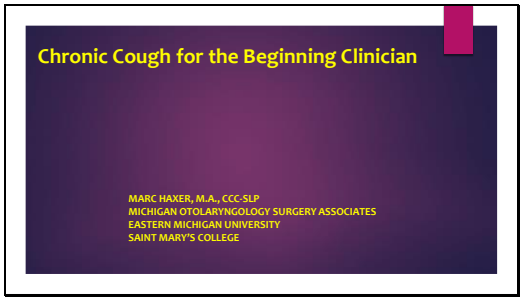
Slide 1



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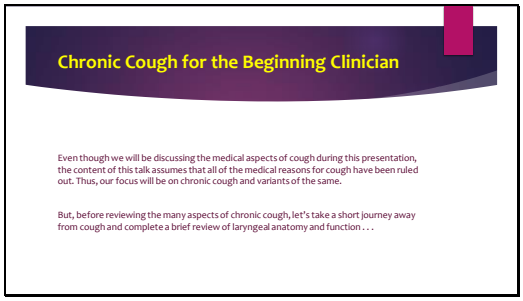

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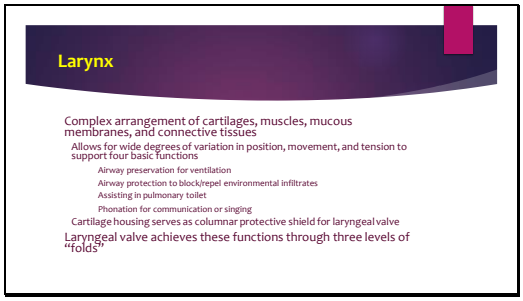

Slide 4

Larynx

- Upper rim of larynx formed by aryepiglottic folds
  - Lateral boundary of larynx
- Second sphincter formed by ventricular folds
  - Directly superior/parallel to ventricle/true vocal folds
  - Form double layer of medial closure w/TVFs if needed
- Most inferiorly are true vocal folds
  - Open for respiration
  - Close for airway protection
  - Provide vibrating source for phonation
  - Also close tightly for nonspeech and vegetative tasks

Slide 5

Larynx

Thus, larynx and vocal folds function as variable valve

- Modulate airflow through VFs during phonation
- Close off trachea/lungs to prevent soiling of airway during swallows
- Provide resistance to increased abdominal pressure during effortful activities

Slide 6

Cough

- Occurs for a reason
  - Is an important defense mechanism that clears airway of foreign objects, secretions, and particulates
  - Transmits disease via expectoration of droplets and contamination of objects
  - Assists in maintaining consciousness during potentially fatal arrhythmias and/or converts arrhythmias to more normal cardiac movements
  - Is one of the most common complaints of individuals seeking medical care

Slide 7

Cough

In addition . . .

- Cough relies on intact laryngeal sensation, laryngeal muscle control, and inspiratory/expiratory muscle strength/coordination
- Despite this protective role, cough can result in multi-system issues
  - Anxiety
  - Compromise in quality of life
    - Seclusion/Avoidance
  - Dysphonia
  - Loss of consciousness, rib fractures, episodes of emesis
  - Incontinence
  - Insomnia

(Sandage, 2009; Pitts and Sapienza, 2010)

Slide 8

Cough Classification

Above based on duration of cough; within each category are likely diagnostic possibilities

- Acute
  - Most commonly associated with acute URI
  - Less than three weeks in duration
- Subacute
  - Three to eight weeks in duration
- Chronic
  - Greater than eight weeks in duration

Silvestri and Weinberger, 2017

Slide 9

Cough Reflex Arc

- Initiated by sensory branch of cough reflex
  - Sensory nerve fibers distributed throughout ciliated epithelial cells of upper/lower airway from pharynx to terminal bronchioles
- Receptor triggered by chemical/mechanical stimuli
  - Foreign bodies, acid, cold/heat, irritant particles, fumes, mass effect (tumor)
- Greatest concentration of cough receptors located in larynx, carina, and bifurcation of medium/large bronchi

(Silvestri and Weinberger, 2017; Simpson and Amin, 2006; Weldon, 2005)

Slide 10

Cough Reflex Arc

- Cough center of brain located in the medulla
  - Integrates impulses and coordinates complicated expiratory muscle activity that comprises an effective cough
- Efferent impulses leave medulla and travel to larynx and tracheobronchial tree via cranial nerve X and the intercostal muscles, abdominal wall, diaphragm, and pelvic floor via the phrenic and spinal motor nerves C3 through S2

Slide 11

Location of Cough Receptors

Region	Afferent Nerve
Paranasal	Trigeminal (V)
Pharynx	Glossopharyngeal (IX)
Larynx/tracheobronchial tree	Vagus (X)
External auditory canal/tympanic membrane	Vagus (X)
Esophagus, stomach, pleura	Vagus (X)
Diaphragm/pericardium	Phrenic

(Silvestri and Weinberger, 2017; Simpson and Amin, 2006)

Slide 12

Phases of Cough Generation

- Inspiratory
  - Sudden deep gasp that fills lungs with air
- Compressive
  - Tight, valve-like closure of larynx
    - Glottic/supraglottic levels
    - Provides critical one-way valve effect that prevents egress of air
  - Contraction of expiratory muscles
    - In face of closed glottis, creates dramatic increase in airway pressure

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Phases of Cough Generation

- Expiratory
  - Laryngeal sphincter opens
  - Same results in explosive release of high-pressure air column
  - Contraction of expiratory muscles continues
  - VFs, supraglottic structures, and posterior commissure vibrate to actively displace secretions loosened from larynx
  - Cross-sectional area of trachea reduced significantly to allow for generation of powerful "tussive squeeze" which allows for clearance of secretions from tracheobronchial tree via high-velocity turbulent airflow

(Vertigan and Gibson, 2016)

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Cough – Differential Diagnosis

Slide 15

Cough – Differential Diagnosis

Upper Respiratory Tract	Allergic or vasomotor rhinitis, postnasal drip syndrome, infectious/post-infectious cough, sinusitis Medical management

Slide 16

Cough – Differential Diagnosis

Lower Respiratory Tract	Abscess, allergic inflammation, aspiration, asthma, bronchiectasis, bronchitis, COPD, cystic fibrosis, drugs, eosinophilic bronchitis, interstitial lung disease, pertussis, primary or metastatic lung tumors, sarcoidosis, tuberculosis Medical management

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Cough – Differential Diagnosis

Cardiovascular system	Left ventricular failure, mitral stenosis, medications (ACE inhibitors) Medical management
Gastrointestinal system	Reflux disease (GERD/LPRD) Medical/behavioral management

Slide 18

Cough – Differential Diagnosis

Central Nervous System (psychological response)	Habit cough, chronic cough, psychogenic cough, neuropathic cough Behavioral/medical management

(Silvestri and Weinberger, 2017; Vertigan and Gibson, 2016; D'Urzo and Jugovic, 2002)

Slide 19

Cough – Differential Diagnosis

C: cigarette smoking; congestive heart failure
O: obstructive lung disease
  Asthma, COPD, non-asthmatic eosinophilic bronchitis
U: upper airway inflammation
  Sinusitis, pharyngitis, otitis
  Pollutants, dry heat, dust particles,
G: gastroesophageal(laryngopharyngeal reflux disease
H: HTN medication (ACE inhibitors)

(Dalal and Garaci, 2011)

Slide 20

Cough – Differential Diagnosis

PND
  Allergic rhinitis
  Chronic sinusitis
GERD/LPRD
Cough-variant asthma
ACE inhibitor medications
Pertussis
Neurogenic
  Traumatic vagal injury
  Post-URI neuropathy
Psychogenic
Chronic aspiration
Zenker's diverticulum

Foreign body
  Tracheobronchial tree
  Laryngopharynx
  Sinonasal
  External auditory canal
Chronic bronchitis
Bronchiectasis
Lung carcinoma
Subglottic stenosis
Tracheomalacia
Tracheoesophageal fistula
Tuberculosis
Sarcoidosis
Congestive heart failure

(Simpson and Amin, 2006)

Slide 21

Etiologies of Cough

Slide 22

Etiologies of Cough

- Upper airway cough syndrome
  - Cough secondary to allergic/non-allergic rhinitis
- Asthma
  - Cough variant asthma
    - Diagnosis made after cough improves or resolves with anti-asthmatic therapy
- GERD – an elephant in the room?
  - Causes cough via irritation of CN X
    - Vagus nerve has fibers thought to be sensitive to acid/non-acid volume reflux

Slide 23

Etiologies of Cough

- LPRD – another elephant in the room?
  - Distinct entity from GERD
  - Regurgitation of stomach contents to level of larynx/pharynx
  - Resultant irritation of larynx/pharynx instead of esophagus as in GERD
    - Hypersensitivity/hyper-reactivity

Slide 24

Etiologies of Cough

- Medications
  - Angiotensin Converting Enzyme (ACE) Inhibitors
    - Cough usually begins within one week of instituting use
    - Discontinuation of medication results in resolving of cough within 1-4 weeks

Slide 25

Etiologies of Cough

- Illness
  - Respiratory Tract Infection (Pertussis)
  - Chronic Bronchitis
  - Bronchiectasis
  - Lung Cancer
  - Nonasthmatic Eosinophilic Bronchitis

Silvestri and Weiberger, 2017; Sandage, 2009)

Slide 26

Etiologies of Cough

- Sensory Neuropathic Cough
  - Diagnosis of exclusion after myriad of examinations/evaluations completed
  - Suspect in patients with history of viral upper/lower respiratory infections (increased occurrence in the future given current Covid-19 pandemic?), metabolic damage, mechanical trauma to CN X/SLN
    - Post-viral vagal neuropathy
  - Thought to be secondary to nerve degeneration/injury resulting in lowered threshold for sensory laryngeal nerve firing resulting in perceived throat irritation/chronic cough
    - In other words, nerve becomes hyper-sensitive

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Etiologies of Cough

- Inclusion Criteria for Sensory Neuropathic Cough:
  - Intractable idiopathic long-standing cough
  - Tickle at sternal notch/other location in neck/throat presages episodes of cough
  - Some episodes described as severe
    - 10 seconds to 2 minutes, accompanied by oculo- and rhinorrhea, emesis, and occasionally laryngospasm, syncope, or near-syncope
  - Cough occurs spontaneously/associated w/triggers
    - Talking, laughing, exposure to temperature extremes, swallowing, etc.
  - Cough is nonproductive
    - If productive, always at end of severe attack (productivity a result of cough not a cause of cough

(Bastian, Vaidya, and Delsupehe, 2006; Lee and Woo, 2005)

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Etiologies of Cough

Exclusion Criteria for Sensory Neuropathic Cough

- Emotional disconnect from problem
- Identifiable secondary gain
- Abrupt onset/offset of problem
- Periods of complete resolution

(Bastian, Vaidya, and Delsupehe, 2006)

Slide 29

Etiologies of Cough

Viruses

- Submicroscopic infectious agents that replicate only inside the living cells of an organism
- Spread in many ways
  - Coughing and sneezing (influenza , SARS-CoV-2, chickenpox, smallpox, measles)
  - Fecal-oral route (Norovirus/Rotavirus – viral gastroenteritis)
- Provoke immune response that usually eliminates infecting virus
- Immune responses also produced by vaccines

Slide 30

Etiologies of Cough

Viruses

- Can lie dormant in the human body for decades
- Can the re-emerge and manifest in a different form of the virus
  - Varicella (chicken pox) in childhood/adolescence re-emerging decades later as herpes zoster (shingles)
  - Idiopathic vocal fold motion disorders

Amin and Koufman, 2001

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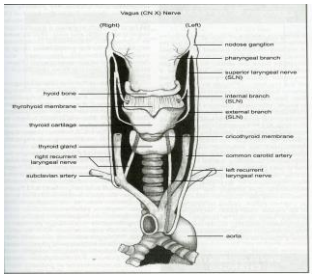

Slide 32

Chronic Cough

Slide 33

Chronic Cough

Multiple names
- Habit cough, behavioral cough, psychogenic cough

> 8 weeks duration in adults; 4 weeks in children

Excessive/unnecessary

Productive versus nonproductive

QOL deterioration

Often secondary to multiple conditions

Slide 34

Chronic Cough

Cough can co-exist with other laryngeal issues such as

- Globus
- Chronic throat clearing/cough
- Dysphonia
- PVFM/episodic laryngospasm
  - Above are symptoms of ILS
    - Continuum of laryngeal misbehavior
- Organic versus functional component?
- (Sandage, 2009; Morrison, Ramage, and Amami, 1999)

Slide 35

Evaluation/Treatment of Chronic Cough

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Multi-disciplinary in Scope

- Pulmonary/Critical Care Medicine
- Allergy/Immunology
- Otolaryngology
- Gastroenterology
- Psychology/Psychiatry
- Pediatrics
- Speech Pathology
  - Last one on list not because we're not important
  - Rather, all potential medical reasons for cough need to be ruled out before initiation of behavioral evaluation and management by us
    - There is a growing body of evidence that supports speech pathologists taking a **primary** role in the management of cough, PVFM, and some reflux related voice/airway disorders (Cazzano and Serrano, 2017; Vertigan and Gibson, 2016; Vertigan, Haines, and Slovarp, 2019; Slovarp, Jette, Gillespie, Reynolds, and Barkmeier-Kraemer, 2021)

Slide 37

Pulmonary Disease

Chest x-ray
- Pulmonary changes, change in cardiac silhouette, adenopathy

Spirometry
- Flow-volume loop - determines presence of upper/lower airway restriction

Pre-/post bronchodilator spirometry
- Airway obstruction reversibility

Methacholine challenge
- Identifies airway hyper-responsiveness
- Negative challenge rules out asthma

Eosinophilic bronchitis
- Cough responsive to use of cortico-steroids
- Presenting symptoms can mimic silent reflux

Bronchoscopy
- Identifies anatomic abnormalities

(Sandage, 2009)

Slide 38

Pulmonary Disease

Treatment
- Inhaled corticosteroids w/wo spacer
- Elimination of irritant(s)
- Systemic corticosteroids

Slide 39

Upper Airway Cough Syndrome

Allergy
- Identify potential environmental triggers for cough

Infections
- Viral RIs (current Covid-19 pandemic), sinusitis, polyps

Treatment
- Buffered nasal rinses, nasal steroid spray
- Use of first generation antihistamine decongestant therapy (Chlor-Trimeton)
- Avoidance of offending allergens

Slide 40

GERD/LPRD

- Esophagram
- ph probe
- Reflux Symptom Index
- Bravo study
- Endoscopy
- Empiric treatment
- Fundoplication?

Slide 41

GERD/LPRD

- Initial medical therapy should be intensive
  - American College of Chest Physicians suggest empiric treatment with twice-daily PPI along with behavioral anti-reflux management for three months
  - H2 receptor blockers @ HS as needed versus use of Gaviscon at HS
- Long-term maintenance will be necessary

Johnston, et.al. (2007); Birchall, et.al. (2008)

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GERD/LPRD

- GERD/LPRD
  - Behavioral treatment
    - Nothing to eat/drink within 3 hours of HS
    - If athlete, no solids 2 hours prior to practice meets/ no liquids 1 hour prior to practice/meets
    - Upper body elevated during sleep and/or sleep on left side
    - Decrease intake of caffeine, acidic foods/beverages, spicy/fatty foods
    - Lose weight/wear loose-fitting clothing at waistline

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Medications (ACE Inhibitors)

Discontinuation of drug

With discontinuation, cough should improve or resolve within 1-4 weeks

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Sensory Neuropathic Cough

Bastian, et.al.: 2006, 2009

- Initial treatment
  - Elavil 10mg @ HS for three days
  - Titrate up by 10 mg every 3 days to maximum of 80 mg
  - If patient cannot achieve 85% reduction in cough consider,
- Gabapentin
  - Build to 300 mg TID initially
  - Can advance to as much as 2700 mg per day or more to desired benefit or tolerance
- Other pharmacological interventions
  - Lyrica
  - Trileptal
  - Botulinum Toxin Type A (Chu, Lieser, and Sinacort, 2010)
- Adjunct behavioral management as per physician

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Sensory Neuropathic Cough

Medical Management

In patients with diagnosed motion impairment of the vocal folds (VF paresis) in addition to chronic cough, injection laryngoplasty resulted in reduction in cough in small cohort of patients

(Crawley, Murry, and Sulica, 2015)

Slide 46

Behavioral Management

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Behavioral Management

Role of SLP

- Medical history
- Behavioral/environmental history
- Endoscopy as needed
- Behavioral education
- Follow-up

(Sandage, 2009)

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Behavioral Management

Evaluation

- Chart review
- Patient interview – remains the most valuable tool in the assessment/remediation of a laryngeal disorder
  - Nature (episodes short/long, mild/severe)
  - Pattern (time-specific, associated w/meals/certain activities, fluctuations)
  - Environment (new building materials, dry/dusty environment, worse w/exposure to heat/cold/odors/ventilation)
  - Stressors/emotional issues?
  - Patient awareness of cough onset
- RSI
- Cough Severity Index
- Voice Handicap Index
- Use of probes to manage episodes of cough during evaluation
  - (Sandage, 2009; Stemple, et.al., 2010; Gibson and Vertigan, 2016)

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Clinical Evaluation of Cough

MICHIGAN OTOLARYNGOLOGY SURGERY ASSOCIATES
SPEECH-LANGUAGE PATHOLOGY CLINICAL EVALUATION OF COUGH

NAME:
CHART #:
DOB:
AGE:
DATE OF EVALUATION:
DATE OF ONSET OF MEDICAL CONDITION:
MEDICAL DIAGNOSIS: Dysphonia; cough
SLP DIAGNOSIS: Dysphonia (Rasp-p1; cough (Ros)
REFERRING PHYSICIAN:, MD
DATE OF REFERRAL:
CPT CODE: 92524 (Behavioral and qualitative evaluation of voice)

HISTORY: Mr./Ms./Dr. <_____> was seen for clinical evaluation of cough on the above date.

Mr./Ms./Dr. <_____> is a <___> male/female who presents with a medical history significant for <_____>.

EVALUATION RESULTS: Mr./Ms. /Dr./ <_____> was/not able to fully participate in today's evaluation. He/She had no specific complaints of pain/reported pain in the area(s) of ***. Prior to the onset of current medical issues, he/she reported absence of cough.

Hearing was deemed adequate/compromised in the conversational setting. Amplification was/not worn. The same was unilateral/bilateral in nature. Results of an oral-motor examination were unremarkable/revealed <_____>. Speech perceptual examination revealed <_____> to-of his/her speech to be intelligible in a conversational setting. Voice was within functional limits for an individual of his/her age and gender/characterized by <_____>. Language and cognitive skills appeared adequate/compromised/consistent with the presenting medical diagnosis based on functional assessment. Mr./Ms. /Dr./ <_____> indicated no current problems with eating or swallowing/current swallowing issues are detailed previously.

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Clinical Evaluation of Cough

COUGH PARAMETERS

Occurs when: [ ] AM [ ] PM [ ] Evening [ ] Post-MS [ ] Throughout the day

Episodes: [ ] Same [ ] Different (describe)_____

Episodes result in: [ ] Emesis [ ] Loss of continence [ ] Loss of consciousness

Anxiety/Stress: [ ] Present [ ] Absent

If present [ ] Because of cough [ ] Outside of cough (describe)_____

Currently being treated for reflux: [ ] Yes [ ] No

If yes, medication and dosage _____

RSI/Self Score:_____

Symptom correlation [ ] None [ ] Low [ ] Moderate [ ] High

History of viral URIS: [ ] Yes (describe): [ ] No

Triggers: [ ] Changes in temperature [ ] Changes in humidity [ ] Exposure to wind [ ] Exertion [ ] Odors [ ] Smoke [ ]
Clothing supplies
[ ] Detergents [ ] Colognes/Perfumes
[ ] Other (describe): tickle in throat prior to cough onset

Episodes of voice compromise: [ ] Yes (describe)_____ [ ] No

If yes: [ ] Associated with cough [ ] Not associated with cough

VHI Score: F - /P - /E - Total Score: (mild/moderate/severe impairment in voice)

On ACE inhibitor? [ ] Yes [ ] No

Cough Severity Index Score: _____

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Clinical Evaluation of Cough

Given the presenting history as well as the above results, Mr./Ms./Dr.<_____> cough is felt to be multifactorial in nature and possesses components of a disordered loop of laryngeal behavior (given duration of cough), potential irritation of the laryngeal complex by regurgitated stomach contents (given elevated self-score on the RSI), and laryngeal hypersensitivity or hyper-reactivity secondary to a potential neurosensory component (given history of viral respiratory illnesses and/or presence of sensory changes in the pharynx prior to cough onset). Stress/anxiety is also felt to play a role in cough. As such, a detailed discussion of these issues and their relationship to cough was undertaken during today's session. Behavioral strategies to address laryngeal hypersensitivity/reactivity/airway protection/stress/anxiety management/pharmacologic management of potential sensory neuropathic cough were reviewed. Laryngeal manual maneuvers were not introduced during today's session pending return for vocal therapy.

IMPRESSIONS: Multifactorial cough with/out dysphonia in this individual who presents with a medical diagnosis of dysphonia and cough.

PROGNOSIS: Based on the results of today's evaluation, Mr./Ms./Dr.<_____> demonstrates unknown potential for functional reduction in episodes of cough pending short-term involvement in voice therapy.

PATIENT/FAMILY EDUCATION: At the end of today's session, the above results, impressions, and prognosis were reviewed with Mr./Ms. /Dr./ <_____>. He/She/They expressed understanding of the information presented and agreed with the plan of care as reviewed.

RECOMMENDATIONS:

1. Initiate vocal hygiene measures to reduce phonotrauma, prevent future injury to the vocal musculature, and facilitate voice rehabilitation (weekly adherence of > 8of);
2. Initiate modified breathing exercises to re-posture the larynx into appropriate patterns of function during episodes of cough and/or paradoxical vocal fold motion (weekly completion of > 8of);
3. Medical management of cough as per physicians
4. Initiate daily completion of semi-occluded vocal tract exercises to optimize vocal tract function, improve laryngeal agility, and help minimize current/future injury to the vocal musculature (weekly completion rate of > 8of);

Specific therapy goals are included above. Therapy activities and techniques included strategies designed to behaviorally re-calibrate levels of laryngeal function during episodes of cough. Proposed frequency of therapy is two times per month with session length varying between (ie: 45 minutes per session. Duration of the proposed treatment program is

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Clinical Evaluation of Cough

MICHIGAN OTOLARYNGOLOGY SURGERY ASSOCIATES
SPEECH-LANGUAGE PATHOLOGY PLAN OF CARE

Certification:

PLAN OF CARE:

(copy/paste from Evaluation Report: IMPRESSIONS, PROGNOSIS, PATIENT/FAMILY EDUCATION, RECOMMENDATIONS)

PHYSICIAN STATEMENT:

I certify that the patient described above is under my care. I have reviewed the plan of care. I certify / re-certify that skilled speech-language pathology treatment services are necessary. I will review this plan of care every 60/90 days.

, MD Date

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Reflux Symptom Index

Reflux Symptom Index

Instructions: These are statements that many people have used to describe their voices and the effects of their voices on their lives. Please circle the response that indicates how frequently you have the same experience.

Within the last MONTH, how did the following problems affect you?

0 = No problem
5 = Severe problem

Hoarseness or a problem with your voice	0	1	2	3	4	5
Clearing your throat	0	1	2	3	4	5
Excess throat mucous	0	1	2	3	4	5
Difficulty swallowing food, liquids or pills	0	1	2	3	4	5
Coughing after eating or after lying down	0	1	2	3	4	5
Breathing difficulties or choking episodes	0	1	2	3	4	5
Troublesome or annoying cough	0	1	2	3	4	5
Sensations of something sticking in your throat or a lump in your throat	0	1	2	3	4	5
Heartburn, chest pain, indigestion, or stomach acid coming up	0	1	2	3	4	5

Please check that you have answered all the questions

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Cough Severity Index

Cough Severity Index (Shembel, Gartner-Schmidt, and Rosen: 2011)

Please use the following scoring to answer the statements below

0 = None
1 = Almost never
2 = Sometimes
3 = Almost always
4 = Always

1. My cough is worse when I lay down ____
2. My coughing problem causes me to restrict my personal and social life ____
3. I tend to avoid places because of my cough problem ____
4. I feel embarrassed because of my coughing problem ____
5. People ask "What's wrong?" because I cough a lot ____
6. I run out of air when I cough ____
7. My coughing problem affects my voice ____
8. My coughing problem limits my physical activity ____
9. My coughing problem upsets me ____
10. People ask me if I am sick because I cough a lot ____

Total Score ____

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Voice Handicap Index

VOICE HANDICAP INDEX

Name: Date:

These are statements that many people have used to describe their voices and the effects of their voices on their lives. Circle the response that indicates how frequently you have the same experience.

0-never 1-almost never 2-sometimes 3-almost always 4-always

Part I-F	
My voice makes it difficult for people to hear me.	0 1 2 3 4
People have difficulty understanding me in a noisy room.	0 1 2 3 4
My family has difficulty hearing me when I call them throughout the house.	0 1 2 3 4
I use the phone less often than I would like to.	0 1 2 3 4
I tend to avoid groups of people because of my voice.	0 1 2 3 4
I speak with friends, neighbors, or relatives less often because of my voice.	0 1 2 3 4
People ask me to repeat myself when speaking face-to-face.	0 1 2 3 4
My voice difficulties restrict my personal and social life.	0 1 2 3 4
I feel left out of conversations because of my voice.	0 1 2 3 4
My voice problem causes me to lose income.	0 1 2 3 4
SUBTOTAL	

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Voice Handicap Index

Part II-P	
I run out of air when I talk.	0 1 2 3 4
The sound of my voice varies throughout the day.	0 1 2 3 4
People ask, "What's wrong with your voice?"	0 1 2 3 4
My voice sounds creaky and dry.	0 1 2 3 4
I feel as though I have to strain to produce voice.	0 1 2 3 4
The clarity of my voice is unpredictable.	0 1 2 3 4
I try to change my voice to sound different.	0 1 2 3 4
I use a great deal of effort to speak.	0 1 2 3 4
My voice is worse in the evening.	0 1 2 3 4
My voice "gives out" on me in the middle of speaking.	0 1 2 3 4
SUBTOTAL	

Part III-E	
I am tense when talking to others because of my voice.	0 1 2 3 4
People seem irritated with my voice.	0 1 2 3 4
I find other people don't understand my voice problem.	0 1 2 3 4
My voice problem upsets me.	0 1 2 3 4
I am less outgoing because of my voice problem.	0 1 2 3 4
My voice makes me feels handicapped.	0 1 2 3 4
I feel annoyed when people ask me to repeat.	0 1 2 3 4
I feel embarrassed when people ask me to repeat.	0 1 2 3 4
My voice makes me feel incompetent.	0 1 2 3 4
I am ashamed of my voice problem.	0 1 2 3 4
SUBTOTAL	

TOTAL SCORE__________

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Voice Handicap Index

Score Range	Severity	Common Association
0-30	Mild	Minimal amount of handicap
31-60	Moderate	Often seen in patients with vocal nodules, polyps, or cysts
60-120	Severe	Often seen in patients with vocal fold paralysis or severe vocal fold scarring.

The Voice Handicap Index (VHI): Development and Validation. Barbara H. Jacobson, Alex Johnson, Cynthia Grywalski, Alice Silbergleit, Gary Jacobson, Michael S. Benninger. American Journal of Speech-Language Pathology, Vol 6(3), 66-70, 1997. The Voice Handicap Index is reprinted with permission from all authors and ASHA.

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Behavioral Management

Therapy
- Improve laryngeal environment
  - Increase hydration, nasal respiration
- Train awareness of situations/sensations that precipitate cough
- Implement strategies to allow for increased patient control of laryngeal function
  - Proactive (delay/eliminate cough onset)
  - Reactive (eliminate cough after emergence)
- Assist in maximizing patient compliance with medical/pharmacological therapy

(Sandage, 2009; Gibson and Vertigan, 2009; Gibson and Vertigan, 2016; Vertigan, Haines, and Slovarp, 2019)

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Behavioral Management

Feature	Potential treatment goals/strategies
Cough occurs in bouts (Y/N)	Implement strategies to suppress cough each time same is triggered
Cough occurs continuously (Y/N)	Implement strategies to suppress cough for gradually increasing periods of time
Warning before cough (Y/N)	Implement strategies to suppress cough proactively
No warning before cough (Y/N)	Increase awareness of throat sensations; implement strategies even if warning sign(s) absent

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Behavioral Management

Feature	Potential treatment goals/strategies
Deliberate coughing (Y/N)	Breathing exercises for PVFM if relevant; education that cough is counter-productive
External locus of control (Y/N)	Implement strategies to suppress cough in response to throat sensations
Trigger(s) for cough identified	Education re: rationale for behavioral treatment/mechanism behind voluntary control; encourage implementation of strategies Avoid exposure to trigger(s) for short period of time; gradual re-introduce exposure to trigger w/implementation of cough suppression strategies

(Vertigan, et.al, 2007; Vertigan and Gibson, 2016)

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Patient Awareness . . .

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Behavioral Management

- Respiratory retraining
  - Manipulate configuration of VFs during symptomatic episodes
  - Control air pressure between VFs during symptomatic episodes
    - Increase resistance at level of glottis

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Behavioral Management

- Respiratory retraining (Murry and Sapienza, 2010)
  - Quiet rhythmic breathing
    - Exhaling w/shoulders relaxed, abdominal movement in/out consistent w/ continuous exhalation/inhalation
  - Breathing w/vocal resistance
    - Exhaling while sustaining /sh/, /f/, /z/ for increasing lengths of time
  - Pulsed exhalation
    - Produce pulse of air using /ha/ or /sha/ followed by sniffing in through the nose w/closed mouth
  - Abdominal focus at rest
    - Lie flat w/small book on stomach, focus on elevation of book w/inhalation and lowering of book w/exhalation; when successful, straw breathing initiated to increase resistance while focusing on abdominal movement; exercise expanded to include sitting/standing

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Behavioral Management

In addition to Murry and Sapienza, train patient in the following modified respiration strategies
- In/out through nose
- In through nose, out against pursed lips
- In/out through pursed lips
- In through nose, out through straw
- In/out through straw
- Sniff in x2/out through pursed lips/straw
  - Vary length/bore of straw to increase/decrease resistance as needed by the patient

Swallows (saliva, liquids, wet snacks, etc.)
- Delays onset of Laryngeal Adductory Response (LAR) by 5 seconds

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Behavioral Management

Respiratory retraining

All exercises practiced in one-minute increments
- Reduces patient boredom
- Allows for repeated episodes of patient control over laryngeal function throughout the day

Exercises #1-5 practiced 2x/day for 3 weeks

Exercise #6 practiced 10/day for 3 weeks
- 1st week in isolation (no distractions), always sitting down, using clock as timing device
- Emphasize slow emptying of lungs during exhalation before repeating sequence to minimize risk of hyperventilation
- Monitor # of repetitions achieved in one minute

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Behavioral Management

Respiratory retraining
- Week #2
  - Pattern of sniff/blow transitioned into activities of daily living (not driving at this time)
  - Focus now on practicing X# of repetitions 10x/day
  - Maintain focus of complete exhalation before beginning new repetition
- Week #3
  - As above but pattern can now be practiced while driving
- Week #4 and beyond
  - Patient begins to experiment with all of the above techniques during episodes of cough
    - Determine which strategy(ies) are most efficacious in managing episodes of cough
  - Continue to maximize patient adherence to other interventions
  - Schedule therapy at 4, 6, 8, and 12 weeks initially
    - If progress demonstrated by 12 week mark, gradually schedule follow-up at greater intervals
    - If not, follow-up at 4 week intervals; recommend follow-up w/physicians as needed

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Behavioral Management

Throat Clearing\Cough Protocol

When your body engages in episodes of cough and/or throat clearing, your vocal folds close in patterns that can cause vocal fold trauma. Additionally, these behaviors are not under your control. Rather, your larynx (voice box) is misbehaving when it causes you to clear your throat and/or engage in cough.

This protocol contains multiple strategies that are designed to reduce and eventually eliminate episodes of throat clearing\cough.

Rigid reflux management (if appropriate):
Take medication as prescribed by physician; optimum for PPI's is 20-30 minutes before meals; Gaviscon 30 minutes after meals/prior to bedtime.
Attempt to minimize food/liquid intake within three hours of bedtime
Sleep on left side and/or elevate the upper part of your body (sleep on a wedge or elevate head of bed)
Minimize caffeine, acid, and spice intake
Optimum management may take between 4 to 6 months or longer.

Swallows
Allow for benign closure of the vocal folds
The closure pattern is under your control
Use the following to interrupt episodes of throat clear/cough
If your body causes you to clear your throat/cough, swallow immediately after the episode of throat clear/cough ceases
In addition, note the sensation(s) that are present which cause you to clear your throat/cough
Attempt to do this every time you catch your body engaging in these undesirable behaviors
Complete (b) above for one month

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Behavioral Management

In month #2, when you perceive any sensation that you have come to associate with throat clear\cough, initiate use of swallows to reduce the risk for throat clearing\cough
Maintain use of swallows until you feel the need for throat clearing\cough has subsided
Consume lubricating foods (butter Rum Lifesavers or Werther's Caramels to facilitate saliva production
Consume non-acidic fruits/vegetables ("wet snacks")

Throat clearing\Cough Protocol
Page 2

Modified breathing techniques– another management strategies for episodes of throat clearing or cough.
a. Cut a drinking straw in half – can vary the diameter of straw.
Place this between your lips and close lips around the straw.
Slowly inhale then exhale through straw.
Focus on the ease of respiration you achieve when practicing this.
This maneuver increases the air pressure between your vocal folds thus making their attempts to close for throat clear\cough occur at an increased level of resistance.
When a throat clear\cough erupts, use this to interrupt cycle and eventually return your larynx to body to normal function. Can also transition this to breathing through pursed lips (like blowing out a candle or whistling) without use of the straw. These are additional techniques to reduce throat clear\cough.
You can also vary the diameter of the straw to see if a smaller diameter interrupts a cough more efficiently. You will note the need to use greater force to inhale/exhale when using a smaller diameter straw.
Additionally, you can utilize variations on the above –
Breathe in and out through your nose;
Breathe in through your nose and out through pursed lips;
Breathe in and out through pursed lips;
Breathe in through your nose and out through a straw.

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Behavioral Management

i. Practice the above in one-minute increments, 10 times per day (2 times each with use of nasal inhalation/exhalation – in\out through nose, in through nose\out through pursed lips and straw, in\out through pursed lips, and in\out through straw).

For #s 2 and 3 above, feel what your throat is like when you are practicing. It should feel relaxed and open. Compare this sensation to what your throat feels like when your body is engaged in an episode of throat clear\cough. You will want to focus on the relaxed\open sensation you achieve while practicing, and carry this sensation over into your management of throat clear\cough episodes.

Throat Clearing\Cough Protocol
Page 3

You can also use the following to control episodes of throat clear\cough:

Sniff in twice through nose, blow out through pursed lips, through a straw that has been cut in half and placed between your lips or on the /s/ or /f/ sounds (silent count to four for pursed lips\straw\sounds)
This makes vocal folds move opposite of how they move for a throat clear\cough (sniffs) and makes the vocal folds stay open during exhalation (pursed lips\straw\sounds) – opposite of throat clear\cough
Over time, dampens an out of control voice box and forces the body back to quieter respiratory pattern
Do above in one-minute increments; repeat 10 times per day
For week #1, do in isolated practice setting (i.e., nothing else going on) – sit down while practicing
For week #2, complete half of your practices in isolated context and complete the other half during activities of daily living
For week #3, all practices during activities of daily living
For week #4 and beyond, five one-minute practice sessions daily during activities of daily living
Do not rush through this pattern of breathing as it may cause hyperventilation. To avoid this risk, it is imperative that you extend the exhalation through pursed lips until you have no more air to exhale. When you reach this point, sniff twice and repeat the process until one minute has passed. This is another one of your respiratory intervention strategies for episodes of throat clear\cough.

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Behavioral Management

5. Hydrate, hydrate, and hydrate

Try to drink one-half of your body weight in ounces of H2O per day

Sip water throughout the day or suck on ice chips

Suck on Butter Rum Lifesavers or Werther's caramels; when you swallow the saliva you generate by sucking on these hard candies, it will hydrate and lubricate your throat helping to reduce potential vocal fold dryness.

Use non-acidic (no oranges, lemons, etc.) "wet snacks" throughout the day to keep your throat moist. Cucumbers, melon, watermelon, grapes, apples, pears, peaches, apricots, plums, carrots, celery, cucumbers, bell peppers, etc. would all be considered "wet snacks".

Throat Clearing/Cough Protocol
Page 4

5. For management of throat clear/cough

When tickle is felt in throat or when a throat clear/cough occurs, initiate the following

Sip water or suck on ice chips to initiate a swallow after a cough

Pair the cough with a swallow to make the vocal folds move in different patterns

Once your body is familiar with this pairing, use the swallow instead of a cough

Suck on a lifesaver/caramel/consume "wet snacks"

Initiate modified breathing using any of the techniques reviewed previously.

Use the above for all episodes of throat clear/cough regardless of their severity. In this way, your body will come to associate use of your intervention strategy (sniff/blow modified respiration) with the onset of cough. The more familiar your body is with the strategies, the more it will accommodate their use for cough suppression.

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Behavioral Management

Stay with all suggestions in #s 2, 3, 4, and 5 for as long as you need to in order to bring the episode of throat clear/cough under control. Do not get discouraged if this takes awhile – NO timeframe is placed on ending an episode of throat clearing/cough. You may find that you body needs different amounts of time to bring each episode under control. Your long-term goal is to prevent episodes of throat clear/cough breakthrough. Your short-term goal is to bring an episode under control if throat clear/cough breakthrough is experienced.

Please keep a diary of episodes as well as your body's response to use of intervention(s). We will review this at your next return visit.

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In Summary . . .

- Effective management of cough involves multiple professionals/disciplines
- Requires extensive testing to rule out medical bases for cough
- Requires in-depth assessment and the development of specific intervention strategies by SLPs for cough management/cessation
- Requires the development and maintenance of patient motivation throughout the course of treatment
  - A long journey begins with a single step (Confucius)
  - "Follow the Yellow Brick Road" (MGM, 1939)
  - "The Long and Winding Road" (The Beatles 1969)
    - Can be a "long and winding road" for some patients (clinicians too!)
- Requires respect for patient QOL and their "comfort zone" with regard to practice and use of strategies regardless of the orientation of those interventions
- Is a very rewarding experience when you and your patient arrive at the end-point of therapy and they can say to you:
  - "My cough is gone" or "I can live with my cough now that I have learned how to control it"

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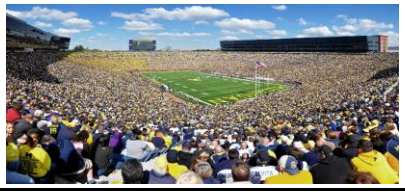
Thank you . . .



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Case Study

- 67 year-old female
- Six year history of dysphonia/cough and multiple environmental allergies
  - No salient event at time of cough onset
  - Cough occurs randomly throughout day/night
  - Also triggered by exposure to smells, fumes, and air movement
  - Above led to reduced attendance at Mass as well as other activities outside of the house
- Diagnosis of reflux
  - Same diagnosed during trans nasal esophagoscopy/esophagram
  - Self-score of 32 on RSI
  - Inconsistent adherence to behavioral reflux interventions
  - Preference for natural/holistic management

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Case Study #1

- Therapy initiated
  - Swallows, modified respiration, behavioral anti-reflux management
  - Continued resistance to traditional recommended pharmacologic management of reflux
  - Inconsistent modification of diet along with herbal/holistic treatment
- Throughout Tx, repeat scorings of RSI revealed scores of 26, 12, and 32
  - As scores declined, cough declined
  - As scores increased, cough increased
  - Lowest score achieved w/use of Zantac bid
    - Patient declined to continue use of same beyond 2 weeks secondary to ongoing desire to use of herbal/holistic management
  - Continued use of behavioral interventions with alleviation of cough
  - Episodes of cough continued to occur

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Case Study #1

- Most recent therapy session
  - Repeat scoring of 38 on RSI
  - Continued inconsistent diet modification
  - Patient admission that herbal/holistic management of reflux "not working"
  - Continued good management of cough w/use of behavioral strategies
  - However, continued episodes of cough
- Your thoughts/recommendations?