Contact allison.hilger@colorado.edu with questions or comments

Colorado Motor Speech Framework

Assess	*Task*	*Characteristics*
Rate of Speech	*Complete running speech tasks, which may include:* *1) Observation of conversational/informal speech. Ask questions such as,* ***"What does a typical day look like for you?"*** *2) Narrative task: Ask the patient to describe an image (ex. the Kite Picture, or Cookie Theft picture).* *3) Reading task (ex. the Grandfather Passage or Caterpillar Passage).*	Slow rate of speech
		Fast rate of speech
		Variable rate of speech
		Short phrases
Fluency and Cadence		Abnormal noises which interrupt speech or occur when pt is not speaking
		Stutter-like disfluencies (sound/syllable repetition)
		Distorted substitutions or articulatory additions
		Syllable segregation
		Prolonged interword intervals
		Prolonged phonemes
Vocal Loudness		Reduced vocal loudness (<70dB)
		Explosive loudness bursts (often at the start of a phrase)
		Monoloudness
		Loudness decay (per utterance)
		Excessive loudness variation
Voice Quality and Respiration	*Observe during other speech tasks. Measure maximum phonation time: Ask the patient, "****Take a deep breath and hold out the sound 'ah' for as long as you can****."*	Breathiness
		Aphonia
		Hoarseness
		Strained, strangled
		Diplophonia (i.e. presence of two separate pitches)
		Harshness
		Monopitch
		Voice stoppage
		Maximum phonation time less than 9 seconds
		Vocal tremor
		Rapid vocal flutter (i.e. rapid voice tremor)
Word and Phrasal Stress	*Observe during other speech tasks. Optional additional task: Present patient with a sentence in writing: "The deadline is tomorrow." Ask, "****Read this sentence with a different stress. For example, 'The deadline IS tomorrow.'****"*	Reduced use of stress (i.e. minimal emphasis placed on any word or syllable; may impact how meaning is conveyed or implied)
		Prosodic excess or scanning (i.e. equal emphasis on each syllable or word; may have word-by-word cadence)
		Atypical silences / pauses
		Errors marking stress (i.e. emphasis placed on the wrong word or syllable)

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Assess	*Task*	*Characteristics*
Articulation	***"Repeat these words after me: northwest, twist, fused, sleeps, scarecrow, playground, lifeboat, shipwreck, mushroom, woodwork." (from Tikofsky, 1970)*** ***"Repeat this sentence after me: 'A strong job interview actually breathes life into my morning.' 'The other difficult colleague will perhaps confront my behavior and enjoy it.'" (from Gurevich & Kim, 2023)*** *Assess automatic speech:* ***"Tell me the days of the week."***	Imprecise consonants *Note if errors occur consistently based on place / manner of articulation (i.e. lingual phonemes, oral pressure consonants, etc.)*
		Distorted Vowels
		Irregular articulatory breakdown
		Articulatory groping (i.e. movement of the jaw, tongue, or lips in an attempt to correctly place for speech)
		Telescoping (i.e. syllable series run together or multisyllabic words are collapsed)
		Deterioration of speech during continuous speaking
Resonance	*Check for nasal emission by either placing a mirror underneath the patient's nose while they are speaking OR by asking the patient, "****Repeat after me: 'Buy Bobby a puppy.' Now, pinch your nostrils shut. Again, repeat after me: 'Buy Bobby a puppy.****" Compare the patient's resonance when the nares are not occluded, versus are occluded.*	Audible nasal emission or nasal snorting
		Hyponasality
		Hypernasality
Diadochokinetic Rate (DDK)	***AMR: "Take a breath and repeat 'puh-puh-puh-puh-puh for as long and steadily as you can."*** *Provide a 2- to 3-second example. Repeat with "tuh" and "kuh"* ***SMR: "Now, take a breath and repeat 'puh-tuh'kuh' over and over again until I tell you to stop."*** *Provide a 2- to 3-second example. If this speech sequence cannot be learned, as the patient to repeat "buttercup, buttercup, buttercup."*	Slow rate: *AMR= <5-7 repetitions per second* *SMR= <5 repetitions per second*
		Irregular rhythm
		Rapid, accelerated AMRs
		Overall imprecise articulation of AMRs / SMRs
		"Puh" is more imprecise/slow than "tuh" or "kuh"
		"Tuh" and "Kuh" more imprecise/slow than "Puh"
		"Puh-tuh-kuh" is poorly sequenced
Self-Report	*Ask the patient: "****On a scale of 1-7, 1 being the worst and 7 being the best, how would you rate your speech right now?"***	_____ / 7
Intelligibility	*Judge during running speech tasks. Estimate of the percentage of words correctly understood.*	_____%
Naturalness	*Judge during running speech of how well speech matches normal stands of rate, pitch, and loudness.*	WFL, Mild, Moderate, Severe, Profound
Efficiency	*Judge during running speech tasks for how efficient message is conveyed (e.g., is it effortful? Slow?)*	WFL, Mild, Moderate, Severe, Profound

Colorado Motor Speech Framework

Assess	*Task*	*Characteristics*
Emotional Expression	*Observe the patient's emotional state throughout the assessment. Note patient or caregiver report of uncontrolled or inappropriate emotional responses.*	Pseudobulbar Affect (i.e. emotional lability) Flat affect/masked facies
General Oral Mech Observations	*Observations across oral mechanism tasks.*	Incoordination / dysmetria Muscle atrophy *Location(s):* Involuntary, unpredictable movements (of the lips, jaw, tongue, eyes, etc). Tremor: action-induced *Location(s):* Tremor: with sustained movements *Location(s):* Tremor: at rest *Location(s):*
Overall Face	***"Relax and look straight ahead. Open your lips and breathe quietly."*** *Look at the jaw and lips at rest.*	Drooping on entire side of face *L / R* Drooping on lower side of face *L / R* Bilateral facial weakness Hypotonia (i.e. reduced muscle tone) Muscle weakness Spasticity Drooling Nonverbal oral apraxia (i.e. inability to perform or imitate voluntary movements of the speech structures, ex. "cough" or "click your tongue")
Lips	***"Smile. Hold that smile for three seconds."*** *Count to three.* ***"Keep smiling. Don't let me move your lips."*** *Attempt to push the lips towards the center of the face.* ***"You can relax your face. Now, squeeze your lips tightly together for three seconds."*** *Count to three.* ***"Don't let me open your lips."*** *Attempt to open the lips.*	Asymmetrical movement *Reduced on L / R* Weakness Limited range of motion

Colorado Motor Speech Framework

Assess	*Task*	*Characteristics*
Jaw	***"Open your mouth wide. Hold it open; don't let me close your mouth."*** *Attempt to close the jaw.* ***"Close your mouth. Don't let me open it."*** *Attempt to open the jaw.* ***"Keep your lips closed. Bite down five times, like you're chewing on a piece of gum."***	Jaw hangs open at rest Jaw deviation to one side *L / R* Decreased sensation of the face, cheek, teeth, tongue, or palate Weakness when opening or closing Clonus (shivers when relaxed after clenching the teeth) Limited range of motion Progressive weakening of jaw movements
Soft Palate / Velpoharynx	***"Close your lips and puff your cheeks up with air."*** ***"Open your mouth wide."*** *Depress the tongue with tongue blade, and observe the palate at rest.*	Palate hangs low in mouth Palate asymmetry *Hangs lower on L / R (NOTE slight asymmetry is normal)* Asymmetric movement on phonation Air escapes from nose when puffing cheeks
Tongue	***"Open your mouth. Let your tongue relax. "Stick your tongue straight out. Hold it out for three seconds."*** *Count to three.* ***"Don't let me push your tongue back into your mouth."*** *Attempt to push the tongue with a tongue blade while the patient continues to resist.* ***"Curl your tongue up, towards your nose. "Lower your tongue down, towards your chin.*** *Place your finger against the patient's left cheek.* ***"Push your tongue into the inside of your cheek. Push against my finger."*** *Repeat with the right side.*	Fasciculations (i.e. involuntary, fast, spontaneous muscle contraction and relaxation): assess at rest and with protrusion Deviation to one side on protrusion *L / R* Weakness *Bilateral / L / R* Limited range of motion *Bilateral / L / R* Diminished ability to curl tip of tongue Slow movements
Larynx	***"Cough."*** *Produce a glottal coup:* ***"Say, 'uh-oh."*** *Listen to patient inhaling.*	Weak Cough* Weak Glottal Coup* (i.e. glottal stop or glottal attack) Inhalatory stridor *weak cough but strong glottal coup *weak coup and weak cough

Colorado Motor Speech Framework: Scoring Form

		Lower Motor Neuron	Upper Motor Neuron		Basal Ganglia		Cerebellum	Left Hemisphere
	Characteristics	**Flaccid**	**UUMN**	**Spastic**	**Hypokinetic**	**Hyperkinetic**	**Ataxic**	**Apraxia of Speech**
Rate of Speech	Slow rate of speech	X (can be compensatory or primary)	X (un-common)	XX		X	X	X
	Fast rate of speech	-	-	-	XX (short rushes of speech)	-	-	-
	Variable rate of speech				X	X (unpredictable movement)	X	
	Short phrases	XX		X		X		X
Fluency & Cadence	Abnormal noises	-	-	-	-	XX	-	-
	Stutter-like disfluencies				XX			X
	Distorted substitutions or articulatory additions							
	Syllable segregation						X	X
	Prolonged interword intervals				X	XX		X
	Prolonged phonemes					X	X	X
V. Loudness	Reduced vocal loudness (<70dB)	X (CN X)	X		XX			
	Explosive loudness bursts						XX	
	Monoloudness	X		X	XX	X	X	X
	Loudness decay				X		X	
	Excessive loudness variation					XX	XX	
Voice Quality and Respiration	Breathiness	X (CN X)			X	X (transient)		
	Aphonia	X (CN X)		X (intermittent)		X (intermittent)		
	Hoarseness	X (CN X)						
	Strained, strangled	X (ex. compensatory for diaphragmatic weakness)	X (un-common)	XX		X (ex. adductor spasmodic dysphonia)	-	
	Diplophonia	XX (CN X)	-	-	-	-	-	-
	Harshness		X	XX		X		
	Monopitch	X		X	XX	X	X	X
	Voice stoppage					XX		
	Maximum phonation time less than 9 seconds	X (CN X, phrenic nerve)		X	X	X		
	Vocal tremor				X	X	X	
	Rapid vocal flutter (i.e. rapid voice tremor)	X (CN X)			X			
Word & Phrasal	Reduced use of stress			X	XX			
	Prosodic excess or scanning			X			XX	X
	Atypical silences / pauses				XX	X	X	X
	Errors marking stress							XX

Colorado Motor Speech Framework: Scoring Form

		Lower Motor Neuron	Upper Motor Neuron		Basal Ganglia		Cerebellum	Left Hemisphere
	Characteristics	**Flaccid**	**UUMN**	**Spastic**	**Hypokinetic**	**Hyperkinetic**	**Ataxic**	**Apraxia of Speech**
Articulation	Imprecise consonants	X (errors are typically consistent; errors reflect CNs affected)	X	X	X	X	X (inconsistent breakdowns)	X (inconsistent breakdowns; fewer errors for automatic speech)
	Distorted Vowels	X (CN V, VII, and XII)		X		XX	XX	X
	Irregular articulatory breakdown		X			X (due to unpredictable movement)	XX	X
	Articulatory groping							XX
	Telescoping		X (due to imprecise articulation)				XX (due to poor coordination)	X (due to imprecise articulation)
	Deterioration of speech during continuous speaking	XX (ex. Myasthenia Gravis: improvement after rest)	-	-	-	-	-	-
Resonanc	Audible nasal emission or nasal snorting	XX		-	-	-	-	-
	Hyponasality						X (intermittent)	
	Hypernasality	X (CN X)		X	X	X (intermittent)		
Diadochokinetic Rate (DDK)	Slow rate	X (may be compensatory for poor articulation)	X	X (slow and regular AMR)	X	X	X	X
	Irregular rhythm					XX (from unpredictable movement)	XX (irregular AMR)	X (SMRs likely more irregular than AMRs)
	Rapid, accelerated AMRs				XX			
	Overall imprecise articulation of AMRs / SMRs	X	X					X (SMRs likely less precise than AMRs)
	"Puh" is more imprecise/slow than "tuh" or "kuh"	X (CN V)						
	"Tuh" and "Kuh" more imprecise/slow than "Puh"	X (CN XII)						
	"Puh-tuh-kuh" is poorly sequenced						X	XX
	Self-Rating: ___ / 7							
	Intelligibility _____%							
	Naturalness:	WFL, Mild, Moderate, Severe, Profound						
	Effiency:	WFL, Mild, Moderate, Severe, Profound						

Colorado Motor Speech Framework: Scoring Form

		Lower Motor Neuron	Upper Motor Neuron		Basal Ganglia		Cerebellum	Left Hemisphere
	Characteristics	**Flaccid**	**UUMN**	**Spastic**	**Hypokinetic**	**Hyperkinetic**	**Ataxic**	**Apraxia of Speech**
	Pseudobulbar Affect	-	-	XX	-	-	-	-
	Flat affect/masked facies	-	-	-	XX	-	-	-
General OME	Incoordination / dysmetria						XX	
	Muscle atrophy	XX	-	-	-	-	-	-
	Involuntary, unpredictable movements	-	-	-	-	XX	-	-
	Tremor: action-induced				X	XX (Essential Tremor)	X (terminal tremor)	
	Tremor: with sustained movements				X	X		
	Tremor: at rest	-	-	-	XX		-	-
OME (Face)	Drooping on entire side of face	X (Bell's Palsy, CN VII)						
	Drooping on lower side of face		XX (droop on side opposite from the site of lesion)					X
	Bilateral facial weakness			X				
	Hypotonia	X					X	
	Muscle weakness	X						
	Spasticity			X				
	Drooling	X	X	X	X			
	Nonverbal oral apraxia		X					XX
OME (Lips)	Asymmetrical movement	X (CN VII; ex. reduced retraction on the impaired side, contralateral to the site of lesion)	X					X
	Weakness	X (CN VII; ex. weakness on the impaired side, ipsilateral to the site of lesion)	X (weakness on the impaired side, contralateral to the site of lesion)				-	X (commonly right lower facial weakness; likely comorbid UUMN Dysarthria)
	Limited range of motion	X	X (reduced on impaired side)	X	X			

Colorado Motor Speech Framework: Scoring Form

		Lower Motor Neuron	Upper Motor Neuron		Basal Ganglia		Cerebellum	Left Hemisphere
	Characteristics	**Flaccid**	**UUMN**	**Spastic**	**Hypokinetic**	**Hyperkinetic**	**Ataxic**	**Apraxia of Speech**
OME (Jaw)	Jaw hangs open at rest	X (CN V bilaterally)						
	Jaw deviation to one side	X (CN V unilaterally; jaw deviates to weak side)						
	Decreased sensation of the face, cheek, teeth, tongue, or palate	X (CN V)						
	Weakness when opening or closing	X (CN V)						
	Clonus			X				
	Limited range of motion	X			X			
	Progressive weakening of jaw movements	X (associated with Myasthenia Gravis)						
OME (Soft Palate)	Palate hangs low in mouth	X (CN X)						
	Palate asymmetry	X (CN X; hangs lower on side of lesion)	X (un-common)					
	Asymmetric movement on phonation	X (CN X; palate moves towards nonimpaired side)	X (un-common)					
	Air escapes from nose when puffing cheeks	X (CN X)						
OME (Tongue)	Fasciculations	XX (CN XII)	-	-	-	-	-	-
	Deviation to one side on protrusion	X (CN XII; deviates to weak side, towards the side of lesion)	X (deviates to opposite side of lesion)					
	Weakness	X (CN XII)	X (unilateral)				-	X (commonly right lingual weakness)
	Limited range of motion	X (CN XII)		X	X			
	Diminished ability to curl tip of tongue	X (CN XII)						
	Slow movements	X (CN XII)	X	X			X	
OME (Larynx)	Weak Cough*	X (CN X)						
	Weak Glottal Coup*	X (CN X)						
	Inhalatory stridor	X (CN X)				X (usually accompanied by hyperkinesias)		
	*weak cough but strong glottal coup	could indicate respiratory weakness						
	*weak coup and weak cough	could indicate laryngeal weakness						