Clinical Otolaryngology HNS of “Aeromedical Significance”

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Overview

A Review of ENT conditions and their Civil Aeromedical significance regarding FAA standards

- Otology—Ears R’ Us
- Rhinology—Snot’s nice
- Laryngology—NORDO?
- Miscellaneous / Questions
Code of Federal Regulations

All Classes: 14 CFR 67.105(b)(c), 67.205(b)(c) & 67.305(b)(c)

• No disease or condition of the Middle or Internal Ear, Nose, Oral Cavity, Pharynx, or Larynx that:
  - Interferes with or is aggravated by flying, or may reasonably be expected to do so.
  - Interferes with or may reasonably be expected to interfere with, clear and effective Speech Communication.

• No disease or condition manifested by, or that may reasonably be expected to be manifested by, Vertigo or a disturbance of the equilibrium
The Ear
Ears: External Ear/Ear Canal

- **Microtia/Malformed Pinna**
  - Conductive Hearing Loss
  - Ear Canal Collapse with Headphones
Otology

External Ear

- Rarely causes aeromedical problems
- Some conditions that can interfere with flying
  - External otitis
  - Cerumen block with reduced hearing acuity

Perichondritis in a diabetic due to Pseudomonas infection
Ears: Tympanic Membrane

Our “Window” to the Middle Ear

- Perforations: Not necessarily disqualifying
  - Look for it to be dry
  - Otorrhea or granulation may indicate other pathology such as a Cholesteatoma
  - Requires FAA decision

- Ear tubes:
  - Not disqualifying
  - You can certify
Ears: Tympanic Membrane

Dry

Wet (worrisome)

Debris (Cholesteatoma)
Ears: Middle Ear

Serous Otitis Media

- Can have a Conductive hearing loss
- May indicate Eustachian Tube Dysfunction
- Use of Pneumatic Otoscopy can help
Ears: Middle Ear

Eustachian tube dysfunction

- Atlectasis
- Hemotympanum
- Can cause an ear block with deafness and/or pain
Ears: Middle Ear

Ossicular Abnormalities

- Congenital, Acquired (Traumatic)
- Otosclerosis (Stapes fixed to Oval Window)
- Conductive hearing loss (up to 60dB)
Otology

Middle Ear

• Eustachian Tube dysfunction
  – Can cause ear block with Hearing loss and/or pain
  – Severe block > Hemotympanum
  – Can result in Chronic Otitis Media with possible Mastoiditis and Cholesteatoma
Otology

Inner Ear

- Auditory System – Cochlea
  - Sensorineural hearing loss (SNHL)
  - Decreased Hearing Acuity
  - Reduced Speech Discrimination
  - AIED, PLF, Meniere’s, Syphilis, IEBT (Bends)
Otology

Audiologic Testing

Initial assessment – Conversational Voice Test
Normal conversational volume
Candidate faces away from the Examiner at a distance of 6’
Test one or both ears hearing acuity

Causes of Failure
Reduced hearing acuity
Reduced speech discrimination or failure to comprehend English
Otology

Hearing evaluation by Audiometer

- Approved and Calibrated to ANSI 1969 standards
- Must meet hearing levels in the AME’s Guide

<table>
<thead>
<tr>
<th>Frequency (Hz)</th>
<th>500 Hz</th>
<th>1000 Hz</th>
<th>2000 Hz</th>
<th>3000 Hz</th>
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<tbody>
<tr>
<td>Better ear (Db)</td>
<td>35</td>
<td>30</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>Poorer ear (Db)</td>
<td>35</td>
<td>50</td>
<td>50</td>
<td>60</td>
</tr>
</tbody>
</table>
Speech & the Audiogram

http://www.hdhearing.com/learning/part2.htm
Speech & the Audiogram
Speech & the Audiogram
Equipment Issues?

My dad says he can't hear anyone on his new cell phone
Comprehension?

The guy on the radio said to extend my downwind leg...
Otology

If fails Pure-Tone then do Speech Audio

- Must demonstrate an acceptable understanding of speech. Speech Discrimination score of at least 70% at an intensity of No greater than 65 dB in the better ear

- **If FAILS?** Can request a MFT (Medical Flight Test) and if passes given a SODA (Statement of Demonstrated Ability) along with a Special Issuance (because often not static condition).

- If a language problem exists, defer to OKC
Otology

Results of Testing:

• The need for any amplification to pass Hearing tests must be noted on 8500-8

• Typical Statement: “Auditory Amplification is Required”
  Must **NOT** state that Hearing Aids are needed.

• *(WHY? Pilot can use aircraft radio volume or hand held radios, noise cancelling headsets, in place of hearing aid)*
Otology

Really Can’t hear? (Deaf)
Can qualify for a Private Pilot Certificate if OWQ

“NOT VALID FOR CONTROL ZONES OR AREAS WHERE RADIO COMMUNICATION IS REQUIRED”

Applicants/Pilots with other Hearing devices who need a MFT should contact AMCD or RFS for MFT for check ride with an ASI

Currently Waivered with Severe HL (Deaf) N = 7
Currently Waivered with Cochlear implants N = 18
Currently Waivered with BAHA’s N = 6
Past Waivered with Implanted HA N = 1
Cochlear Implant
Cochlear Implant
Cochlear Implant
CI Accessories

Phonak ComPilot Accessory

Enjoy the convenience of connecting to phones, MP3 players, computers, and tablets.
GA Pilots with CI’s

Audio Cable is plugged into the cable of the Advanced Bionics Com Pilot

When Com Pilot turned on-receiving Audio exclusively from the Com Panel

When Blue Tooth connected, the CI turns off the Microphone - eliminates Background & engine noise

Still able to talk to Passengers with the 4 way intercom and ATC through the Headset Microphone
BAHA (Bone Anchored HA)
Fully Implantable HA
Otology

General Aviation Aircraft cause hearing loss!

Always use hearing protection!
Head phones, especially the noise cancelling models are effective
Otology

Inner Ear

Vestibular System – Macule, Saccule and the Semicircular canals; Source of a host of SD illusions in the IFR environment

May become dysfunctional
- Benign Positional Vertigo (BPPV)
- Vestibular Neuronitis
- Meniere’s Disease
- Acoustic Neuroma
- Cerebellar Pathology
Vertigo

Central
• Vascular, Tumor, Migraine, Demyelinating, Psych, Trauma

Peripheral
• Meniere’s, BPPV, Vestib Neuronitis, AIED, PLF, Trauma

Non vestibular
• Ao Stenosis, Postural Hypotension, Anemia, Arrhythmias, Rx’s
WAY TOO GENERAL PRACTITIONER

COULD BE ANYTHING.
Vertigo

Observations:
• Most AMEs either don’t comment or put “PRNC”

Can you fly after having Vertigo?
• “It Depends” The majority can if properly worked up

How you can help your Airmen:
• Don’t ignore 18b “Dizziness or fainting spells”
• Ask Questions
• Ask for documentation, copies of workups, tests, etc.
• Ask for an evaluation if indicated
Vertigo

What kind of questions should I ask?

(Quick screening questions)

• How long did it last? Did it come back?
• Nausea or vomiting? Incapacitation?
• Hearing loss? Tinnitus? Pressure or pain in ear?
• Visual symptoms? Headache? Photophobia?
• Falling? Loss of consciousness?
• Trauma?
• What brings it on?
• Comorbid conditions? Medications? Previous Surgery?
Vertigo

If the Vertiginous attacks lasts:

• **Seconds (consider)**
  – Benign Paroxysmal Positional Vertigo (BPPV)
  – Post-traumatic labyrinthine dysfunction
  – Orthostatic hypotension

• **Minutes (consider)**
  – Vertebrobasilar Insufficiency
  – Migraine attacks – with or without Headaches
Duration of Common Causes of Vertigo

If the Vertiginous attacks lasts:

- **Hours (consider)**
  - Meniere’s syndrome
  - Migraine attacks

- **Days-Weeks (consider)**
  - Vestibular Neuronitis
  - Acute Toxic or Traumatic Labyrinthine injury
  - Labyrinthine infection
Vertigo

Some of the more common conditions:

- Meniere’s
- BPPV
- Vestibular Neuronitis
- PLF
- SSCD
Meniere’s Disease

Aka “Cochlea Hypertension”

“Classic” Meniere’s disease:
• Episodes of vertigo lasting hours
• Fluctuating Low Freq Hearing loss
• Worsens over time
• Tinnitus
• Aural Fullness or Ear pain
• Episodic in nature and maybe “Progressive” or “Non-progressive”
• Can be associated with Migraine

Cochlear Meniere’s-No Vertigo
Benign Positional Vertigo (BPPV)

BPPV results when Otoliths from the Vestibule fall into Posterior Semicircular Canal

Classically noted when rolling over in bed, or turning head

Causes vertigo that last seconds, can occur several times a day, depending on head position

Does NOT cause Hearing loss

May resolve on its own, sooner with treatment
BPPV
Dix-Hallpike Maneuver

With the patient sitting, the neck is turned to one side (Use care with Elderly and those with Neck pathology)

The patient is then reclined supine rapidly, with the Head hanging over the edge of the examining table; The patient is kept in this position and observed for Nystagmus for 30 seconds. This usually appears with a Latency of a few seconds and lasts less than 30 seconds

After it stops and the patient sits up, the Nystagmus will recur but in the opposite direction and the patient is observed for 30 seconds.

The maneuver is considered the “Gold Standard” for the diagnosis of BPPV
Dix-Hallpike Maneuver

Use Frenzel Lenses
Benign Positional Vertigo (BPPV)

Treatment Options:

• Do nothing

• Canal Repositioning maneuvers
  – Semont Liberatory Maneuver
  – Epley Maneuver
  – Others

• Severe/Refractory cases - Surgery
Semont (Liberatory) maneuver

For Right Ear
Epley Maneuver

1. Sitting

2. Side lying for 30-60 seconds

3. 30-60 seconds

4. 30 seconds

5. Finished

Repeat x 2
Vestibular Neuronitis
(aka Vestib Neuritis, Viral Labyrinthitis, Epidemic Vertigo, Acute Vestibulopathy)

Viral or bacterial infections of the Inner Ear and or 8\textsuperscript{th} nerve. Not uncommon after an antecedent URI. Hearing rarely affected

**Typical Viral Neuronitis**
Causes episodes of vertigo that last for hours or days. The initial episode is usually the worst-Dramatic! Usually does not have Hearing loss; Often goes away on its own, but many require treatment for N/V
Perilymph Fistula

- Due to “loss of the inner ear hydraulics” from RW or OW
- History of Barotrauma or straining (“Pop”) resulting in Vertigo
- May have associated SNHL
- May heal spontaneously with bed rest
- Surgical exploration with patch to RW or OW may be required
Superior Canal Dehiscence Syndrome

First described by Dr. Lloyd Minor in 1998

**Symptoms:** Vertigo associated with Low freq sounds
Oscillopsia common with triggering activities
May have Fullness / Autophony; Inner Ear CHL

**Cause:** Dehiscence of the SSC in the MCF (L > R)

Treatment - observation or surgery
Other “Ear General” stuff

Motion Sickness
- If occurred in Flight training and resolved OK to issue

Do NOT Issue items that requires FAA Decision
- Acoustic Neuroma
- Mastoid fistula, Mastoiditis, Impaired Aeration of Middle Ear, Active Chronic Otitis Media, Progressing Otitis Externa
- First time Otologic Surgery—FAA needs to review
NO - I TOLD YOU - I CAN'T TURN THAT ONE ON UNTIL I GET A MULT-ENGINE LICENCE.
Rhinology

• Examination
• Epistaxis
• Allergy
• Polyps
• Sinusitis
• Trauma
• Masses
Rhinology

“The Nose should be examined for the presence of Polyps, Blood, Signs of Infection or Allergy and Substance abuse”

- **Epistaxis** – If frequently should get it fixed! Low humidity at altitude and Aircraft O$_2$ is drying both of which can exacerbate Epistaxis
- **Nasal polyps** – Can result in sinus blockage with severe pain, The pain may be severe enough to cause loss of control of the aircraft (esp. Frontals) Obstruction of Sinuses requires a FAA decision. May issue if the condition is mild and have no potential for a sinus block
- **Septal Perforation** - May whistle on expiration; Crusting and Bleeding; Due to Cocaine use or surgery?
Rhinology

Trauma to the nose
Any condition which results in obstruction to the ventilation of the sinuses is disqualifying, such as a severely deviated septum with blockage

Malignancy
All cases of Malignancy of the Sinonasal region require a FAA decision. All pertinent medical information should be submitted to AMCD
Trauma/ Septal Deviation

No Obstruction-OK to issue
Rhinology- Malignancy

All cases require FAA Decision
Rhinology

Sinusitis

Intermittent and responds to Tx without side effects
OK to issue

Severe- Requiring Continuous use of Rx’s or problems with Barotrauma: Requires FAA Decision
Rhinology-- Polyps

- Inflammatory in nature
- Sometimes associated with allergy
- Nasal steroids can shrink or stop growth
- You can issue a certificate if...
  - Asymptomatic
  - No observable growth over 12 months
  - No potential for sinus block
- Otherwise, defer
Rhinology - Polyps & “Cysts”
Rhinology- Allergy Comorbidities

ALLERGY

- OME
- Nasal Polyps
- Sinusitis
- Asthma
- URI
Rhinology

Radiographic Studies:
Coronal CT Scan best for diagnosing sinusitis and nasal pathology
MRI scans tend to over read any sinusitis that may be present.
Plain films are of minimal utility
Rhinology
Rhinology

Severe Allergic Rhinitis:

**Hay fever** Controlled by Desensitization and/or by the use of **Non-Sedating Antihistamines** is NOT Disqualifying.

**Severe Allergies** require a FAA decision; Submit all pertinent medical information and current status report

**Medications** used to control Allergic Rhinitis
- **Nasal Steroids**: All current available OK to use while flying
Rhinology

Medications used for Allergic Rhinitis

Non-sedating Antihistamines are OK for use while flying Loratidine (Claritin®) and Fexofenadine (Allegra®);
Must use for at least 1 week without side effects before flying

All Sedating Antihistamines are NOT to be used while flying.
Rule of Thumb—5 Dosing Intervals before Flying

No Cetirizine (Zyrtec®), Diphenhydramine (Benadryl®), etc.

Nasal Antihistamines approved: Azelastine (Astepro®)

Cromolyn Sodium (Nasalcrom®) OK to use
Rhinology

Cystic Fibrosis

There are about 20 pilots actively flying with this disease. As treatments improve, life expectancy is getting longer so more will be seeking aeromedical certification.

The major aeromedical concern is sudden Spontaneous Pneumothorax with a high recurrence rate.

Obviously Pulmonary functions and the risk is Hypoxemia is of concern; Nasal Polyposis as well.

Some may actually get a Lung transplant

*These cases all require a FAA decision.*
Oral Cavity and Oropharynx
Malignant Tumors  (*Squamous Cell Carcinoma most common*)
Oral Cavity and Oropharynx

Speech

Must be able to speak English clearly

English is used world-wide for aircraft communication
Inability to understand or speak English is extremely disruptive to controllers, in a busy terminal area.

Stuttering would impair voice communication and the condition should be defined with a current status report and all information submitted to the FAA for decision.

Palatal adhesions to the pharynx, i.e. a palatal flap done for Velopharyngeal Insufficiency (VPI), must be described and all information sent to the FAA for decision.
Oral Cavity and Oropharynx

Obstructive Sleep Apnea – Fatigue (See Next Talk)

More prevalent as more Airmen become more obese. Several events involving Aviation Safety (Significant issue in the Trucking industry)

Findings suggestive of Obstructive Sleep Apnea (OSA):
- Short latency to sleep (Airman falls asleep in the Examining Chair)
- Obesity and elevated BMI (body mass index)
- Fatigue and day time somnolence
- Loud snoring with or without snorting
- Neck Circumference $\geq 17''$
Oral Cavity and Oropharynx

Obstructive Sleep Apnea  (*Cont’d*)

- Long/Redundant Palate & Uvula
- Reduced A-P distance of Nasopharynx
- Big tongue (Fat)
- Large Tonsils/Adenoids
- Presence of a pharyngeal flap
- Recent onset of Hypertension or Drug resistant AFib
- Type II Diabetes
Large Tonsils
Breathing During Sleep

During normal sleep, air flows freely past the structures in the throat.

- Air flow
- Base of the tongue
- Turbinate
- Soft palate
- Uvula
- Tonsil

Side view of nose and mouth
Breathing During Sleep

Snoring

Tongue Fat

Sleep Apnea
Obstructive Sleep Apnea (cont’d)

Many intervention strategies:
- Breathing assistance with CPAP/VPAP/BiPAP
- Weight reduction program
- Sleep Dental Appliance

Surgical treatments
- Tonsillectomy/Adenoidectomy
- Tongue stabilization/reduction; Laryngeal suspension
- Uvulopalatopharyngoplasty (UPPP)

More on this in the Talk to follow
Send to FAA for decision—Requires AASI Authorization
Uvulopalatopharyngoplasty (UPPP)
First Stage Treatment for Retrolingual Obstruction

Bone Screw (actual size): 2.8 x 5.5mm

First Stage treatment for Retrolingual Obstruction

Pre

Post
“Traditional” Head & Neck Ca (SCC)

- Older patient (late 50’s)
- Smoker
- Significant EtOH consumption
- Treated with Surgery & XRT, Occ Chemo
- Survival rates in 60% range
“Traditional” Head & Neck Ca (SCC)

Older patient 50+
• Smoker Relative Risk of 19.5x
• Heavy EtOH consumption RR 5.5x
• Both Smoker & EtOH 56.5x
• HPV+ RR soars to 230x
The New Epidemic of SCC

- **Younger** patient (40’s)
- White; College educated
- **Non-Smoker**
- Occ EtOH consumption
- Better Survival rates
- **75% are p16 and/or HPV (+)**
Famous People with HPV+ SCC

Michael Douglas - “Oral Sex caused my Throat Cancer”
HPV (+) vs. HPV (-) Incidence

Age Standardized cases per 100K person years

Incidence of HPV CA

Figure 2. Age-standardized incidence of tonsillar and base of tongue cancers, Stockholm, Sweden, 1970–2006.

Human Papilloma Virus (HPV)

- Over 60 types are cutaneous – Warts
- Over 40 types infect Mucosa
  - Low Risk Types 6, 11
  - High Risk 16, 18
- Life time risk – over 80% + for HPV Ab’s
- For most (90%) it’s transient-eradicated in 1-2 yrs.
  - 15% of Men Age 50-59 continue with an active infection
- However 10% will go onto chronic infection – Cancer
Human Papilloma Virus (HPV)

- Integrates into host DNA
- Down regulates p53 Tumor inhibition gene
- Exposures occur 15-30 yrs. prior
- Virus has changed-Higher transmission rate
- Lives in the Reticulated Epithelium
  - Cryptic Mucosa of Tonsils & BOT enters
  - Lymphovascular bundles
- Cancer may be poorly differentiated-but does not behave that way
Risk Factors

• Oral Sex, Open Mouth Kissing, Sexual Intercourse
  – HIV with increase condom use has led to more oral
  – Active disease – sheds virus and can spread it

• Age of Sexual Debut

• Number of partners (Just takes one!)
  – 1-4 partners have a 2 fold risk
  – 5 or more partners 5 fold risk

• Male (increase of 225% from 1988 to 2004)
**Presenting Symptoms of HPV+ SCC**

<table>
<thead>
<tr>
<th>Presenting Symptoms</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck mass</td>
<td>51</td>
</tr>
<tr>
<td>Sore throat</td>
<td>33</td>
</tr>
<tr>
<td>Dysphagia</td>
<td>16</td>
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<tr>
<td>Visualized mass</td>
<td>13</td>
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<tr>
<td>Globus sensation</td>
<td>10</td>
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<tr>
<td>Odynophagia</td>
<td>9</td>
</tr>
<tr>
<td>Otalgia</td>
<td>7</td>
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</table>

McIlwain WR, Sood AJ, et al; Initial Symptoms in Patients with HPV+ and HPV- Oropharyngeal Ca, JAMA Otolaryngology HN Surgery 2014, 140, 441-7
HPV+ SCC of H&N

May present as Unknown Primary in 10%

May have Painless BOT or Tonsil lesion

Neck mass – Large Cystic nodes
Survival rates for HPV+ Tonsillar cancer vs. HPV-  p<0.0005

Data from Lindquist et al. In Emerging Infect. Dis. www.cdc.gov/eid
Vol. 16, No. 11, Nov 2010
BOT Primary Tumor

T1 (<2cm) 
T2 (2-4cm) 
T3 (>4cm) 
T4a (invasive)
Challenges

Most are Married; had several partners before marrying
Can I kiss my wife? She already has it!

Women have a greater immune response to HPV than men do.

Prognosis
- HPV (+) and Non-smoker: Excellent 96% cure rates
- HPV (+) and Smoker: Intermediate Risk
- HPV (-) High Risk: High Risk
- HPV (-) and Smoker: Poorer Prognosis
Vaccine Preventable Cancer?

Gardasil ®

HPV Quadrivalent Vaccine Covers 6, 11, 16 & 18

Used in Boys & Girls

Not effective if already exposed
Treatment Options

Tonsillectomy with Lingual Tonsillectomy

Surgery vs. XRT vs. Chemo
All with good results
Head & Neck Cancers

How to help your Airmen

*What the FAA is looking for:*

1) Treatment is **complete**!
2) **Favorable** status report
3) All **relevant records** (Path/Op Report/ X-rays/Labs etc.)
4) Airman **back to Normal** living
5) Any **Aeromedically significant side effects** from Tx?
Laryngology

“Any condition that interferes with, or is aggravated by flying or maybe reasonably expected to do so”

- Reflux Laryngitis? Hoarseness? Trauma?
- Leukoplakia? Carcinoma in situ?
- Spasmodic dysphonia? Trach with talking valve?

If in doubt, Call the FAA or Defer the Exam
The Larynx
Laryngectomy patients

Laryngectomy is NOT a Tracheostomy

Both have a “hole” in the neck, however the former is missing the Entire Voice Box (Larynx)

Can you fly without a Voice Box?

FAA thinks so—We have several who do!
Tracheostomy patients

Airman with a Tracheostomy is a Deferral
Laryngectomy patients
Blom Singer Valve

Tracheoesophageal Voice Prosthesis

Location of tissue
Vibration for voice
Tracheoesophageal Puncture and
Blom-Singer Voice Prosthesis
Esophagus
Trachea and
Air from Lung

Speech
Stoma closure with thumb
Adjustable trachea-
Stoma valve for hands
Free operation

Cough relief flap
Air for breathing enters from the side
Adjustable magnet
HME cassette
Housing/baseplate

ATOS Free-Hands HME
Spatial Disorientation

“Say . . . What’s a mountain goat doing way up here in a cloud bank?”
Beech Baron Twin N3600H – Dr. James Styner Feb 1976
Spatial Disorientation

Learn about it and give lectures

- 10% of GA Accidents are due to SD
- 90% of these are Fatal!
- Average time to incapacitation is < 3 minutes
- Variety of ways your body lies to you
- Flying is “extra-terrestrial” and our “sensors” can fail us
- Visual, Vestibular, Proprioceptive, Supra-tentorial
- Classified as Type I, Type II, Type III
Spatial Disorientation

TYPE I (UNRECOGNIZED)
CLUELESS that there is a problem. Aviator does not perceive anything is Wrong. Failure to recognize or correct usually results in a Fatality.

TYPE II (RECOGNIZED)
KNOWS there is a problem but may not recognize as SD. Pilot believes Controls not working right, there is an Instrument failure and believes Powerful Vestibular and Proprioceptive input.

TYPE III (INCAPACITATING)
Pilot experiences OVERWHELMING Sensation of Movement that he or she cannot orient using VISUAL cues or Aircraft Instruments. Often FATAL if no Co-Pilot to take over.
Spatial Disorientation
Spatial Disorientation

Graveyard Spiral & Spin
Spatial Disorientation

NVG’s FLIR entering commercial use-Air Ambulances, etc.
Spatial Disorientation
THE FOUR FORCES OF FLIGHT

DREAMS

REALITY

MONEY

FAA
THANK YOU!

Questions??
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