

Ear Disease, Video Otoscopy & Tympanometry

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OUTLINE

Why use video
otoscopy?
Why do
tympanometry?
How do these
procedures help?

- Ear Disease
- Video Otoscopy
- Ear Tubes
- Tympanometry
- Efficiencies
- Conclusion

- Approximately 15 million antibiotic prescriptions written per year in the United States for Acute Otitis Media.
- The diagnosis and treatment for OM is estimated at 5.3 billion dollars.
- The expenses multiply when one factors in the loss of parental work, transportation, and other indirect costs.

McCaig LF Trends in antimicrobial prescribing rates for children and adolescents. JAMA 19-JUN-2002; 287(23): 3096-102

Bondy J, Berman S, Glanzer J, et al. Direct expenditures related to otitis media diagnosis: extrapolations from a pediatric Medicaid cohort. Pediatrics 2000;105:E72.

Alsarraf R, Gates GA. The real cost of otitis media. Acta Peditr 1999;88:487-488.

- Annual rates of antimicrobial prescribing for children by office-based physicians increased from 1980 through 1992
- Antimicrobial resistance increased for many organisms during the 1990s

McCaig LF Trends in antimicrobial prescribing rates for children and adolescents.

- JAMA - 19-JUN-2002; 287(23): 3096-102

- Annual rates of antimicrobial prescribing for children by office-based physicians decreased in 1989-1990 and 1999-2000.
 - Pharyngitis and URI: Both population- and visit-based prescribing rates decreased
 - Otitis Media and Bronchitis: Only population based rates decreased
 - Sinusitis: No change in prescribing rates

McCaig LF Trends in antimicrobial prescribing rates for children and adolescents.

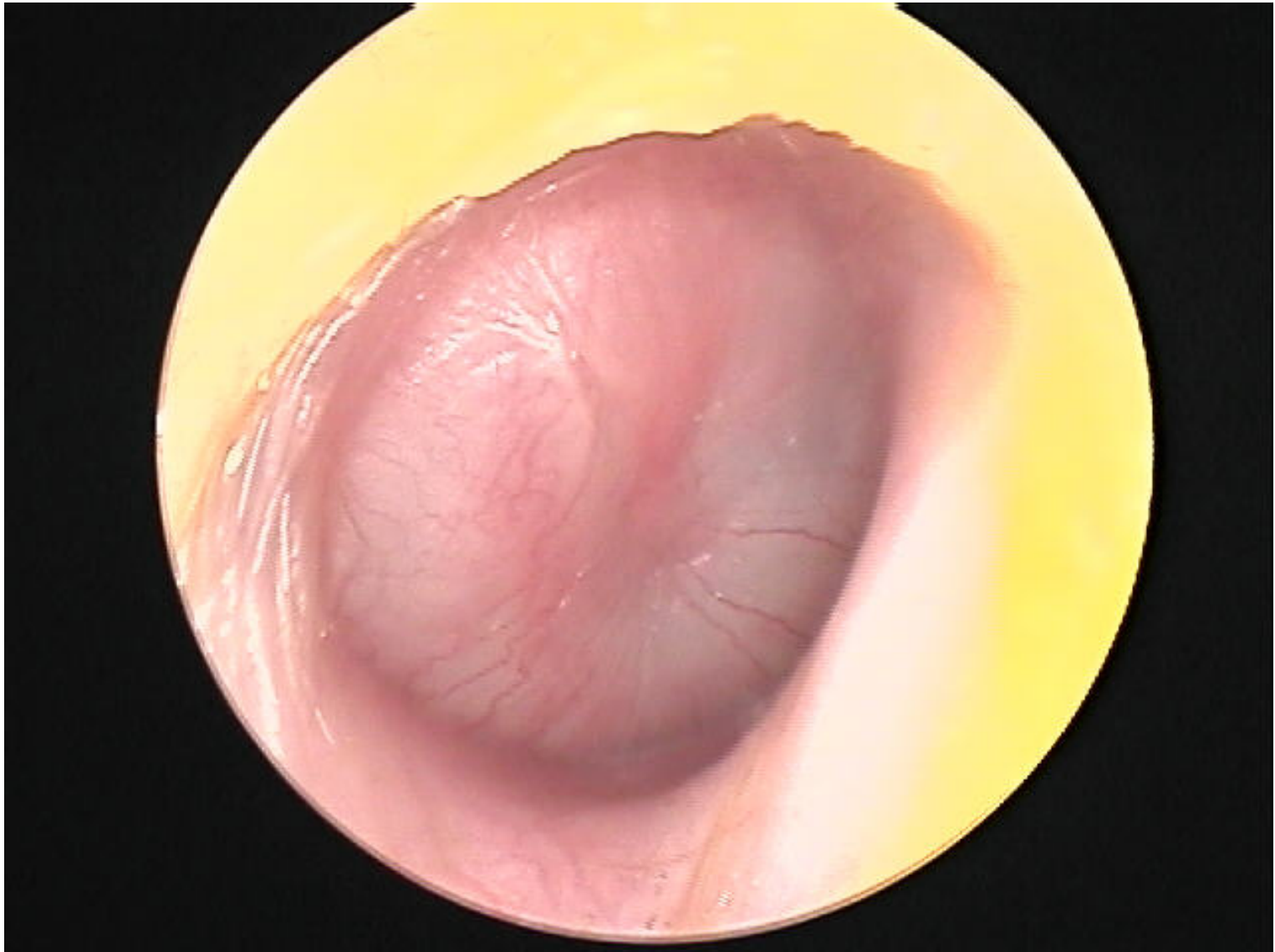
- JAMA - 19-JUN-2002; 287(23): 3096-102

Diagnosis of Acute Otitis Media (AOM)

Clinical Practice Guidelines from American Academy of Pediatrics and American Academy of Family Physicians Subcommittee on Management of Acute Otitis Media. Diagnosis & management of acute otitis media. Pediatrics 2004 May;113(5):1451-65.

Diagnosis of AOM requires:

- History of acute onset of signs and symptoms
- Presence of MEE (middle ear effusion)
 - Bulging of the tympanic membrane
 - Limited or absent mobility of the tympanic membrane
 - Air-fluid level behind the tympanic membrane
 - Otorrhea
- Signs or symptoms of middle ear inflammation
 - Distinct erythema of the tympanic membrane
 - Distinct otalgia (discomfort clearly referable to the ears that results in interference with or precludes normal activity or sleep)



Treatment of Acute Otitis Media

- High dose Amoxicillin (80 – 90 mg/kg/d)
- For persistent or recurrent AOM
Amoxicillin/clavulanate (90/6.4 mg/kg/d),
Cefdinir, Cefprozil, Cefpodoxime, Cefuroxime, or
Ceftriaxone
- Need antibiotic that covers *Strep pneumoniae* and has good *B*-lactamase stability (Increasing the dose of Amoxicillin does not cover infection with *B*-lactamase producing pathogens)
- Key factors enhancing compliance are taste, dosing frequency and duration of therapy.

Pichichero M and Casey J. Acute Otitis Media: Making sense of recent guidelines on antimicrobial treatment. Vol. 5 No. 4 Journal of Family Practice, Applied Evidence. 2005. pp. 313 – 322.

American Academy of Pediatrics Subcommittee on Management of Acute Otitis Media. Diagnosis and management of acute otitis media. Pediatrics 2004 May;113(5):1451-65.

Wait and See Prescription

Methods

- Children randomly assigned to receive either a Standard Prescription or Wait-and-See Prescription
- All patients received an antibiotic prescription

Spiro DM, et al. Wait and See Prescription for the Treatment of Acute Otitis Media – A Randomized Controlled Trial JAMA, 13-September- 2006; 296(10): 1235-1241.

Wait and See Prescription

Methods

- Prescription expired 3 days after being seen
- WASP Group given instructions “not to fill the antibiotic prescription unless your child either is not better or is worse 48 hours (2 days) after today’s visit.”
- Standard Group given instructions “fill the antibiotic prescription and give the antibiotic to your child after today’s visit.”

Spiro DM, et al. Wait and See Prescription for the Treatment of Acute Otitis Media – A Randomized Controlled Trial JAMA, 13-September-2006; 296(10): 1235-1241.

Wait and See Prescription

Results

- 283 patients WASP group (n = 138) SP group (n = 145)
- No serious adverse events
- Substantially more parents in the WASP group did not fill the antibiotic prescription (62% vs 13%; $P < .001$).
- There was no statistically significant difference between the groups in the frequency of subsequent fever, otalgia, or unscheduled visits for medical care. Within the WASP group, both fever (relative risk [RR], 2.95; 95% confidence interval [CI], 1.75 - 4.99; $P < .001$) and otalgia (RR, 1.62; 95% CI, 1.26 - 2.03; $P < .001$) were associated with filling the prescription.

Spiro DM, et al. Wait and See Prescription for the Treatment of Acute Otitis Media – A Randomized Controlled Trial JAMA, 13-September-2006; 296(10): 1235-1241.

Wait and See Prescription

Conclusion

- The Wait-and-See Prescription approach substantially reduced unnecessary use of antibiotics in children with AOM seen in an emergency department and may be an alternative to routine use of antimicrobials for treatment of such children.

Spiro DM, et al. Wait and See Prescription for the Treatment of Acute Otitis Media – A Randomized Controlled Trial JAMA, 13-September- 2006; 296(10): 1235-1241.

Wait and See Prescription

Exclusion Criteria:

1. Additional bacterial infection; pneumonia
2. Pt. appeared “toxic”
3. Pt. was hospitalized
4. Pt. was immunocompromised
5. Pt. was treated with antibiotics the previous 7 days
6. Pt. had perforated TM or Myringotomy Tubes
7. Uncertain access to medical care, including lack of telephone
8. Primary language other than English or Spanish
9. Pt. already enrolled in the study

Spiro DM, et al. Wait and See Prescription for the Treatment of Acute Otitis Media – A Randomized Controlled Trial JAMA, 13-September- 2006; 296(10): 1235-1241.

National Guideline AHRQ

Diagnosis and management of acute otitis media.

- **Recommendation 1:** To diagnose acute otitis media (AOM), the clinician should confirm a history of acute onset, identify signs of middle-ear effusion, and evaluate for the presence of signs and symptoms of middle-ear inflammation. **(Recommendation)** (See Table 2 in the original guideline document.)
- **Recommendation 2:** The management of AOM should include an assessment of pain. If pain is present, the clinician should recommend treatment to reduce pain. **(Strong Recommendation)**
- **Recommendation 3A:** **Observation without use of antibacterial agents in a child with uncomplicated AOM is an option for selected children based on diagnostic certainty, age, illness severity, and assurance of follow-up. (Option)**
- **Recommendation 3B:** If a decision is made to treat with an antibacterial agent, the clinician should prescribe amoxicillin for most children. **(Recommendation)** When amoxicillin is used, the dose should be 80 to 90 mg/kg/day. **(Option)**
- **Recommendation 4:** If the patient fails to respond to the initial management option within 48 to 72 hours, the clinician must reassess the patient to confirm AOM and exclude other causes of illness. If AOM is confirmed in the patient initially managed with observation, the clinician should begin antibacterial therapy. If the patient was initially managed with an antibacterial agent(s), the clinician should change the antibacterial agent(s). **(Recommendation)**
- **Recommendation 5:** Clinicians should encourage the prevention of AOM through reduction of risk factors. **(Recommendation)**
- **Recommendation 6:** There is insufficient evidence to make a recommendation regarding the use of complementary and alternative medicine (CAM) for AOM. **(No Recommendation)**

American Academy of Pediatrics Subcommittee on Management of Acute Otitis Media. Diagnosis and management of acute otitis media. Pediatrics 2004 May;113(5):1451-65.

Scottish Intercollegiate Guidelines Network (SIGN).

Medical Treatment

Acute Otitis Media

- B - Children diagnosed with acute otitis media should not routinely be prescribed antibiotics as the initial treatment.**
- B -** Delayed antibiotic treatment (antibiotic to be collected at parents' discretion after 72 hours if the child has not improved) is an alternative approach which can be applied in general practice.
- B -** If an antibiotic is to be prescribed, the conventional five day course is recommended at dosage levels indicated in the British National Formulary.
- A -** Children with acute otitis media should not be prescribed decongestants or antihistamines.
- D -** Parents should give paracetamol for analgesia but should be advised of the potential danger of overuse.
- B -** Insertion of oils should not be prescribed for reducing pain in children with acute otitis media.

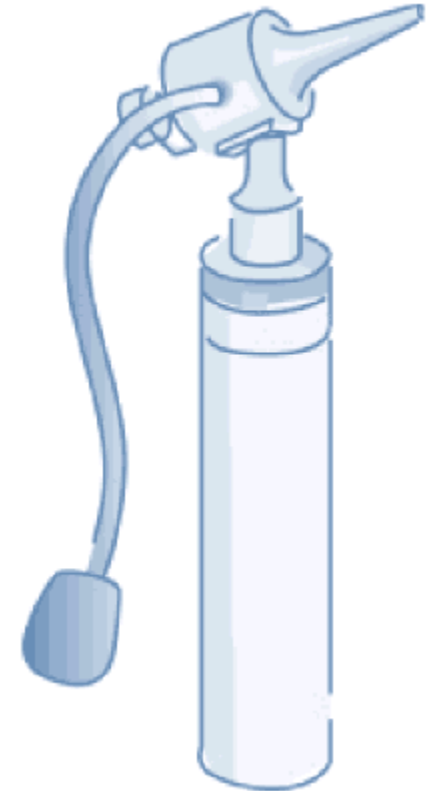
Diagnosis and management of childhood otitis media in primary care. A national clinical guideline. Edinburgh (Scotland): Scottish Intercollegiate Guidelines Network (SIGN); 2003 Feb. 18 p. (SIGN publication; no. 66). [77 references]

Considering the present environment, what can help us with diagnosis and management of ear disease?

1. Pneumatic otoscopy (Insufflation)
2. Otoscopy (Video otoscopy)
3. Tympanometry

Pneumatic otoscopy

- When comparing either test alone, pneumatic otoscopy has a better sensitivity and specificity than tympanometry for the diagnosis of OME



American Academy of Family Physicians; American Academy of Otolaryngology-Head and Neck Surgery; American Academy of Pediatrics Subcommittee on Otitis Media With Effusion. Otitis media with effusion. *Pediatrics* 2004;113:1412–29

Performing pneumatic otoscopy

Equipment –

- Rubber squeeze bulb, insufflator bulb (WA #21501)
- Insufflator specula (SofSpec Reusable Set of 3 WA #24420)
- Normal specula and tubing
- Air pump



Normal otoscopy plus...

- Obtain a seal
- Squeeze bulb gently
- “Luffing of a sail”

Online Pneumatic otoscopy review course:

<http://www.aap.org/otitismedia/www/vc/ear/rvw/rvw1.cfm>

Ear Disease

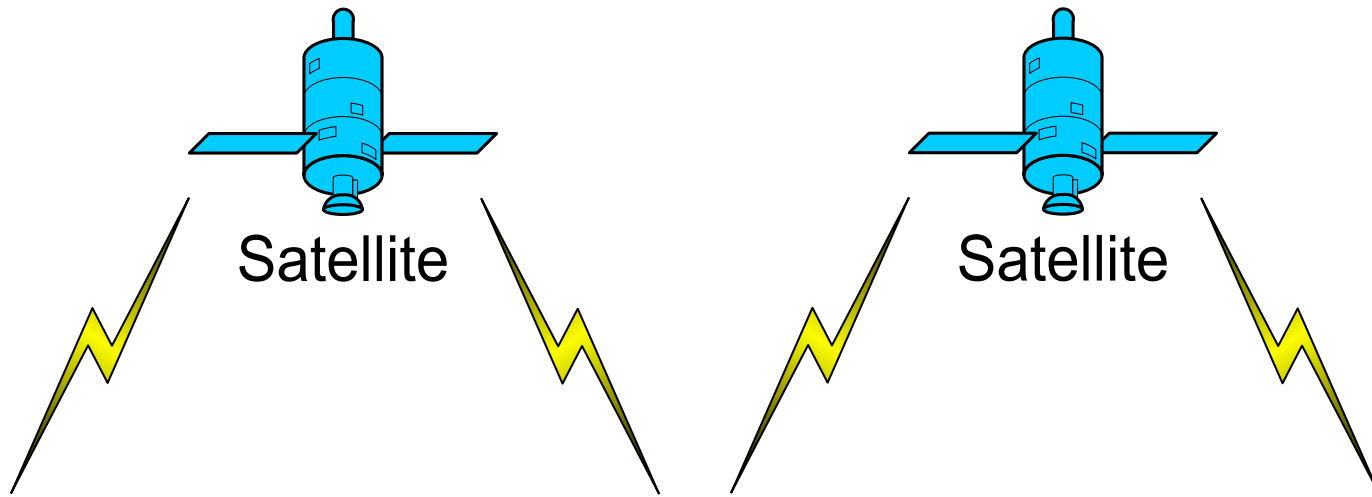
- Ear disease accounts for:
 - 10-15% Alaska village encounters and 31% under the age of five
 - 59% of the antibiotic prescriptions for those under the age of seven

Among groups most affected by chronic suppurative otitis media are the Inuits of Alaska (30% to 46%), Australian Aborigines (12 to 25%) and certain Native American tribes such as the Navajo tribes (4% to 8%).



- 11+ years operational history
- 30,000+ cases / year
- R & D and Manufacturing of Medical Devices
- Whole Product Solution
 - Design → Installation → Training → Support → Marketing
- Installed Customer base includes:
 - 300+ sites
 - ~90 health care organizations utilizing our system
 - 400+ telemedicine carts deployed





Village Clinic



Regional Health Center



Tertiary Care Hospital





Ear examination in Buckland, Alaska.



Case review in Kotzebue and Anchorage, AK

External Ear Disease

- Otitis Externa
- Ear Canal Lacerations/Injuries
- Foreign Bodies
- Exostosis of Ear; Surfer's Ear

Middle Ear Disease

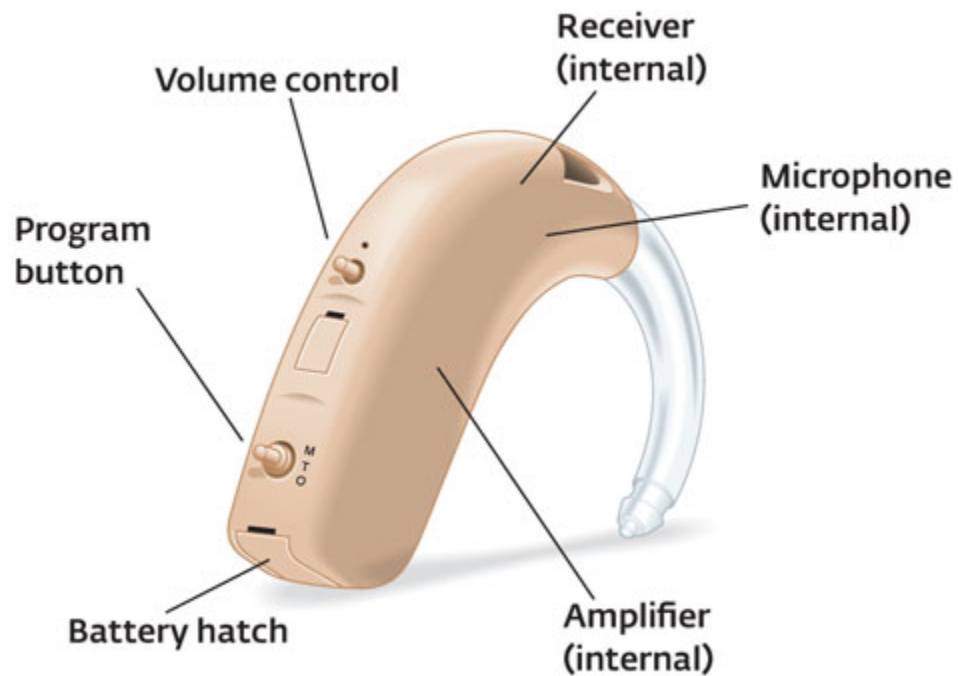
- Based on over 10,000 Otolaryngology telemedicine cases, the most prevalent ICD9 primary diagnostic codes were 384.2 (Perforation of tympanic membrane), 381.1 (Chronic serous otitis media), and 382.9 (Unspecified otitis media), accounting for approximately 33% of all cases.

John Kokesh, MD, A. Stewart Ferguson, PhD, Chris Patricoski, MD
The Alaska Experience Using Store-and-Forward Telemedicine for ENT Care in Alaska
Otolaryngologic Clinics of North America

Volume 44, Issue 6 , Pages 1359-1374, December 2011

[http://www.oto.theclinics.com/article/S0030-6665\(11\)00144-7/abstract](http://www.oto.theclinics.com/article/S0030-6665(11)00144-7/abstract)

Hearing Aids



ConsumerReports

Hearing Aids Clearance

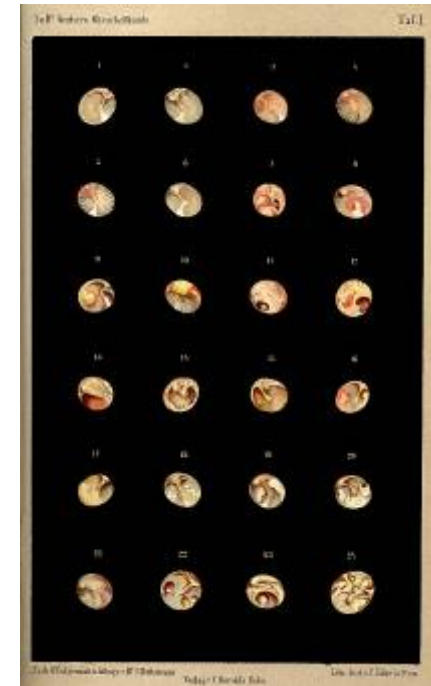
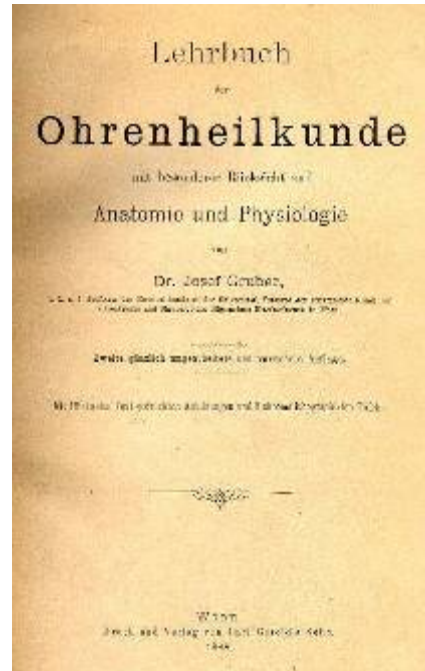
- Clear ear canal
- Hearing Test, Audiogram
- Report
- Scan or Fax

Ear Imaging Video Otoscopy



Ear Imaging

There is a long history in the medical field of tympanic membrane photography.



Stein ST. Apparat zur Photographischen Aufnahme des Trommelfells. *Arch Ohren Nasen Kehlkopfheilkd* 1873;7:56-58.

Buckingham RA. Photography of the Ear. In: *Otolaryngology* 1981, Vol.1. English GM Editor. Harper and Row Publishers, Hagerstown, MD, Chapter 58.

Pensak MI, Yanagisawa E. Tympanic Membrane Photography: Historical Perspective. *Am J Otol* 1984;5:324-332.

Video Otoscopy

Telescopic video otoscopy is a relatively new method of ear imaging that continues to evolve.

- Yanagisawa E, Carlson RD. Telescopic Video-Otoscopy Using a Compact Home Video Color Camera. *Laryngoscope* 1987;97: 1350-1355.
- Konrad HR, Berci G, Ward P. Pediatric Otoscopy and Photography of the Tympanic Membrane. *Arch Otolaryngol* 1979;105:431-433.
- Crump WJ, Kumar R, Orsak G, Pfeil T. A Field Trial of 2 Telemedicine Camera Systems in a Family Practice. *Arch Fam Med* 1998;7:174-176.

Video Otoscopy

It is now finding its way into daily ENT and audiology practice.



Jaisinghani VJ, Hunter LL, Yaoli L, Margolis RH. Quantitative Analysis of Tympanic Membrane Disease Using Video-Otoscopy. *Laryngoscope* 2000;110: 1726-1730.

Burgess LPA, Holtel MR, Syms MJ, Birkmire-Peters DP, Peters LJ, Mashima PA. Overview of Telemedicine Applications for Otolaryngology. *Laryngoscope* 1999;109: 1433-1437.

Sullivan RF. Video-Otoscopy in Audiologic Practice. *J Am Acad Audiol* 1997;8:447-467.

Video Otoscopy

Clinicians are finding increasing value in using video-otoscopy for teaching students and educating patients on their conditions.

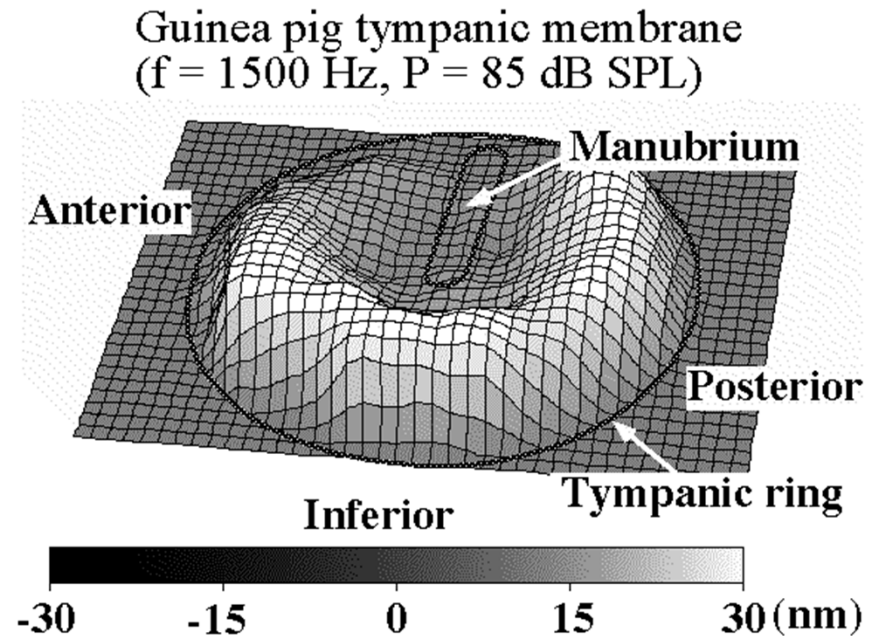
Yanagisawa E. The Use of Video in ENT Endoscopy: Its Value in Teaching. *ENT Journal* 1994;73:754-763.

Jaisinghani VJ, Hunter LL, Yaoli L, Margolis RH. Quantitative Analysis of Tympanic Membrane Disease Using Video-Otoscopy. *Laryngoscope* 2000;110: 1726-1730.

Burgess LPA, Holtel MR, Syms MJ, Birkmire-Peters DP, Peters LJ, Mashima PA. Overview of Telemedicine Applications for Otolaryngology. *Laryngoscope* 1999;109: 1433-1437.

Video Otoscopy

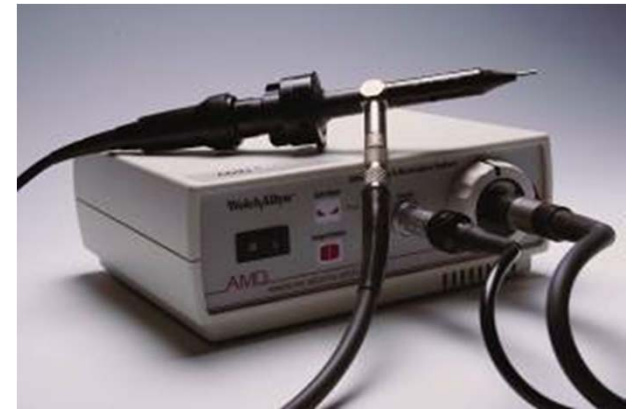
The video otoscope has been used for experimental quantitative analysis of the tympanic membrane to determine and monitor disease progression.



Jaisinghani VJ, Hunter LL, Yaoli L, Margolis RH. Quantitative Analysis of Tympanic Membrane Disease Using Video-Otoscopy. *Laryngoscope* 2000;110: 1726-1730.

Video Otoscope Adoption in AK

- In 1999, a comprehensive evaluation was conducted on the available video otoscopes with emphasis on image quality.*
- In 2001 The AFHCAN Telemedicine Project adopted the AMD/Welch Allyn 300S as the Video Otoscope Imaging and Illumination platform.



*Ferguson AS. Video otoscope testing. Final report. Alaska Native Health Board. Anchorage (AK): University of Alaska Anchorage; 1998.

Training Manuals

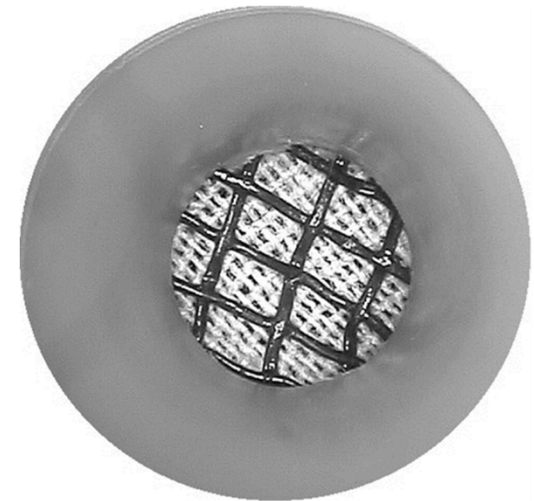
- Continued use of this video otoscope led to best practices on image acquisition documented as a user's manual.



AFHCAN. User's manual. Video otoscope, AMD-300S (Welch Allyn/AMD)
Document ID: Pub-112. Anchorage (AK): Alaska Native Tribal Health
Consortium; 2006.

Improvements

- It was recognized over time, that some images were blurry and were caused by improper focus. Therefore, a focus tool was designed, manufactured and distributed to “prefocus” the instrument.



Focus Tool

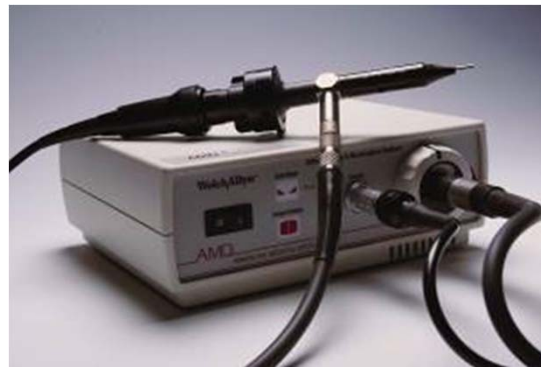
- Focus Tool



Patricoski C, Ferguson AS, Tooyak A. A focus tool as an aid to video-otoscopy.
J Telemed Telecare 2003;9:303–5.

Video Oscopes in AK

- The AFHCAN Telemedicine Project now uses video otoscopes by JedMed, WelchAllyn & AMD.



<http://www.afhcan.org/documentation.aspx>

HG-0016 How to capture images using the JedMed Oscope.

HG-0021 How to capture images using the Welch Allyn Oscope.

TTAC

Toolkit on Video Otoscopes, 2011

<http://www.telehealthtac.org/toolkits/video-otoscopes>



TTAC

Toolkit on Video Otoscopes, 2011

- About Video Otoscopes
 - Technology Overview
 - Deployment & Support
 - Resources

TTAC

Toolkit on Video Otoscopes, 2011

- **Assessment Process**
 - Testing Process
 - Assessment Guide
 - Product Cut Sheets
 - Sample Media

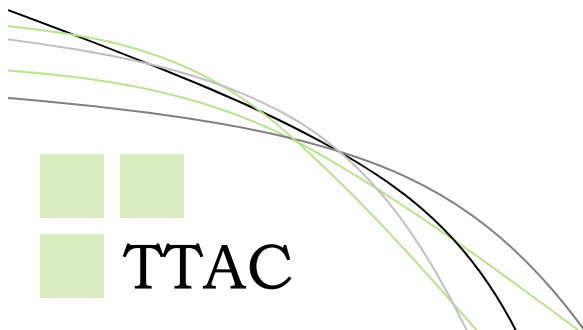
Definitions – The Categories

- Oscilloscopes with Video Output
 - Multiple video connector options
 - S-Video
 - Composite
 - HDMI
 - DVI
 - Multiple interface options
 - Stand-alone monitors
 - VTC Endpoints
 - “Framegrabber” video cards
 - Video-USB adapters

Video Otoscopes

▶ The Market

- 10 Manufacturers producing 16 devices
- Price range from <\$400 to >\$8,000
- Video output options include S-Video, Composite, HDMI, DVI, and USB
- Form factor varies widely across the market



Video Otoscopes

1. Advanced Monitors VO – USB
2. Advanced Monitors VO – Video
3. AMD 300 (discontinued)
4. AMD 500
5. Aurical OTOCam 300
6. Jedmed Combo 24
7. Jedmed Digicam
8. Lightning Enterprises M-100
9. MedRx
10. MGE DinoLite Pro – USB
11. MGE DinoLite Pro – Video
12. RF Co. ME-16 Morse TypeS – Video
13. RF Co. ME-16 Morse TypeS – USB
14. SecondOpinion DrCamscope – Standard Definition
15. SecondOpinion DrCamscope – High Definition (discontinued)
16. WelchAllyn Macroview

Field of View

- How much of the world can be captured by the sensor
- Wide field of view is important
- Extremely wide FOV can lead to distortion or “fish-eye”

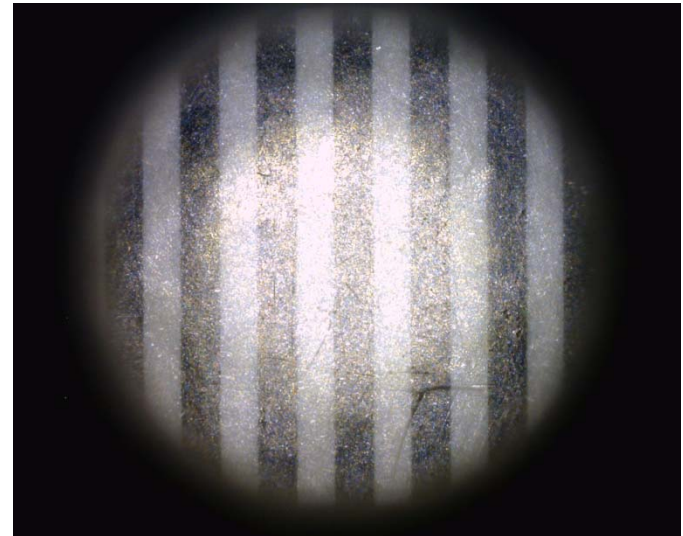
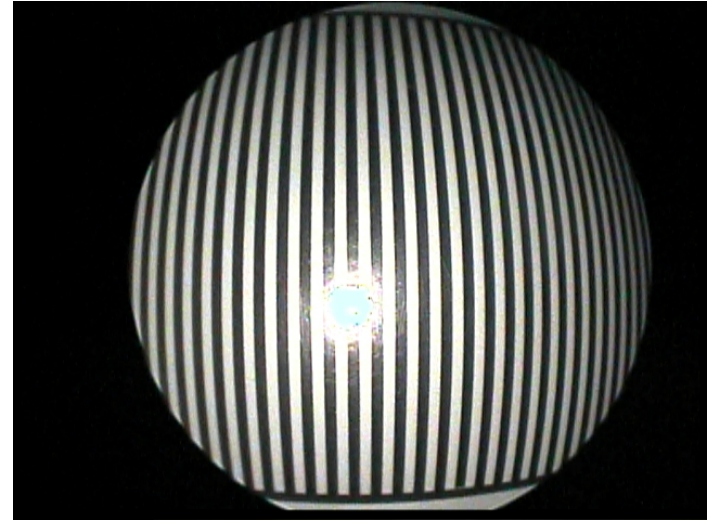
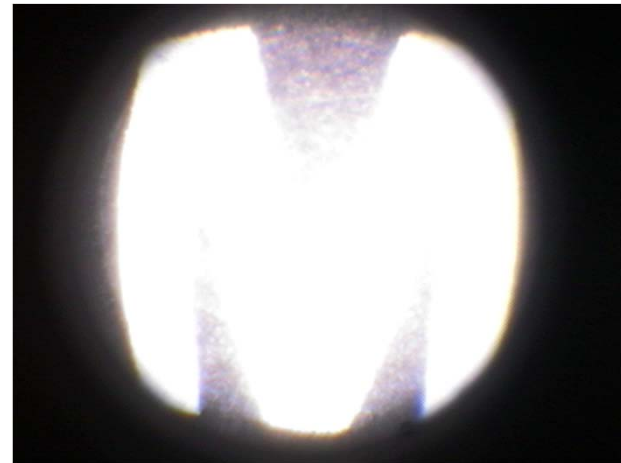


Image Quality Varies



Color

Blooming

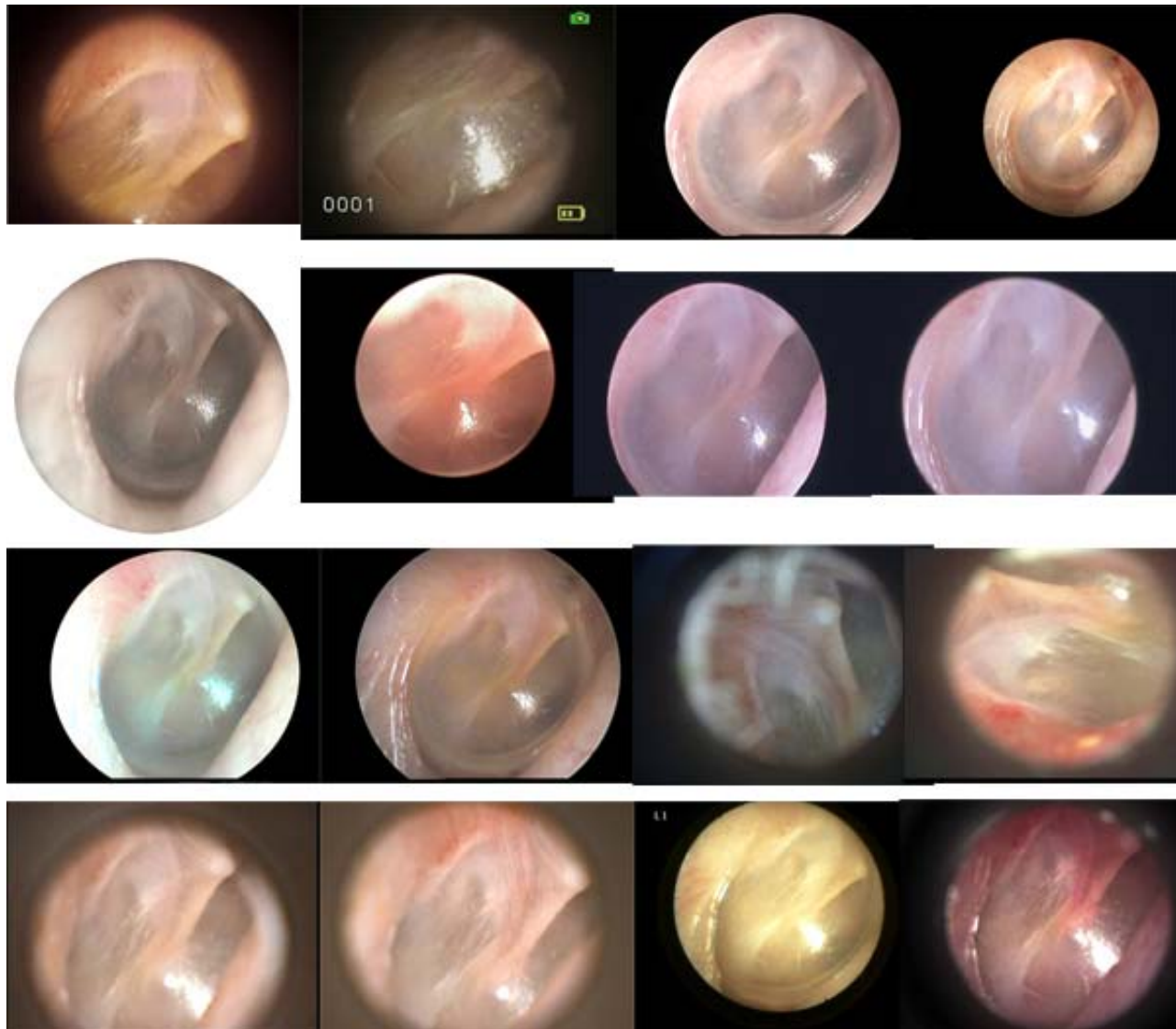
Tympanic Membrane 2

Row 1: Advanced Monitors VO USB, AM VO, **AMD 300**, **AMD 500**

Row 2: GN Otocam 300, **Jedmed Combo 24**, Jedmed Digicam x 2

Row 3: Lightning Enterprises M-100, MedRx SLS Light Source, MGE DinoLite Pro USB, MGE Pro Video

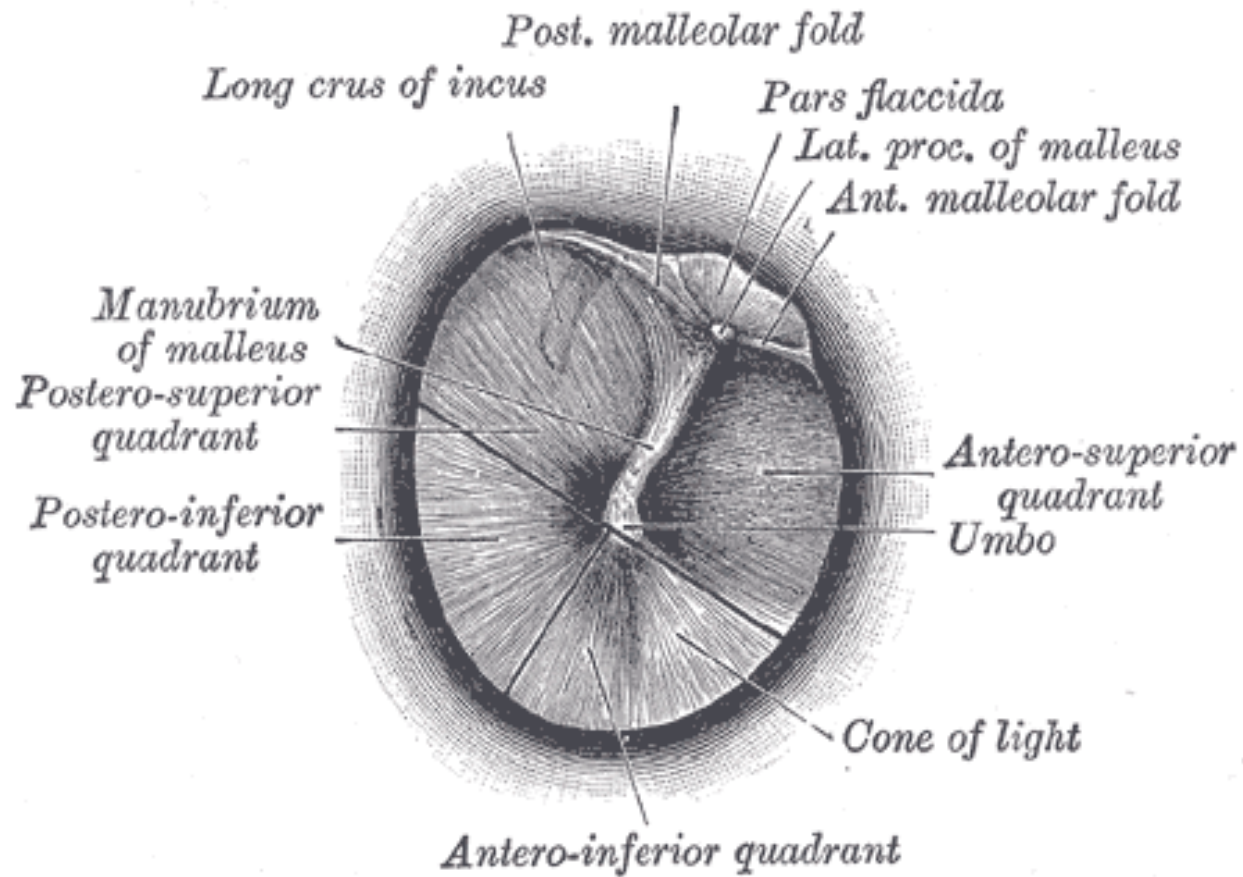
Row 4: RF CO ME-16, RF CO ME-16 USB, Dr. Camscope, WA Macroview



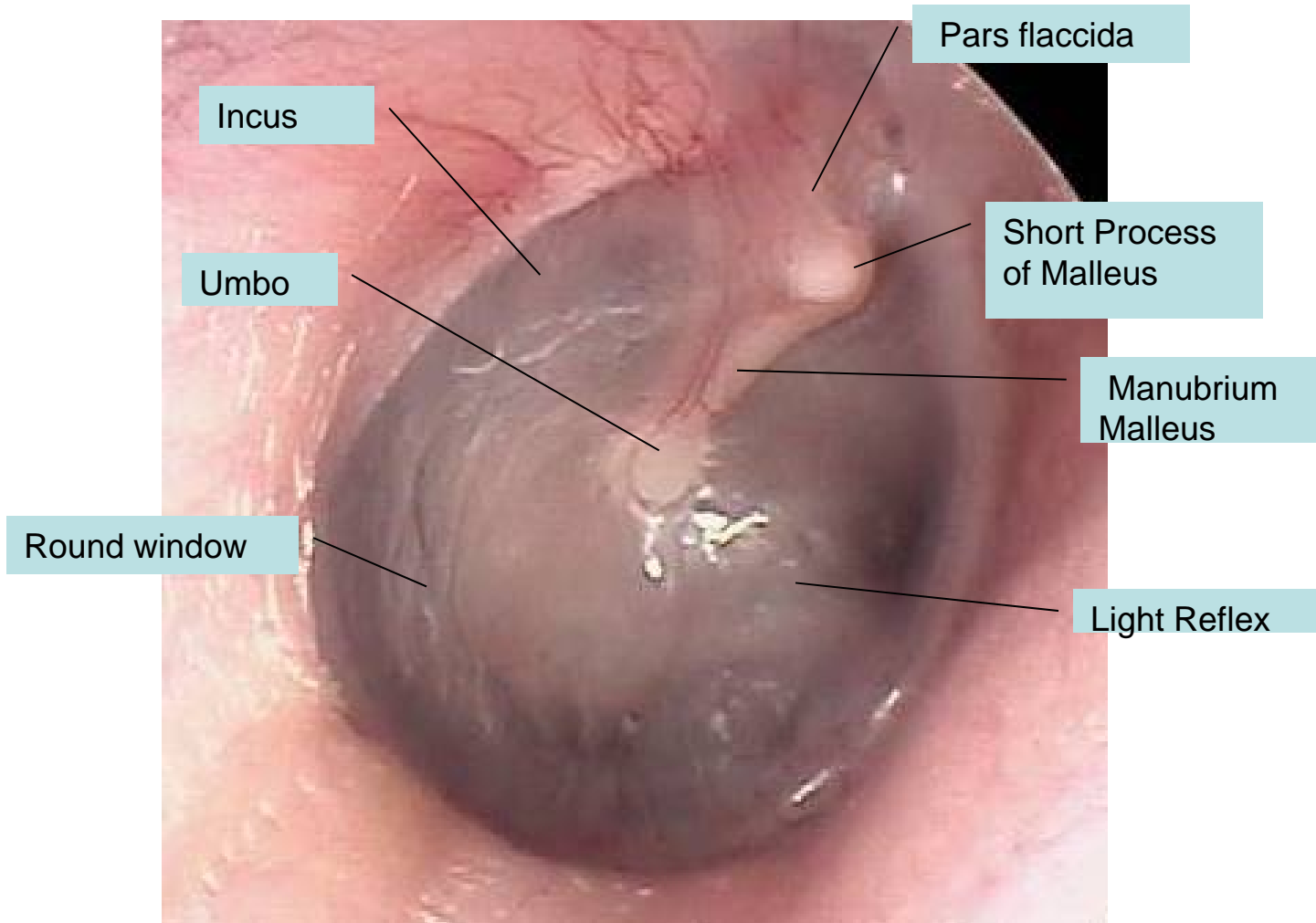
Video Otoscopes

▶ What We Learned

- Lighting and Sensor chips
- There is still a wide range of quality issues in many of the products
- Clinical imaging of ear drums is more valuable than imaging of objects and the miniMacbeth color chart
- Portable models are capturing better images than they were last time we looked
- You still get what you pay for
- Better video otoscopes cost over \$5000



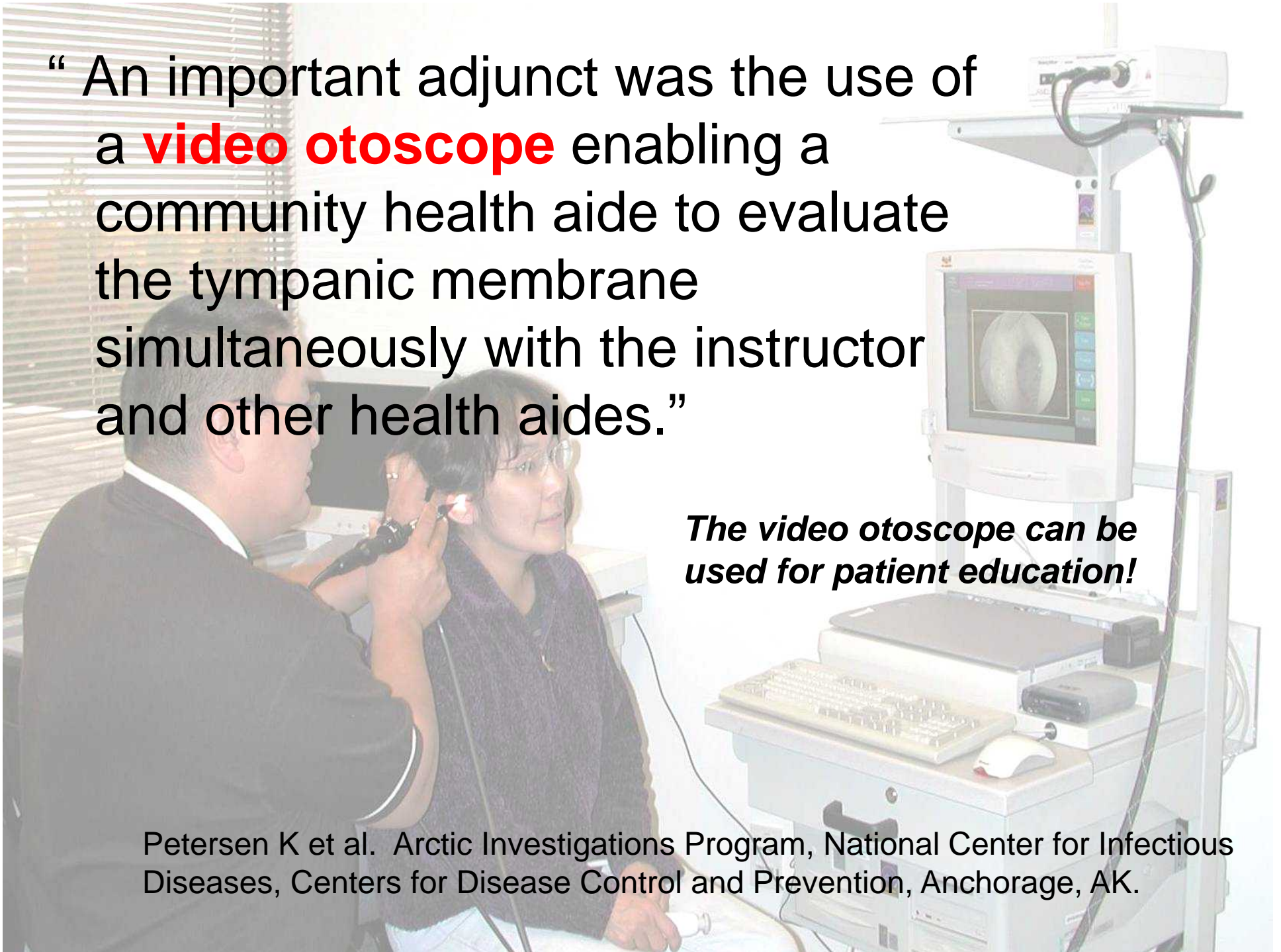
Henry Gray *Anatomy of the Human Body* 1918



“ An important adjunct was the use of a **video otoscope** enabling a community health aide to evaluate the tympanic membrane simultaneously with the instructor and other health aides.”

The video otoscope can be used for patient education!

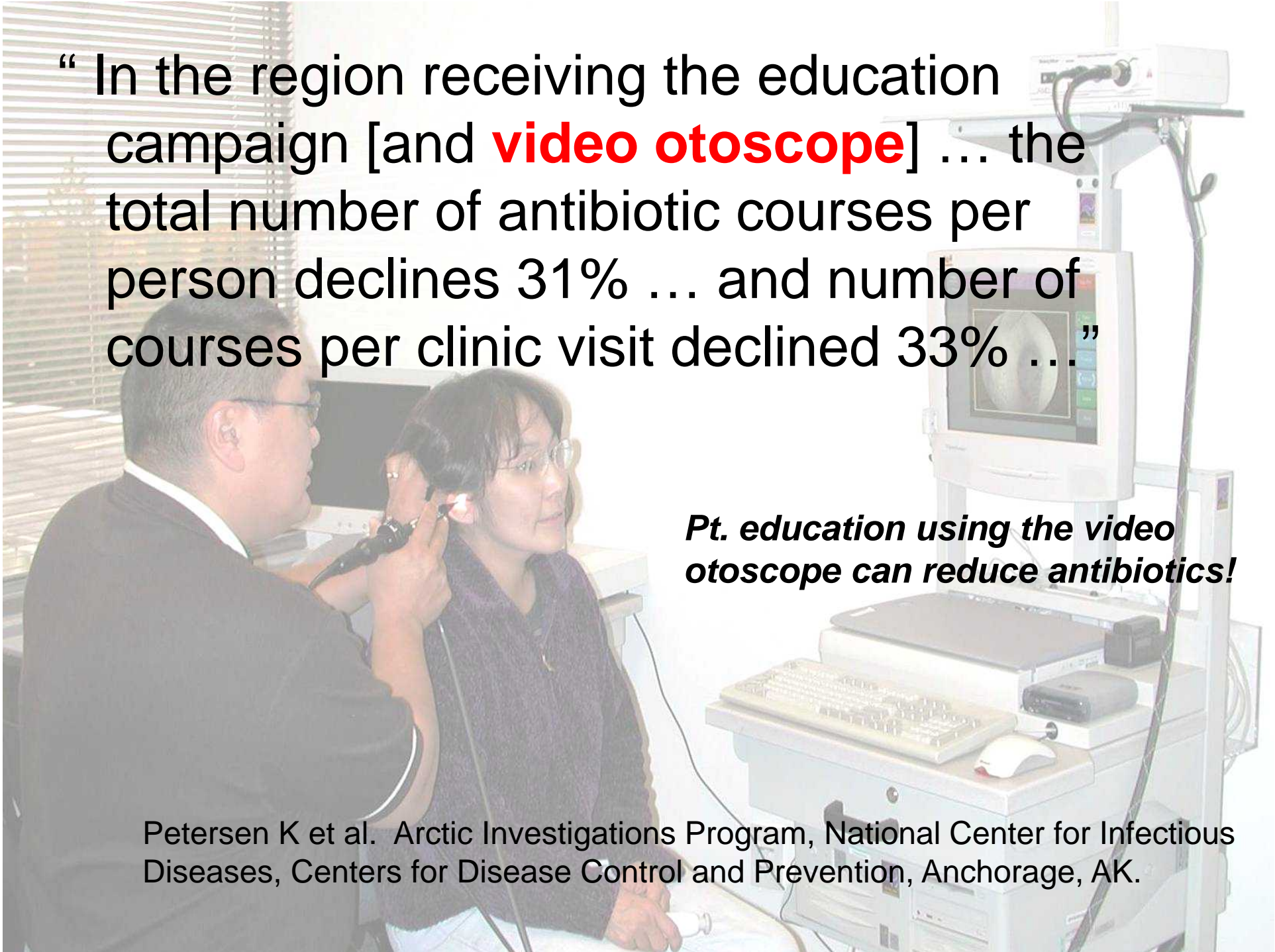
Petersen K et al. Arctic Investigations Program, National Center for Infectious Diseases, Centers for Disease Control and Prevention, Anchorage, AK.

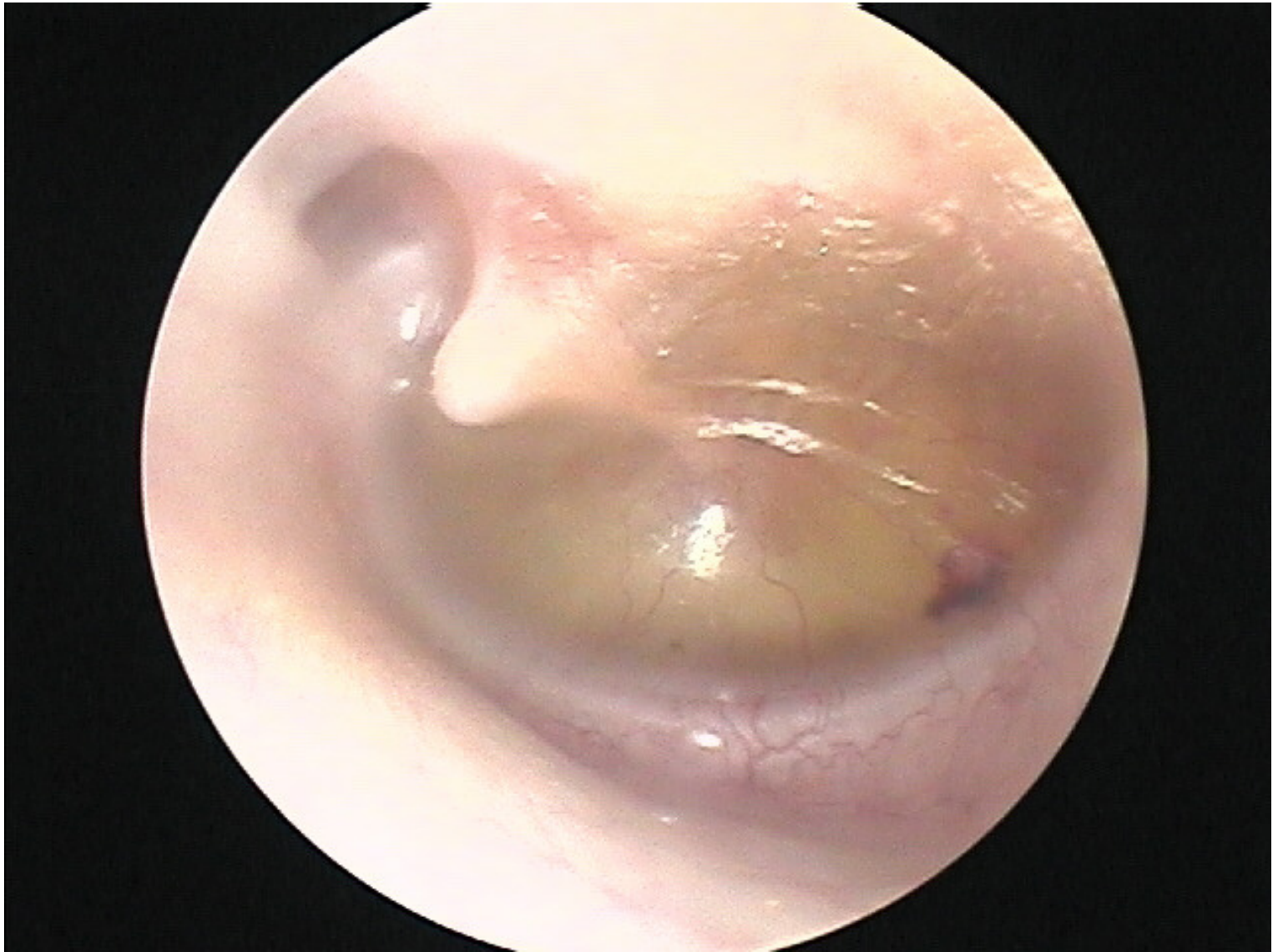


“ In the region receiving the education campaign [and **video otoscope**] ... the total number of antibiotic courses per person declines 31% ... and number of courses per clinic visit declined 33% ... ”

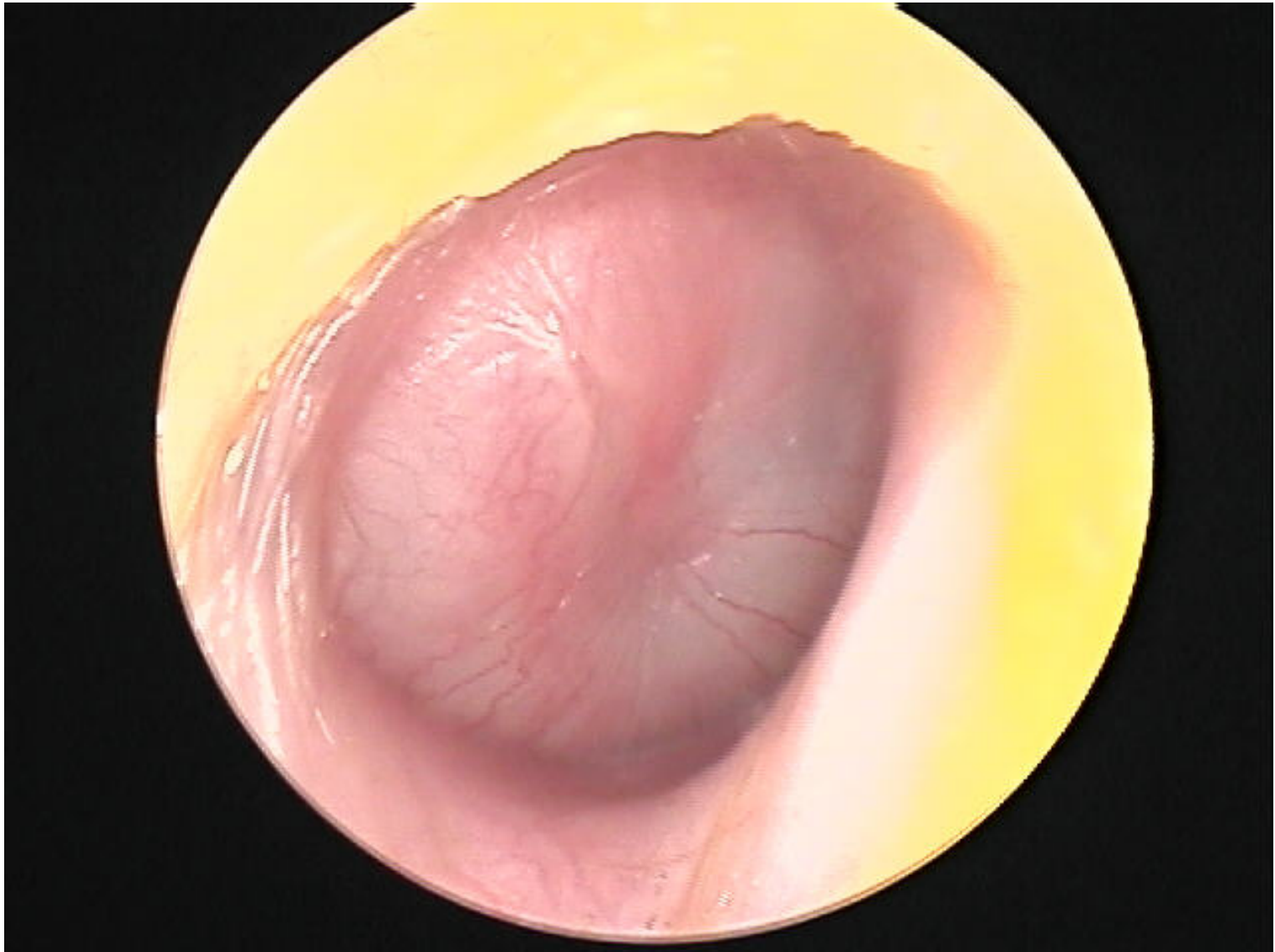
Pt. education using the video otoscope can reduce antibiotics!

Petersen K et al. Arctic Investigations Program, National Center for Infectious Diseases, Centers for Disease Control and Prevention, Anchorage, AK.









Otitis Media in 3 y.o.

Treatment with Cefdinir, Omnicef



Day 1



Day 3

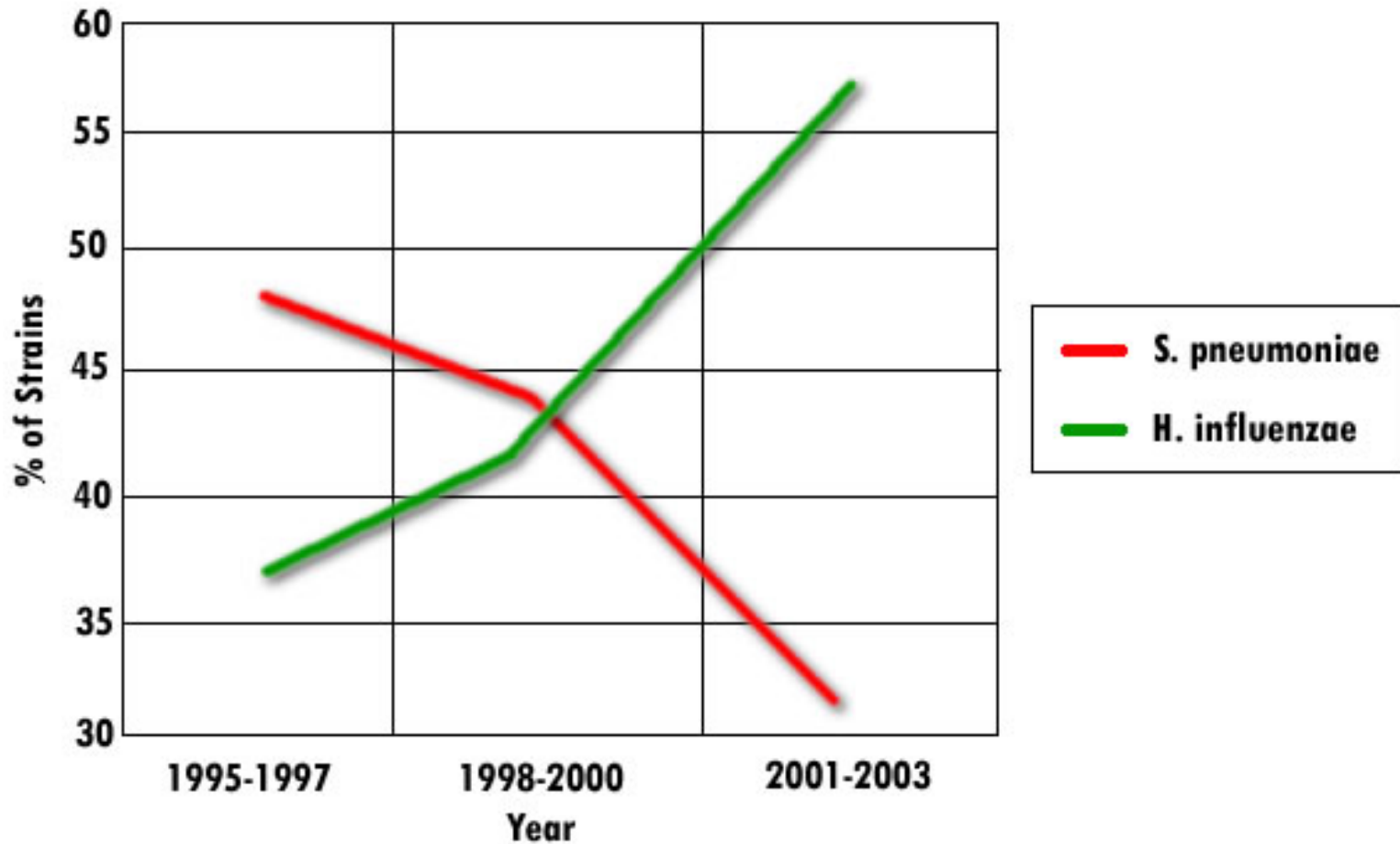


Day 4



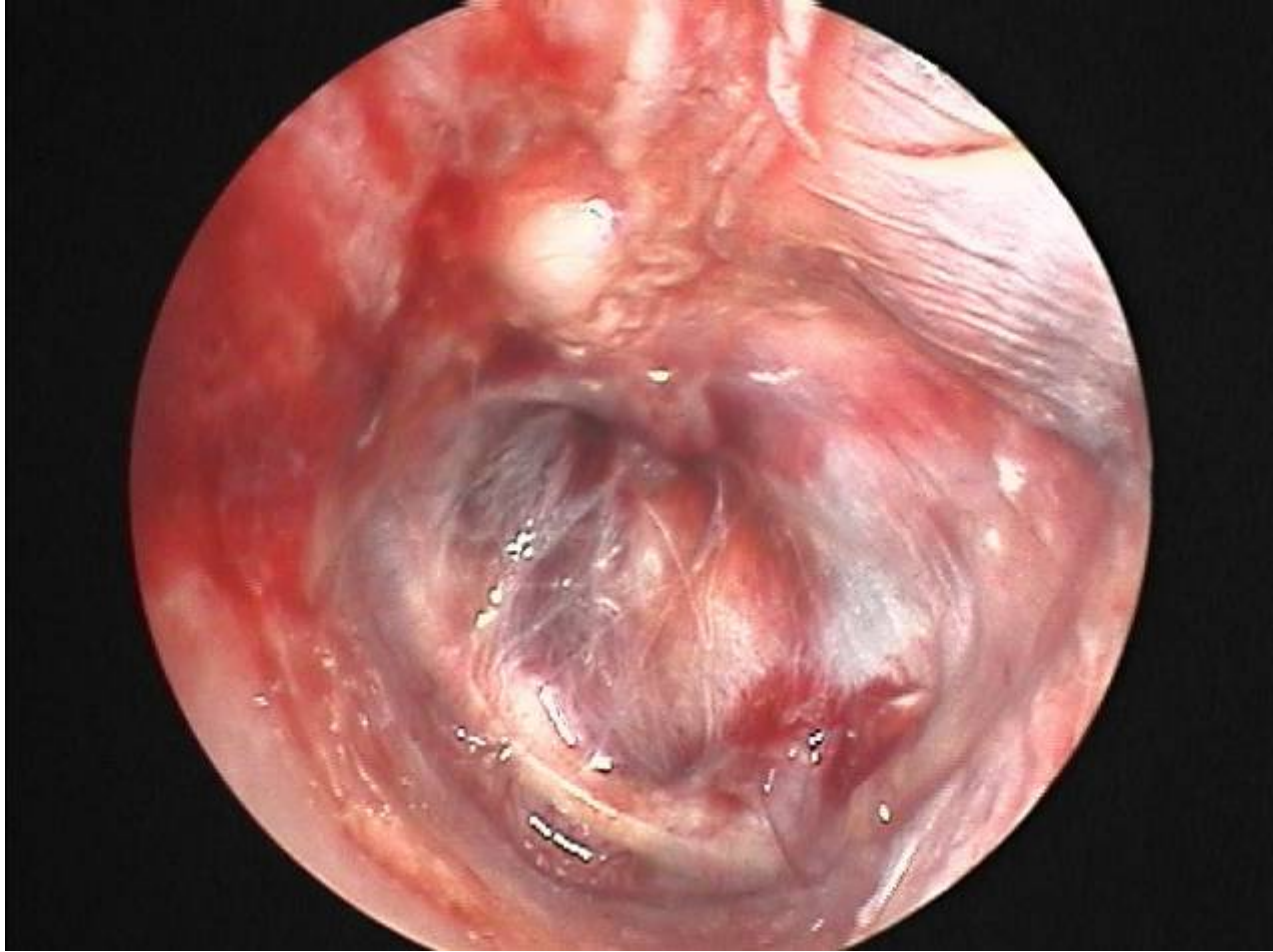
Day 9

Percentage of total pathogens causing persistent AOM and/or AOM treatment failures from Rochester, NY.



Adapted from Casey JR, Pichichero ME. Changes in frequency and pathogens causing acute otitis media in 1995-2003. *The Pediatric Infectious Disease Journal*. 23(9):824-28.



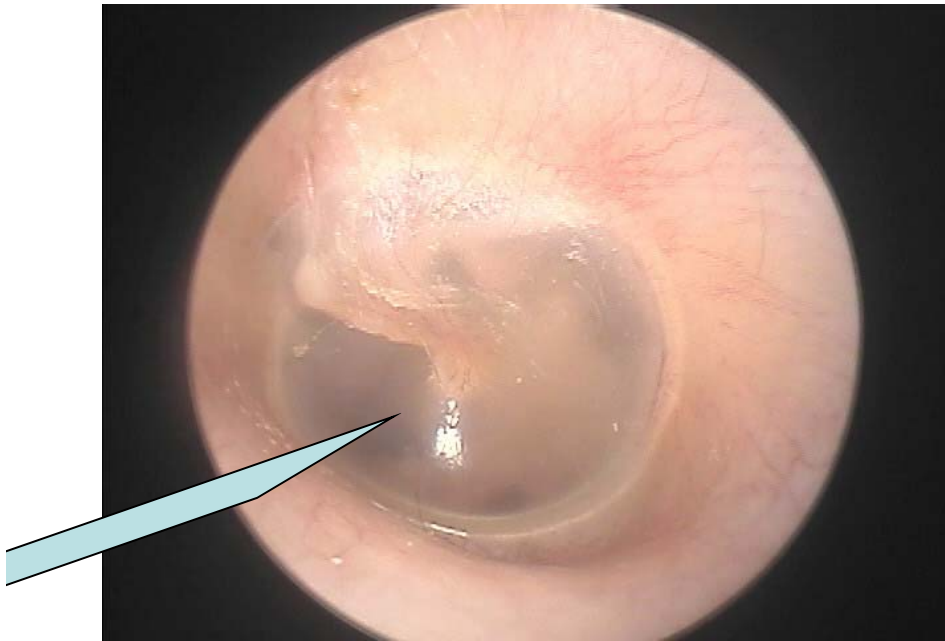




Definitions

- Myringotomy
- Ear Tubes:
 - Tympanostomy Tubes (T Tubes)
 - Pressure Equalization Tubes (PE Tubes)
 - Ventilation Tubes, Ventilatory Tubes (BVTs)

Putting hole in the ear

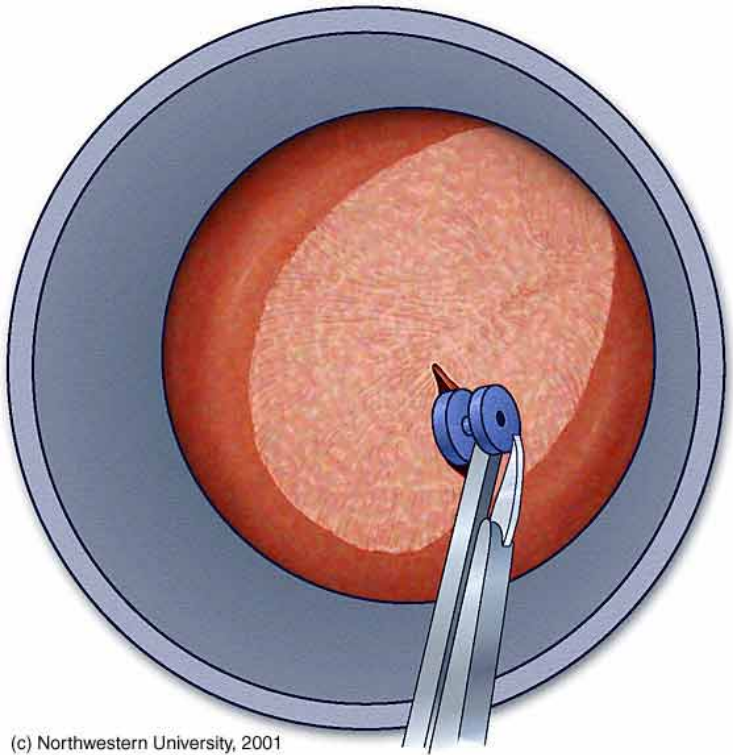


Yes

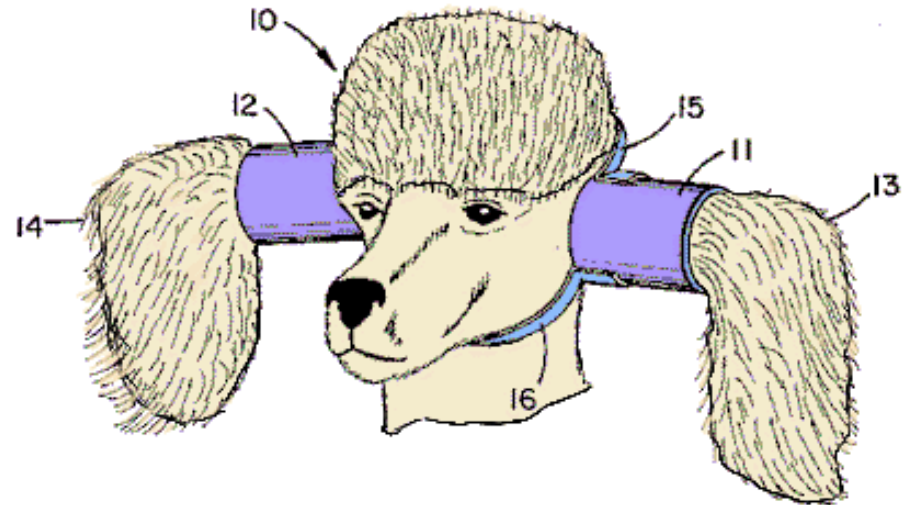


No

Ear Tubes



Yes



US Patent Issued 1980

No

Ear Tubes - Frequency

Myringotomy with tube insertion is the leading procedure for children under 15 years old, with 512,000 surgeries being performed in ambulatory and inpatient settings in 1996.

Owings MF, Kozak LJ. Ambulatory and Inpatient Procedures in the United States, 1996. National Center for Health Statistics. Vital Health Stat 13(139). 1998.

Indications for Ear Tubes

1. recurrent acute otitis media (three or more episodes of OM in a 6 month period or 4 episodes during a 1 year period) and
2. chronic otitis media with effusion (bilateral OME which has been unresponsive to non-surgical therapy for three months or more), with a documented associated hearing loss.

Clinical Indicators for Otolaryngic - Head and Neck Surgery. American Academy of Otolaryngology-Head and Neck Surgery, Inc., 1995.

Clinical Practice Guideline, Otitis Media with Effusion in Young Children (AHCPR Publication No. 94-0622) and the Quick Reference Guide for Clinicians, Managing Otitis Media with Effusion in Young Children (AHCPR Publication No. 94-0623) 1994.

Ear Tube Follow Up

- Postsurgical follow-up of ear tubes:
- 1 month, then...
- Every 3, 4 or 6 months depending on the otolaryngologist

Cunningham et al. Follow-Up Management of Children With Tympanostomy Tubes. *Pediatrics* 2002;109(2):1-4.

Derkay CS, Carron JD, Wiatrak BJ et al. Postsurgical Follow-Up of Children With Tympanostomy Tubes: Results of the American Academy of Otolaryngology-Head and Neck Surgery Pediatric Otolaryngology Committee National Survey. *Otolaryngology-Head and Neck Surgery* 2000;122:313-318.

EAR TUBE IMAGE STUDY



Tympanostomy tube follow up study

- Can store and forward digital imaging replace in person examination for tympanostomy tube follow up?
- 350 sets of tubes placed by ANMC providers in FY 01
- 1000 -1300 follow up appointments needed in 13 month period
- Many of these patients from remote areas



Methods

40 Patients with myringotomy and tube placement
in last 12 months



Microscope exam by Dr #1



Microscope exam by Dr #2



Ear images taken by trained midlevel provider



Image review by Drs #1 and #2 at 6 weeks



Image review by Drs #1 and #2 at 12 weeks

In-Patient exam only:	Percent Agreement		0.86					
Kappa = .79	JK Assessment							
GZ Assessment	Intact & functional tube	Nonfunctional tube	Otitis media	Perforation, draining	Perforation, dry	Retracted TM	Tube extruded/normal TM	
Intact & functional tube	40	1	0	0	0	0	1	42
Nonfunctional tube	1	1	0	0	0	0	1	3
Otitis media	1	0	1	0	0	0	0	2
Perforation, draining	0	0	1	0	0	0	0	1
Perforation, dry	0	0	0	0	7	0	0	7
Retracted TM	0	0	1	0	0	2	2	5
Extruded/ normal TM	0	0	2	0	0	0	18	20
	42	2	5	0	7	2	22	80

Image Reviews only	Percent Agreement		0.85						
Kappa = .76	JK Assessment								
GZ Assessment	Blank	Intact & functional tube	Nonfunctional tube	Otitis media	Perforation, draining	Perforation, dry	Retracted TM	Tube extruded/normal TM	
Blank	0	0	0	0	1	0	0	1	2
Intact & functional tube	0	84	0	1	0	0	0	0	85
Nonfunctional tube	0	1	1	0	0	0	0	0	2
Otitis media	0	0	1	5	0	0	0	4	10
Perforation, draining	0	0	0	0	1	0	0	0	1
Perforation, dry	0	0	0	0	1	9	0	2	12
Retracted TM	0	0	0	0	0	0	1	3	4
Extruded/normal TM	0	2	1	3	1	1	1	35	44
	0	87	3	9	4	10	2	45	160

JK Exam vs Image1	Percent Agreement						0.85	
Kappa = .76	Exam							
Image 1	Intact & functional tube	Nonfunctional tube	Otitis media	Perforation,draining	Perforation,dry	Retracted TM	Tube extruded/normal TM	
tube	41	1	0	0	0	0	1	43
Nonfunctional tube	0	1	0	0	0	0	2	3
Otitis media	0	0	2	0	0	0	1	3
Perforation, draining	0	0	1	0	0	0	0	1
Perforation,dry	0	0	1	0	5	0	0	6
Retracted TM	0	0	0	0	0	1	0	1
Extruded/normal TM	1	0	1	0	2	1	18	23
	42	2	5	0	7	2	22	80



Video Otoscope Images



- Physicians agreed this left TM had an intact, patent, functioning tympanostomy tube. They were confident to very confident in their diagnosis.

Video Otoscope Images



- Physicians disagreed as to whether this left TM was normal, retracted, or demonstrated otitis media (post tube extraction). They were somewhat to very confident in their diagnosis.

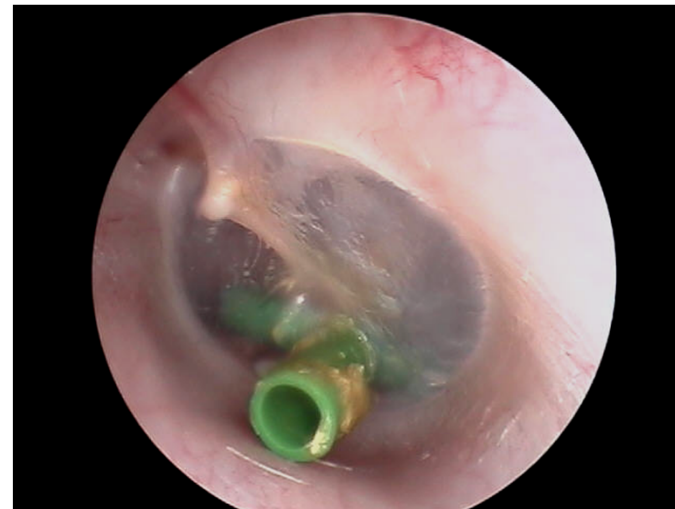
Video Otoscope Image Comparison Study Conclusion

- Video otoscope still images of the tympanic membrane are comparable to an in-person microscopic examination.
- Electronic consultation may be an acceptable means of following patients post-tympanostomy tube placement.

Patricoski C, Kokesh J, Ferguson AS, Koller K, Zwack G, Provost E, and Holck P.
“A Comparison of In-Person Examination and Video Otoscope Imaging for Tympanostomy Tube Follow Up.” Telemedicine Journal and eHealth. 2003; Vol. 9 No. 4: 331-334.

Ear Tube Follow Up Video Otoscopy

- Correlation between in person exam and telemedicine exam good to excellent
- SFT appropriate for routine ear tube follow up.
- Addition of tympanometry or pneumotoscopy would improve correlation

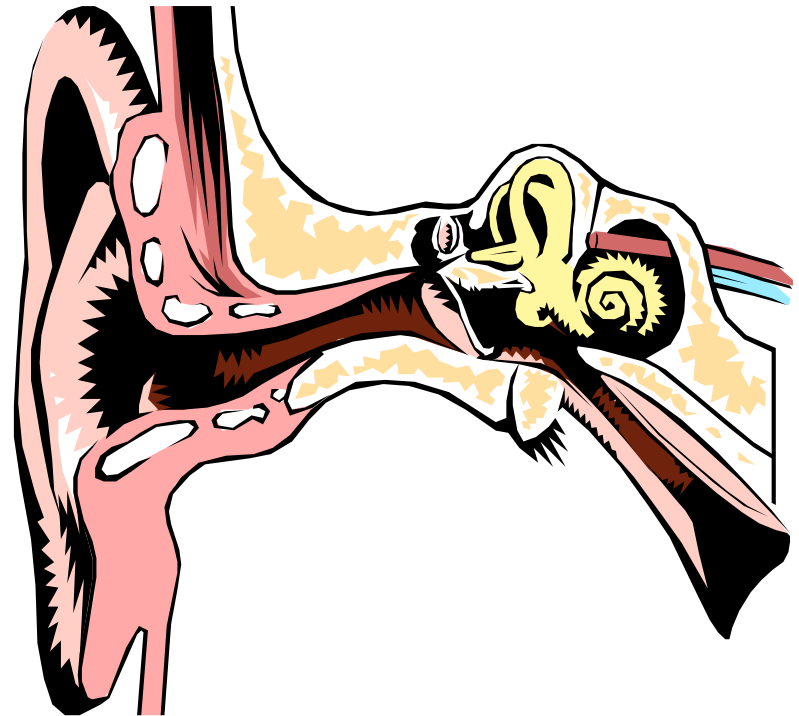


- The AAP/AAFP/AHRQ guidelines for AOM **require the documentation of middle ear effusion** for the diagnosis of AOM by **tympanometry, pneumatic otoscopy**, acoustic reflectometry, tympanocentesis, or the visualization of fluid in the external ear canal with tympanic membrane perforation. However, for OME and AOM, pneumatic otoscopy is recommended as the primary tool for diagnosis of middle ear effusion.

American Academy of Pediatrics Subcommittee on Management of Acute Otitis Media. Diagnosis and management of acute otitis media. *Pediatrics* 2004;113:1451–65

Tympanometry

- Tympanometry measures the compliance of the TM and ossicular chain and estimates middle ear pressure.
- Compliance = Freedom of Movement (cc)



How it Works

Tympanometry utilizes two energy sources:

- Pressure
- Sound

Units:

1. Pressure = daPa (deca Pascals)
2. Sound = Hz (Frequency) dB (Loudness)
3. Compliance = cc

Tympanometers



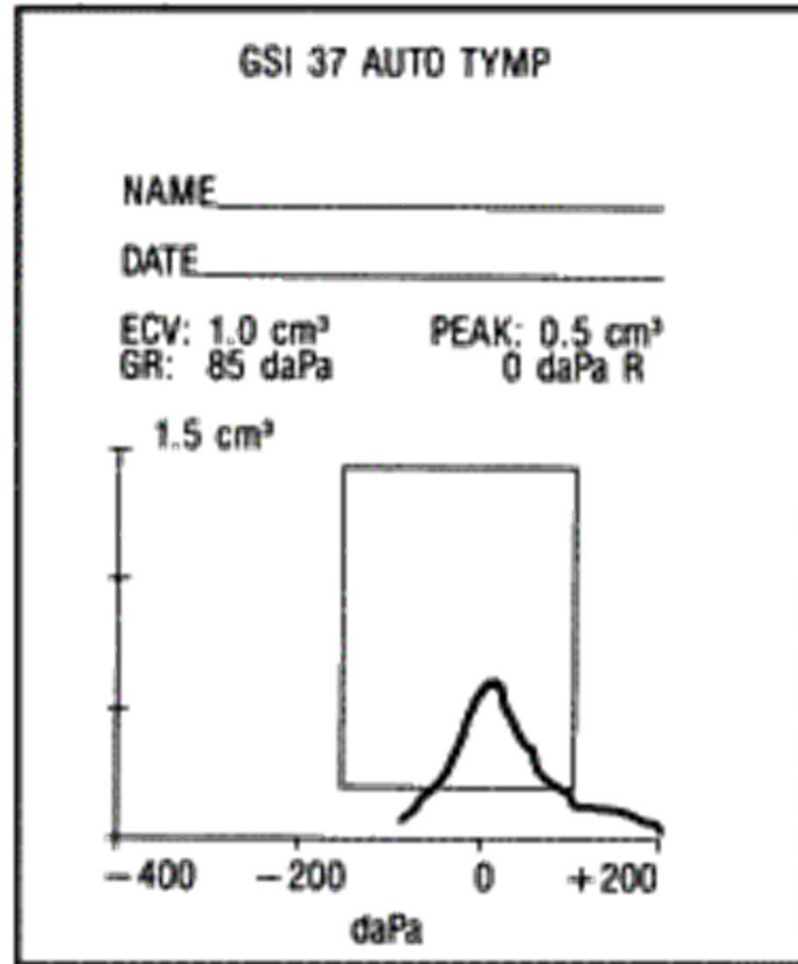
TTAC Toolkit 2012

Webinar

May 24, 2012

Normal

Compliance on
vertical "y" axis



Pressure on horizontal "x" axis

Tympanometry in Just Seconds, GSI

The success rate for...

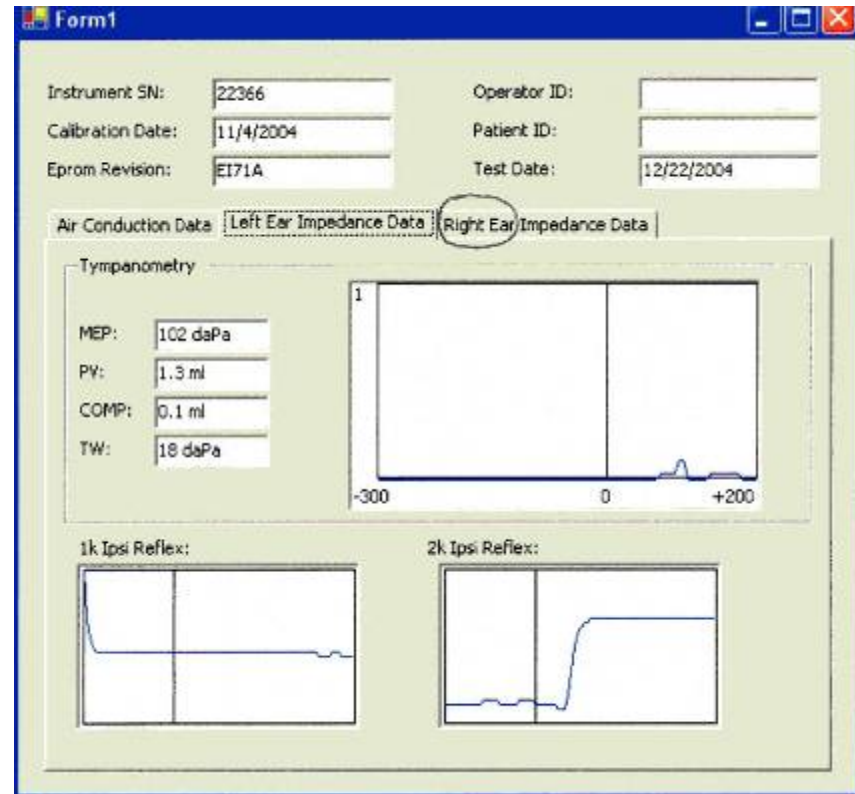
Tympanometry is 74 and 94 percent

Otoscopy is 85 to 91 percent

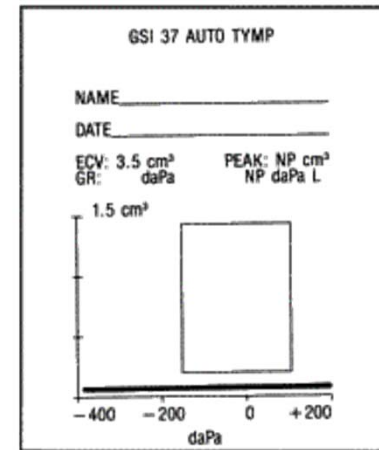
Comparison of otoscopic and tympanometric findings indicated sufficient diagnostic agreement (Cohen's kappa between 0.41 and 0.74) at age 6-24 months.

Engel J, Anteunis L, Chenault M, Marres E. Otosopic findings in relation to tympanometry during infancy. *Eur Arch Otorhinolaryngol* 2000;257:366–71.

Otitis Media



Ear Tube Follow Up Tympanometer



Access to Care

Decreased Waiting Times for ENT Specialty Clinic

- Bethel, AK
 - ENT waiting time
 - 5 months in '02
 - 0-2 months in '03
- Each open slot created by telehealth provides an opportunity for “non-telehealth” patients to benefit from telehealth

“ Waiting time for a field clinic appointment has gone from 4-5 months a year ago to 1-2 months now. I’ve probably got 100 stories of patients or parents who were pleased with the quicker, easier access to ENT services they received either through telemed or direct referral. ”

Mike Comerford
Audiologist, Yukon Kuskokwim Health Corporation

Standard of Care

Meeting the Standard of Care for TT Follow Up

- Post-surgical follow-up is difficult for patients from remote settings.



- Telehealth provides ability to monitor and followup.

*“Many simple problems, such as tympanostomy tube follow-up can be done with telemedicine **without asking the patient to leave their village.**”*

ENT Specialist

- Validated model
- “Reverse Consult” empowers CHA/Ps and midlevels to respond to requests from specialists.

Cost Savings

Medicaid Study Shows Decreased Travel Costs

	Quantity	Cost
Claims paid by Medicaid	91	(\$6,970)
<hr/>		
Telemedicine Prevented travel	79	\$55,437
Notes:		
<ul style="list-style-type: none">• Only specialty clinic travel is being saved.• 86% of cases were from village → region• Assume all cases had an escort• Travel costs average \$307.57 RT per person• No lodging / per diem calculated		
<hr/>		
Net Savings Realized by Medicaid		\$48,467

Note: For every \$1 spent by Medicaid on reimbursement... \$7.95 is saved on travel costs.

Conclusion

Ear Imaging & Tympanometry aid...

- **Diagnosis**
 - Identify Effusion and Other Lesions
 - Better lighting; Crisp, clear picture
 - Graphical and Numerical Data
- **Documentation**
- **Patient Education**
- **Provider Education**
- **Follow Disease Course**
- **Electronic Consultation**
- **Revenue**
- **Patient Satisfaction**

