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Screening for Hearing Impairment

U.S. Preventive Services Task Force: Screening for hearing impairment. In Guide to Clinical Preventive Services, Second Edition. *Baltimore: Williams & Wilkins, 1996, pp 393–401.*

The U.S. Preventive Services Task Force (USPSTF) evidence-based series of preventive guidelines (updated edition) includes a screening guideline on hearing impairment.* The recommendations are intended for primary care clinicians, including physicians, nurses, nurse practitioners, physician assistants, other allied health professionals, and students.

The guideline sketches out the burden of suffering; reviews the evidence on the accuracy of the main screening tests and the effectiveness of early detection; indicates clinical trials under way to test key areas of uncertainty; and reports the recommendations of other groups.†

USPSTF recommendations for or against preventive interventions are graded according to both the strength of the recommendation (A to E, with C being neither for nor against) and the quality of the evidence (I to III; Table 1).

The USPSTF recognizes a serious health problem associated with developmental delay in speech and language function but finds little evidence to support routine, universal screening for all neonates. Although screening methods have reasonable sensitivity and specificity, a substantial number of infants will be misclassified because of the low prevalence of hearing impairment. Also, screening technology is evolving, and costs and feasibility for universal application are not fully known. Most important, the evidence for efficacy of early intervention is incomplete: (1) No controlled clinical trials have tested whether devices or complex protocols lead to superior speech and language outcomes in screened children, (2) for older children good quality evidence suggests little benefit from screening, and (3) for adolescents and young and middle-aged adults evidence is limited to evaluate hearing impairment and treatment.

Given these findings, the USPSTF makes the following graded recommendations (Table 1) for the different age and risk groups and screening methods:

- Screening older adults by periodically questioning them about their hearing, counseling them about the availability of hearing aid devices, and making referrals for abnormalities when appropriate is recommended (B). Optimal frequency of screening has not been determined and is left to clinical discretion. An otoscopic examination and audiometric testing should be performed on all patients who report evidence of impaired hearing upon inquiry.
- There is insufficient evidence to recommend for or against routinely screening older adults for hearing deficits using audiometry testing (C). Although handheld audioscopes are sensitive screening tools, pa-

*Ed note: The guidelines were prepared under the supervision of the 10-member task force, which is chaired by Harold C. Sox, Jr, MD, Joseph M. Huber Professor and Chair, Department of Medicine, Dartmouth-Hitchcock Medical Center (Lebanon, NH). Support staff were based at and provided by the Office of Disease Prevention and Health Promotion in the U.S. Department of Health and Human Services. The draft update of the hearing impairment screening chapter was prepared for the USPSTF by Robert Wallace, MD, MSc, and John Laurenzo, MD.

†Recommendations are reported for the Joint Committee on Infant Hearing (1994 Position Statement developed and approved by the American Speech-Language Association [ASHA], American Academy of Otolaryngology—Head and Neck Surgery, American Academy of Audiology, American Academy of Pediatrics [AAP], and directors of speech and hearing programs in state health and welfare agencies), the American Academy of Family Physicians, authors of the Bright Futures guidelines, the Institute of Medicine, National Institutes of Health (NIH), and the Canadian Task Force on the Periodic Health Examination. [See the Related Guidelines and Reviews in this issue, p 15, for annotations.]

Table 1. Screening for Hearing Impairment*

Intervention	Level of Evidence	Strength of Recommendation
Periodically questioning older adults about their hearing	I, III	B
Routine audiometric testing in older adults	I, III	C
Routine hearing testing in adolescents and working-age adults†	III	C
Routine evoked otoacoustic emission testing or auditory brainstem response in newborns	II-2, III	C
Routine hearing testing in children aged >3 yr	II-2	D

*Ed note: This table is taken from "Appendix A: Task Force Ratings," pp 861-62 (originally Table 35, p 872), which explains the grades for levels (quality) of evidence and strength of recommendations.
I = Evidence obtained from at least one properly randomized controlled trial (RCT); II = Evidence obtained from well designed cohort or case-control analytic studies, preferably from more than one center or research group; III = opinions of respected authorities, based on clinical experience; descriptive studies and case reports; or reports of expert committees; B = fair evidence to support specifically considering the condition in a periodic health examination; C = insufficient evidence to recommend for or against inclusion of the condition in a periodic health examination, but recommendations may be made on other grounds; D = good evidence to support the recommendation that the condition be excluded from consideration in a periodic health examination.
†Screening for workers for noise-induced hearing loss should be performed in the context of existing worksite programs and occupational medicine guidelines.

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tient inquiry is likely to be a more rapid and less expensive screening method in older adults.

- There is insufficient evidence to recommend for or against routinely screening asymptomatic adolescents and working-age adults for hearing impairment (C). Recommendations against screening (except for those exposed to excessive occupational noise levels) may be made on other grounds, including low prevalence, high cost, and the likelihood that any hearing deficits will present clinically. Screening for noise-induced hearing loss should be performed in the context of existing worksite programs and occupational medicine guidelines.
- Routine screening of asymptomatic children older than 3 years is not recommended (D). When such testing occurs outside the clinical setting, any abnormal test results should be confirmed by repeat testing at appropriate intervals, and all confirmed cases identified through screening referred for ongoing audiologic assessment, selection of hearing aids, family counseling, psychoeducational management, and periodic medical evaluation.
- There is insufficient evidence to recommend for or against using evoked otoacoustic emission (EOE) testing or auditory brainstem response (ABR) for routine screening of asymptomatic neonates (C).
- Recommendations to screen high-risk infants may be made on other grounds, including relatively high prevalence of hearing impairment, parental anxiety or concern, and the potentially beneficial effect of early treatment on language development for infants with moderate or severe hearing loss. ABR testing may be useful for all infants who fail EOE testing or who meet at least one of the following high-risk criteria for congenital or perinatally acquired hearing loss:
  - —Family history of hereditary childhood sensorineural hearing loss;
  - —Congenital perinatal infection with herpes, syphilis, rubella, cytomegalovirus, or toxoplasmosis;
  - —Malformations of head or neck (eg, cleft palate);
  - —Birth weight less than 1,500 g; bacterial meningitis;
  - —Hyperbilirubinemia requiring exchange transfusion;
  - —Severe perinatal asphyxia (Apgar scores of 0–4 at 1 minute or 0–6 at 5 minutes, absence of spontaneous respirations for 10 minutes, or hypotonia at 2 hours of age);
  - —Ototoxic medications; and
  - —Findings associated with a syndrome known to include hearing loss.

High-risk infants should ideally be screened prior to leaving the hospital after birth, but those not tested at birth should be screened before age 3 months with the goal of initiating rehabilitation by age 36 months as clinically indicated. Clinicians examining any infant or young child should remain alert for symptoms or signs of hearing impairment, including parent/caregiver concern regarding hearing, speech, language, or developmental delay.

Commentary 1: In my opinion, the USPSTF's recommendations on screening for hearing impairment as they relate to adolescents and newborns are seriously flawed, and I believe that adherents who would put these recommendations into practice also put themselves at risk for serious medical-legal challenges.[1] The underlying assumption that universal screening of infants is not justified runs counter to published research.[2] Indeed the recommendations represent no significant acknowledgments of progress since the end of World War II and are essentially identical to those high-risk criteria prevalent at that time. Given what this research suggests, the recommendations could have the effect that 50% of newborns afflicted with hearing impairment will not be identified early.[3] Moreover, using a high-risk registry system as proposed by the USPSTF could result in a substantial proportion of at-risk children being identified later than not-at-risk children because of inefficient registration.[4]

The prevalence of hearing loss in the intensive care nursery population is 4% to 5%, whereas in the well-baby population, the prevalence is 5 per 1,000,[5] which is greater than many diseases already being universally screened. The USPSTF recommendation is therefore inconsistent with current practice and doesn't take into account the suffering of tens of thousands of people with hearing loss who were not identified until they were 3 to 6 years old.[6] Even children with mild or minimal hearing impairment have been shown to suffer significant communicative disabilities under various listening conditions.[7-10] Even children with unilateral hearing impairment are shown to experience academic failure 10 times more frequently than those in the general population, and half of these children experience documented educational difficulties[11,12] and are significantly at risk for educational delays and behavioral difficulties.[13,14] We also know that whereas 1/1,000 children are born deaf, 7/1,000 have bilateral hearing impairment, and about 14/1,000 school-age children have hearing loss significant enough to harmfully affect learning and academic achievement.[15]

As a screening tool, automated ABR has been shown to be 100% sensitive and 96.7% specific, and under the use of a high-risk registry only (such as is recommended by the USPSTF) only 3% of all children born in the United States can be expected to participate in any kind of newborn hearing screening program. With this the average age of identification of hearing impairment would remain at about 3 years, which is where it has been under that kind of system, and therefore well past many critical learning periods.[16]

The argument of excessive costs associated with an alleged high false-positive rate is fallacious. Even if the success of an attempted universal newborn screening results in coverage of only an additional 20%, the benefits would result in significantly better outcomes, management, and fiscal profitability.[17] An estimated cost of the screening program is about $7,000 per identified child.[18] This compares with $40,000 to detect one newborn with phenylketonuria, hypothyroidism, or sickle cell anemia with current screening

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techniques.[19] The cost to educate one child in a K-12 regular classroom is $48,000 in Rhode Island (which already has implemented a universal hearing screening program). The cost for a hearing-impaired child in a self-contained classroom is $130,000, and in a residential school it is $450,000. Thus, for the universal hearing screening program to pay for itself, only 76% of early-identified children would have to be educated in regular classrooms instead of self-contained classrooms, or alternatively only 2% of early-identified children would need to be educated in self-contained classrooms rather than residential schools for the program to pay for itself.[18]

The lack of internal consistency in recommendations across diseases and criteria argues for serious revisions in the USPSTF guidelines. Introducing such a regressive standard of care guideline at this time may well jeopardize the fiscal solvency of existing programs in 60 hospitals in 18 states because payors will see this as a means of reducing their need to pay for services. The introduction of conclusions that essentially demean the benefits and cost-effectiveness of hearing screening at this time is somewhat surprising in light of otolaryngologists' basic uninvolvement in the hearing screening process.[20] Yet such programs can be successful only with the full participation of medical specialists.

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Commentary 2: The USPSTF makes a series of graded, age-specific recommendations regarding hearing screening. Many of their recommendations are appropriate, some are not adequately specific, a few are wrong, Given the high cost of universal screening, the USPSTF is correct in suggesting that in adolescents, working age adults, and older adults, hearing evaluation be reserved for those with complaints of hearing loss. However, the implication that any hearing deficit present clinically is erroneous. Many patients with significant hearing loss, particularly of gradual onset, adapt and are unaware of a problem. Routine, large-scale screening would undoubtedly reveal undiagnosed pathology such as acoustic neuroma, chronic ear disease, noise-induced hearing loss, or significant hereditary hearing loss. Many lives might be made better for the effort.

The USPSTF is vague as to what constitutes "audiometric testing." It should be made clear that audiometric testing must be performed on a calibrated audiometer in a soundproof booth, testing both pure tones and speech (speech reception threshold and discrimination). This testing is best administered by an audiologist with a master's degree. An experienced technician who has completed a certified course is an acceptable alternative.

The USPSTF recommendations for hearing screening in children are, appropriately, based on high-risk criteria. Also emphasized is the importance of evaluation if a parent suspects a hearing loss or if there is a delay in speech or language. Many pediatricians still respond to parental concern with "it's developmental" when in fact the ONLY acceptable response is "let's get the hearing tested." Recall that with modern testing techniques children can be tested within the first weeks of life. It is important that rehabilitation for hearing impairment begin as early as possible. The goal of initiating therapy by the age of 36 months is far too generous. Children should receive a diagnosis and aid as early as three months of age, and certainly, the sooner the better.

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