Ototoxicity Identification Device

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BACKGROUND / RATIONALE:

When therapeutic treatment involves the use of pharmacologic agents having ototoxic potential, especially aminoglycoside antibiotics and the chemotherapy agent cisplatin, irreparable damage can be done to hair cells within the cochlea. When ototoxic-induced hearing loss is allowed to progress undetected and without consideration of alternative treatment regimens, the resultant hearing disability can have severe emotional, social, financial and vocational consequences. This is particularly true for a population such as veterans, where hearing loss frequently is present before treatment. Ototoxicity that goes unchecked can immediately exacerbate speech communication and impair post-treatment quality of life. Thus, early identification and monitoring of ototoxicity are critical to facilitate responsible evidence-based practice by providing practitioners the critical information and opportunity to minimize or prevent the progression of hearing loss into the speech communication range.

The Portland VAMC Auditory Research Laboratory, now the VA RR&D National Center for Rehabilitative Auditory Research (NCRAR), began to pioneer ototoxicity early identification and monitoring nearly 25 years ago. Animal models had demonstrated that the ototoxic process initially damages the outer hair cells of basal turn of the cochlea, where higher frequency sounds are processed. Our group applied these principals to the development of a high-frequency testing methodology, and subsequently established that ototoxicity could be detected earliest in the high-frequency range of human hearing. We demonstrated that the most effective, reliable and sensitive method for detection of incipient ototoxicity could be achieved through serial evaluation of behavioral hearing thresholds at frequencies from 0.5-20kHz. This discovery led to publication of national guidelines for effective ototoxicity monitoring,

OBJECTIVE(S):

In spite of these guidelines, and out further research findings that support their efficacy, ototoxicity early identification and monitoring programs have not become commonplace in hospitals and clinics where they are needed. This is perhaps in part due to the time-consuming and labor-intensive procedures required to conduct full spectrum threshold evaluation. Subsequent research efforts

focused on developing more clinically efficient and cost-effective monitoring techniques that maintain a high degree of sensitivity and intra-patient reliability. The outcome of these efforts was the discovery of a patient-specific, sensitive range for ototoxicity (SRO) that facilitated the development of a shortened test protocol. The SRO identifies a limited range of frequencies, separated by 1-6th octave intervals, that is unique to each individual based upon his/her hearing configuration, and within which it is possible to monitor for early indication of ototoxicity while cutting testing time by at least two-thirds and maintaining 90% sensitivity. The shortened, individualized 1/6th octave SRO ototoxicity early audiometers capable of high-frequency testing in 1/6th octave SRO ototoxicity early identification protocol is time-efficient, sensitive to ototoxicity early detection, and reliable; however, no portable audiometers capable of high-frequency testing in 1/6th octave steps are commercially available.

METHODS:

Development and field-testing if the proposed second-generation OtoID device will result in the integration of current best evidence with portable, state-of-the-art technology to establish best practice guidelines for ototoxicity early identification and monitoring.

FINDINGS / RESULTS:

No findings to report.

STATUS:

This project is in the start-up phase.

IMPACT:

Development and field-testing if the proposed second-generation OtoID device will provide optimal efficiency and versatility for audiologists, health care providers and patients. It will extend ototoxicity monitoring services to patients who otherwise would not have their hearing thresholds monitored because they either are too ill to leave their hospital ward rooms or homes, or they live too far away to make it practical to commute for purposes of participating in an ototoxicity monitoring program. Advances of this nature are needed to make early detection of ototoxicity a standard level of health care for veterans and other individuals throughout the nation.

PUBLICATIONS:

None at this time.