Clinical Otolaryngology HNS of “Aeromedical Significance”

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FAA AME Refresher Seminar
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CAMA / Mayo
Greetings
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
  – 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
w/possible Mastoiditis and Cholesteatoma
Otology

Inner Ear

Auditory System – Cochlea

Sensorineural hearing loss (SNHL)
Decreased hearing acuity
Reduced discrimination of speech
AIED, PLF, Meniere’s, Syphilis, IEBT (Bends)
AIRCRAFT HAVE RIGHT OF WAY ON ROADS
Otology

Audiologic Testing

Initial assessment – Conversational Voice Test*

- Normal conversational volume
- Examiner faces away from the candidate 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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</thead>
<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 discrimination

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

**FAILS?** May be eligible for **SODA** (Statement of Demonstrated
Ability) after MFT (Medical Flight Test)

If a language problem exists, defer to OKC
Otology

Results of Testing:

Need for sound amplification to pass auditory 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? i.e. Deaf

Can qualify for a private pilot certificate if otherwise qualified

AMCD may issue a combined Medical/Student Pilot certificate as follows:

“VALID FOR STUDENT PILOT PURPOSES ONLY”

*With the additional comment:*

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

When the pilot is ready for check ride—must contact AMCD or RFS for MFT

Currently Flying with Severe HL (Deaf) N = 7
Currently Flying with Cochlear implants N = 11
Currently Flying with BAHA’s N = 3
Currently Flying with Implanted HA N = 1
Cochlear Implant
BAHA (Bone Anchored HA)
Fully Implantable HA
Otology

General Aviation Aircraft are very loud and can 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; Can cause a host of 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, Medications
COULD BE ANYTHING.

WAY TOO GENERAL PRACTITIONER.
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

Results from “Cochlea Hypertension”

Typical 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 may be “Progressive” or “Non-progressive”
- Can be associated with Migraine
Benign Positional Vertigo (BPPV)

BPPV results when crystals in the vestibule dislodge into canals

Typically noted 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 (take care with elderly and others 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

Severe cases - Surgery
Semont (Liberatory) maneuver

For Right Ear
Epley Maneuver

1. Sitting upright
2. Lying on back, supported
3. Reaching hands behind head
4. Rolling to side
5. Sitting upright

30-60 Seconds
30-60 Seconds
30 Seconds

Finished
Repeat x 2
Vestibular Neuronitis
(AKA Vestib Neuritis, Neurolabrynthitis, 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 inner ear hydraulics” around 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; CHL (inner ear)

**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 - Requires FAA Decision
Acoustic Neuroma
Mastoid fistula, Mastoiditis, Impaired Aeration of Middle Ear
Active Chronic Otitis Media, Progressing Otitis Externa (MOE?)
First time Otologic Surgery—FAA needs to review
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 Sinusitis/Rhinitis is mild or Cysts/Polyps have no potential for a sinus block

**Septal Perforation** - May whistle on expiration; 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
    12 months
  – No potential for sinus block
• Otherwise, defer
Rhinology- Polyps/ “cysts”
Rhinology- Allergy Comorbidities

- OME
- URI
- Allergy
- Nasal Polyps
- Asthma
- Sinusitis
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 to control allergic rhinitis

Non-sedating Antihistamines are OK for use while flying  
Loratidine (Claritin®) and Fexofenadine (Allegra®);  
Airman use Rx 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®) is non-sedating: 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

Some may actually get a lung transplant

These cases all require a FAA decision. Forward all pertinent medical information to the AMCD
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

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

Findings suggestive of Obstructive Sleep Apnea (OSA):
  - Short latency to sleep (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 \( > 17” \)
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 requires mult Rx’s
- Type II Diabetes
Large Tonsils
Breathing During Sleep

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

- Side view of nose and mouth
- Air flow
- Base of the tongue
- Turbinate
- Soft palate
- Uvula
- Tonsil
Breathing During Sleep

Snoring

Sleep Apnea

Tongue Fat
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
Uvulopallatopharyngoplasty (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 SCC’s H&N

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

Older patient 50+

• Smoker RR of 19.5x

• Heavy EtOH consumption  RR 5.5x

• Both 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 – Cause 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 have 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

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 Have a 2 fold risk
5 or more 5 fold risk

Male (increase of 225% 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>
</tr>
</tbody>
</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 we are 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”

“Interferes with, or may reasonably be expected to do so”

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

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 Lungs

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

Adjustable magnet
Cough relief flap
Air for breathing enters from the side
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!
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
THANK YOU!

Questions??
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