

## Abstract

**Background:** Hearing loss and auditory symptoms such as tinnitus (a ringing or noise in the ear) affect people of all ages. Approximately 2-3 per 1000 children are born in the U.S. with a detectable degree of hearing loss.<sup>1</sup> The prevalence increases with age, with almost half of adults 70 years and older experiencing some hearing loss.<sup>2</sup> Patients with hearing impairment may have communication challenges. Ineffective or inadequate communication between patients and health care providers may result in a plethora of complications including misdiagnosis, lack of understanding of treatment needs, failure to receive accurate informed consent for care, and miscomprehension of treatment recommendations. Given the high prevalence of hearing loss, especially among older adults, it is important for oral health professionals to learn strategies to effectively communicate with patients with hearing impairment. In addition, dental professionals may be at risk of developing hearing loss or tinnitus due to noise exposure sustained during clinical practice.<sup>3-4</sup>

In 2017, an innovative, collaborative educational experience for dental hygiene and audiology students was developed and implemented at the University of North Carolina. The purpose of this initiative was to provide dental hygiene students an opportunity to learn about the audiology profession, collaboration with audiologists, hearing assessments, their own hearing health, noise-induced hearing loss and protection, and communicating with patients with hearing loss.

**Objectives:** The study's purpose was to evaluate this new educational experience involving dental hygiene and graduate dental hygiene students, and students in the UNC School of Medicine Doctorate in Audiology Program.

**Methods:** Supervised audiology students provided hearing screenings for 33 senior dental hygiene students and 4 graduate dental hygiene education students. Subsequently, a didactic session about the topics mentioned was taught by an audiology doctoral student followed by class discussion. Surveys about the screening and education session were completed by the students. Before-after changes in students' perception of knowledge were assessed.

**Results/Outcomes/Improvements:** For 49% of the dental hygiene students, this was their first hearing screening. Almost all of students, 97-100%, agreed or strongly agreed that the experience was well-organized, valuable, contained important information for dental practice, and increased their understanding of importance of collaborating with other health professions and comfort level when collaborating with audiologists. Almost all, 94%, recommended that this experience be included in future curriculum. Students reported significant change (all  $p < 0.05$ , Wilcoxon Signed Rank Test) in their knowledge of hearing assessments, noise induced hearing loss and communication with patients with hearing loss.

**Significance/Implications/Relevance:** The participants reported that the didactic and experiential education experience was a valuable learning experience that increased their knowledge about the audiology profession and hearing health for themselves and their patients. Future plans for this project include continuation of these didactic and audiology screening activities for subsequent groups of students including dental students. There will also be an opportunity for the audiology students to learn from the dental and dental hygiene students regarding topics such as head and neck exam technique, oral cancer screenings, and TMD.

## Introduction

- Ineffective or inadequate communication between patients and health care providers may result in misdiagnosis, lack of understanding of treatment needs, failure to receive accurate informed consent for care, and miscomprehension of treatment recommendations.
- Inconsistent and perhaps limited exposure for Dental Hygiene students exists in both clinical and didactic curriculum
- Dental professionals may be at risk of developing hearing loss or tinnitus due to noise exposure sustained during clinical practice<sup>3-4</sup>

## Methods and Materials

- Reviewed by IRB and deemed a non-human subjects project
- Dental Hygiene (DH) and Dental Hygiene Education Graduate (DHE) students were asked to volunteer for auditory hearing screenings and then provided didactic content in a Special Care in Dentistry course.
- 5 first-year Audiology students in the UNC School of Medicine's Clinical Doctorate in Audiology Program performed the screenings, supervised by one third-year audiology doctoral student and one faculty audiologist.
- Hearing Screenings:
  - Participants were screened at the level of 20 dB HL at frequencies of 1000, 2000, 4000, and 6000 Hz using conventional pure-tone audiometry.
  - Otoscopy was performed prior to pure-tone audiometry and participants were informed immediately if any abnormal findings were present.
  - If a participant did not pass at one or more frequency in either ear, tympanometry was also performed to assess function of the middle ear.
  - An optional video otoscopy station was set up for interested participants to view their own ear canals.
- Didactic learning experience:
  - Presentation given by a third-year doctoral student in the Audiology program
  - Content included: audiology profession, anatomy of the ear, prevalence of hearing impairment, components of the audiogram, consequences of hearing loss, types and levels of noise, types of hearing protection, work-related risks for dental professionals, effective communication for patients with hearing impairment, and how and when to make appropriate referrals to an audiologist.
- Program Review:
  - A 13-item survey for the DH and DHE students was developed to gain quality improvement feedback following the screening and didactic experiences.
  - The survey included items about participants' demographics, previous experience with audiology screening, and questions that asked students to rate their level of knowledge on hearing assessment, the audiology profession, noise-induced hearing loss, and communicating with patients with hearing loss.
  - Two questions were open-ended and asked students to indicate the most and least valuable aspects of this interprofessional education (IPE) experience.
  - A separate survey was created for first-year Audiology students with the goal of collecting feedback to improve the quality of the experience for future students.



## Results

- 37 auditory screenings were completed, 33 were senior DH students and 4 graduate DHE students, for participation rates of 94% and 67%, respectively.
- 35 students (32 DH students and 3 DHE students) completed the survey for response rates of 94% (DH) and 50% (DHE).
- 30 DH students attended the didactic presentation.
- 18 students indicated this was their first hearing assessment by an audiologist.
- 4 out of 5 Audiology students completed the Audiology student survey (80% response rate)
- 75% rated this as a valuable experience; feedback included that they would like to receive instruction from the dental professionals on craniofacial abnormalities and oral care

**Table 1. Percentage of Dental Hygiene and Dental Hygiene Education students who rated each item "Agree" or "Strongly Agree" <sup>1</sup>**

	N	%
<b>Students who participated in the Audiology Screening (n=33)</b>		
1. The Audiology Screening experience was well organized.	33	100
2. The Audiology screening activity was a valuable learning experience.	33	97.0
<b>Students who attended the Audiology Lecture (n=30)</b>		
3. The Audiology lecture contained important information for dental practice.	30	100
<b>All students (n=35)</b>		
4. This experience increased my understanding of the importance of collaborating with other health professionals.	33*	100
5. This experience will increase my comfort level when collaborating with audiologists in the future.	33*	100
6. I would recommend that this Audiology learning experience be included in the Dental hygiene curriculum.	35	94.3

\*Number of responses to question=33

<sup>1</sup> Four point rating scale: Strongly Agree, Agree, Disagree, and Strongly Disagree

**Table 2. Percentage of DH and DHE students who self-assessed their level of knowledge "Moderately knowledgeable" or "Very knowledgeable" before and after the Audiology Screening and/or Lecture**

Level of knowledge about:	BEFORE	AFTER	p value
<b>The profession of audiology: Students who attended the screening and/or lecture (n=35)</b>			
	2.9%	85.7%	0.00
<b>Hearing assessment conducted by an audiologist: Students who participated in the audiology screening (n=33)</b>			
	3.0%	84.8%	0.00
<b>Students who attended lecture (n=30)</b>			
Noise induced hearing loss	3.3%	93.3%	0.00
Communicating with patients who have hearing loss	40.0%	93.3%**	0.00

\*\* Before the screening and didactic sessions, 40% of the students rated "Moderately Knowledgeable", while after, 43.3% rated "Very Knowledgeable".

## Participant Feedback

When asked to share the most valuable aspects of the screening and lecture, some of the comments included:

- *"How to communicate with patients with hearing loss."*
- *"Discovering your level of hearing and realizing what causes that."*
- *"Familiarity with audiology screening process and information on noise-induced hearing loss and protective equipment."*
- *"Knowing how much I could hear and the repercussions of not wearing hearing protection."*



## Future Directions

- Fall 2018: Expansion of project to include both DH and Dental students, and a presentation from the Dental faculty and students to the Audiology students
- DH and Dental students will receive a combined didactic session and will be offered an opportunity for hearing screenings following the didactic session. Audiology students will continue to lead both the didactic presentation and screenings
- Interprofessional education experience will be provided to Audiology students:
  - All first and third-year Audiology students
  - 2 Faculty members from UNC School of Dentistry (1 dental and 1 dental hygiene) will present instruction on completion of a head and neck examination
  - Didactic instruction including utilization of an instructional video from Smiles For Life, a national oral health curriculum, and a demonstration will be included
  - 7 Dental and 7 DH students will lead small group demonstration and practice sessions with the Audiology students

## References

1. Vohr B. Overview: infants and children with hearing loss—part I. Ment Retard Dev Disabil Res Rev. 2003;9:62–64.
2. Dillon CF, Gu Q, Hoffman H, Ko CW. Vision, hearing, balance, and sensory impairment in Americans aged 70 years and over: United States, 1999-2006. NCHS data brief, no 31. Hyattsville, MD: National Center for Health Statistics. 2010.
3. Goncalves CGd, Santos L, Lobato D, Ribas A, Lacerda ABM, Marques J. Characterization of hearing thresholds from 500 to 16, 000 Hz in dentists: a comparative study. Int Arch Otorhinolaryngol 2015;19:156-160.
4. Myers J, John AB, Kimball S, Fruits T. Prevalence of tinnitus and noise-induced hearing loss in dentists. Nosie Health. 2016 18(85):347-354.