Addressing Auditory Health with a Medical Student-Run Screening Program in an Urban, Underserved Minority Population

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Abstract:

Background: Introduction: 1 in 6 Americans has or will have a sensory or communication disorder in their lifetime. In New York, approximately 12.6% of the population is affected by some degree of hearing loss or vestibular dysfunction. Osteopathic medical student auditory screenings have the potential to positively impact communities in screening for auditory disorders. The aim of this study is to argue for the importance of incorporating auditory screening programs into osteopathic student-run health fairs to positively impact underserved communities.

Methods: Osteopathic medical students developed an auditory screening protocol and training session to detect auditory pathologies in health fair participants. Screenings included patient intake, hearing loss risk factor discussion questions, and audiological testing such as the whispered voice and turning fork tests. Participants of Touro College of Osteopathic Medicine’s fall and spring health fairs were invited to undergo the screening from September 2017 to March 2018 in New York City, New York.

Results: During the inaugural health fairs, 28 participants were screened for auditory pathologies. 6 participants (21%) were referred for additional testing due to abnormal or inconclusive results. Median age of participants was 60 with 19 females and 9 males, IQR 5. Participants primarily self-identified as African American/Black (54%, n=15) or Hispanic (29%, n=8).

Conclusion: The results of this pilot project underscore the benefits of effective auditory screening programs at osteopathic student-run health fairs, especially in urban, underserved communities.

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Introduction: At least 1 in 6 Americans has or will have a sensory-communicative disorder in their lifetime, with approximately 12.6% of the New York population being affected by some degree of hearing loss or vestibular dysfunction.\textsuperscript{1} Previous research on audiological screening programs have been limited; conflicting data, in regard to aspects of the
individual’s medical history and components of hearing tests, result in questionable utility in audiological disease progression. Nevertheless, it is important for physicians, and by extension, medical students to recognize the significance of auditory health in an increasingly aging population.

Of these disorders, presbycusis, or age-related sensorineural hearing loss, is the most common auditory pathology in America and worldwide. Characterized by symmetrical, progressive decrease in hearing, presbycusis can be multifactorial, with genetics, cumulative environmental noise exposures, and age-dependent pathophysiological degeneration all playing a possible role in its pathogenesis. Despite non-reversible cochlear hair cell death beginning as early as 25, auditory decline typically does not symptomatically manifest until ages 50-60. For initial work-up, it is often the patient’s partner or family member that notices the initial drop in auditory perception, evinced asking for repetition in conversations or difficulty discriminating speech in loud environments. Diagnosis is often delayed due to the insidious onset, variable baseline presentation, and a perceived stigma related to standard interventions such as hearing aids. While there is no cure for presbycusis, numerous studies have validated benefits of early intervention, including positive effects on self-esteem and overall quality of life.

Medical students enrolled in an osteopathic medical school are trained in the Osteopathic Concepts, published in 1953, which emphasize the tenets of the body as a unit, of the body equipped with self-regulatory mechanisms, of interrelation between structure and function, and of rational treatment. Awareness and specific medical training guided by the osteopathic tenets allow students of osteopathic medical schools to comprehend the impact of sensory-communicative disorders on not only the social isolation and limited activities of daily living of those affected but also the adaptive mechanisms and structure-function relationship involved, such as requiring higher volumes to combat decreased auditory sensation which lead to further damage. The auditory screenings at student-run health fairs allow these medical students to provide treatment rationale for participants identified to have abnormal results.

Here we present the development, initial results, and challenges associated with a medical student-run, community-based, free auditory screening program in Harlem-New York City, NY to argue for the importance of incorporating auditory screening programs into osteopathic student-run health fairs to positively impact the auditory health of urban, underserved communities.

Methods:
Participants were recruited for complimentary community hearing screenings that were held at Touro College of Osteopathic Medicine – New York in the Harlem neighborhood of the New York City borough of Manhattan biannually in conjunction with the Fall into Health and Spring into Health fairs in September 2017 and March 2018. Apart from general advertisement of the health fair via posters, flyers, and signage at location, participants were not actively solicited to participate in the health fair or auditory screening. Informed consent for health fair participation, which included all medical student-run screenings, was obtained upon entrance. Inclusion criteria was English, Spanish, and French speakers. Participants with a known or declared auditory disorder were offered screening but omitted from data analysis. Additional exclusion criteria include minors and those who did not speak the aforementioned languages, due to lack of available translators.

All medical student volunteers received a one-hour training session in conjunction with the Otolaryngology and Ophthalmology Touro Interest Club (OOPTIC) of Touro College of Osteopathic Medicine. The training consisted of patient intake, testing setup, and referral protocols (Figure 1). All training and protocols were student-led but designed, reviewed, and supervised by board-certified physicians, including an otolaryngologist, audiologist, and members of a medical advisory committee.
Medical student volunteers utilized the auditory health questionnaire to engage the participant in discussion. Regardless of result, all participants were given auditory health pamphlets and encouraged to follow-up with their primary care physician if there are any change in symptoms. Primary Care Physician = PCP, Ear, Nose and Throat = ENT

At health fairs, each auditory screening lasted approximately 15 minutes and began with general demographic intake and an auditory health questionnaire, modified from the American Speech-Language-Hearing Association (ASHA) hearing loss risk factor assessment.\(^7\) If participants had 3 or more positive risk factors (Figure 2), the whispered voice test was performed, in which the screener stood behind the patient and occluded one ear.\(^11\)

Referred participants were given contact information for further follow-up and acute care resources. Guidelines for acute auditory crises were also established, in which emergency services would be called to assess the status of the participant. Acute auditory crisis was defined as sudden sensorineural hearing loss in which participants were asked if they had unexplained, rapid loss of hearing—in one or both ears—either at once or over several days.\(^13\) If a participant endorsed sudden sensorineural hearing loss, immediate assessment by an audiologist/otolaryngologist was recommended. Data was collected retrospectively from previous health fair screenings; this data collection was IRB exempt under Exempt Research.

**Results:**

During the health fairs in which hearing screenings were offered, 28 participants were screened for auditory pathologies. No participants endorsed any previous auditory pathology prior to screening. Six participants (21%) were referred for additional testing due to abnormal results, as they failed all parameters in the screening protocol (>3 risk factors in auditory health questionnaire, failed whisper voice test, and failed tuning fork tests).

Median age of participants was 60 with 19 (67.9%) females and 9 (32.1%) males, with an interquartile range of 5. Participants primarily self-identified as
African American/Black (54%, n=15) or Hispanic (29%, n=8). The remaining 17% of participants (n=5) self-identified as Caucasian or Asian.

Discussion: This report demonstrates the findings of a student-run auditory screening program through an osteopathic medical school in a culturally diverse neighborhood of New York City. In the auditory screenings that were performed, 21% of participants (n=6) had an abnormal result that would require further audiological workup. There were no significant differences observed between race or gender, with demographics roughly approximating the racial distribution in Harlem. If abnormal results and necessity for referral are equated with true audiological pathologies, the results were similar to the most recent community health survey findings by the New York City Department of Health and Mental Hygiene, which found hearing problems in 16%, or 1 in 6, of the New York City population.1 Similar to the survey, our screenings found auditory pathologies in 21%, or 1 in 5, of participants, which reveals the potential of medical student-run health fairs to address the auditory health of urban, underserved minority populations. In comparison to the surrounding neighborhoods that comprise New York City, it is important to note that Harlem is a medically underserved area (MUA), which is defined as an area that lacks many of the medical services that may be more prevalent in surrounding affluent/resourced areas.14 To underscore this, there is only one audiologist located in the Harlem area compared to the numerous offices in lower Manhattan. This pilot project, though limited in sample size, suggests audiological pathologies are present in the Harlem community, and medical student-run health fairs may benefit the people of the community who participate in these health fairs by providing no-cost screening services, patient education, and appropriate referrals, especially the medically underserved. Other medical schools can consider these findings, as their students 1) may be able to have an impact in another MUA or 2) be inspired to run a similar project. With lack of healthcare resources, communities in medically underserved areas (MUAs) have worse health outcomes in seemingly preventable diseases.14,15 For example, while presbycusis lacks a curative treatment, early intervention is critical in slowing disease progression. With the goal of preserving residual hearing, physicians would be able to identify and negate risk factors such as ototoxic medications and lack of appropriate protection in chronic loud noise exposure.5 Hearing aids have also been proven to improve quality of life by improving social interactions, decreasing cognitive decline, and ameliorating associated symptoms such as tinnitus.16 Thus, the benefits must outweigh the challenges of early intervention and must be addressed in developing an auditory screening program. Community-based, auditory screening programs are often part of one-day community health education, awareness, and screening events, known as health fairs; many are organized and run by nonprofit organizations, federally-funded programs, or health profession schools and its students, such as this pilot project by osteopathic medical students.

Barriers to success included, but were not limited to, suboptimal testing environment due to ambient noise pollution, and medical student unfamiliarity with screening tests. As an initial presentation of a medical student initiative, the small number of screened participants complicates the generalizability of the findings and would require further investigation. This study was also restricted in its ability to ascertain impact of auditory health outcomes as there was limited follow-up to patient care. Previous studies of medical student-run screenings have also highlighted similar difficulties in assessing follow-up and referral compliance.17,18 Future development and research can include optimizing screening conditions and providing a method of care continuity, such as improved noise cancellation in testing rooms and assessing if the participant subsequently followed through with the referral to a primary care physician. Despite the aforementioned limitations, the medical student-run audiological screening addressed many of the concerns raised by the local community and national initiatives. At the local level, while this screening program was unable to determine the exact cause of abnormal results, it provided an important opportunity for participants to engage in a discussion regarding their auditory health; the screenings helped to fill the community-perceived gap in audiological healthcare and...
encouraged members to be more cognizant of their aural health. Similarly, on a state or national level, these screenings brought healthcare resources to a MUA and closer to goals set by the United States Department of Health and Human Services’ Healthy People. For osteopathically trained physicians and medical students, these screenings serve as an important reminder of the osteopathic tenet of seeing the body as unit as hearing is integral to overall fitness and quality of life. The audiological protocol can be replicated at other medical schools and health fairs to potentially benefit other medically underserved communities.

Conclusion:

The results of this project underscore the potential benefit of effective auditory screening programs at osteopathic student-run health fairs, especially in underserved communities. With early detection, many auditory diseases, such as hearing loss and tinnitus, may be more effectively monitored and managed. Auditory screenings allow for this early detection, compared to national average age of detection (65-75), and helps to inform patients of their care options. This can lead to better understanding of disease progression, thus avoiding preventable healthcare costs in the future and/or limitations of quality of life.

Author Contributions:
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