Screening up to three years of age for late onset hearing loss (LOHL):

Considerations for early hearing detection and intervention (EHDI) programs and two models of implementation.

Linda Hazard, Ed.D., CCC-A
Vermont EHDI Program

Bradley Hartman Bakken, Ph.D.
Wyoming EHDI Program

Overview for today

- Workshop objectives
- Etiology and incidence of LOHL
- Wyoming model (0-5)
- Vermont model (0-3)
- Existing resources
- 0-3 expansion ideas and discussion

Objectives for this workshop

Increase awareness of currently available resources related to LOHL hearing screening.

Explore potential roles that state/territorial EHDI systems could play in screening children up to 3 years of age.

Provide support to help meet HRSA's requirement for grantees to submit a 0-3 screening expansion plan (deadline: 4/28/2023).

LOHL: incidence and etiology

Incidence

- Congenital: 2-3/1000 (Butcher et al. 2019)
- LOHL: 5-6/1000 (additional) by school-age (Sharagorodsky et al. 2010)

Etiology

- Delayed onset of genetic hearing loss
- Perinatal infections (e.g., congenital cytomegalovirus)
- Ototoxic drug exposure [e.g., neomycin, non-steroidal anti-inflammatory drugs (NSAIDs)]
- Syndromic hearing loss
- Trauma, noise-induced, etc.
- JCIH (2007) risk factors for late onset and/or progressive hearing loss

Early detection of LOHL and appropriate early intervention improves outcomes (e.g., language, educational, social-emotional) for children and families (Lieu et al. 2020).

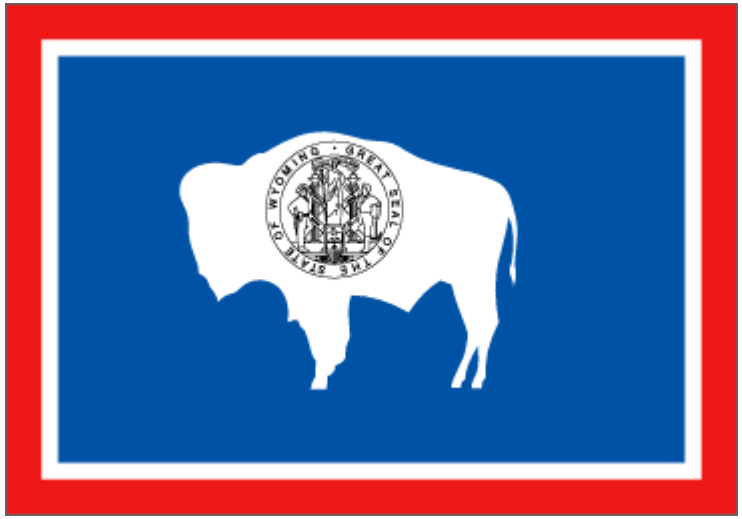
Implementation Models & Ideas

Both Vermont and Wyoming EHDI programs have a lead role in LOHL screening in their states.

What elements from these screening programs might you be able to…

steal, adapt, adopt, or implement

in your jurisdiction?



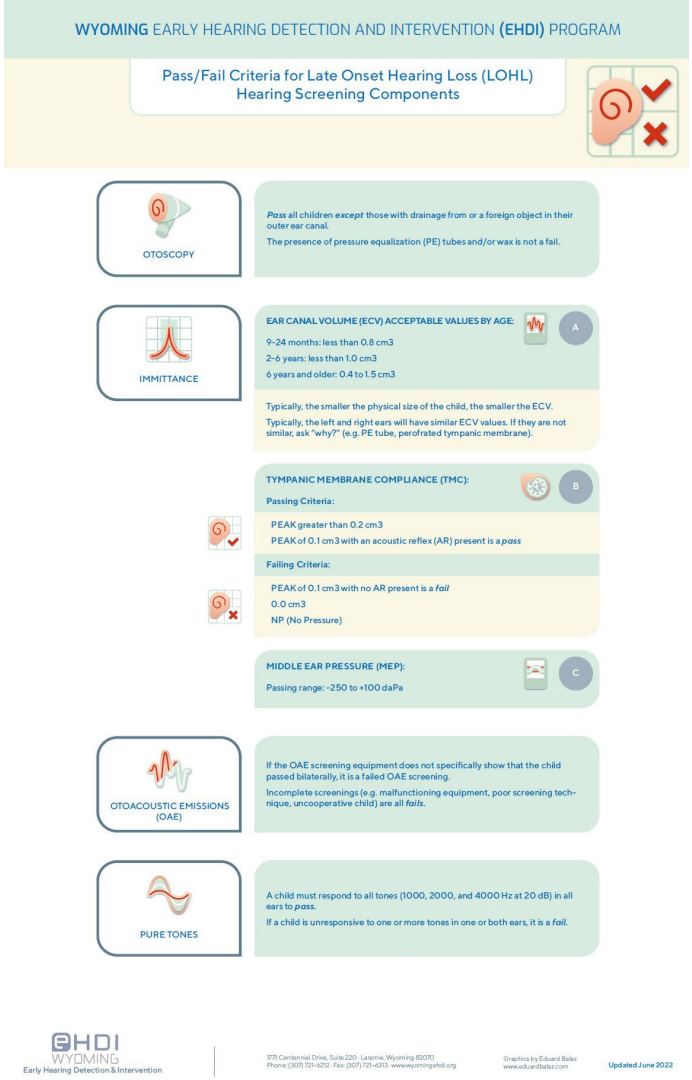
Wyoming's model

Key elements:

- EHDI program is in the same Department of Health division as the agency that provides both Part C and Part B/619 services
- LOHL screening program is supported by Part C funding (~$70,000 annually)
- Children up to school-age (~5 years-old)
- Screening protocol includes:
  - Otoscopy (all ages)
  - OAE (up to ~3 years-old)
  - Pure Tones (~3 years-old and up)
  - Immittance (9 months and older)
    - Tympanometry
    - Acoustic Reflex

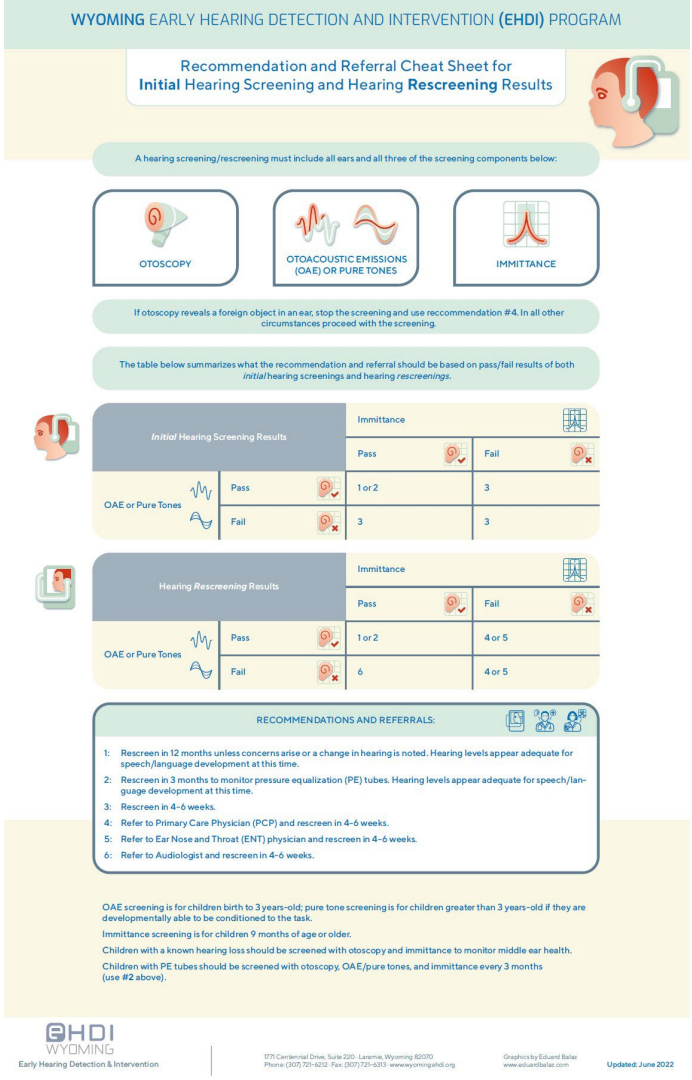
Screening Protocols and Procedures:

Pass/Fail Criteria for Each Screening Component



Screening Protocols and Procedures:

Recommendation and Referral Guide



WYOMING EARLY HEARING DETECTION AND INTERVENTION (EHDI) PROGRAM

Recommendation and Referral Cheat Sheet for **Initial** Hearing Screening and Hearing **Rescreening** Results

A hearing screening/rescreening must include all ears and all three of the screening components below:

OTOSCOPY | OTOACOUSTIC EMISSIONS (OAE) OR PURE TONES | IMMITTANCE

If otoscopy reveals a foreign object in an ear, stop the screening and use reccommendation #4. In all other circumstances proceed with the screening.

The table below summarizes what the recommendation and referral should be based on pass/fail results of both *initial* hearing screenings and hearing *rescreenings*.

Initial Hearing Screening Results		Immittance: Pass	Immittance: Fail
OAE or Pure Tones	Pass	1 or 2	3
	Fail	3	3

Hearing *Rescreening* Results		Immittance: Pass	Immittance: Fail
OAE or Pure Tones	Pass	1 or 2	4 or 5
	Fail	6	4 or 5

RECOMMENDATIONS AND REFERRALS:

1: Rescreen in 12 months unless concerns arise or a change in hearing is noted. Hearing levels appear adequate for speech/language development at this time.
2: Rescreen in 3 months to monitor pressure equalization (PE) tubes. Hearing levels appear adequate for speech/language development at this time.
3: Rescreen in 4-6 weeks.
4: Refer to Primary Care Physician (PCP) and rescreen in 4-6 weeks.
5: Refer to Ear Nose and Throat (ENT) physician and rescreen in 4-6 weeks.
6: Refer to Audiologist and rescreen in 4-6 weeks.

OAE screening is for children birth to 3 years-old; pure tone screening is for children greater than 3 years-old if they are developmentally able to be conditioned to the task.

Immittance screening is for children 9 months of age or older.

Children with a known hearing loss should be screened with otoscopy and immittance to monitor middle ear health.

Children with PE tubes should be screened with otoscopy, OAE/pure tones, and immittance every 3 months (use #2 above).

EHDI WYOMING
Early Hearing Detection & Intervention

1771 Centennial Drive, Suite 220 · Laramie, Wyoming 82070
Phone: (307) 721-6212 · Fax: (307) 721-6313 · www.wyomingehdi.org

Graphics by Eduard Ballaz
www.eduardballaz.com

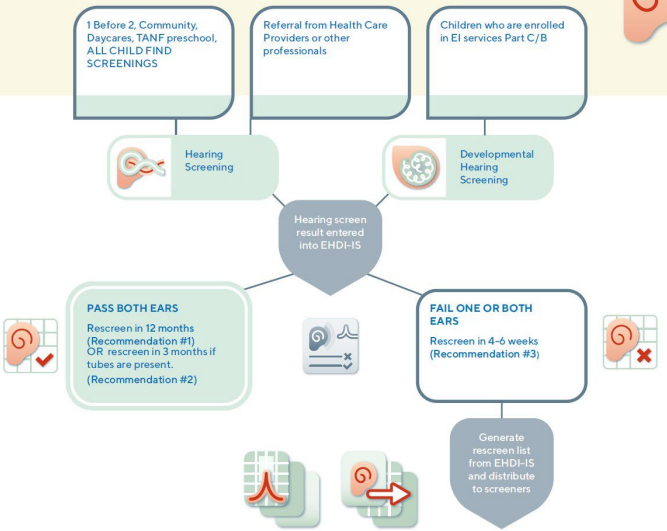
Updated: June 2022

Screening Protocols and Procedures:

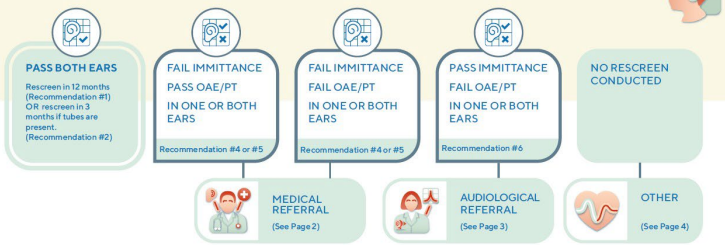
Flowchart summarizing the entire screening, referral, and reporting system

WYOMING EHDI LATE ONSET HEARING LOSS (LOHL)
Hearing Screening Flowchart

Screening, Referral, and Reporting Process



COMPLETE RESCREENING, ENTER RESULTS INTO THE EHDI-IS, AND FOLLOW-UP APPROPRIATELY

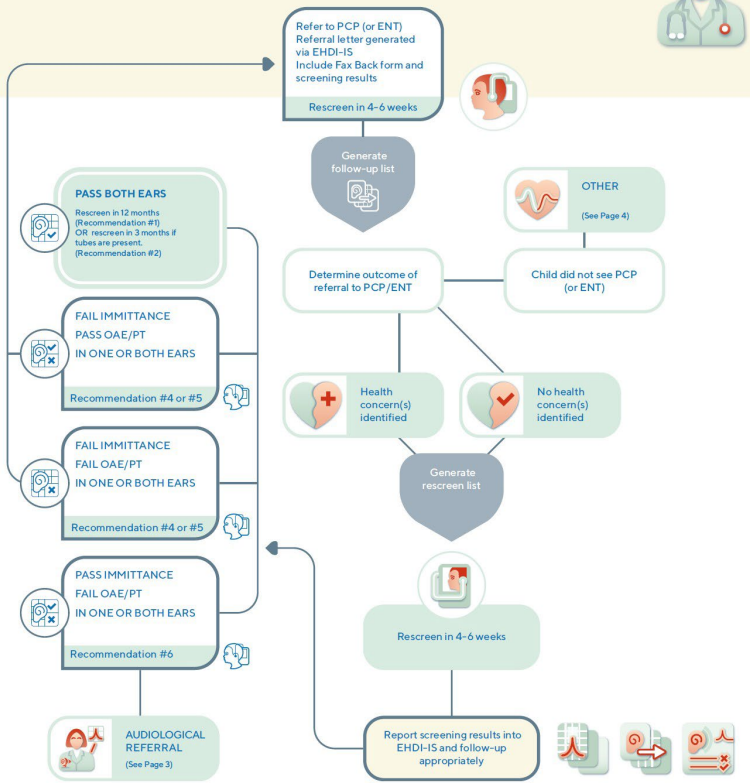


Screening & Rescreening ←

→ Medical Referral

WYOMING EHDI LATE ONSET HEARING LOSS (LOHL)
Hearing Screening Flowchart

Medical Referral



Audiological Referral

Refer to audiologist for audiological evaluation

Recommendation #6

Generate follow-up list and distribute to person doing follow-up

- HEARING WITHIN NORMAL LIMITS
- HEARING LOSS IDENTIFIED
- CHILD DID NOT SEE AUDIOLOGIST

Determine appropriate follow-up in consultation with the EHDI Program Audiologist.

SEND AUDIOLOGY REPORT VIA
email: **kalley.ellis@wyo.gov**
fax: (307-473-1440)
mail: (CDC+ Audiology, 2020 E 12th St, Casper, WY 82601)

OTHER (See Page 4)

Ensure recommended follow-up is accurately reflected in the EHDI-IS

- Rescreen in 4-6 weeks
- Cancel 4-6 week rescreen
- Other recommended follow-up

Audiology Referral ←

→ Other Follow-up Procedures

WYOMING EHDI LATE ONSET HEARING LOSS **(LOHL)**
Hearing Screening Flowchart

Other

Remind parent in a two-way conversation of recommended follow up

- No answer to email, text, or letter
- Child moved
- Parents decline rescreen

→ DESIGNATE THE CHILD AS LOST TO FOLLOW-UP IN THE EHDI-IS IN ORDER TO REMOVE FROM RESCREEN LIST

→ SCHEDULE RESCREEN

→ AUDIOLOGY APPOINTMENT RESCHEDULED

→ Medical appointment rescheduled

MEDICAL REFERRAL (See Page 2)

Rescreen in 4-6 weeks

AUDIOLOGICAL REFERRAL (See Page 3)

COMPLETE RESCREENING, ENTER RESULTS INTO THE EHDI-IS, AND FOLLOW-UP APPROPRIATELY

- **PASS BOTH EARS** — Rescreen in 12 months (Recommendation #1) OR rescreen in 3 months if tubes are present. (Recommendation #2)
- FAIL IMMITTANCE, PASS OAE/PT IN ONE OR BOTH EARS — Recommendation #4 or #5 → MEDICAL REFERRAL (See Page 2)
- FAIL IMMITTANCE, FAIL OAE/PT IN ONE OR BOTH EARS — Recommendation #4 or #5 → MEDICAL REFERRAL (See Page 2)
- PASS IMMITTANCE, FAIL OAE/PT IN ONE OR BOTH EARS — Recommendation #6 → AUDIOLOGICAL REFERRAL (See Page 3)
- NO RESCREEN CONDUCTED → OTHER (See Page 4)

EHDI WYOMING Early Hearing Detection & Intervention
1771 Centennial Drive, Suite 220 · Laramie, Wyoming 82070
Phone: (307) 721-6212 · Fax: (307) 721-6313 www.wyomingehdi.org
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Screening Form:

Results, Recommendations, and Follow-up...

Wyoming Early Hearing Detection and Intervention (EHDI) Program
Hearing/Vision Screening Results Form

LEGEND
DNT = Did Not Test (e.g. < 9 months for immittance)
CNT = Could Not Test (e.g. behavior/sensitivity to task)
CNC = Could Not Condition (e.g. did not understand pure tone listening game)
MEP = Middle Ear Pressure
TM COMP = Tympanic membrane compliance
ECV = Ear canal volume (physical size)
OAE = Otoacoustic emissions

**Required Information*

Child's Name:* _____ **DOB:*** _____ **Gender:* M**____ **F**____

Screening Locale: _____

Parents/Caregiver: _____ Phone: _____

Parents/Caregiver Address: _____

Child's Physician: _____ Permission to send results to physician: Yes_____ No _____

If necessary, permission to rescreen child's hearing: Yes____ No____

1. Hearing Screening Results:																**2. Vision Screening Results**			**3. Tracking**			
			IMMITTANCE				PURE TONES															
Screen Date	Ear	Otoscopic	ECV	TM COMP	MEP	Acoustic Reflex	1,000 Hz	2,000 Hz	4,000 Hz	OAE	Pass (P) / Fail (F)	Follow-up Recommendations (use I: 1-6, See below)	Follow-up to referral, Include date (use II: 1-13, See below)	Screener's Initials	Audiologist/Reviewer's Initials	Appearance of Eyes Pass (P) / Fail (F)	Camera Pass (P) / Fail (F)	Recommendation (use III: 1-5, see below)	Hearing Results Entered into EHDI database	Vision Results Entered into EHDI database	Results Entered into MDT report	Notes
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I. Follow-up Recommendations:
(Please choose one based on hearing screening results)

1. Rescreen in 12 months unless concerns arise or a change in hearing is noted. Hearing levels appear adequate for speech/language development at this time.
2. Rescreen in 3 months to monitor pressure equalization (PE) tubes. Hearing levels appear development at this time.
3. Rescreen in 4-6 weeks.
4. Refer to Primary Care Physician (PCP) and rescreen in 4-6 weeks.
5. Refer to Ear Nose and Throat (ENT) physician and rescreen in 4-6 weeks.
6. Refer to Audiologist and rescreen in 4-6 weeks.

II. Follow-up to Medical and/or Audiological Referral:
(Please choose one for each referral made)

1. Physician confirmed medical condition.
2. Physician did not confirm medical condition.
3. Audiologist confirmed hearing loss (conductive, SNHL, mixed).
4. Audiologist reports hearing within normal limits at all frequencies.
5. Pressure equalization tubes placed.
6. Per parent report, medical referral has not been acted upon. Child has not been seen by doctor.
7. Per parent report, audiological referral has not been acted upon. Child has not been seen by audiologist.
8. Per parent report, medical appointment/follow-up is scheduled, but pending.
9. Per parent report, audiological appointment/follow-up is scheduled, but pending.
10. Phone call to parent. No answer. Left message asking them to call.
11. Phone call to parent. No answer. Did not leave message.
12. Letter sent to parent.
13. Other_____

III. Vision Follow-up Recommendations:
(Please choose one based on vision screening results)

1. Passed both eyes, rescreen in 12 months.
2. Child not screened due to corrective lenses.
3. Refer to Eye Care Professional.
4. Rescreen in _____ months.
5. Other: _____

Updated: 5/28/2020

IV. Risk Factors for Late Onset Hearing Loss Not Present/Noted at Birth: (check all that apply)

____ 1. Parental or caregiver concern regarding hearing, speech, language and/or developmental delay

____ 2. Syndromes associated with progressive hearing loss such as Neurofibromatosis, Osteopetrosis, and Usher's Syndrome

____ 3. Head trauma

____ 4. Ototoxic medications

____ 5. Recurrent or persistent Otitis Media with effusion for at least 3 months

____ 6. Exposure to high noise levels

____ 7. Other: _____

____ 8. None

V. Early Intervention Status

____ IFSP ____ IEP ____Referred for Developmental Evaluation ____ No Early Intervention at this time

Initial IFSP/IEP Date (if applicable): _____

Annual review data IFSP/IEP Date (if applicable): _____

Other: _____

VI. Known Hearing Loss

____ No

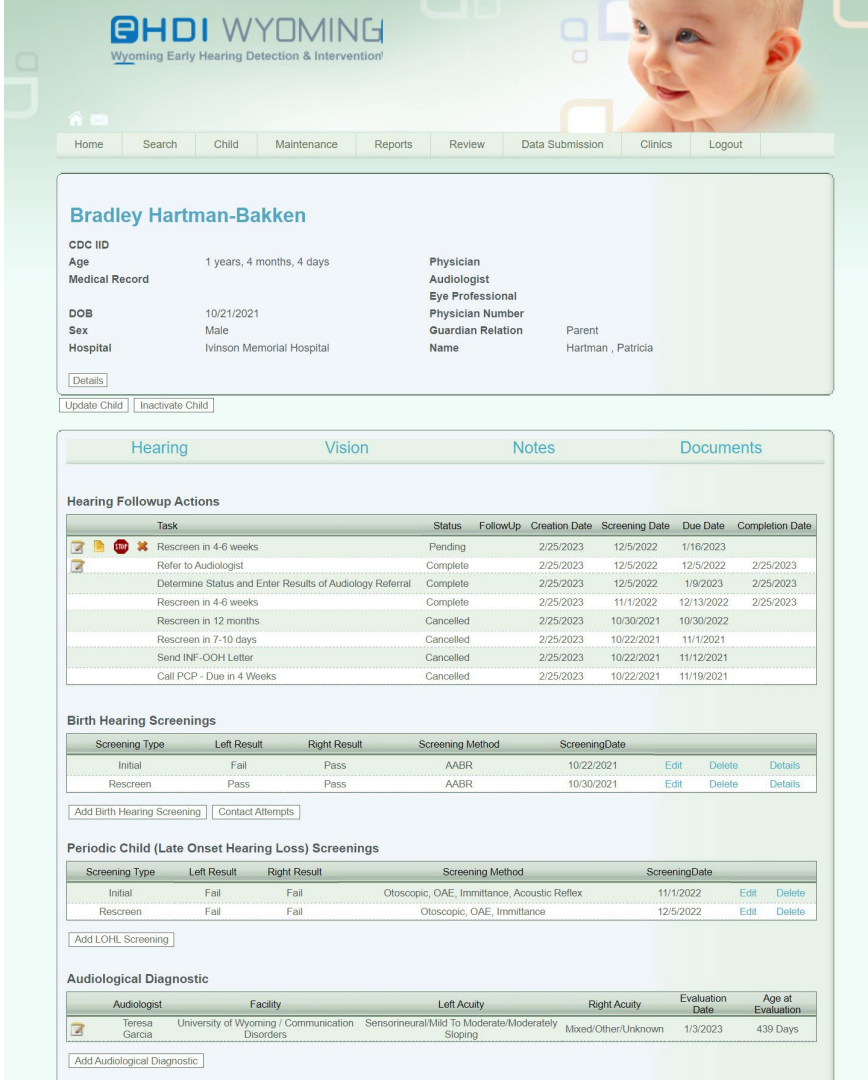
____ Yes ____ Hearing aid(s) ____ BAHA(s) ____Cochlear Implant(s) ____ Other _____

VII. Notes: _____

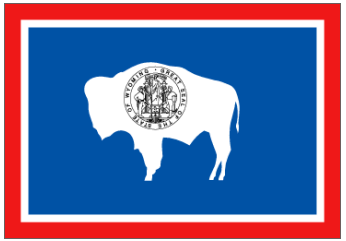
_____

Reporting Mechanism:

LOHL System Uses the EHDI – Information System (EHDI-IS) to Manage Screenings, Referrals, and Follow-up



Additional Supports



Hearing Screening Training

How to obtain, interpret, refer, and follow-up on hearing screening results

Onsite with supporting material online

Approved for CEUs

Hearing Screening Mentoring

Onsite support during community screening days (Child Find Mandate of the IDEA)

Education and Awareness

Importance of hearing to speech/language development

Hearing protection and hearing through the lifespan

Parents and professionals

EHDI-IS Training

Reporting and documentation

Virtual or in-person

Compliance Support

Review of screening results

Review of audiology reports and medical diagnostic results

Screening Equipment & Supplies

Statewide database
Repair and replace program
Annual equipment calibration

Vermont’s model

Key elements:

- EHDI program is in the Department of Health division and same as the agency that provides Part C services
- Early Intervention services are part of the University of Vermont Medial Center (UVMMC) and provide the single point of entry for birth to 3 services for Deaf, Hard of Hearing and DeafBlind Services.
- Vermont Department of Health and the University of Vermont Medical Center have a 20-year collaboration for the Vermont Early Hearing Detection and Intervention Program.
- UVMMC houses some of the Part B services for Vermont's children who are Deaf, Hard of Hearing or DeafBlind (Direct Instruction from a Teacher of the Deaf, ASL/ Bilingual services, Speech and Language evaluations and services, Educational Audiology and Consultation).

Hearing Screening Birth to 3 years of Age

Birth to 3 Screenings

Quality Improvement Initiatives:

- Pilot Studies that started in 2010 with Homebirth Midwives and Primary Care Providers.
- Vermont Participated in the ECHO Initiative and expanded support to Head Start Programs
- Children's Integrated Services (CIS): Speech and Language and Hearing Screening

Education and Awareness

On going training and mentoring for Early Head Start and Head Start Programs, Early Intervention, Primary Care, Midwives and Part C.

Importance of hearing to speech/language development

Parents and professionals

EHDI-IS: Childhood Hearing Health System Database (CHHS)

CHHS Training and Reporting

Reporting and documentation

Virtual or in-person trainings

Compliance Support

Web based reporting in CHHS
Electronic Medical Records (EMR) Access

Screening Equipment & Supplies

Statewide database
Provide some equipment and supplies
Annual calibration for some partners

Birth to 3 Screenings

Hearing Screening Birth to 3 years of Age

- Where are we going?
- Who is responsible?

Quality Improvement Initiatives

- Primary Care
- Early Intervention
- Hearing Outreach Program (HOP)

Challenges:

Capacity

Funding

CHHS Training and Reporting

Reporting and documentation

Virtual or in-person trainings

Funding:

Bill introduced into the Vermont Legislature for Early Childhood Services

Private Insurance and/or Medicaid

Additional Existing Resources

NCHAM / NTRC & the Early Childhood Hearing Outreach (ECHO) Initiative

https://www.infanthearing.org/earlychildhood/index.html

ASHA

Decision tree for screening protocols
https://www.asha.org/siteassets/practice-portal/hearing-screening-childhood/childhood-hearing-screening-protocols-flowcharts.pdf

AAA

Childhood Hearing Screening Guidelines
https://www.cdc.gov/ncbddd/hearingloss/documents/aaa_childhood-hearing-guidelines_2011.pdf

Questions

Ideas

Discussion

Implementation consideration

Keep it S.M.A.R.T.

S. pecific

M. easurable

A. chievable

R. elevant

T. ime-bound

References

Butcher, E, C Dezateux, M Cortina-Borja, RL Knowles. 2019. Prevalence of permanent childhood hearing loss detected at the universal newborn hearing screen: systematic review and meta-analysis. PLoS One 14(7): e0219600.

Lieu, JEC, M Kenna, S Anne, L Davidson. 2020. Hearing loss in children: a review. Journal of the American Medical Association 324(21): 2195-2205.

Shargorodsky, J, SG Curhan, GC Curhan, R Eavey. 2010. Change in prevalence of hearing loss in US adolescents. Journal of the American Medical Association 304(7): 772-778.

Thank you!

Enjoy the rest of the conference and our time together in Cincinnati.

linda.hazard@partner.vermont.gov

bradley.bakken@wyo.gov