The Nomenclature of Hearing Conservation
Web Seminar
Recorded January 29, 2014

The Nomenclature of Hearing Conservation

Thomas L. Hutchison, MA, MHA
Hearsafe of New England
Dover, New Hampshire

Occurrence of Occupational Hearing loss in U.S.A.

- Twenty-two million U.S. workers are exposed to potentially damaging noise each year.
- In 2007, approximately 23,000 cases were “reported” of occupational hearing loss that were great enough to cause hearing impairment.
- “Reported” cases of hearing loss accounted for 14% of occupational illness in 2007.


Polling Question

The following statement best matches my experience with hearing conservation programs (HCPs) and its terminology:

A. No experience.
B. Some experience but mostly limited to assessment of those with a loss.
C. I consider myself familiar with most aspects of hearing conservation but not an expert.
D. I would consider myself extremely knowledgeable in hearing conservation.
AGENDA

WHAT'S IN A NAME?
- The nomenclature of hearing conservation roles, responsibilities, agencies, and organizations.

MAJOR ELEMENTS OF AN OCCUPATIONAL HEARING CONSERVATION PROGRAM (HCP)
- What do the regulations require versus what might be best practice?

EVALUATING THE EFFECTIVENESS OF AN HCP
- How do you know if the program is working?

What's in a name?

HCP: The Hearing Conservation Program
- HC Team
- HC Agencies
- HC Organizations
- HC Noise parameters

HCP Team

PS - Professional Supervisor

The term Professional Supervisor is used in Federal Standards, rules, notices and directives:

"The professional in charge of the program is a licensed or certified audiologist, otolaryngologist, or other physician."

(OSHA, Code of Federal Regulations)
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PS (cont.)
The PS is responsible for technical oversight and shall:
• Review problem audiograms..
• Determine whether there is a need for further evaluation..
• Revise audiometric baselines……
• Supervise and be responsible for the training and competence of the OHC.” (occupational hearing conservationist)
• Determine work relatedness……

Hearing Conservation Amendment 29 CFR 1910.95(g)(3) & (g)(7)(iii)

PS (cont.)
“Problem” Audiograms
1994 OSHA letter of interpretation
“Audiograms that show large differences in hearing thresholds between the two ears.”
• For example - difference of 40 dB or more between ears at any frequency and/or difference of 25 dB or more between ears at two consecutive frequencies

PS (cont.)
“Problem” Audiograms (cont.)
• “Audiograms that show unusual hearing loss configurations that are atypical of noise induced hearing loss”
  • For example - loss confined to low frequencies
• “Audiograms with thresholds that are not repeatable.”
  • For example - unreliable responses
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PS (cont.)

Determine whether there is a need for further evaluation:

“….. further evaluation must be done by a licensed or certified audiologist, otolaryngologist, or other physician.”

Further evaluation might include:
- Re-test or more frequent tests with OHC
- Full audiometric test battery
- Medical referral

PS (cont.)

Revise audiometric baselines:

- The OHC would physically revise/reestablish the baseline audiogram but only under the direction of the PS.

PS (cont.)

Supervise and be responsible for the training and competence of the OHC

For example, a review OHC:
- Performing thorough and valid audiometric tests:
  - All frequencies (500, 1K, 2K, 3K, 4K, 6K Hz)
  - Valid:
    - For example - all values not "0" dB HL
    - Test/retest within 5 dB at 1000 Hz
Supervise and be responsible for the training and competence of the OHC. (cont.)

- Instructing and consulting with the workers effectively?
- Keeping appropriate and complete records?

Determine work-relatedness of hearing loss:

Consider:

- "...an injury or illness to be work-related if an event or exposure in the work environment either caused or contributed to the resulting condition or significantly aggravated a pre-existing injury or illness."
- "Work-relatedness is presumed for injuries and illnesses resulting from events or exposures occurring in the work environment, unless an exception specifically applies."

(30 CFR 1910.1030)

The Professional Supervisor (cont.)

- Determine work-relatedness of hearing loss (cont.)
  - The PS reviews:
    - The audiograms
    - Noise exposure history
    - Calibration records
    - Medical history
Note: Council for Accreditation in Occupational Hearing Conservation (CAOHC) offers an 8 hr. course to prepare the Professional Supervisor.

Course elements:
- Review of "problem audiograms";
- Baseline revisions;
- Determination of work relatedness;
- Understanding the use of audiometric database to track HCP effectiveness;
- Review of "best practices"

OHC - OCCUPATIONAL HEARING CONSERVATIONIST
- A designation used by Council for Accreditation in Occupational Hearing Conservation (CAOHC) to refer to those "certified" under their requirements;
- The term is also used in some regulatory language.

OHC (cont.)
- Typically has the most interaction with the noise exposed worker
  - Audiometry
  - Otoscopy
  - Hearing Protection fitting
  - Training
  - Counseling
  - "Reviewing" the audiogram
  - Assigning follow-up
  - Communicating with PS and often with other team members
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HCPM - Hearing Conservation Program Manager
- Is the administrator of the program;
- Occupational Health Nurse, Audiologist, Occupational Health Physician, Safety Manager, OHC, etc..

Other HCP team members
- Industrial Hygienist - Noise surveys, individual dosimetry, booth certification, hearing protection
- Acoustical Engineer - Advise on engineering modifications and noise controls as well as equipment noise specifications, e.g., purchasing.
- Safety Manager - Enforce hearing protection use, post noise signs, post regulations, etc.
- Management - Demonstrate and promote support of the program and pay the bills
- NOISE EXPOSED WORKER

Polling Question

An audiologist can be:
A. Hearing Conservation Program Manager but not a Professional Supervisor.
B. A Professional Supervisor but not Hearing Conservation Program Manager.
C. Both a Professional Supervisor and Hearing Conservation Program Manager.
D. Both a Professional Supervisor and Hearing Conservation Program Manager, but never at the same time.
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AGENCIES

✈ OSHA - Occupational Safety and Health Administration (Dept. of Labor)
• Basis for hearing conservation requirements for other agencies with
HCPs, e.g.,
✈ MSHA - Mine Safety and Health Administration
✈ DoD - Department of Defense
✈ FRA - Federal Railroad Administration
✈ DoT - Department of Transportation

AGENCIES (CONT.)

✈ U.S. Coast Guard (Homeland Security)
• Also covers US flagged commercial carriers
• Exposure calculations are based on a 24-hr. exposure vs. OSHA 8-hr.

NIOSH - National Institute for Occupational Safety and Health
• Conducts research;
• Develops criteria;
• Performs “health hazard evaluations”
• Recommends policy parameters

ORGANIZATIONS

CAOHC – Council for Accreditation in Occupational Hearing Conservation
• Mission: Promote hearing loss prevention by enhancing the quality of
occupational hearing loss prevention practices. Education/certification
for OHCs, PSs and CDs (Course Directors).
• Council membership:
 ✈ AAA (American Academy of Audiology)
 ✈ ASHA (American Speech-Language Hearing Association)
 ✈ AAOHN (American Association of Occupational Health Nursing)
 ✈ AAO-HNS (American Academy of Otolaryngology - Head &
Neck Surgery)
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ORGANIZATIONS (CONT.)

CAOHC (cont.)

- ACOEM (American College of Occupational and Environmental Medicine)
- AIHA (American Industrial Hygiene Association)
- ASSE (American Society of Safety Engineers)
- INCE (Institute of Noise Control Engineering)
- MAA (Military Audiology Association)

NHCA – National Hearing Conservation Association

- Association of audiologists, physicians, industrial hygienists, safety specialists, engineers, scientists, occupational health nurses and hearing conservationists, equipment manufacturers, students.

NOISE PARAMETERS

Acronyms/ Terms

- AL (Action Level) - When the HCP must be implemented
  - OSHA, 8 hrs. @ 85 dBA, TWA;
  - This level is a 50% maximum allowable dose

- PEL (Permissible Exposure Limit)
  - OSHA, 8 hrs. @ 90 dBA, TWA;
  - This level is a 100% maximum allowable dose
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Acronyms/Terms (cont.)

- **TWA** - Time Weighted Average
  - The average amount of noise an individual may be exposed to over an eight-hour day.

- **Exchange Rate or Doubling Rate**
  - Rate of exposure accumulation used to calculate halving/doubling allowable exposure time; e.g., 0.5 dBA = 5 dB.
  - 5 dB exchange rate: 90 dBA – 8 hrs.; 95 dBA – 4 hrs; 100 dBA – 2 hrs; 105 dBA – 1 hr; etc.
  - 3 dB exchange rate: 90 dBA – 8 hrs; 93 dBA – 4 hrs; 96 dBA – 2 hrs; etc...
  *With a 3 dB exchange rate the exposure time, at 105 dBA, would be 5 min vs. 1 hr with a 5 dB exchange rate.

Acronyms/Terms (cont.)

- **SLM** - Sound Level Meter
  - Used for area or personal monitoring as well as booth certification. (Types/class used for laboratory measurements)
    - **Type/class 1**: octave bands and weighting networks
      - Tighter tolerances, wider frequency range
      - Specific noise analysis and booth certification
      - Weighting networks: dBA, dBB, dBC, dBZ

Acronyms/Terms (cont.)

- **SLM** - Sound Level Meter
  - **Type II & III** (classes 2, 3): Weighting networks dBA and dBC
    - **dBA**
      - Less sensitive to low frequencies, how the human ear interprets
      - Primarily used to measure hearing risk and for enrollment and compliance
    - **dBC**
      - Often used with A weighting to compute hearing protection requirements
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Acronyms/Terms (cont.)
• Dosimeter
  - Individually worn, integrating meter, intended to measure noise exposure over a period of time (finding that TWA)

• STS - Standard Threshold Shift
  Reminder - frequencies for HCP: 500, 1K, 2K, 3K, 4K, & 6K Hz
  - For STS calculation only 2K, 3K and 4K are used
  - When there is an AVERAGE change of 10 dB or greater at 2K, 3K & 4K Hz relative to the current baseline in one or both ears.

Acronyms/Terms (cont.)
• TTS - Temporary Threshold Shift
  - An STS that resolves

• PTS - Permanent Threshold Shift
  - An STS that does not resolve

Acronyms/Terms (cont.)
• HPD - Hearing Protection Device(s)
  - Formable
  - Pre-molded
  - Custom
  - Insert/canal/caps
  - Supra-aural
  - Helmets
  - Communication
HPD (cont.)

- OSHA - must attenuate exposures to a TWA of at least 90 dBA (or if an STS, to 85 dBA).
  - MSHA - specifies that double HPD (plugs and muffs) required with exposures >105 dBA TWA.
  - NIOSH recommends attenuation down to 85 dBA TWA and double HPD > 100 dBA TWA.

BEST PRACTICE:

- Use HPD at or above 85 dBA (without consideration of TWA).
- Double HPD at or above 100-104 dBA (without consideration of TWA).

NRR - Noise Reduction Rating

- Term applied to hearing protectors that indicates the capability of the product to attenuate.
- Does NOT determine how an individual will function with any given HPD.

De-rating - An attempt to determine how HPD will function in the field

- NIOSH had cited:
  - Ear muffs: Subtract 25% from the manufacturer's labeled NRR.
  - Formable earplugs: Subtract 50% from the manufacturer's labeled NRR.
  - All other earplugs: Subtract 70% from the manufacturer's labeled NRR.
- NIOSH now recommends doing Personal Attenuation Rating.
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Acronyms/Terms (cont.)

- PAR  Personal attenuation rating
  - R.E.A.T. Real Ear Attenuation at Threshold
  - M.I.R.E. Microphone-in-real-ear

Acronyms/Terms (cont.)

- NIHL  Noise Induced Hearing Loss
- NIPTS  Noise Induced Permanent Threshold Shift

U.S. REGULATORY STRUCTURES

- **Mandates** for occupational hearing conservation programs:
  - OSHA (1983)
  - MSHA (2000)
  - Federal Railroad Administration (2006)
  - Military programs (DoD 6055.12) (2010)
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Major Elements of the HCP
- Noise Measurement & Noise Control
- Audiometric Monitoring
- Hearing Protection
- Education and Motivation
- Record Keeping
- Program Evaluation

Best Practice
Meeting regulatory requirements should only be the starting point for an effective HCP.
Exceeding the requirements will serve the best interests of the worker.

Beyond compliance: Occupational Noise Exposure Revised Criteria 1998
http://www.cdc.gov/niosh/docs/96-110/

Noise Measurement and Control
- Were studies done?
- Have noise-exposed employees been notified of their exposures and apprised of auditory risks?
- Are the results known to supervisors and other key individuals?
- Are results entered into health/medical records?
- Have there been changes in areas, equipment, or processes that have altered noise exposure? (engineering controls)
NOISE MEASUREMENT and CONTROL (cont.)

- If noise maps exist, are they used, (administrative controls e.g., relocating employees, swapping out work, etc.)?
- Are appropriate steps taken to include (or exclude) employees in the hearing loss prevention programs whose exposures have changed significantly?
  - Similar exposure groups
  - HPD determination

AUDIOMETRIC MONITORING

Test frequencies for HCP: 500 1000 2000 3000 4000 6000 Hz

- Baseline audiogram
  - OSHA & MSHA:
    - Test to be preceded by 14 hr. “protected” from workplace noise (HPD use allowed to meet requirement)
    - Used as reference, unless re-established later under direction of PS
    - Must be done within six months of first exposure at or above the AL
  - If mobile test van used, must be done within 1 yr. and HPD must be used after first 6 months

AUDIOMETRIC MONITORING (cont.)

- Annual monitoring and follow-up and periodic monitoring
  - Compare each ear separately to reference at 2K, 3K & 4K Hz for SIS
  - * Note: Reference could be different for Left and Right
  - Compare entire audiogram for “problems”
AUDIOMETRIC MONITORING (cont.)

Testing equipment & environment

- Calibration of Audiometer
  - Daily functional check
  - Daily bio-logical calibration
  - Electro-acoustic calibration annually, and/or with 10 dB change in biological results.
  - Exhaustive calibration every two years, and/or with 15 dB change on electro-acoustic calibration.

- Test room certification
  - Must meet 1977 American National Standard Institute (ANSI) requirements: Octave-band center frequency:
    - 500 1000 2000 4000 8000
    - 40 40 47 57 62 (SPL)

AUDIOMETRIC MONITORING (cont.)

- Has the audiometric technician been adequately trained, certified, and recertified as necessary?
  - MSHA and some states require CAOHC certification as the demonstration of proficiency.
- Do on-the-job observations of the technicians indicate they:
  - perform a thorough and valid audiometric test;
  - instruct and consult the employee effectively;
  - keep appropriate and complete records?
AUDIOMETRIC MONITORING (cont.)
• Are the annual test results compared to baseline to identify the presence of an STS?
• Are the results of audiometric tests being communicated to supervisors and managers as well as employees?
  CAUTION - Supervisors' management can know if there is an STS. Do not release specific medical/threshold information without worker’s approval.

Hearing Protection & Hearing Protection Devices (HPD)
• HPD available to all employees whose daily average noise exposures are 85 dBA TWA or above?
  NIOSH recommends, others require, HPD if noises equal or exceed 85 dBA regardless of exposure time.
• Opportunity to select from a variety of appropriate protectors? OSHA says a plug & a muff; MSHA says two plugs & 2 muffs.
  Greater selection improves compliance
• Are employees fitted carefully with special attention to comfort?

HPD (cont.)
• Are employees trained?
  Not only initially but at least once a year?
• Are the protectors checked regularly for wear or defects, and replaced immediately if necessary?
  Annually
• Do employees who incur noise-induced hearing loss receive intensive counseling and re-fitting with training?
• Are those who fit and supervise the wearing of hearing protectors competent to deal with the many problems that can occur?
Other Best Practice considerations:

- Have any employees developed ear infections or irritations associated with the use of hearing protectors?
  - Company is required to pay for f/u care.

- Are there any employees who are unable to wear these devices because of medical conditions?
- Do employees understand the appropriate hygiene requirements?

HPD (cont.)

- Do workers complain that protectors interfere with their ability to do their jobs?

- Do they interfere with spoken instructions or warning signals?

- Are employees encouraged to take their HPD home?

- Are these complaints followed promptly with counseling, noise control, or other measures?

HPD (cont.)

- Is the effectiveness of the hearing protector program evaluated regularly?

- Have at-the-ear protection levels been evaluated to ensure that balanced according to the anticipated ambient noise levels?

- Is each HPD user required to demonstrate that he or she understands how to use and care for the protector?

- Are the results documented?
EDUCATION & MOTIVATION
- Has training been conducted initially and at least once a year by a qualified instructor?
- Was the content and success of each training program evaluated?
- Are managers and supervisors directly involved?
- Are personal counseling sessions conducted for employees having problems with hearing protection devices or showing hearing threshold shifts?

RECORD KEEPING
- Are employees incurring STS notified in writing within at least 21 days?
  - OSHA requires notification but does NOT require a retest if there is an STS. If retest done, must be done within 30 days.
  - NIOSH recommends (others require) retest within 30 days, preceded by “noise” rest with immediate notification if retest shows STS, same ear, same frequency.
- Are all follow-up actions documented?

RECORD KEEPING (cont.)
- Do records show that appropriate calibration procedures have been followed?
  - Annual, Bio-logical, Functional, Audiometric room cert.
- Are copies of company policies and guidelines regarding the hearing loss prevention program available?
Evaluating the effectiveness of an HCP

- No regulatory guidance on best approach.
- Population comparisons at single point in time or longitudinal changes all have challenges.

Evaluating the effectiveness of an HCP (cont.)

- The evaluation of STS rates is very common but:
  - What is an acceptable STS rate - 3%, 6%, other;
  - Testing variability:
  - Age corrections;
  - Pre-existing hearing loss;
  - Population age and years of service;
  - Employment turnover;
  - Baseline revision (different PSI's, etc).

Evaluating the effectiveness of an HCP (cont.)

- Compliance check-list(s). Are all the parts of the HCP in place and followed?
- ADBA - ANSI S12.13 41, 2002 *Evaluating the Effectiveness of Hearing Conservation Programs through Audiometric Data Base Analysis.*
  - Goal is to identify variability of threshold measurements in annual monitoring audiograms for groups.
Evaluating the effectiveness of an HCP (cont.)

ADBA

- Are audiometric trends (deteriorations) being identified, both in individuals and in groups of employees?
- OSHA recommends no more than 5% of workers showing 15 dB Significant Threshold Shift (STM, same ear, same frequency).
- Is the annual incidence of standard threshold shift greater than a few percent? If so, are problem areas pinpointed and remedial steps taken?
- Are hearing threshold levels reasonably consistent from test to test? If not, are the reasons for inconsistencies investigated promptly?
- Has corrective action been taken if the rate of no-shows for audiometric test appointments is more than approximately 5%?

SUMMARY

If an Audiologist is functioning as a PS, they must understand their role and responsibilities as well as be familiar with the variety of common terms and concepts within the HCP.

THANK YOU!

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HearSafe.Hutchison@gmail.com
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Q&A

To ask a question, please type your question into the chat box in the lower left corner of the screen and click on the “Send” button located right below the box.

THANK YOU!

Tom Hutchison
Hearsafe.Hutchison@gmail.com

List of acronyms/terms used in this presentation

- AL: Action Level
- CAOHC: Council for Accreditation in Occupational Hearing Conservation
- CDC: Centers for Disease Control
- dBA: A-weighted decibel measurement
- dBC: C-weighted decibel measurement
- DoD: Department of Defense
- DoHHS: Department of Health and Human Services
- Doubling Rate: Doubling Rate (Exchange Rate)
List of acronyms/terms used in this presentation

- Exchange rate
- Exchange rate (Doubling Rate)
- FRA Federal Railroad Administration
- HCP Hearing Conservation Program
- HCPM Hearing Conservation Program Manager/Management
- HPD Hearing Protection Device(s)
- IH Industrial Hygiene/Industrial Hygienist
- M.I.R.E. Microphone-in-real-ear
- MSHA Mine Safety and Health Administration
- NIOSH National Institute of Occupational Safety and Health
- NIHL Noise Induced Hearing Loss
- NIPTS Noise Induced Permanent Threshold Shift
- NRR Noise Reduction Rating
- OHC Occupational Hearing Conservationist
- OSHA Occupational Safety and Health Administration
- PAR Personal attenuation rating
- PEL Permissible Exposure Limit
- PM Program Manager/Management
- PS Professional Supervisor
- PTS Permanent Threshold Shift
- R.E.A.T. Real Ear Attenuation at Threshold
- SLM Sound Level Meter
- STS Standard Threshold Shift (Significant Threshold Shift)
- TTS Temporary Threshold Shift
- TWA Time Weighted Average