimuli (assessment of posture, oral sensory testing, assessment of motor functions etc). Given the multicultural issues in India, selection of direct stimuli requires to be done with care if one attempts to develop a test kit for the assessment of swallowing.

Keeping these in mind, the present study aims to develop a clinical protocol for comprehensive assessment of all the three phases of swallowing, that is, oral, pharyngeal and esophageal phase, based on behavioral paradigm. Assessment of oral and pharyngeal stages will be aimed at using direct observation procedures, but the esophageal stage will be assessed based on history and indirect observation procedures.

Aim of the study

- To develop a clinical protocol for the assessment of swallowing disorders in adults.
- To check for item and content validity of the protocol developed
- To test the sensitivity of protocol developed, by administering the same on clients with swallowing disorders.

Brief overview of the structure of proposed profile (CP-ASA)

The structure of the protocol included the following:

Sections	Title
Section A	<i>Assessment of Posture</i>
Section B	<p><i>Assessment of respiratory abilities</i></p> <ul style="list-style-type: none"> • At rest • During speech • Coordination of respiration and swallowing <p><i>Assessment of sensory abilities</i></p> <ul style="list-style-type: none"> • Taste • Temperature • Oral sensation <p><i>Assessment of cognitive status</i></p> <ul style="list-style-type: none"> • General status • Specific dysfunction
Section C Subsections	<p><i>Assessment of Cranial nerve functions and Oral reflexes</i></p> <ul style="list-style-type: none"> • Assessment of cranial nerve functions • Assessment of oral reflexes
Section D Subsections	<p><i>Physical Examination of the oral mechanism</i></p> <ul style="list-style-type: none"> • Lips • Tongue • Velum

	<ul style="list-style-type: none"> • Teeth • Jaw
Section E	<i>Assessment of swallow in different stages</i>
Subsections	<ul style="list-style-type: none"> • Oral preparatory stage of swallow • Oral stage of swallow • Pharyngeal stage of swallow • Esophageal stage of swallow

Implications of the Assessment Protocol (CP-ASA)

The CP-ASA is targeted for use by student clinicians being trained in the field of speech - language pathology and practicing speech-language pathologists. The CP-ASA, which was developed for use with adolescents and adults who are suspected of having oropharyngeal or esophageal dysphagia has four principle uses.

- The results of CP-ASA can be used to identify specific problems occurring during the oral, pharyngeal and esophageal stages of swallowing
- The results of CP-ASA can be used to develop recommendations regarding treatment plans
- It can be used for periodic reevaluation and assessment of progress in therapy

Limitations of the protocol

1. The protocol have been developed based on theoretical knowledge and practical experience
2. The number of subjects evaluated with the protocol was limited
3. The protocol needs to be administered and validated on a larger group of subjects for it to be standardized.

REVIEW OF LITERATURE

Deglutition, which is more commonly called swallowing, is defined as the semiautomatic motor action of the muscles of the respiratory and gastrointestinal tracts that propels food from the oral cavity to the stomach (Miller, 1986). It is a highly complex motor event that, to be successful, requires exquisite organization and functioning of central and peripheral nervous systems and intricate co-ordination of actions of multiple muscles of the oral cavity, pharynx and esophagus (Miller, 1982). Both voluntary and reflex components are involved in the normal swallow (Rouche, 1980). Neither mechanism alone is capable of producing swallowing with the regularity and immediacy which is necessary during the normal process of oral feeding. The normal swallowing response is initiated or triggered by sensory input coming from oral and pharyngeal cavities in the form of touch, liquids or soft pressure to the soft palate, anterior faucial pillars, dorsum, tongue and valleculae (Bosma, 1990). To trigger a swallow, sensory information must be sent and decoded by the swallowing center within the brainstem. In young to middle aged adults, the swallowing response is triggered at the anterior faucial pillars (Logemann, 1993).

Physiology of normal swallow

The physiology of normal swallow involves complex interaction of the muscles, nerves and anatomical structures related to the mouth, larynx, pharynx and esophagus

(Farell & O'Neill, 1999). Normal swallow is usually described as having four phases: oral preparatory, oral, pharyngeal and esophageal stage (Logemann, 1998).

Oral preparatory phase: The food or liquid is manipulated in the oral cavity, chewed (if necessary), and made into a bolus, which is sealed with the tongue against the hard palate.

Oral phase: The tongue moves the food or liquid towards the back of the mouth (toward the anterior faucial pillars).to achieve this, the tongue presses the bolus against the hard palate and squeezes the bolus posteriorly. The oral – preparatory and oral phases are voluntary, not reflexive, actions.

Pharyngeal phase: During this phase, the swallow reflex is triggered and bolus is carried through the pharynx, while these simultaneous actions occur (a) the velopharyngeal port closes, (b) the bolus is squeezed to the top of the esophagus (Cricopharyngeal sphincter) , (c) the larynx elevates as the epiglottis, false vocal folds and true vocal folds close to seal the airway, and (d) the cricopharyngeal sphincter relaxes to allow the bolus to enter the esophagus.

Esophageal phase: During this fourth and final phase, the bolus is transported through the esophagus into the stomach. (Logemann, 1997).

The oral phase of swallow is under voluntary control, the remainder is reflexive. Over 40 paired muscles contribute to swallowing, as do the trigeminal, facial, glossopharyngeal, vagus, and hypoglossal cranial nerves. Overall, the afferent sensory input, via mucosal receptors throughout the pharynx and larynx, is integrated at a brainstem level, predominantly in nucleus solitarius. In the oral phase of swallow,

information from the oral cavity ascends to the medulla via sensory branches of the trigeminal, facial, and glossopharyngeal cranial nerves, terminating in the nucleus of the tractus solitarius. The trigeminal cranial nerve seems to be of greatest importance. At nucleus solitarius, projections go to a “pattern generator” in the medullary reticular formation. Much activity at this stage is controlled by higher forebrain centers. There are important cortical and sub cortical pathways in the voluntary initiation.

In the pharyngeal phase of swallow, a discrete set of medullary neural connections of a highly patterned nature controls this phase. Most of the important information is sensed on the posterior tongue, the faucial pillars, and the pharynx. Thus, the trigeminal and the vagus cranial nerves predominate. The pharyngeal stage of the swallow begins as the pharyngeal swallow is triggered. Dodds, (1989) and others have suggested that the sensory portion of the pharyngeal swallow is carried by cranial nerves IX, X and XI. The impulses travel to the medullary reticular formation, or swallowing center, located within the brainstem (Miller, 1972; Sumi, 1972). This center acts as a neuronal pool to organize the synergy necessary for normal pharyngeal swallowing. The motor portion is carried by nerves IX and X. Nerve VII may additionally contribute to the sensory portion. Nerves V, VII and XII have been identified as possible contributors to the afferent portion.

In the esophageal phase of swallow, sensory fibers travel in the vagus and end centrally in a discrete portion of the nucleus tractus solitarius. Projections then occur to esophageal motor neurons. Innervations to striated muscle (proximal one third) are in

the ventrolateral medulla in the nucleus ambiguus. Innervations to the smooth muscle and lower esophageal sphincter reside in the dorsal motor nucleus of vagus, immediately adjacent to the nucleus tractus solitarius.

The first three phases are of interest for the speech language pathologists. The fourth phase (esophageal phase) is most often treated medically. The duration and characteristics of each of these phases depend on the type and volume of food being swallowed and the voluntary control exerted over it (Bisch, Logeman, Rademaker, Kahrilas & Lazarus, 1994, and 1996).

Disorders of swallowing

The word ‘dysphagia’ is derived from the Greek words, dys-with difficulty and phagia-to eat; i.e., difficulty in swallowing. The incidence of dysphagia is reported to increase, with age because swallowing ability decreases overall during the course of normal aging (ASHA, 1987). This encompasses persons swallowing his/her saliva, liquids, foods of all consistencies and pills (Murray, 1999).

The American Speech Language Hearing Association (ASHA 1990) defines dysphagia as a swallowing disorder that may occur in the mouth, pharynx, larynx or esophagus of individuals due to various etiologies. The swallowing difficulty may arise from mechanical problems of the swallowing mechanism, neurologic disorders, gastrointestinal disorders, or loss of organs due to surgery. Dysphagia is a delay in, or misdirection of a fluid or solid food bolus as it moves from the mouth to the stomach.

Delay or misdirection of the food bolus may interfere with functional oral intake. A swallowing disorder must be distinguished from feeding disorder. A feeding disorder is impairment in the process of food transport outside the alimentary system. A feeding disorder is usually the result of weakness or in coordination in the arm used to move the food from the plate to the mouth. Persons with feeding disorders (motor transfer problems) also may be dysphagic.

Classification of dysphagia

Dysphagia may be classified as oropharyngeal or esophageal. Oropharyngeal dysphagia refers to difficulty in the passage of food from the mouth to the esophagus. In esophageal dysphagia, there is a disordered passage of food through the esophagus. These problems should be distinguished from feeding disorders, which are difficulties in presenting food to the mouth. Swallowing problems are related to neuromotor speech disorders in that they frequently (though not necessarily always) accompany disturbances in speech movement. There are many vulnerable target sites within the nervous system, both centrally and peripherally, at which Neurogenic disorders may strike and thereby cause neurogenic dysphagia. Neurologic disorders can result in oropharyngeal dysphagia, if there is involvement of central efferent pathway for swallowing, including parts of cerebral cortex, basal ganglia, sub cortical structures (i.e.; hypothalamus and midbrain central grey matter), corticobulbar tracts, and brainstem structures including multiple lower cranial nerve nuclei and ventral and dorsal medullary center. Brainstem diseases are more likely to be associated with dysphagia than cortical

or sub cortical disease. When a neurologic disorder is localized above the brainstem, oral/pharyngeal dysphagia is more likely to occur and more severe if the disorder is distributed bilaterally rather than unilaterally.

Etiology of dysphagia

Dysphagia could be caused due to multiple etiological factors. Table.1 shows few commonly occurring conditions.

Table 1: Etiology of dysphagia in children and adults (Gisel, 1999)

NEUROGENIC CAUSE	NON NEUROGENIC CAUSES
Cerebral palsy	Gastro esophageal tract disorder
Neoplasm	Respiratory disorder
Infectious	Cardiac defects
Inflammatory	Prematurity
Autoimmune	Structural anomalies
Motor neuron disease	Behavioral/psychological
Neurodegenerative diseases	Malnutrition
	AIDS
	Craniofacial anomalies

Characteristics present in different stages of dysphagia

The difficulties /deviations /disorder experienced by clients with the involvement of different stages of swallow have characteristic clusters. These often help a speech

language pathologist in profiling the specific deficits related to the oral, pharyngeal and esophageal stages. A few of the prominent signs and symptoms at each stage of swallow is as follows:

Disorders in oral preparation for swallow

- Cannot hold food in the mouth anteriorly: reduced lip closure
- Cannot hold a bolus-reduced tongue shaping coordination
- Cannot form a bolus-reduced range of tongue motion or coordination
- Material falls into anterior sulcus
- Materials falling into lateral sulcus
- Abnormal hold position –reduced tongue controls, tongue thrust.

Disorders in oral phase of swallow

- Delayed oral onset of swallow
- Tongue thrust
- Residue in floor of mouth, tongue
- Disturbed lingual peristalsis
- Incomplete tongue- palate contact
- Repetitive lingual rocking –rolling actions

Disorders in pharyngeal stage of swallow

- Delayed pharyngeal swallow
- Nasal penetration during swallow due to reduced velopharyngeal closure
- Cervical osteophytes, pseudo epiglottis
- Residue on side of pharynx and in pyriform sinus.
- Aspiration during swallow
- Residue throughout the pharynx

Disorders of esophageal phase of swallow

- Esophageal to laryngeal or pharyngeal backflow
- Tracho esophageal fistula
- Zenkers diverticulum
- Gastroesophageal reflux disease (GERD)

Role of speech language pathologists in assessment and management of dysphagia

Recognizing that many Speech Language Pathologists (SLP's) are involved in the diagnosis and treatment of adult dysphagia, the American speech language hearing association (ASHA) task force on dysphagia developed a statement outlining the knowledge and skill needed to provide these services (American speech language hearing association, 2000). Speech language pathologist's working with adults with dysphagia must be competent in the following area:

- Identifying persons at risk for dysphagia
- Conducting and interpreting clinical assessments of oral pharyngeal and respiratory functions related to feeding
- Conducting and interpreting instrument based evaluations of swallowing
- Developing intervention strategies (i.e.; safe feeding recommendations, swallowing precautions and therapeutic interventions).
- Documenting care and discharge planning.
- Providing education, counseling and training to patients and all other relevant individuals (i.e., family, health professionals, etc).

Need for profiling swallowing and related behaviors

A detailed examination of each stage of deglutition in the light of what is known about normal swallowing physiology and neurophysiology is necessary to effectively treat clients with dysphagia. Despite the relative recency of the investigation into the attendant complications of dysphagia, our knowledge of the incidence, characteristics (clinical and radiological), and prognosis of dysphagia is incomplete. A great deal of research has focused on videofluoroscopic study of swallowing. Particularly the modified barium swallows procedure as the most sensitive diagnostic tool for detecting the presence of aspiration in dysphagia. However recent advances suggest that clinical swallowing evaluations can identify the presence of aspiration in patients with sensitivities near 80% and specificity near 70 % (ASHA, 1992).

The prognosis of patients with dysphagia as individuals is extremely variable; some have remarkably benign prognosis and others a poor prognosis. As treatment for swallowing problems are available, some of which are safe and inexpensive (such as compensatory maneuvers) and others which are hazardous and expensive (such as nasogastric or gastrostomy insertion), it is important that client's with dysphagia at high (and low) risk of serious complication can be identified at initial assessment so that resource allocation can be prescribed. Otherwise clients with dysphagia with extremely good prognosis may be exposed to inconvenient, costly and perhaps even risky treatments that result in no long term benefit, whereas clients with poor prognosis may be denied treatments that may be more effective in reducing their risk of serious complication.

The reported high incidence for dysphagia following stroke and consequent risk associated emphasize the need for early identification and evaluation of dysphagia. American stroke association (ASA) stroke management guidelines (2001), recommended the completion of a comprehensive clinical assessment for any client suspected with dysphagia. Identifying clients at risk for developing dysphagia remains a difficult task. In ASHA preferred practice patterns for the profession of speech language pathology and Audiology (ASHA, 1997), the association describes a clinical swallowing examination as including procedures such as a review of client's medical chart and history, a brief questionnaire for the client or caregiver, a physical evaluation of oropharyngeal structures and muscles and their function, and a functional analysis of swallowing. However, AHCPR (1999) found that an extremely wide range of

assessment techniques and procedures are currently employed by individual therapists under the label of clinical or bedside swallowing examinations.

Indications of clinical assessment of swallowing

The symptoms and warning signs for that suggest the presence of impaired swallowing and the risk of aspiration is listed in Table 2. The clinical assessment of swallowing should screen clients for the likelihood and seriousness of a swallowing impairment - pain with swallowing, a sensation of sticking and obstruction during swallowing, or visible effort when swallowing are signs of discrete disease. This is so even when sensation is intermittent, as it may be organic structures (Schatzki and Gary, 1963) or made worse by emotional stress (Tucker, Snape & Cohen, 1978 ; Benjamin, Gerhardt & Castell, 1979 ; Pope, 1989). Most clients seek help because they have recognized some malfunction of their swallowing (Ravich, Wilson, Jones & Donner, 1989). Hospitalized or institutionalized patients may be unable to recognize or describe dysphagia, and accounts of swallowing problems must then be elicited from attendants (Langmore, Schatz & Olsen, 1988; Siebens, Trupe, Siebens, 1986).

Oral feeding problems are likely in client's whose neurologic disease has led to confusion or dementia (Buchholz, 1994). Clients with poor judgment, sensory deficits or poor motor coordination from brain damage may not possess the vigilance and physical ability to handle their food intake safely. Frequent coughing and choking on food or sputum signify impaired swallowing (Gerhardt, Shuck, Bordeaux, & Winship, 1978).

Strenuous chewing, labored swallowing, repetitive swallowing of a single bolus and prolongation of meal time should be taken seriously, particularly if associated with disinterest or fear of food and weight loss. Sialorrhea (excessive drooling) is of aesthetic consequence and related to poor orolabial continence. Drooling is more ominous when due to poor pharyngeal clearance of secretions by periodic swallowing. Pooling of mucus or debris in the pharyngeal recess (valleculae or pharyngeal sinuses) implies poor bolus clearance and increased risk of aspiration (Jordan, 1977; Perlman, Booth & Grayhack, 1994).

Table 2: The symptoms and findings that are warning signs for presence of impaired swallowing:

Decreased alertness or cognitive dysfunction	<ul style="list-style-type: none"> • Stupor, coma, heavy sedation, delirium, dementia or profound mental retardation. • Playing with food, inappropriate size of bites, talking or emotional lability during attempts to swallow.
Changes in approach to food	<ul style="list-style-type: none"> • Avoidance of eating in company • Special physical preparation of food or avoidance of foods of specific consistency • Prolonged mealtime, intermittent cessation of intake, frequent wash downs. • Compensatory measures • Laborious chewing, repetitive swallowing • Coughing and choking upon swallowing, increased need to clear throat
Manifestations of impaired oropharyngeal	<ul style="list-style-type: none"> • Dysarthria • Wet, hoarse voice

function	<ul style="list-style-type: none"> • Dysfunction of focal musculature • Drooling or oral spillage • Pooling and pocketing of food
Patients complaints or observation of	<ul style="list-style-type: none"> • Difficulty initiating a swallow • Sensation of obstruction of bolus in the throat or chest • Regurgitation of acid or food • Unexplained weight loss impaired breathing • Pain on swallowing

Role of clinical evaluation

Dysphagia or impaired swallowing, may severely affect ones quality of life. It may turn a pleasurable experience to torment. It can make clients dependent on others or on non oral nutritional support. It can pose constant threat of sudden airway obstruction or respiratory infections from aspiration. Along with a cranial nerve examination, the clinical evaluation of client should provide information on general health and social and cognitive ability. Is a generalized disease causing dysphagia, or has led to deterioration in general health? Has the patient been physically and emotionally able to compensate for dysfunction? Is the swallowing dysfunction a source of isolation and depression? The knowledge affects the selection of appropriate feeding modality and other aspects of diagnosis, prognosis and management.

Screening procedures provide the clinician with some indirect evidence that the client has a swallowing disorder. It tends to identify the signs and symptoms of

dysphagia such as coughing behaviors, history of pneumonia, drooling, chewing difficulties or the presence of residual food in the mouth. Screening procedures are generally performed at the patients bedside or in a home or school environment and provide the clinician with increased evidence that the client needs an in depth physiological assessment.

There has been increased interest in refining screening procedures with goal of eliminating the need for videoflouroscopy study or other instrumental procedures (De Pippo, Holas & Redding, 1992). However, screening procedures answer a very different set of questions than does a diagnostic procedure such as videoflouroscopy. Screening procedures ask and attempt to answer the question, is the patient dysphagic? They do not answer the question, what is the nature of the client's physiology during swallowing? The latter question is answered by diagnostic procedure. Some of the newly developed screening procedures involve continuous swallowing of larger amounts of liquids (3-oz water test the timed swallowing test) (De Pippo et.al., 1992). These should be used very judiciously in clients at with significant immediate or delayed pulmonary reaction (Batchelor, Nielson, Sexton, 1996).

Generally when a screening procedure is examined for its accuracy in identifying the presence of a dysphagia symptom, two characteristics are statistically examined. First the procedure should correctly identify those individuals who are actually aspirating or have residue (true positives), known as procedural sensitivity and those who have none of these symptoms (true negatives), known as procedural specificity.

Second, the procedure should generate many false positives (i.e., those who are aspirating but are identified as not aspirating) or false negatives (i.e. those who are aspirating but are identified as not aspirating). The ability of screening procedure to identify the presence of symptom such as aspiration or residual food in the pharynx has not nearly reached 100% accuracy in any of the studies that have been completed to date with any screening procedures. Screening should be quick (less than 15 minutes), easy and inexpensive.

Logemann, (2002) lists five reasons for clinical evaluation for a swallowing disorder:

- to define a potential cause
- to establish a working hypothesis that defines the disorder
- to establish a tentative treatment plan
- to develop a potential list of questions that may need further study
- to establish the clients readiness to cooperate with any further testing

A comprehensive evaluation for dysphagia should be considered a team evaluation, as no one discipline can assess in detail all phases of swallowing. Without attempting to enumerate all the disciplines that might contribute to comprehensive dysphagia evaluation and recognizing the responsibilities and expertise may vary from setting to setting. One component of comprehensive dysphagia evaluation is the clinical evaluation of dysphagia (CED). CED comprises a detailed description of the subjective complaint or problem, the acquisition of relevant health history, pertinent clinical observations and a focused physical examination. At a minimum, the CED should allow

the clinician to (1) screen for the presence or absence of swallowing impairment (2) contribute information regarding the possible etiology of dysphagia relative to its anatomic and physiologic basis (3) ascertain the relative aspiration risk for the certain patients (4) determine the need for an alternative means of nutritional management, and (5) recommend additional tests and procedures to diagnose and treat dysphagia.

The assessment of swallowing function is the primary aim and is commonly undertaken by clinical observations. There are three general possibilities. First, a swallowing evaluation may form a part of medical diagnosis where the practitioner is attempting to determine the underlying pathology. Second, the swallowing evaluation may be conducted to determine the patients abilities and impairment and the degree to which impairment can be modified. Third, a combination of previous two goals may be used (Langemore and Logemann, 1991).

Swallowing may be impaired because of mechanical impingement on the bolus passage, lack of salivary secretions, weakness in the muscular structures propelling the bolus, or dysfunction of the neuronal networks coordinating swallowing (Buchholz, 1987; Hughes et.al., 1996). The clinical assessment of swallowing should identify the most likely sites and mechanics of disordered swallowing .The techniques used to do this are like those employed in all clinical disciplines: to define the nature of the problem by prompting the patient to describe the symptoms and clarify the symptoms through direct questioning. The clinician constantly compares the information provided by history and examinations to the manifestations of various categories of the

swallowing disorders. The clinician may then define the client's problem category, syndrome, or in some instances a single disease entity (Castell 1987).

A swallowing assessment is intended to ascertain the factors related to swallowing function but need not in itself be diagnostic of the underlying disease. The speed and complexity of the swallowing mechanism are too great to be assessed without a clinical aid. Many methods have been employed, but have limitations in a clinical environment. Management is frequently undertaken on an empirical basis, yet the greater the accuracy of assessment the greater the opportunity to recommend an optimum management plan.

The advantages of clinical examination are as follows.

- It incorporates more aspects of swallowing than only the mechanical movements of mouth larynx and pharynx
- It may provide information about the bigger picture of ingesting food to sustain nutrition and hydration
- It is more available as an assessment tool than other procedures that require expensive and elaborate equipment to complete
- It is not invasive, has no known health risks and is much less burdensome to fragile patients who may find some techniques or act of moving to the examination room, intolerable.

The clinical evaluation (CES) provides a road map to the diagnosis and treatment of the swallowing disorder. The CES provides a preliminary assessment of the clients current medical status, his or her needs for nutrition, and alerts the clinician to select appropriate instrumental testing protocol .Depending on the status of the client (e.g.; severe impairment from stroke or extensive traumas) a complete CES is sometimes not possible; nonetheless, the clinician should make an attempt to conduct as thorough a CES as possible. Even an incomplete CES provides important information regarding the clients's cognitive ability to follow instruction and to cooperate during the testing and rehabilitation process.

Detecting the presence of aspiration and penetration is an important part of CES as health status and recovery are dependent on adequate nutrition and safe swallowing .Several investigators have examined the sensitivity and specificity of CES for predicting aspiration. Mc Cullough, Wertz and Rosenbeck, (1999) examined 60 stroke patients and found that CES was not highly predictive of which clients subsequently aspirated during the modified barium swallow examination. Ramsey et.al.,(2002) found that CES had highly variable specificity and sensitivity and also concluded that this was inadequate for detecting silent aspiration. Puruzzi et. al., (2004) compared the use of bedside dye test to videoflouroscopy studies of swallowing in 20 consecutive clients with tracheostomy and found that videoflouroscopic examination was significantly better than bed side dye test.

Each aspect of the swallow evaluation is designed to address the issue of (1) swallow safety (2) nutritional status (3) continuation or possible modification of

present diet, and (4) need and appropriateness for additional instrumental tests. The clinical examination determines the contributing causes of the swallowing disorder and which treatments will best improve the functional adequacy of feeding and swallowing behaviors (Logemann, 1998). In adults, primary dysphagia is caused by anatomical abnormalities and sensory motor deficiencies. However it is frequently complicated by secondary consequences of dysphagia and by co-occurring disorders. Despite the failure of clinical examination to consistently demonstrate validity at assessing the degree and characteristics of oropharyngeal dysphagia, the presence of aspiration, or diet textures for safe oral intake, clinicians often use and rely on their results as their first mode in the assessment of swallowing.

This reliance on the clinical examination may occur for several reasons:

- It incorporates more aspects of swallowing than only the mechanical movements of mouth, larynx and pharynx.
- It may provide information about the bigger picture of ingesting food to sustain nutrition and hydration
- It is more available as an assessment tool than other procedures that require expensive and elaborate equipment to complete.
- It is not invasive, has no known health risks, and is much less burdensome to fragile patients who may find some techniques, or the act of moving to the examination room, intolerable.

Many of the components of clinical examination may lack the validity that rigorous research could bring to bear. As such clinical examination may be more an art than a science, an art of extracting and integrating information into a conceivable premise that allows the management of swallowing problem within the context of client's daily life. This is the significant strength of clinical examination.

In the clinical dysphagia evaluation, oral, pharyngeal and thoracic anatomy, oral reflex reactivity, voluntary movement patterns, bolus motility and developmental eating skills are examined. Overall adequacy of swallow for nutrition and airway protection is deduced from client's history and from observed behavioral and sensory motor events which when associated with swallow, suggests pharyngeal, respiratory or gastroesophageal competency. Symptoms that indicate possibility of oral initiation, pharyngeal, and esophageal dysphagia are coughing, gagging, regurgitation, increased respiratory rate, skin color change, gurgling breath or vocal sounds, and self restricted bolus size, viscosity, or amount of intake among others.

The clinical assessment rules out or confirms the dysphagia and motivates referrals for assessment to rule out or manage related behavioral, medical, maxillofacial or nutritional problems. In addition, the results are useful in determining the need for x ray or other instrumental studies of the dysphagia. The clinical dysphagia examination therefore is frequently the first procedure scheduled in a team evaluation. The clinical examination may be more an art than a science, an art of extracting and integrating information into a conceivable premise that allows the management of swallowing

problem within the context of the client's daily life. This is a significant strength of the clinical examination. However as stand alone, the clinical exam also has limitations. Therefore clinicians should recognize both its strengths and limitations as it is employed. The three major components of the clinical examination include history taking, meal observation, and physical examination.

Methods of profiling swallowing

Several methods have been proposed for the evaluation of dysphagia. No consensus currently exists on a standard method of assessment. Investigators have used methods ranging from subjective impression such as observation of coughing following liquid ingestion, to global impressions of function or the use of computerized instrumental techniques (Videoflouroscopy and video endoscopy). Regardless of method an appropriate assessment tool should be readily accessible, validated in dysphagic population and should demonstrate both inter and intra subject reliability. Matrino, Pron and Diamant, (2000) reported survey data which indicated that 71% of the respondent dysphagia clinicians (speech language pathologists) performed a complete evaluation of dysphagia. Conversely only 36% of these clinicians completed an instrumental swallowing examination. Moreover instrumental swallowing examinations were never completed in the absence of full clinical examination. Thus these results strongly suggest that clinical examination is the primary method of swallowing examination among the practicing clinicians.

Evaluating children with feeding and swallowing

Eating and swallowing behaviors are modified by the child's cognitive fine and gross motor abilities (Christensen,1989). Furthermore, the infants or child's early feeding circumstance is distinctively linked with mother or other care giver (Bosma, 1990).

Dysphagia is a symptom of disease that may be affecting any part of the swallowing tract from the mouth to the stomach. (Donner 1986) and may present as respiratory compromise, growth failure and or negative behavior at meal times. The goal of feeding and swallowing assessment is to develop a management protocol which enables safe and efficient feeding that is enjoyable for both the child and the caregivers.

Assessment of feeding safety requires the identification of factors that predispose the youngster to airway compromise as well as conditions that lead to elimination of airway contamination during oral intake. The ability to meet nutrition and hydration goals is dependent on oral – pharyngeal efficiency (rate of intake per unit time) without compromise of airway safety. These goals are often met through team approach including input from nutritionist in conjunction with the initiation of therapies to increase oral-pharyngeal efficiency. Finally, the most subjective management goal is the facilitation of an enjoyable interaction between the child and caregiver.

Differences between pediatric and adult evaluations

Normal and disordered swallowing mechanisms in adult have been extensively discussed (Groher, 1992; Logemann, 1983) however there are limitations associated with the application of the adult model to pediatric population. As stated by Bosma (1990), the clinical approach to these (feeding) impairments in early pediatric age is notably different from that of dysphagia which is acquired in neurologically mature adult. Feeding and swallowing function are dynamic process under constant change mediated by differential growth and development of structures comprising the upper aero digestive tract. The growth rate is dramatic enough to have substantial effects on infant vocalization. Likewise, the infants feeding and swallowing behavior must continually adapt to changing system. Through out all stages of growth, the infant's pharynx is responsible for four primary functions including: airway maintenance, food and liquid passage, respiration and phonation. (Bosma and Donner 1985). Consequently, identification of children at risk for feeding and swallowing impairment is dependent on assessing a dynamic system which continuously accommodates to growth and development while supporting safe and efficient food and liquid deliver.

Components of Feeding and Swallowing evaluation

Groher (1994), stated that the goals of the clinical evaluation are to (1) establish a possible cause of dysphagia (2) assess the ability to protect the airway (3) determine the practicality of oral feeding and /or recommend alternative methods for nutrition management.(4) determine the need for additional diagnostic tests or studies; and (5)

establish baseline clinical data. To accomplish these goals, the feeding and swallowing evaluation must include four primary components: a careful history; examination of swallowing mechanism, observation of a trial feeding, and specialized imaging studies as carefully indicated (Groher, 1984; Tuchman & Walter, 1994).

Research and challenge in methodology in the assessment of swallowing disorder

A growing array of technologies is available to assess various aspects of deglutination function. In general, these technologies allow measurement of the movement of the deglutition structures and /or boluses or the activity of muscles involved in deglutition in temporospatial domains. Several challenges confront the optimal use of methodologies. An inherent difficulty with all modalities is that they are more or less invasive or constraining on the natural act of deglutition. This means that some aspects of deglutitive process can be altered or interfered with by examining methodology and some aspects simply cannot be recorded. An obvious example would be subjects who gag on barium. A more subtle example is the increase in swallow frequency resulting from stimulation of salivary flow when a nasopharyngeal catheter is present (Helm et. al., 1982; Kapila, Dodds, Helm & Hogan, 1984). Some modalities require substantial constraints of movement to avoid movement artifacts in the recording, such as CT & MRI. Little data are available on many such methodologies about how the imposed constraints affect the natural deglutition (Lang, Dantas, Cook, & Dodds, 1991; Robbins, Hamiltron, Lof & Kempster, 1992).

Scanty information exists about the degree and sources of error in making measurements for many of these methodologies. In some instances error ascertainment may be impossible because there are no gold standard criteria for measurement. For instance, there is no ready way to assess how accurately and precisely the surface EMG signal reflects the magnitude of muscle activity in vivo. Nor, for example is there information about how much of variability in scintigraphic bolus clearance from swallow to swallow is a result of inherent variability in the swallow process or in the variability of the technique. Unpublished observations suggest that for movement of hyolaryngeal structures during observation the intra observer variability of measurement is on the order of 10%. Hence, changes in any parameter felt to affect such movement will have to do so by an amount larger than this for the effects to be detectable.

For a given methodology there are significant differences in specific techniques among different practitioners. For example, in videoflouroscopy different institutions will use different bolus sizes and compositions. Another challenge in terms of different methodology is to determine how they relate to each other and which is preferred (Brasseur & Dodd, 1991). While the diverse information provided by the use of several different methodologies can be at times complimentary, there can also be wasteful redundancy in the data so obtained. Little knowledge exists regarding which is the most useful methodology in specific situations.

Both instrumental and subjective assessment procedures are used to assess the abnormalities in different phases of swallowing. The assessment of deglutition

incorporates the use of various techniques based on direct observation through instruments, and these have been advocated since 4 to 5 decades. Some examples are the cineradiographic studies (Saunders, Davis and Miller, 1951; Moll, 1965), combined pressure and radiographic studies (Atkinson, 1957; Sokol, 1966) and video graphic technique (Logemann, 1998).

Evaluation and management approaches will differ in the acute and chronic care settings. In the acute care settings, contact may be brief, goals are short term, client's stability is variable, and progress is associated with improvement of medical status and is expected to be rapid. In the chronic care setting, contact is ongoing, goals are long term, the client is generally stable, and progress is viewed from a rehabilitation perspective and is expected to be slower and progressive. The characteristics associated with the settings will guide the evaluation process and the ensuing management plans.

Western protocols available for swallowing evaluation

Many protocols which are available and reported are ones which are developed in the western countries. Assessment of swallowing in children and adults assumes different dimensions. This study aims to develop a protocol for the assessment of swallowing disorders in adult population. Hence, a few protocols developed in the western countries for the assessment of swallowing disorders is reviewed and presented in Table 3.

Table 3: Protocols / scales commonly used to assess swallowing difficulties in adults (Western)

Sl. No	Name of the Protocol / Scale / Test	Author	Purpose / Nature of the Protocol / Scale / Test	Advantages	Disadvantages
1	Burke Dysphagia Screening Test (BDST),	De Pppo, Holas, & Reding (1994)	Screening test	Helps as bedside testing tool	Detailed evaluation of swallowing difficulty in the four phases of swallow not possible Results stated only as pass/fail.
2	MASA (Mann's assessment of swallowing ability)	Mann, (2002)	Diagnostic test to assess all four phases of swallow through behavioral dimensions	Helps to identify the dysfunction in the different phases of swallow Classification of the following possible:	Comprehensive assessment of all behavioral dimensions in the 4 phases of swallow is not specified

				normal, predicted dysfunction and probable dysfunction	
3	SAFE (Swallowing ability and functional evaluation)	Kipping & Ross Swain (2003)	Diagnostic test to assess only two phases of swallow through behavioral dimensions	It is a standardized scale Incorporates rating scale to assess the dysfunction in 2 phases of swallowing : oral and pharyngeal Gives due importance to recording the client details in terms of psychological factors	It does not assess the esophageal stage of swallow All behavioral dimensions of the Oro – pharyngeal stage of swallow is not addressed comprehensively

				such as alertness, cooperation and comprehension	
4	TOR-BSST(Toronto bedside screening test)	Matrino and Damant (2007)	Screening test Comprises 5 clinical test : 50 ml water test, impaired pharyngeal sensation, impaired tongue movements, dysphonia and general muscle weakness.	It accurately and reliably detects dysphagia Presence of aspiration and physiological abnormality in stroke patients regardless of the time of post stroke.	Comprehensive assessment of all behavioral dimensions in the 4 phases of swallow is not specified

5	Exeter dysphagia Assessment tool.(EDAT)	Parrot and Pinnington (2000)	Diagnostic It checks for- anticipator y, delivery, oral holding, oral transit and oral pharyngeal	Five clinically relevant and distinct consecutive phases were identified	It does not assess the esophageal stage of swallow
6	SWAL-QOL (Patient self assessment scale)	Mc Horney, Colleen, Harris; (2006)	44 items To assess the swallowin g quality of life and quality of care	Differentia te patients with normal swallowin g from patients with oropharyn geal swallowin g dysfunctio n The SWAL-QOL can be used with any patient who has	Comprehensive assessment of all behavioral dimensions in the 4 phases of swallow is not specified

				swallowing disorder.	
7	SWAL-CARE (Patient self assessment scale)	Mc Horney, Colleen, Harris; (2006)	To assess the swallowing quality of life and quality of care	15 items Patients can respond prior to treatment, at various times during treatment and after treatment	Comprehensive assessment of all behavioral dimensions in the 4 phases of swallow is not specified
8	MD Anderson Dysphagia inventory (MDADI)	Chen (1996)	Patient's responses to swallowing quality of life following treatment for head and neck cancer	Consist of global, emotional, functional and physical subscales, all with internal consistency and high reliability	Comprehensive assessment of all behavioral dimensions in the 4 phases of swallow is not specified

9	Reflux symptom index (RSI)	Breumelhof , Smout(1991)	10 question patient self assessment that quantifies a patients reflux symptoms.	Gastro esophageal reflux (GER) and laryngoesophageal reflux (LPR) are identified.	Comprehensive assessment of all behavioral dimensions in the 4 phases of swallow is not specified
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Any protocol / test / scale developed for the assessment of swallowing difficulties is required to meet certain features to account for its credibility as a clinical tool to aid in the evaluation of swallowing difficulties as well as its further application in the management of the client. These factors as listed by Murry (2001) include the following:

- Appropriate definition of the anatomical structure that is involved in swallowing dysfunction
- Ability to detect and quantify aspiration
- Ability to detect etiology for the swallowing dysfunction
- Comprehensively assess all the phases of swallowing
- Ability to test for oral reflexes
- Type of test (screening and diagnostic)

Table 4 shows the rating of the western scales listed in Table 3 adapting the criteria specified by Murry (2001)

Critical evaluation of the western protocols / scales

Table 4: Critical Evaluation of the western protocols / tests / scales listed under Table 3

.	<i>Defi- nes anat- omy</i>	<i>Detects aspirati- on</i>	<i>Quanti- fies aspirati- on</i>	<i>Detects etiology in swallow- ing dysfunc- tion</i>	<i>Compreh- en-sive assess- ment of all phases of swallowi- ng</i>	<i>Quant- ifies reflexes</i>	<i>Screenin- g/Diagn- ostic</i>
BDST	-	+	-	-	-	-	Screenin- g
MASA	-	+	-	+	-	partial	Diagnos- tic
SAFE	-	-	-	+	-	partial	Diagnos- tic
TORBS ST	-	+	-	-	-	-	Screenin- g
EDAT	-				-	-	Screenin- g
SWAL- QOL	-	-	-	-	-	-	Patients self assessm- ent
SWAL- CARE	-	-	-	-	-	-	Patients self assessm- ent
MDADI	-	-	-	-	-	-	Diagnos

							tic
RSI	-	-	-	-	-	-	Self assessm ent

Critical evaluation of the western protocols / scales used for assessment of swallowing in adults as listed in Table 3 reveals the following:

- All the three scales do not assess all the phases of swallowing at a time.
- Majority of the parameters addressed in these scales advocate use of stimuli, eg food articles and their consistencies which are not culture friendly to Indian context
- The scales do not promote a cause – effect relationship in terms of associating the dysfunction with the structural deficit.
- Although the BDST and MASA scales allow for detection of aspiration, there is no scope for quantifying the extent of aspiration. The SAFE scale does not allow for detection nor quantification of aspiration.
- There is no scope for inferring the specific etiology in the different phases of swallow in BDST.
- Oro pharyngeal reflexes which play a major role in the swallowing function is not accounted for in BDST, whereas it is only partially accounted for in MASA and SAFE.
- BDST is only a screening tool unlike MASA and SAFE which are diagnostic tools.

In comparison to the assessment tools available in the western countries, there are no comprehensive protocols available to suit the Indian population and hence this is attempted in the study.

METHOD

There are no formal protocols / tests / scales developed in the Indian context to assess adult clients with swallowing and related problem. Most of the centers which cater to the clientele with swallowing disorders have developed their own indigenous questionnaires and proformae to assess the swallowing disorders in children as well as adults. The variation in the test material used from place to place has given rise to serious challenges to standardization of the client data. A protocol which is comprehensive and addresses all the major and minor contributing factors which leads to swallowing disability is required and is the need of the hour. Hence, a protocol called “Clinical protocol for assessment of swallowing in adults (CP-ASA)” was compiled and developed.

Aims of the study

- To develop a clinical protocol for the assessment of swallowing disorders in adults.
- To check for item and content validity of the protocol developed
- To test the sensitivity of protocol developed, by administering the same on clients with swallowing disorders.

The protocol was compiled, developed and tested for its sensitivity in 3 stages:

Stage 1: Compilation and development of the protocol and test kit

Stage 2: Checking for item & content validity of the protocol

Stage 3: Testing the sensitivity of protocol developed by administering the same on clients with swallowing disorders

Stage 4: Finalizing the protocol after incorporating modifications based on the feedback obtained from stage 2 and 3.

Stage 1: Compilation and development of the protocol and test kit

A comprehensive review of different assessment scales/tools/literature and web based search was employed. Items that contributed to the assessment of a gamut of swallowing disorders in adults were pooled in order to develop a comprehensive protocol addressing various aspects of the disorder. The items were then verified one by one to look for its relevance to the adult population as well as its application in Indian context. The items which were not relevant to the Indian context were modified and / or replaced as per the need, The material was further classified under different domains, sections and subsections. This exercise led to the development of a protocol comprising of four main domains, with sections and subsections within them.

The structure of the protocol included the following:

Part A

A) Demographic details of the client
B) Client history
C) Family and medical history

Part B

Section	Title of the Section & Subsections	Number of items	Scoring
Section A	Assessment of Posture	14	<u>4 point rating scale</u> 3 = Within functional limits 2 = Mild impairment 1 = Moderate impairment 0 = Severe impairment
Section B	<p>Assessment of respiratory abilities</p> <ul style="list-style-type: none"> • At rest • During speech • Coordination of respiration and swallowing <p>Assessment of sensory abilities</p> <ul style="list-style-type: none"> • Taste • Temperature • Oral sensation <p>Assessment of cognitive status</p> <ul style="list-style-type: none"> • General status • Specific dysfunction 	<p>1</p> <p>1</p> <p>3</p> <p>5</p> <p>2</p> <p>10</p> <p>11</p> <p>9</p>	<u>4 point rating scale</u> 3 = Within functional limits 2 = Mild impairment 1 = Moderate impairment 0 = Severe impairment
Section C	<p>Assessment of Cranial nerve functions and Oral reflexes</p> <p>Assessment of cranial nerve functions</p> <p>Assessment of oral reflexes</p>	<p>4</p> <p>4</p>	<p><u>4 point rating scale</u> 3 = Within functional limits 2 = Mild impairment 1 = Moderate impairment 0 = Severe impairment</p> <p><u>2 point rating scale</u> 1 = Normal reflex for the age 0 = Primitive/immature/ no response/exaggerated response to the stimulus</p>

Section D	Physical Examination of the oral mechanism <ul style="list-style-type: none"> • Lips • Tongue • Velum • Teeth • Jaw 	5 7 9 2 4	<u>4 point rating scale</u> 3 = Within functional limits 2 = Mild impairment 1 = Moderate impairment 0 = Severe impairment
Section E	Assessment of swallow in different stages <ul style="list-style-type: none"> • Oral preparatory stage of swallow • Oral stage of swallow • Pharyngeal stage of swallow • Esophageal stage of swallow 	25 14 18 10	<u>4 point rating scale</u> 3 = Within functional limits 2 = Mild impairment 1 = Moderate impairment 0 = Severe impairment

The protocol is supplemented with 2 Appendices to aid the clinician in preparation of material required for the administration of food as well as a ready reckoner. The details are enclosed as follows:

Appendix 1: Height weight statistics to check for appropriateness of the same in a given client.

Appendix 2: Tips for selection of food items that can be used for the assessment of swallowing functions in the client (Section E).

Scoring

A 4 point rating scale was used in all the sections except for the subsection on oral reflexes which utilized a 2 point rating scale. The scales depict the descending order of normal behavior of swallow in various sections. Under each section and subsection, the specific behavior for which the rating scales need to be given is described.

Apart from the quantitative assessment using the rating scales, scope for qualitative description, noting the behaviors, comments and other remarks is made available under the column of remarks in every section and subsection.

Stage 2: Checking for item and content validity of the protocol

Once the protocol was developed, it was verified by four speech language pathologists who had working and clinical knowledge in dysphagia management. The items in the protocol was verified by these specialists individually and independent of each other. They were asked to rate each item within the sections and subsections of Part A and B on a 4 point rating scale to identify whether the items were worthy of inclusion (or not) in a clinical assessment of dysphagia. The rating scale was as follows:

1 = is poor and needs to be deleted or substituted

2 = needs major alteration

3 = needs minor alteration

4 = is adequate

Those items which were rated as 1, 2 and 3 were subject to omission or modification as per the suggestion and the same was incorporated in the protocol.

Stage 3: Testing the sensitivity of protocol developed by administering the same on clients with swallowing disorders

The sensitivity of the test protocol was tested by administering it on three subjects with swallowing disorders due to various impairments. The demographic details of the clients tested on the protocol is provided in Appendix 3.

During the physical testing, it was ensured that the client is kept in most comfortable position possible in a well-lit room with no distracters. The session was video recorded after desensitizing the clients, in order to facilitate observation and verification of the responses at a later time to ensure that the behavior was rated appropriately.

The testing session was spread over 2- 3 sittings depending on the clients cooperation and fatigue level. Written consent was obtained from the clients and the purpose of the test was also explained. Suitable instructions appropriate for each of the section and subsection was given. The responses of the clients were recorded on the score sheets of the CP-ASA. Whenever possible, family members were allowed to be present during the assessment and they were also informed of the process, results and recommendations.

The investigator noted in detail the performance of each of the client on the protocol during the live testing of the clients. This was further verified with the video recordings in order to confirm, observe in depth, reflect and verify whether the assessment proceeded in the right way.

The results of the swallowing assessment revealed that S1 presented difficulty in oral preparatory phase, oral phase with an accompanying delay in pharyngeal phase; S2 presented difficulty in oral preparatory phase & oral phases of swallow; S3 presented difficulty in oral preparatory, oral and pharyngeal phases of swallowing. Based on the observation and noting made, suitable modifications were made in the instructions, scoring, definition of a behavior during rating and others as was indicated during the observations. The outcome of these with the clients helped to improvise some of the items the protocol by rephrasing, substituting some of the items and deleting some of the items.

Stage 4: Finalizing the protocol after incorporating modifications based on the feedback obtained from stage 2 and 3.

The protocol was subjected to modification based on the suggestions/outcome obtained from stages 2 and 3.

The protocol with the score sheet is enclosed in the following section.

**Protocol to assess
swallowing ability in
adults**

(CP-ASA)

**CLINICAL PROTOCOL FOR ASSESSMENT OF
SWALLOWING IN ADULTS
(CP-ASA)**

MANUAL FOR ADMINISTRATION OF THE PROTOCOL

PART - A

Date:

Place:

Name of the examiner:

Referred by:

Reason for referral:

Source of Information: Patient: Family: Medical reports

Others (specify):

Postal address:

I. Client history

Name	
Age/Sex	
Client identification number:	
Date of birth:	
Place of birth:	
Place of residence for more than 10 years:	
Education:	
Native Language:	
Other language/s spoken by the client:	
Handedness Right /Left/ Ambidextrous Pre morbid:	

Post morbid:	
If employed, details including the address: Pre morbid: Post morbid:	
General/physical condition:	
Personality and behavior:	
Vocational interests :	
Hobbies and interests:	
Management of activities of daily living:	
Client stays in nuclear /joint family / alone	
Who feeds the client? Self feeding: Fed by the parent/caregiver:	
Age at which swallowing / feeding problem started	
Complaint by the client (ascertain by food type, volume, frequency, functional impact):	
What are the present concerns with reference to feeding?	
Are there instances when the problem is better or worse?	
Do the client /caregiver complain of changes in approach to food? <ul style="list-style-type: none"> • Avoids eating in company • Avoids specific consistency of foods • Requires specific preparation of food • Mealtimes are prolonged • Intake is ceased abruptly or is intermittent • Laborious chewing • Requires to sip water frequently during feeding • Uses compensatory strategies 	

<ul style="list-style-type: none"> • Uses repetitive swallow to clear the food from the mouth • Coughs and chokes upon swallowing • Feels the increasing need to clear throat during swallowing 	
<p>Do the client / caregiver complain of poor oropharyngeal function?</p> <ul style="list-style-type: none"> • Presence of dysarthria • Presence of wet, hoarse voice • Dysfunction of facial musculature • Drooling or oral spillage • Pooling or pocketing of food 	
<p>Do the client / caregiver complain of the following?</p> <ul style="list-style-type: none"> • Difficulty initiating swallow • Sensation of obstruction of bolus in the throat or chest • Regurgitation of acid or food • Unexplained weight loss • Impaired breathing • Pain on swallowing 	
<p>Therapy if any undergone by the client with duration</p>	
<p>Medication if any prescribed by the specialist and details:</p>	
<p>Generally, what type of utensils are used for the client?,Specify Plate Cup Spoon Straw (Length, Diameter, Thickness)</p>	
<p>Is the client aware of feeding environment (Sights, sounds and smells that provide cues that meals are being prepared and eaten)?</p>	
<p>How the client is usually positioned during feeding? ➤ On the floor</p>	

<ul style="list-style-type: none"> • Seated in the corner of the room • Seated on the lap of the caregiver • Lying on the floor in supine position • Lying on the floor sideways ➤ Chair and table (Specify) <ul style="list-style-type: none"> • High chair • Booster seat • Sitting in a chair at the table • Sitting in wheel chair • Height of the table • Distance of chair from the table 	
<p>What are the clients likes and dislikes for liquids and solids?</p>	
<p>What does the client eat in a typical day? List main types of food preferred /consumed in the :</p> <ul style="list-style-type: none"> • Morning • Afternoon • Evening • Night 	
<p>What is the duration of the average feeding?</p> <ul style="list-style-type: none"> • Less than 10 minutes • 10-20 minutes • 20-30 minutes • Over 30 minutes 	
<p>Does the client use compensatory strategies while feeding?</p>	
<p>Does the client require any kind of oral stimulation during feeding either in terms of type of food or the amount of food?</p>	
<p>Does the client show any adverse response to oral tactile stimulation (e.g.; Touch, Temperature)</p>	
<p>Does the client express the urge for emesis during/after meals?</p>	
<p>Does the client feel tired of feel short of breath after feeding?</p>	

Does the client have specific fears towards certain food substances or instruments or adaptive devices?	
Does the client get easily frustrated over a task or has good tolerance?	
Is the client amiable to suggestions and instructions?	
Does the client present any behavioral problems such as irritability, withdrawal, impulsiveness, aggressiveness and restlessness?	
Does the client report any sleep related problems? <ul style="list-style-type: none"> • Disturbed/ Fitful sleep • Snoring • Insomnia • Sleep apnea 	
History of hospitalization if any for swallowing / feeding disorder:	
Was the person admitted in ICU If yes, number of days and reason for admission:	
Details of Tests /X-rays/ Barium Swallow test / Video fluoroscopy / Nasendoscopy etc administered:	
Was the client seen by a surgeon? If yes, details of surgery: <ul style="list-style-type: none"> • Name of the surgeon • Date/s of surgery • Age at which surgery was done: • Type of surgery: • Place/ Address where surgery was done • Outcome of surgery: 	
Pre surgical status of the client: Post surgical status of the client:	
Further surgical procedures planned: if any: If yes, when and reason for the same	
The client's current medical diagnosis? Primary disorder: Secondary disorders:	

Etiology of swallowing / feeding disorder (if identified): Site of lesion: Extent and type of lesion:	
Nutritional status of the client: Body weight appropriate for age Nutritional status is adequate / inadequate (provide details)*	
Has the problem changed over a period of time? Improved/Worsened/Stable/Intermittent? Provide details:	

[Note: * refer to Table 1 in Appendix]

II. Family and Medical History

Positive family history if any for :						
<ul style="list-style-type: none"> • Swallowing disorder: • Gastrointestinal disorder: • Speech and language disorder: • Any other: 						
Medical and Related history						
	Diagnosis	When and who diagnosed	Present status	Radiation therapy if any	Medications if any taken	Surgery/ies if any undergone by the client
Congenital family illnesses						
Neurological Diseases: <ul style="list-style-type: none"> • Seizure disorder • Stroke • Progressive neurological diseases 						

<ul style="list-style-type: none"> • Traumatic brain injury • Other CNS disorder • Movement disorder 						
Craniofacial anomalies:						
Prosthodontic and Orthodontic problems:						
Psychiatric disorders						
Cancer of oral / alimentary system						
Systemic /metabolic disorders						
Infectious diseases						
Exposure to toxins <ul style="list-style-type: none"> • Endogenic • Exogenic 						
Emotional /psychological/ psychiatric disorders						
Respiratory disorders: <ul style="list-style-type: none"> • Pneumonia • Obstructive disease • Aspiration • Others 						
Cardiopulmonary disorder						
Esophageal diseases: <ul style="list-style-type: none"> • Reflux • Regurgitation • Motility disorders 						
Gastro intestinal disorders						

Otorhinolaryngological disorders						
Emotional trauma						
Others :						

PART - B

III. Assessment Section

Introduction and overview:

This section includes five subtests. The skills/ items listed within each subtest have to be assessed in a client based on a rating scale as indicated in the respective sections. The five subtests are:

- A) Assessment of Posture
- B) Assessment of respiratory and sensory abilities and cognitive status during feeding and swallowing
- C) Assessment of cranial nerve function and oral reflexes
- D) Physical Examination of the oral mechanism
- E) Assessment of swallowing in different stages
 - (a) Oral preparatory stage of swallow
 - (b) Oral phase of swallow
 - (c) Pharyngeal phase of swallow
 - (d) Esophageal phase of swallow

Instructions and Scoring Pattern

A) Assessment of Posture:

Instruction:

The items in this section focus on assessment of posture of the client during feeding. Observe the client's posture during interview. Comment on the symmetry of the head, shoulders, neck, trunk and pelvic region of the client as observed during feeding activity (with liquids and solids) in routine by the client. The clinician should put a tick mark for each item given below in the appropriate column for score based on the following criteria:

Score:

- 3 = Within functional limits
- 2 = Mild impairment
- 1 = Moderate impairment
- 0 = Severe impairment

B) Assessment of respiratory and sensory abilities and cognitive status during feeding and swallowing

(a) Assessment of respiratory abilities

(i) At rest

Instruction:

Observe the mode of breathing (nasal / oral) at rest, when the client is comfortably seated and is not attempting to speak. Each of the tasks listed should be first demonstrated by the clinician and the client should be asked to imitate after the clinician. Two to three demonstrations to be provided if required until the client comprehends the instruction. Once the client comprehends the instruction, performance of the client on the second attempt should be scored.

Score:

- 3 = Within functional limits (Air is expelled smoothly and evenly over a period of 5 seconds).
- 2 = Mild impairment (Inhalation and exhalation cycles are not smooth **or** is shallow).
- 1 = Moderate impairment (Marked interruptions in inhalations or exhalations, **or** difficulty in inhalation and exhalation cycles).
- 0 = Severe impairment (Little control over rate of inspiration and expiration **or** respiration may be short and effortful **or** Client may not be able to perform / attempt the task)

(ii) During speech

Instruction:

Engage the client in conversation and observe the respiratory pattern during speech (counting task). Specifically, look for arrest of breath or short breath during connected speech. Clients with poor velopharyngeal control should be asked to hold his/her nose with fingers while attempting this task.

Score:

- 3 = Within functional limits (The task can be performed in one breath).
- 2 = Mild impairment (Very occasional breaks in fluency of counting due to short breath **or** occasionally client stops counting in between and attempts to take a breath in between **or** client cannot complete the task in one breath and requires two to four breaths).
- 1 = Moderate impairment (Client tries to count during inhalation **or** breath is so shallow that he requires five to seven breaths to complete the task **or** client shows evident dyscoordination or variability between expiration and speech during the performance of the task).
- 0 = Severe impairment (The speech of the client is strained, soft **or** the terminal sounds / words in the utterance is not heard **or** there is a gross effort / strain / squeezing seen

in the neck muscles **or** the client requires more than eight breaths to complete the task).

(iii) Coordination of respiration and swallowing

Instruction:

Observe the coordination of respiration and swallow when the client performs the following:

- Swallowing his/her saliva (dry swallow)
- Swallowing graded liquid preparations poured into his/ her mouth (a thick, pureed and thin liquid in that order presented one after the other with enough time gap and in small or medium quantity suiting the client's comfort level should be poured into the mouth. *Caution: This task should not be assessed in clients with severe aspiration or those who choke on liquid feed*)
- Swallowing graded solid preparations kept in the mouth (semi solid, solid and hard food item in that order presented one after the other with enough time gap and in small or medium quantity suiting the client's comfort level should be placed inside his/her mouth).

Caution: This task should not be assessed in clients with severe aspiration or those who choke on any solid feed)

During the performance of the above mentioned activities, observe:

- If the client can hold his breath for few seconds during swallow (correct)
- If the client is attempting to swallow during inhalation (incorrect) or exhalation (incorrect)
- If the client can continue smoothly into inspiration / expiration cycle after the swallow effort.
- If the client's face turns bluish (sign of aspiration)
- If the client chokes over the swallow effort or coughs after swallow (sign of aspiration)
- If the client is attempting to breathe through mouth (incorrect) or through the nose (correct) during swallow phase

Score:

3 = Within functional limits (Client can exhale smoothly post swallow attempt and can comfortably hold breath during swallow for a minimum period of 5 seconds).

2 = Mild impairment (Some lack of control / in coordination when the client attempts to hold the breath during swallow **or** occasional errors in the form of attempts to inhale post swallow attempt).

1 = Moderate impairment (Client has moderate difficulty in holding the breath during swallow **or** client attempts to breathe through his/her mouth during swallow attempts **or** client attempts to cough after every swallow attempt).

0 = Severe impairment (Client is unable to hold breath during swallow attempts **or** shows signs of severe aspiration such as bluish color of the face)

(b) Assessment of sensory abilities

Instruction:

Three types of sensation, that is, tactual, taste and temperature contribute to an effective swallow. Impairment in these sensations in clients will have an implication on swallow.

Observe for the following:

(i) Taste: The client is presented selected food items (solid). Specifically, the taste sensation for sweet, salty, sour, bitter and hot food items is tested. The client should be instructed to close his/her eyes and the selected food item with different taste is presented in a random sequence with enough time periods between the presentations. The client should be instructed to inform the taste of the item as he/ she sensed it. He/ She may reply verbally or in writing or by ticking the appropriate word on a close ended choice provided.

(ii) Temperature: The client is presented with selected solid food items which are either warm or cold. Care should be ensured to see that the item is not too hot or cold and is within the tolerance limit of the client. The client should be instructed to close his/her eyes and the selected food item with different temperature (warm or cold) is presented in a random sequence with enough time periods between the presentations. Different food items (minimum two) should be presented in warm and cold condition to test this sensation. The client should be instructed to inform the temperature that he / she sensed when the item was placed in the mouth. He/ She may reply verbally or in writing or by ticking the appropriate word on a close ended choice provided.

(iii) Oral Sensation: The clinician should be prepared with the following material.

- Cotton tipped sticks of different thickness (varying from thin endings to thick endings which are not too sharp and which are hygienically prepared) **Or**
- Gauze metal filament or wooden sticks with different thickness (varying from thin monofilament endings to thick endings which are not too sharp).

The selected material should be placed in an ascending or descending order of thickness on the following structures:

- Different parts of the tongue starting from the anterior to the posterior portion and from the center to the sides.
- Different parts of the hard palate and the anterior portion of the soft palate.
- The anterior sulci (space between the upper and lower teeth and the lips) and the lateral sulci (space between the molars and the cheek on either side)
- The faucial pillars next to the tonsils (only if the client tolerates stimulation in this region)

[Note: Care should be taken to watch for hyperactive gag reflex in clients with neurogenic disorders and also in others with oversensitivity leading to gag reflex. Testing should be discontinued if a client shows signs of oversensitivity]

The client should be instructed to close his/her eyes and the selected test item is placed in different regions of the tongue, palate, anterior and lateral sulci as explained above.

The client should be instructed to inform when he/ she feel the sensation of the region being touched by the material. He / she may reply verbally or by using gestures or in writing or by ticking the appropriate word on a close ended choice provided. If the client does not follow

the instructions, practice may be provided by placing the material on the hands of the client initially after he / she closes the eyes.

Score:

- 3 = Within functional limits (The client identifies the placement correctly in all regions of the mouth 100% of times).
- 2 = Mild impairment (The client has mild difficulty in identifying the placement of the items in some parts of the mouth **or** is inconsistent in his/her responses **or** identifies correctly overall only 75 % of times).
- 1 = Moderate impairment (The client has moderate difficulty in identifying the placement of the items in most of the parts of the mouth **or** is inconsistent in his/her responses more often **or** identifies correctly overall only 50 % of times).
- 0 = Severe impairment (The client has severe difficulty in identifying the placement of the items in most of the parts of the mouth **or** is highly inconsistent in his/her responses **or** identifies correctly overall less than 50 % of times).

(c) Assessment of cognitive status

Instruction:

The assessment of this function in a client should be based on the following which is carried out during the administration of the whole protocol:

- Reports obtained by the client himself/herself or the caregivers
- Medical reports as documented by a Clinical psychologist or therapists who are in constant contact with the client
- Observation by the clinician/tester who administers the entire protocol on the client

Based on a single or cumulative observation, the various functions listed under this section should be assessed and rated as indicated in the scoring. The assessment should be based on objective criteria and evidences as obtained from the observation and reports.

Score:

- 3 = Within functional limits
- 2 = Mild impairment
- 1 = Moderate impairment
- 0 = Severe impairment

C. Assessment of Cranial nerve functions and Oral reflexes

(a) Assessment of cranial nerve functions

Material:

Pentorch, tongue depressor, oral swab, dental mirror, disposable gloves, tape recorder

Instruction:

The client should be instructed to listen to the therapist carefully and perform the activities as directed by her/him. Instructions may be repeated until the client comprehends the

commands. If the client presents with hearing impairment or does not/cannot perform the activity independently, he/she is instructed to imitate the task provided as model by the clinician.

Score:

- 3 = Within functional limits
- 2 = Mild impairment
- 1 = Moderate impairment
- 0 = Severe impairment

(b)Assessment of oral reflexes

Instruction:

Testing in this section should be carried out by a clinician with some experience in the assessment of oral reflexes. Specified stimulus is presented and the reflex response in the given structure is observed for the following:

- Presence of the reflex as a primitive reflex
- Presence of the reflex as a mature behavior

Score:

- 1 = Normal reflex for the age
- 0 = Primitive or immature **or** no response **or** exaggerated response to the stimulus

D. Physical Examination of the oral mechanism

Material:

Pentorch, tongue depressor, oral swab, dental mirror, disposable gloves

Instruction:

Ask the client to imitate a few activities shown by the clinician. Give as many trials as possible until the client performs the activity or fails to carry out the activity.

Score:

- 3 = Within functional limits (The clients oral mechanism is structurally and functionally normal)
- 2 = Mild impairment (There is minimal muscle weakness in the structure being tested **or** some movements are slow/slightly incoordinated **or** the impairment only mildly affects swallow function).
- 1 = Moderate impairment (There is visible muscle weakness/asymmetry evident in the structure tested resulting in notable slowness / incoordination in the structure/function).
- 0 = Severe impairment (There is significant muscle weakness **or** facial / lingual asymmetry/ paralysis evident in the structure tested **or** the client is unable to perform the activity).

E. Assessment of swallow in different stages

(a & b) Oral preparatory and oral stage of swallow

Material:

Cup, Spoon, Disposable gloves, Water, Cerelac, Nectar, Ice chips, Rice, Chapati / equivalent.

Instruction:

Ask the client to swallow selected liquid, semisolid and solid foods as presented by the clinician as per a predetermined schedule. Obtain client's consent to the task and also gather information as to his / her likings or dislikes towards any of the chosen food.

Score:

- 3 = Within functional limits (The clients ability to swallow is within normal functional limits)
- 2 = Mild impairment (the client may have difficulty managing thin liquids and dry/crumblly foods **or** may require prompts and cues for safe swallow and may require minimal compensatory strategies for soft oral intake **or** the client is comfortable with a custom made soft diet).
- 1 = Moderate impairment (the client has difficulty managing a soft diet **or** is able to tolerate all intakes orally with supervision/assistance **or** may require compensatory strategies for safe oral intake **or** client may present xerostomia **or** diet is modified to pureed **or** rate and amount of intake are required to be modified for safe swallow).
- 0 = Severe impairment (the client's swallow is nonfunctional and the client is unable to receive adequate nutrition orally **or** the client is at risk for aspiration **or** attempts for safe oral intake require 100% supervision or assistance from the therapist).

(c) Pharyngeal phase of swallow

Instruction:

Observe and monitor the client's session of feeding and assess the functions listed

Caution: Judgment of the pharyngeal and esophageal phases of swallow should always be made using a combination of subjective and objective methods (Instrumental assessment).

Score:

- 3 = Within functional limits (The client's ability to swallow is within normal functional limits **or** the pharyngeal response to swallow is triggered within 2seconds)
- 2 = Mild impairment (The client may have difficulty managing thick liquids, solids, semisolids and dry/crumblly foods **or** may require prompts and cues for safe swallow and may require minimal compensatory strategies to manage the food items **or** the client is safe with a mechanical soft diet, thin liquids).

- 1 = Moderate impairment (the client has difficulty managing even a soft diet **or** is unable to tolerate all intakes orally with supervision / assistance **or** may require compensatory strategies for safe oral intake **or** frequent throat clearing noted **or** the client may demonstrate nasal/oral regurgitation occasionally **or** the client takes sips of water after every bolus intake **or** the diet is modified to only thin liquids **or** rate and amount of intake are modified **or** pharyngeal swallow is slightly delayed).
- 0 = Severe impairment (The client's swallow is nonfunctional and the patient is unable to receive adequate nutrition orally **or** the client is at risk for aspiration **or** hoarse/ wet/ gurgly voice quality after every swallow is evident **or** noisy breathing during / before /after feeding is present **or** pharyngeal swallow is significantly delayed if the client takes food orally **or** post nasal drainage / excessive phlegm in the throat is reported by the client **or** attempts for safe oral intake requires 100% supervision or assistance from the clinician).

(d) Esophageal phase of swallow

Instruction:

Observe and monitor the client's session of feeding and assess the functions listed

Caution: Judgment of the pharyngeal and esophageal phases of swallow should always be made using a combination of subjective and objective methods (Instrumental assessment).

Score:

- 3 = Within functional limits (The clients ability to swallow is within normal functional limits)
- 2 = Mild impairment (The client may have difficulty managing solid and semisolid foods than liquid foods **or** may require prompts and cues for safe swallow and may require minimal compensatory strategies for liquid intake).
- 1 = Moderate impairment (The client complaints of food stuck in the lower throat or chest **or** has difficulty managing a soft diet **or** is unable to tolerate all intakes orally without supervision/assistance **or** the client may experience burning sensation in the mouth/throat/chest **or** the client may regurgitate occasionally after lying down and may require compensatory strategies for safe oral intake which includes modification of the rate, amount and type of diet and sleep timings **or** diet is modified to pureed intake / other types of modification).
- 0 = Severe impairment (the client's swallow is nonfunctional and the client is unable to receive adequate nutrition orally **or** he may have to depend on alternative feeding methods (Tube feeding, PEG) **or** the client is at risk for aspiration **or** attempts for safe oral intake require 100% supervision/ assistance from the therapist).

PROTOCOL AND SCORING

A) Assessment of Posture

Sl No	Items	Score				Remarks
		3	2	1	0	
	<i>A) Assessment of posture</i>					
1.	Habitual body position					
2.	Habitual head position					
3.	Body and head alignment during feeding					
4.	Independent head support					
5.	Trunk stability					
6.	Pelvic stability					
7.	Coordination of head, shoulders, neck, truck and pelvis during feeding					
8.	Ability to move the upper limbs against gravity					
9.	Postural adequacy while drinking from a cup/glass					
10.	Postural adequacy while sucking liquids through straw					
11.	Postural adequacy while feeding on solids with his/her fingers					
12.	Postural adequacy while feeding on solids with fork / spoon*					
13.	Postural adequacy while cutting solid food with knife*					
14.	Postural adequacy while using adaptive feeding devices prescribed if any*					
	Total score					

[Note *= not applicable in clients who are not used to spoon/fork/knife or are not prescribed any adaptive device]

B) Assessment of respiratory , sensory and cognitive status during feeding and swallowing

Sl No	Items	Score				Remarks
		3	2	1	0	
	<i>(a) Assessment of respiratory abilities</i>					
1.	<i>(i) Respiration at rest</i>					
	Ask the client to take a deep breath in through the mouth and let out as audibly and slowly as possible					
2.	<i>(ii) Respiration during speech</i>					
	Ask the client to count numbers one to ten in any language as quickly as possible on one breath. (Note the number of breaths he/she takes to complete the task)					
3.	<i>(iii) Coordination of respiration and swallowing</i>					
	Tasks: (Assess for each liquid and solid consistencies) <ul style="list-style-type: none"> • Ask the client to swallow his / her saliva 					

	<ul style="list-style-type: none"> • Ask the client to swallow graded liquid preparations poured into his/ her mouth in this order <ul style="list-style-type: none"> ➤ Thick liquid ➤ Pureed liquid ➤ Thin liquid • Ask the client to swallow graded solid preparations poured in his/ her mouth in this order <ul style="list-style-type: none"> ➤ Semi solid ➤ Solid ➤ Hard 					
	(b) Assessment of sensory abilities					
1.	(i) Taste: (Assess for each of the different tastes) <ul style="list-style-type: none"> • Sweet • Salty • Bitter • Sour • Hot 					
2.	(ii) Temperature (Assess for both the temperatures) <ul style="list-style-type: none"> • Warm • Cold 					
3.	(iii) Oral Sensation (Assess for sensation in each of the following regions in the mouth) <ul style="list-style-type: none"> • Anterior portion of the tongue • Middle portion of the tongue • Posterior portion of the tongue • Lateral portion of the tongue • Left lateral sulcus • Right lateral sulcus • Upper anterior sulcus • Lower anterior sulcus • Faucial pillar – right • Faucial pillar - left 					
	(c) Assessment of cognitive status (Assess for each of the following as indicated under instructions and scoring)					
1.	(i) General status <ul style="list-style-type: none"> • Motivation 					

2.	<ul style="list-style-type: none"> • Vigilance and alertness • Cooperation • Orientation (self, place, time, persons and situation) • Imitation skills (verbal or nonverbal acts) • Concentration • Memory <ul style="list-style-type: none"> ➤ Antrograde ➤ Retrograde • Endurance to tasks • Ability to judge the reinforcements • Ability to respond to commands • Discipline, neatness and table manners <p>(ii) Specific dysfunction</p> <p>Client is / has:</p> <ul style="list-style-type: none"> • Not in stupor • Not in coma • Not under heavy sedation • No delirium • No dementia • No Profound mental retardation <p>Client shows the following while feeding:</p> <ul style="list-style-type: none"> • Does not play with food • Takes appropriate size of bite • Does not talk (or show) emotional lability during attempts to swallow 					
Total score						

C) Assessment of cranial nerve function and oral reflexes

Sl No	Items	Score				Remarks
		3	2	1	0	
(a) Assessment of cranial nerve functions						
1	<p>(i) Vth Cranial Nerve function (Trigeminal)</p> <p><i>Motor function</i></p> <ul style="list-style-type: none"> • Instruct the client to clench the jaws or bite down hard. In this position carry out the following: <ul style="list-style-type: none"> ➤ Palpate the temporalis and masetter. In normal individuals, there is a bulge observed in these muscles, which suggests that the motor function of the trigeminal nerve which supplies these muscles is normal. 					

	<ul style="list-style-type: none"> ➤ Hold the lower jaw/mandible between your thumb and forefinger. Manipulate the lower jaw/mandible in up down and rotary direction, while simultaneously instructing the client to offer resistance to the passive movement carried out on the jaw. If there is good resistance offered against the passive movements by the examiner or if the client can perform the movement with ease, then the motor function of the trigeminal nerve is normal <p><i>Sensory function:</i></p> <ul style="list-style-type: none"> • Instruct the client to close his eyes and report either verbally or through gestures or in writing when he feels the following carried out by the clinician <ul style="list-style-type: none"> ➤ Touch sensation on the face, oropharynx, gums of the mouth, palate and lower jaw <p>(Note: Any complaint of oversensitivity or undersensitivity to touch, intense pain in the facial muscles experienced by the client during the above test should be noted)</p>					
2	<p>(ii) VIIth Cranial Nerve function (Facial)</p> <p><i>Motor function</i></p> <ul style="list-style-type: none"> • Observe the client’s facial muscles when at rest and when he / she is involved in activities such as laughing, eating etc. During these activities assess for: <ul style="list-style-type: none"> ➤ Weakness or paucity in the facial muscles ➤ Asymmetry in the facial muscles ➤ Unilateral facial palsy of upper or lower or both parts of one side of the face (poor lip function, cannot wrinkle forehead) <p><i>Sensory function</i></p> <ul style="list-style-type: none"> • Observe the client during any feeding activity and test for: <ul style="list-style-type: none"> ➤ Normal or abnormal sense of taste (especially in the anterior 2/3rd of the tongue, floor of the mouth, hard and soft palate. ➤ Normal or abnormal salivation from mouth ➤ Normal or abnormal lacrimation from eyes 					

3.	<p>(iii) <i>IXth Cranial Nerve function (Glossopharyngeal)</i> (iv) <i>Xth Cranial Nerve function (Vagus)</i> (v) <i>XIth Cranial Nerve function (Accessory)</i></p> <p><i>Motor function</i></p> <ul style="list-style-type: none"> • Observe the client during any feeding session and test for: <ul style="list-style-type: none"> ➤ Normal or abnormal gag reflex ➤ Absence of dysarthria ➤ Good swallowing and chewing abilities • Ask the client to cough or clear the throat • Observe for good palatal movements during sustained phonation • Observe the client for the absence of following: <ul style="list-style-type: none"> ➤ Hoarse voice ➤ Poor ability to vary pitch during speech ➤ Hypernasal voice ➤ Weakness in palate (complaints of regurgitation of food) ➤ Difficulty in dumping food from the oral to pharyngeal cavity • Ask the patient to phonate /ah/ /ah/ forcefully. Note unilateral or bilateral drooping in the palate <p><i>Sensory function</i></p> <ul style="list-style-type: none"> • Observe the client during any speaking / feeding session and check for the absence of: <ul style="list-style-type: none"> ➤ Complaint of pain at the base of the tongue, tonsils, ear, angle of jaw which is triggered by talking, swallowing and coughing ➤ Taste and general sensation to posterior one third of the tongue, sensation to tonsils, upper pharynx and soft palate 					
4	<p>(vi) <i>XIIth Cranial Nerve function (Hypoglossal)</i></p> <p><i>Motor function</i></p> <p>Ask the client to perform the following activities with the tongue and test for the adequacy of movements</p> <ul style="list-style-type: none"> • Protrusion and retraction • Lateral movements • Elevation • Pushing against resistance (against tongue depressor). 					
	Total score					

Sl No	Items	1	0	Remarks
	(b). Assessment of oral reflexes			
	Reflex	Stimulus		
1	Gag	Touch posterior portion of the tongue or pharynx to elicit this reflex		
2	Palatal	Touch the posterior portions of the palate and observe for elevation of the soft palate		
3	Swallow	Ask the client to carry out dry swallow or observe for the reflex when he / she is offered food or fluid.		
4	Jaw jerk /maxillary reflex	The client should be relaxed, with the lips parted and the jaw about halfway open. A tongue depressor is placed on the clients chin and the blade of the tongue depressor is then tapped with a reflex hammer or a finger of the other hand. The reflex is characterized by contraction of the masseter and temporalis muscles, leading to a quick jerk of the jaw toward closing.		
		Total score		

D) Physical Examination of the oral mechanism

Sl No	Items	Score				Remarks
		3	2	1	0	
	D. Assessment of oral mechanism					
1	Lips Ask the patient to perform the following and assess for structural and functional adequacy <ul style="list-style-type: none"> • Size • Shape • Lip retraction • Lip protrusion • Lip rounding • Lip closure/seal • Alternating movements of lips 					
2	Tongue <ul style="list-style-type: none"> • Size • Shape 					

	<ul style="list-style-type: none"> • Retraction • Protrusion • Lateral • Elevation • Depression • Sweep • Movement against resistance • Alternating movements of tongue 					
3	<p>Velum</p> <ul style="list-style-type: none"> • Size • Shape • Height • Width • Physical appearance (indicate as normal or presence of conditions such as cleft, tumors etc) • Functional adequacy <p>(Note: If client is using artificial prosthesis, test with and without the prosthesis)</p>					
4	<p>Teeth</p> <ul style="list-style-type: none"> • Alignment and number • Bite <p>(Note: If client is using artificial denture, test with and without the denture)</p>					
5	<p>Jaw</p> <ul style="list-style-type: none"> • Symmetry • Strength • Size • Functional adequacy 					
Total score						

E) Assessment of swallowing in different stages

(a) Oral preparatory stage of swallow

(b) Oral phase of swallow

(c) Pharyngeal phase of swallow

(d) Esophageal phase of swallow

Sl No	Items	Score				Remarks
		3	2	1	0	
	<i>(a) Assessment of oral preparatory phase of swallow</i>					
1	<p><i>Common to oral preparatory and oral phase of swallow:</i></p> <p>Ask the client to swallow the food items presented one by one in a predetermined order and with enough time gap to</p>					

	<p>suit the client's comfort level. During these presentations, observe the pattern of swallow in the client and assess for the following features:</p> <ul style="list-style-type: none"> • Anticipatory open mouth • Adequacy of lip seal • Anterior posterior tongue movement • Tongue peristalsis • Tongue coordination • Tongue shaping (cupping and stripping action) • Lingual rocking-rolling action • Overall range, rate and strength of tongue movement • Mandibular excursion • Jaw gradation • Rotary chewing • Grinding action of molars • Rate/strength of mastication • Mastication overall • Palatal movements • Palate-tongue contact • Ability to suck liquid through lips • Ability to grasp cups with lips • Ability to hold straw with lips • Ability to form bolus • Adequacy of saliva production • Ability to control the bolus • Ability to control of saliva • Ability to move bolus side to side • Oral preparation overall 					
	<p><i>(b) Assessment of oral phase of swallow</i></p>					
2	<ul style="list-style-type: none"> • Bolus transport (move bolus back to pharynx). • Timely onset of swallow • Absence of apraxia of swallow • Material does not fall into anterior sulcus • Material does not fall into lateral sulcus • Degree of oral residue that remains in the oral cavity is less (anterior and lateral sulcus, floor of the mouth, hard palate, mid tongue depression) • Awareness about residue in the mouth is present • Pocketing of food (indicate location) is absent • Oral transit time is correct 					

	<ul style="list-style-type: none"> • Bolus clearance time is correct • Rate of swallowing (fast /slow/normal) • Number of swallow per bolus is adequate • Transition from oral to pharyngeal phase of swallowing is smooth • Ability to coordinate sucking and swallowing is good 					
<i>(c) Assessment of pharyngeal phase of swallow</i>						
	<ul style="list-style-type: none"> • Pharyngeal response is present • Gagging during feeding is absent • Nasal penetration during swallow is absent • Laryngeal elevation is present • Residue on the side of pharynx & pyriform sinus (as evidenced by coughing/choking before/during/after the swallow) is not suspected • Frequent sneezing after eating is absent • Nasal regurgitation is absent • Oral regurgitation is absent • Spitting up or vomiting frequently is absent • Multiple swallows per bolus is absent • Pressure per bolus is adequate • Ability to clear throat during /after swallow in order to prevent food getting stuck is not present as a frequent behaviour • Voice quality (check for hoarse/gurgly/wet voice/weak voice following swallow) is good • Expectoration of food is not there • Amount of saliva that remains in mouth after swallow is adequate • Ability to protect the airway (Aspiration if present, subjectively quantify aspiration) is good. • Pharyngeal phase tolerance of consistencies of food is good • Overall integrity of pharyngeal function is good. 					
<i>(d) Assessment of esophageal phase of swallow</i>						
	<p>Ask whether the patient experiences any of the following after the swallow.</p> <ul style="list-style-type: none"> • Regurgitation after lying down is not present • Burning sensation in the mouth or throat is absent • Discomfort in the chest is absent • Congestion in the chest after eating or drinking is absent 					

	<ul style="list-style-type: none"> • Gagging towards the end /after meals is absent • Awakening at night with gagging /coughing is absent • Pain, pressure or discomfort in the chest is absent. • Feeling of lump in the chest is absent • Belching is absent • Frequent hiccups is absent 					
	Total score					

SCORE SHEET OF CP-ASA

Note: The clinician should enter the scores obtained by the client in each subtest in the protocol and compare this with the total possible scores given in each section. An estimate of the severity of the swallowing disorder of the client may be obtained by observing the total percentage of the scores. Since the protocol facilitates a detailed profiling of the clients swallowing abilities and disabilities, it can also be used as a baseline record to plan for therapeutic intervention, counsel the client and the family / caregiver, compare the pre and post therapy influences etc.

Sections	Total Score	Score obtained by client
A) Assessment of posture	42	
B) Assessment of respiratory at rest		
• At rest	3	
• During speech	3	
• Coordination of respiration and swallowing	21	
C) Assessment of sensory abilities		
• Taste	15	
• Temperature	6	
• Oral sensation	30	
D) Assessment of Cognitive status		
• General Status	33	
• Specific dysfunction	27	
E) Assessment of cranial nerves function and oral reflexes		
• Cranial nerve function	84	
• Oral reflexes	12	

F) Physical examination of the oral mechanism		
• Lips	21	
• Tongue	30	
• Velum	18	
• Teeth	6	
• Jaw	12	
G) Assessment of swallowing in different stages		
• Oral preparatory phase	75	
• Oral phase	42	
• Pharyngeal phase	54	
• Esophageal phase	30	
Total	564	

Remarks and Diagnostic impression made by the clinician:

Recommendation for rehabilitation:

SUMMARY AND CONCLUSION

The aim of the study was to:

- Develop a protocol with features sensitive to (1) screen for the presence or absence of swallowing impairment. (2) establish a possible etiology of dysphagia relative to its anatomic and physiologic basis (3) assess the ability to protect the airway/ ascertain the relative aspiration risk for certain patients. (4) determine the practicality of oral feeding and /or recommend alternative methods for nutritional management.(5) determine the need for additional diagnostic tests and procedures to diagnose and treat dysphagia; and to (6) the assessment of the all the four phases (oral, pharyngeal and esophageal phases) of swallowing in adults.
- Check for item and content validity of the protocol developed
- Test the sensitivity of the protocol developed by administering the same on subjects with swallowing disorders in different phases of swallowing.

This was a preliminary attempt made to aid in the diagnosis and therapeutic intervention for adults with dysphagia. The protocol provides a qualitative as well quantitative (by the use of rating scales) understanding of the elements of dysphagia in the client. The protocol partially fulfills the need for a clinical tool required by clinicians which can be administered based on subjective assessment of the client in the absence of sophisticated objective tools.

The administration of the protocol takes approximately 30-45 minutes. The protocol includes 4 main domains as follows:

Domain I: Demographic details of the client

Domain II: Client history

Domain III: Family and Medical history

Domain IV: Assessment section.

The fourth domain on assessment includes further sections and subsections as follows:

- A) Assessment of Posture
- B) Assessment of respiratory and sensory abilities and cognitive status during feeding and swallowing
- C) Assessment of cranial nerve function and oral reflexes
- D) Physical Examination of the oral mechanism
- E) Assessment of swallowing in different stages
 - (a) Oral preparatory stage of swallow
 - (b) Oral phase of swallow
 - (c) Pharyngeal phase of swallow
 - (d) Esophageal phase of swallow

The scoring of items in the sections and subsections was based on 4 point rating scale (3, 2, 1, 0) (except the section on oral reflexes which employed a 2 point rating scale) where a higher score of 3 indicates that all the features are within normal

limits; 2 indicates mild impairment; 1 indicates moderate impairment and 0 indicates severe impairment. Each subtest also had provision for remarks to include clinicians qualitative observation.

The protocol was subjected to content validation by three speech language pathologists who identified the items worthy of inclusion (or not) in a clinical assessment of dysphagia, by rating them on an ordinal scale (1 = poor; 2 = needs major alteration; 3 = minor alteration; 4 = adequate). The items rated as 1 and 2 were omitted and only those rated as 3 and 4 were included in the protocol. Suitable modifications were made in the assessment protocol depending on the responses and feedback obtained from judges to improve the item and content validity of the tool.

The sensitivity of the test protocol was tested by administering it on three subjects with swallowing disorders due to various impairments (Appendix III). Video recording of the assessment session of the subject were randomly presented to 3 judges who were speech-language pathologists by profession. The results of the swallowing assessment revealed that S1 presented difficulty in oral preparatory phase, oral phase with an accompanying delay in pharyngeal phase; S2 presented difficulty in oral preparatory phase & oral phases of swallow; S3 presented difficulty in oral preparatory, oral and pharyngeal phases of swallowing. The outcome of these with the clients helped to improvise some of the items the protocol by rephrasing, substituting some of the items and deleting some of the items.

The protocol is supported by a score sheet, and relevant information provided to aid in the administration of the protocol on Indian clients in the form of Height weight statistics (Appendix 1) and suggested list of Indian food items in different consistencies which can be used for testing.

The protocol requires to be standardized after administration on many more clients with swallowing difficulties.

Recommendations for future:

Administration of the protocol on larger groups of patients with swallowing difficulty is required to.

- Establish the cut off criteria (for quantitative scoring of errors) for the diagnosis of dysphagia.
- Elaborate on specific distinguishing characteristics of different stages of swallow dysphagia and identify clearly based on the behavioral cues, the dysfunction in different phases of swallowing disorder.

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APPENDIX I

Standard Height and Weight for Indian Men & Women (in terms of Kg's)

(Source: ICMR, 1990)

Height (Feet & Metres)	Men Weight (kgs)	Women Weight (kgs)
5'-0" (1.523 m)	50.8 - 54.4	50.8 - 54.4
5'-1" (1.548 m)	51.7 - 55.3	51.7 - 55.3
5'-2" (1.574 m)	56.3 - 60.3	53.1 - 56.7
5'-3" (1.599 m)	57.6 - 61.7	54.4 - 58.1
5'-4" (1.624 m)	58.9 - 63.5	56.3 - 59.9
5'-5" (1.650 m)	60.8 - 65.3	57.6 - 61.2
5'-6" (1.675 m)	62.2 - 66.7	58.9 - 63.5
5'-7" (1.700 m)	64.0 - 68.5	60.8 - 65.3
5'-8" (1.726 m)	65.8 - 70.8	62.2 - 66.7
5'-9" (1.751 m)	67.6 - 72.6	64.0 - 68.5
5'-10" (1.777 m)	69.4 - 74.4	65.8 - 70.3
5'-11" (1.802 m)	71.2 - 76.2	67.1 - 71.7
6'-0" (1.827 m)	73.0 - 78.5	68.5 - 73.9
6'-1" (1.853 m)	73.3 - 80.7	73.3 - 80.7
6'-2" (1.878 m)	77.6 - 83.5	77.6 - 83.5
6'-3" (1.904 m)	79.8 - 85.9	79.8 - 85.9

APPENDIX – II

List of test materials, including the food items that should be used in the test kit during the administration of assessment protocol (CP-ASA).

- Diagram with lateral view normal anatomy of swallowing
- Laryngeal mirror (for tactile and /or cold stimulation)
- Torch light
- Oral swab
- Disposable gloves
- Spoon
- Fork
- Knife
- Cup (Pouted and Unpouted)
- Plate
- Sterilized Gauze
- Wooden sticks/metal filament
- Straw or pipette
- Syringe and catheter
- Towel
- Apron
- Fork

Examples of the food items that could be used by the clinician during the administration of the assessment protocol (CP-ASA) are listed depending on variations in consistency of solid and liquid foods

Solid food preparations (few examples)

<i>Indian preparations</i>		
<i>Semi solid</i>	<i>Solid</i>	<i>Hard</i>
Smashed rice	Chapati,	Hard baked biscuits
Mashed potato	Rice preparations	Muruku / chakkuli
Pongal	Dosa	Sesame candy
Mashed Curd rice	Idli,	Peanut candy
Bisebele bath	Sweet Halwas	Rava/ Besan laddoo
Kesari bath	Upma	Akki Rotti
Pastry	Parata	Rusk
Cheese	Samosa	Chaat puri
Jam	Cutlet	Roti
Paneer	Pav	Naan
Khichri	Bread	Besan Ladoo
Milk cake		Rusk

Liquid preparations (few examples)

<i>Indian preparations</i>		
<i>Thick liquid</i>	<i>Pureed liquid</i>	<i>Thin liquid</i>
Condensed milk	Payasam/porridge	Water
Cerelac	Kanji	Butter milk
Fruit pulp	Fruit juice (thick)	Tender coconut water
Thick Curd	Nectar	Lemonade
Shrikand	Honey	Soft drinks
Milk cream	Tomato puree	Milk
Thick soup	Dal	Water
Dal fry		Clear soup
		Lime juice

APPENDIX- III

Demographic details of the clients test on the protocol to study the sensitivity

<i>Particulars</i>	<i>S1</i>	<i>S2</i>	<i>S3</i>
<i>Age/Sex</i>	24 Yrs/Male	16 Yrs/Male	18 Yrs/female
<i>Education: (grade completed)</i>	8 th standard	7 th standard	7 th standard
<i>Native Language:</i>	Tamil	Kannada	Malayalam
<i>Other language spoken by the client:</i>	Kannada	Nil	Kannada
<i>Complaint by the client (ascertain by food type, volume, frequency, functional impact):</i>	<ul style="list-style-type: none"> • Difficulty in eating solid foods • Takes long time to chew solid food 	<ul style="list-style-type: none"> • Takes long time to chew solid food • Quantity of food intake is less 	<ul style="list-style-type: none"> • Unable to swallow solid foods. • Aversion to solid and semisolid food. • Quantity of food intake is less.
<i>Age at which swallowing / feeding problem started</i>	Since 5 years	Since 5 years of age	Since 3years of age
<i>Duration of speech therapy undergone by the client with duration</i>	Since 2 months	Since 6months	Since 2years
<i>Present concerns with reference to feeding</i>	Pocketing of food on right side of the mouth	Difficulty in eating solid foods.	<ul style="list-style-type: none"> • Chokes/coughs • Tongue thrust • Pocketing of food • Residue in the floor of the mouth
<i>Fed by self / others</i>	Self feeding	Self feeding	Caregiver
<i>Medical diagnosis</i>	Dysarthria	Moderate degree Mental retardation	Cerebral Palsy