

A Recommended Hearing Screening Protocol for Stroke Patients

By Nehzat Koohi, PhD, and Doris-Eva Bamiou, MD MSc FRCP PhD

HEARING AND STROKE

Stroke is the most common neurological condition and a leading cause of disability, with almost two thirds of stroke survivors leave hospital with a disability ¹. Stroke can affect all levels of the hearing pathway, from the inner ear to the central hearing tracts and may result in various types of hearing impairment, such as peripheral hearing loss (cochlea to auditory nerve), disordered auditory processing (brainstem to cortex) and cortical deafness ². Those stroke patients with hearing impairment have poor physical recovery after being discharged to the community ³. In addition, hearing loss may double the risk of developing dementia, after vascular factors are controlled ⁴, yet is one of a few modifiable risk factors for dementia ⁵. Nevertheless, identifying hearing impairment in stroke patients are often neglected. The hearing difficulties in this population can have adverse effects on patients' communication and rehabilitation after stroke.

HEARING ASSESSMENT IN STROKE PATIENTS

Performing a detailed audiological assessment in all stroke patients would be a laborious process and may not be practical, therefore a preliminary hearing screening program is needed for such patients. With having a hearing screening protocol in place, the full audiological assessment can be reserved for those who fail the initial hearing screening. In order to facilitate early identification of peripheral hearing loss and central auditory processing disorder in stroke survivors, we recently validated a 'two-tiered' hearing screening protocol, a handheld hearing screener and two validated hearing questionnaires, that could be used in stroke units. In our recent article in the *Frontiers in Neurology Journal*⁶, we also recommended an appropriate referral model for stroke patients with hearing impairment. Our study is a first step towards addressing the complex hearing needs of stroke patients in a systematic manner. Our aim is to support their communication needs, long-term recovery after stroke and to improve their quality of life. This approach may also possibly delay onset of post-stroke dementia.

HEARING SCREENING IN STROKE PATIENTS

We evaluated three hearing screening tools for the identification of hearing impairment in stroke patients:

- Handheld hearing screener for determination of peripheral hearing loss
- The modified Amsterdam Inventory for Auditory Disability, a questionnaire that provides information about specific auditory complaints and a tool for identifying auditory processing disorder
- The Hearing Handicap Inventory for Elderly, a sensitive and specific tool for identifying hearing loss

We completed the abovementioned hearing screening tests in 42 stroke patients three to twelve months after their stroke because hearing impairment is stable at this point ⁷. We then performed the full audiological assessment which aimed to identify and categorise the patient's hearing profile into one of the following: a. Normal hearing, b. Peripheral hearing loss, c. Central auditory processing disorder d. Combination of peripheral and central hearing impairment. We chose pure-tone audiogram as the 'gold standard' for the handheld hearing screener, and information from different comprehensive audiological tests for the hearing questionnaires ⁶. We then calculated the sensitivity and specificity to evaluate the accuracy of these screening tools for the diagnosis of hearing impairment ⁶. The results are summarised in Table 1.

Table 1 Accuracy of hearing screening tools

	Sensitivity	Specificity
Handheld Hearing Screener	93%	100%
HHIE questionnaire	44%	100%
AIAD questionnaire	36%	100%
Handheld +AIAD	50%	89%

OUR RECOMMENDED HEARING SCREENING PROTOCOL FOR STROKE PATIENTS

Handheld hearing screeners are not intended to determine hearing thresholds but rather to identify the possibility of an individual presenting with hearing loss ⁸. Self-reported inventories are standardised questionnaires that are used to characterise a complex clinical picture and use of such questionnaires to screen for hearing impairment has been an attractive option because no costly equipment is needed. Furthermore, these hearing screening tools do not require audiology expertise and the time needed to administer them is minimal ¹⁰. In our study we demonstrated that the handheld hearing screener can provide reliable information and indicate if a patient requires detailed assessment for peripheral hearing loss. We also showed that the addition of the AIAD questionnaire can identify a significant proportion of patients who need further central auditory evaluation. Thus, we have recommended a hearing screening protocol for stroke patients that can provide useful information for the rehabilitation team to help identify those patients who have high levels of perceived hearing difficulties and need additional investigation and input on a case-by-case basis. In Figure 1, we demonstrate a schematic representation of a hearing screening protocol for stroke patients in the chronic stage of stroke.

Full report of this study recently published in the *Frontiers in Neurology Journal*⁶.

HEARING SCREENING FOR STROKE

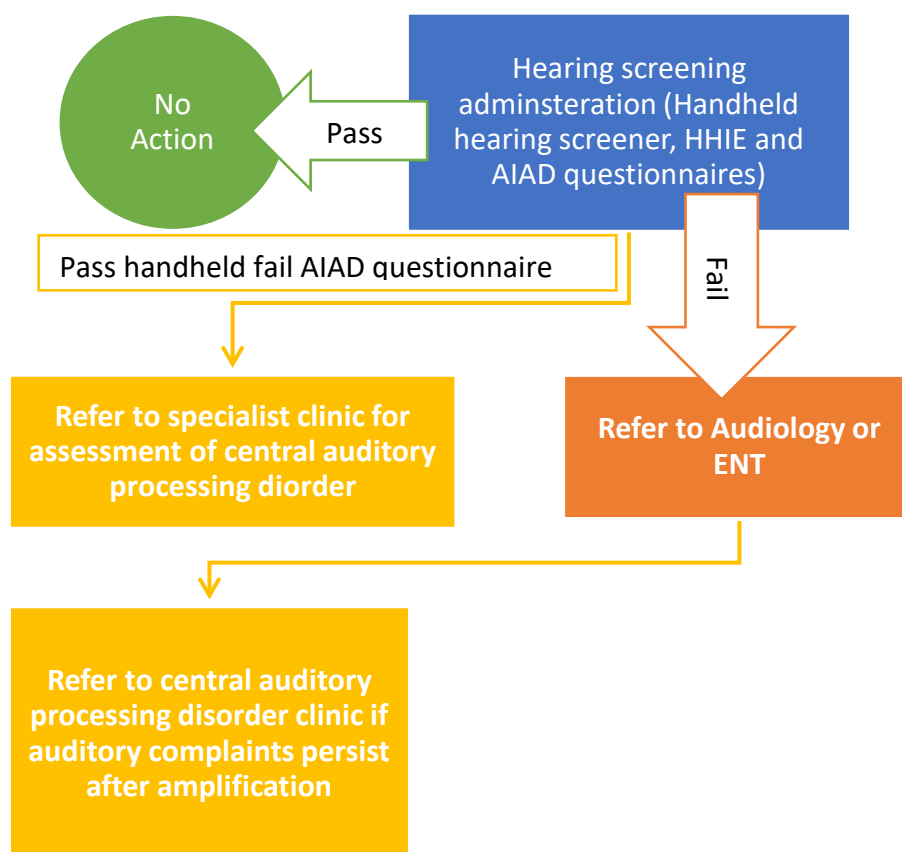


Figure 1 A schematic representation of a hearing screening protocol for stroke patients