**Real World Temporal Relationships between Cardiovascular Disease and Low Frequency Hearing Loss** Erin Harvey MD<sup>1</sup>, David R. Friedland MD, PhD<sup>1.3</sup>, Jazzmyne A. Adams, MPH<sup>1</sup>, Kristen Osinski, MS<sup>3</sup>, Jake Luo PhD<sup>2</sup> <sup>1</sup>Department of Otolaryngology and Communication Sciences: Medical College of Wisconsin <sup>2</sup>Department of Health Informatics and Administration: University of Wisconsin – Milwaukee

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> Low-frequency adult onset hearing loss is likely secondary to cardiovascular compromise, however, in real-world settings a significant number of patients have a vascular hearing loss pattern prior to their first diagnosis of CVD

### Abstract

**Objectives:** To characterize the association between low frequency sensorineural hearing loss and the timing and subtype of cardiovascular disease diagnosis.

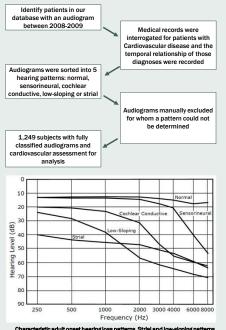
Study Design: Retrospective chart review Methods: Patients undergoing audiometry from 2008-2009 were assessed for hearing loss pattern, prior or subsequent diagnosis of cardiovascular disease (CVD), and subtype of cardiovascular disorder. Correlation analyses were performed between hearing pattern and CVD disease subtype.

and CVU disease subtype. **Results:** CVD was observed in 38.6% of 1249 patients; 34.6% of females and 43.3% of males. Only 21.7% of patients with normal hearing (n=494) had a diagnosis of CVD in contrast to those with the two low frequency hearing loss patterns; 52.3% of those with a low-sioping pattern and 50.2% of those with a strial pattern. The likelihood of low-frequency hearing loss was significantly higher (pc-0001) in those with history of acute MI (OR: 2.175, (C1: 168, 2.81)). heart failure (4.55, 12.25, 9.10), and peripheral vascular disease (2.66, [1.21, 5.85)). Among those with low frequency hearing loss patterns, most were diagnosed with CVD proto the audiometric documentation, however, 39.9% were diagnosed with CVD subsequently.

Conclusions: Low-frequency adult-nose thearing loss showed significant correlation with cardiovascular disease. Hearing loss is likely secondary to cardiovascular compromise, however, in a real-world setting a significant number of patients demonstrated a vascular hearing loss pattern prior to their first diagnosis of CVD. Thus, patients identified with how-frequency hearing loss should be counselled as regards CVD risk and appropriate medical follow-up.

# Methods

#### Study Design: Retrospective cohort study



aring loss patterns. Strial and low-sloping pa prrelate with underlying cardiovascular disea Characteristic have been hy

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## Results

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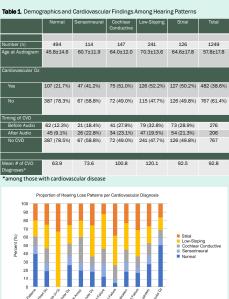
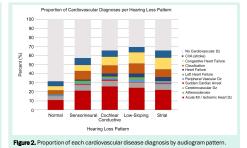


Figure 1. Proportion of Hearing Loss Patterns by Cardiovascular disease diagnosis.

	Cardiovascular Disease	No Cardiovascular Disease	Total
All Subjects (n, %)	482 (38.6%)	767 (61.4%)	1249
Age (mean±std)	66.9±14.0	51.9±17.7	57.7±17.9
Sex (n, %)			
Male	233 (43.1%)	307 (56.9%)	540
Female	249 (35.1%)	460 (64.9%)	709
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Race (n, %)			
White	399 (39.1%)	621 (60.9%)	1020
Black	62 (41.9%)	86 (58.1%)	148
Asian	5 (20.8%)	19 (79.2%)	24
Hearing Pattern (n, %)			
Normal	107 (21.7%)	387 (78.3%)	494
Sensorineural	47 (41.2%)	67 (58.8%)	114
Cochlear Conductive	75 (49.0%)	72 (51.0%)	147
Low-Sloping	126 (52.3%)	115 (47.7%)	241
Strial	127 (50.2%)	126 (49.8%)	253



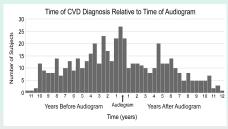


Figure 3. Timing of cardiovascular disease diagnosis relative to the timing of the audiogram. This indicates a spectrum of timing with a preponderance of patients being diagnosed before.

## Discussion

In real-world practice, the temporal relationship of CVD and hearing loss is variable. Hearing loss may represent a marker for atherosclerotic disease and provide an opportunity for cardiovascular assessment. Additionally, as CVD contributes to hearing loss, hearing evaluation would be recommended in those identified with CVD.

## Conclusion

- This study reinforces the association between low
- frequency hearing loss and cardiovascular disorders Substantial portion of patients show these patterns prior to being clinically diagnosed with cardiac or
- peripheral vascular conditions Patients identified with low-frequency hearing loss should be counselled about CVD risk and undergo

### References



**OTO** Clinomics Precision Medicine, Personalized Care

appropriate medical follow up.