

BACKGROUND

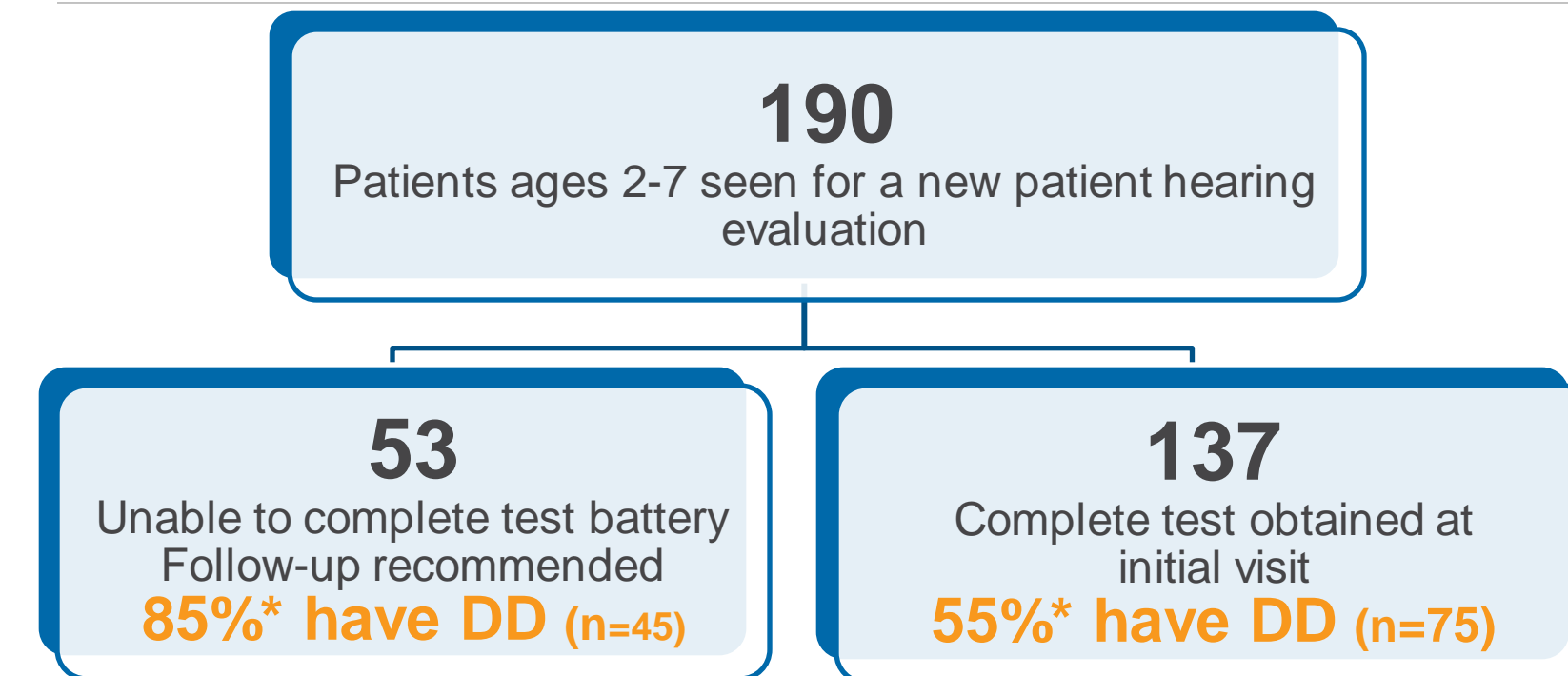
The American Academy of Pediatrics recommends an audiologic evaluation as part of the initial assessment of any child with a developmental delay (DD) (Hyman, Levy, & Myers, 2020). Not only can hearing differences coexist with DD, but the behaviors and effects of reduced hearing can mimic different DDs making reliable exclusion or identification of hearing differences a critical component of medical care for children with DD. Traditional audiological assessment is based on assumptions of typical development and may be mismatched with the developmental, communication, and behavioral needs of children with DD. For example, children with DD may require support to adjust to novel task demands, to interact with new people and environments, to tolerate sensory components of the evaluation, and to communicate. Children with developmental disabilities are less likely than typically developing peers to complete a full behavioral audiogram (Bonino et al, in progress). This project retrospectively reviews charts of children who were unable to complete behavioral audiologic testing in one visit and analyzes differences in testing and outcomes for those with and without DD.

METHODS

A report was generated through the Epic electronic medical record (EMR) system for all new patient audiology evaluations during a one-year period from 2020-2021. Records were reviewed for children between the ages of 2 and 7. The following data was then collected and stored in a REDCap database:

- Age in months
- Insurance type (public or private)
- Yes/No: use of interpreter
- Yes/No: DD in EMR "problem list" (e.g. receptive/expressive language delay, autism spectrum disorder, Trisomy 21, global developmental delay, delayed milestones)
- Testing method type (visual reinforcement audiometry (VRA), conditioned play audiometry (CPA), conventional)
- Yes/No: complete test obtained at initial visit (a minimum of tympanometry bilaterally, DPOAEs bilaterally, puretone soundfield thresholds 0.5-4K Hz, and ear-specific Speech Awareness Threshold (SAT) bilaterally.)
- Yes/No: follow-up appointment completed
- Total visits required to complete the audiologic test battery

RETROSPECTIVE REVIEW



*Chi-square test of independence (2, N = 190) p = 0.0001

43% (n=23) did NOT complete the recommended audiologic follow-up

Presence of DD in Follow-Up vs. Loss to Follow-Up

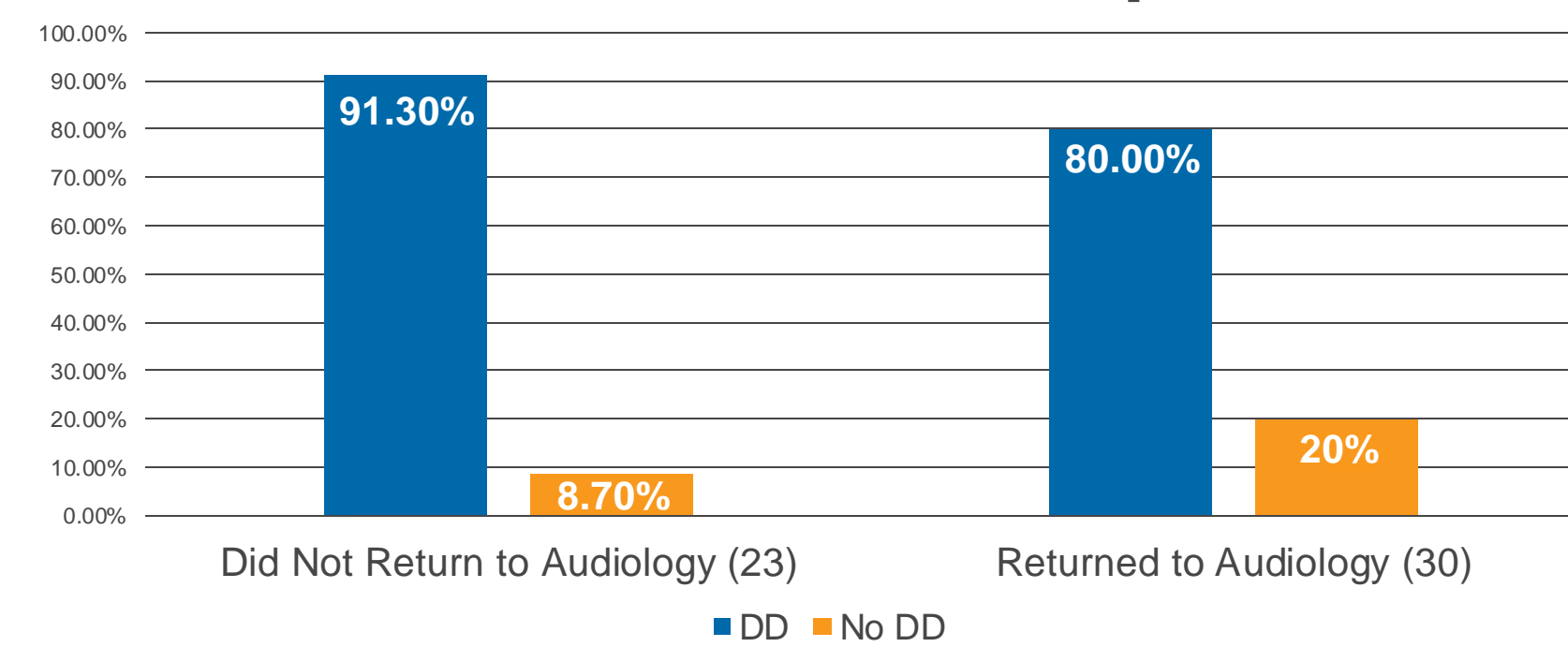


Figure 1: Chi-square test of independence (2, n = 53) p = 0.255

Type of Insurance in Follow-Up vs. Loss to Follow-Up

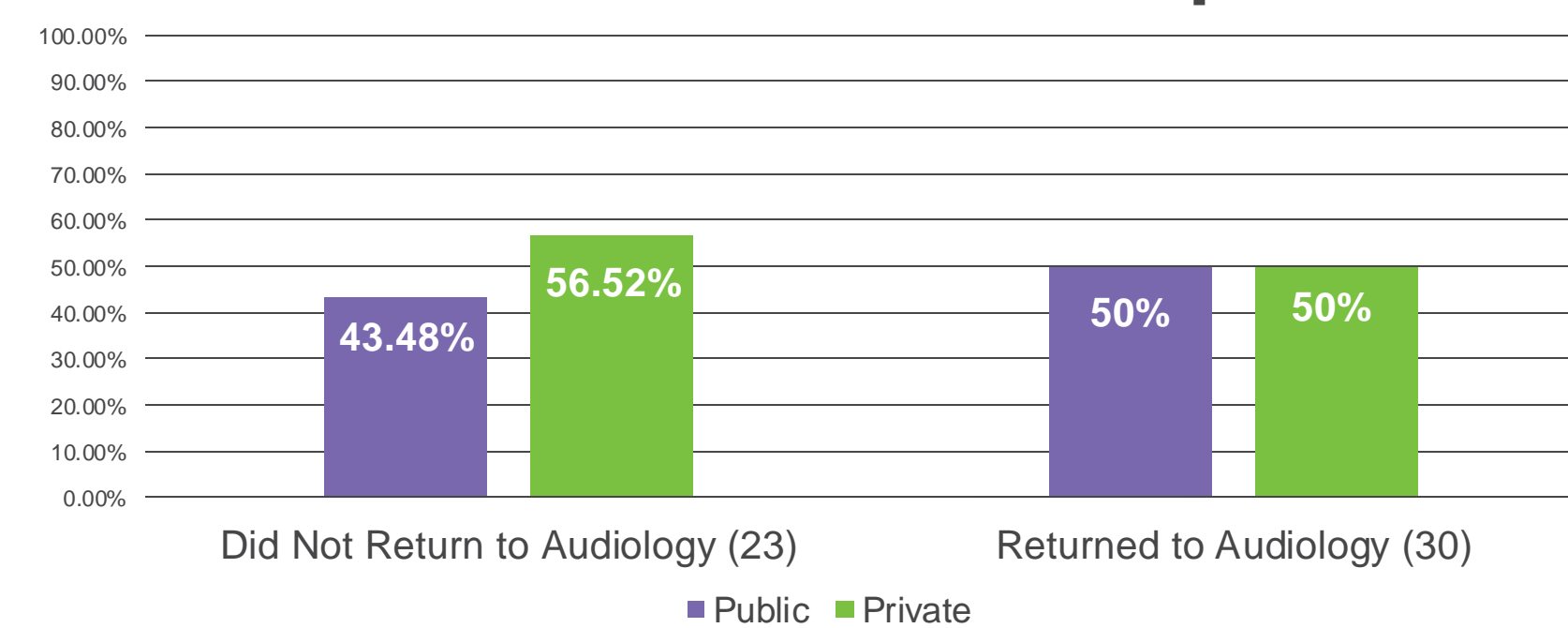


Figure 2: Chi-square test of independence (2, n = 53) p = 0.637

Test Method Used in Children ≥ 3 & Presence of DD

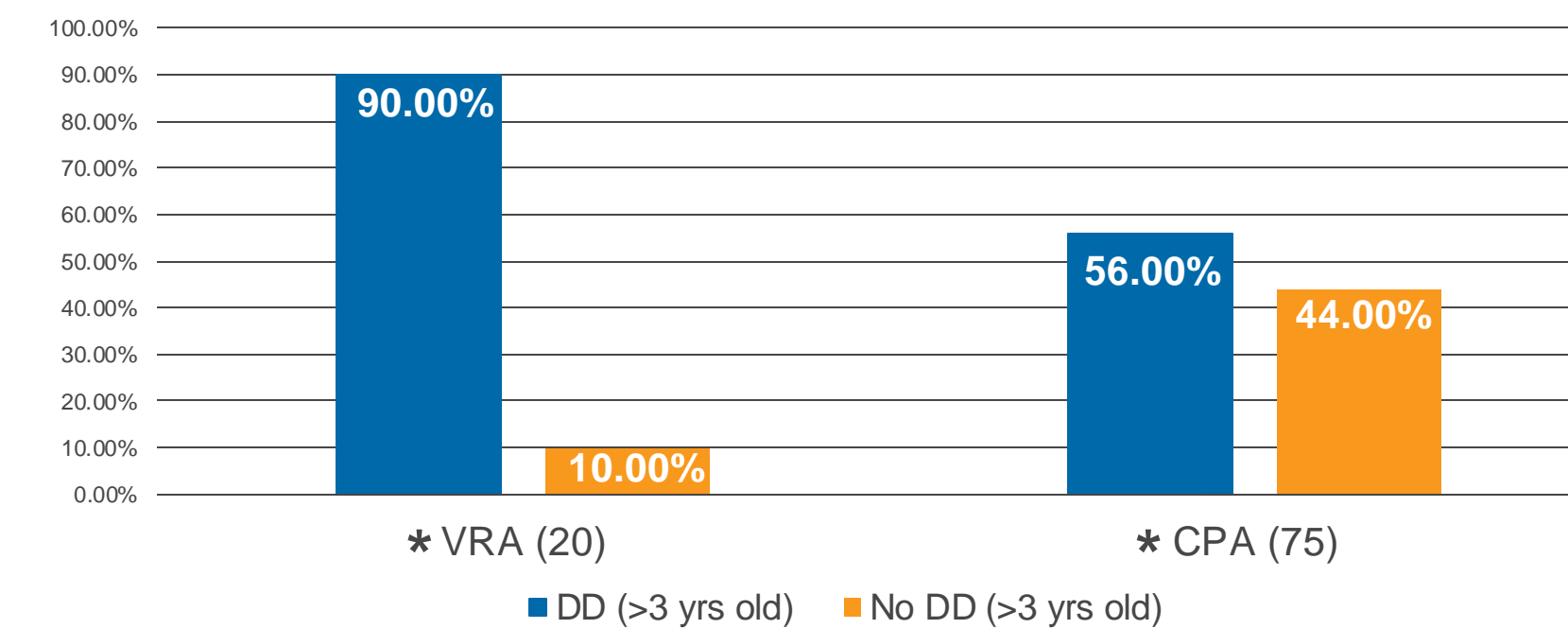


Figure 3: Only children 3 years and older are included in this figure. Presence of DD is compared between those that utilized VRA and those that utilized CPA
*Chi-square test of independence (2, n = 95) p = 0.005

Number of Visits Required to Obtain Complete Test Battery

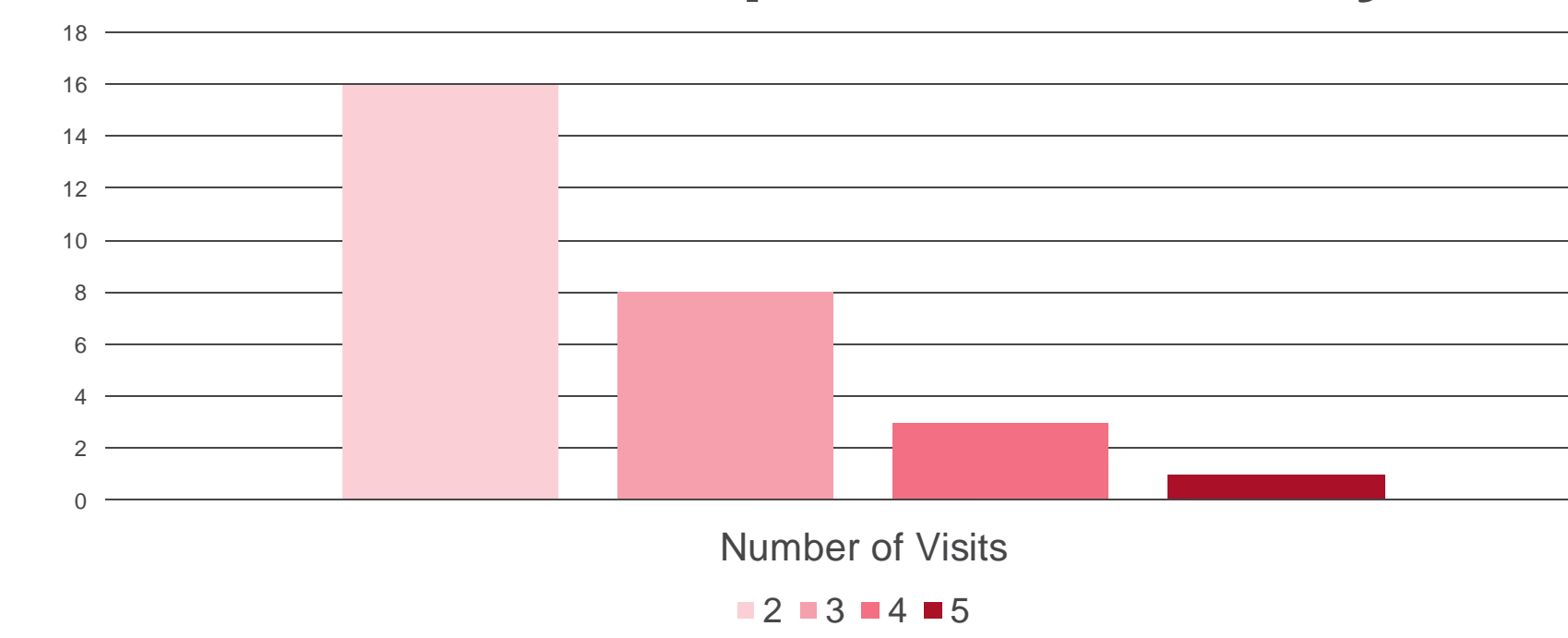


Figure 4: Counts for number of visits required to obtain the complete test battery for those who did not complete it at the first visit.

Presence of DD vs. Number of Visits to Complete Test Battery

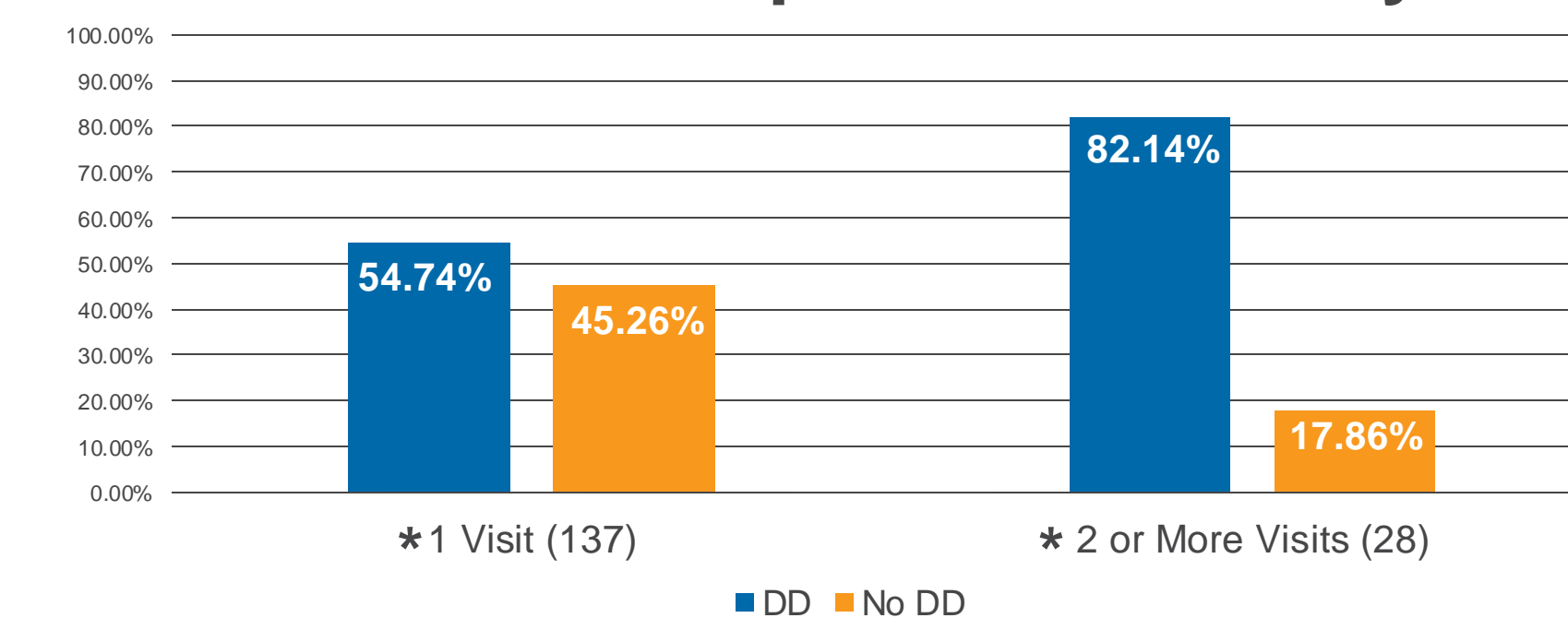


Figure 5: Complete test defined as a minimum of tympanometry bilaterally, DPOAEs bilaterally, puretone soundfield thresholds 0.5-4K Hz, and ear-specific Speech Awareness Threshold (SAT) bilaterally.
*Chi-square test of independence (2, n = 165) p = 0.007

DISCUSSION

Significant loss to follow-up (43%) was noted in this review. Chi-square tests of independence found that neither DD nor insurance type was related to whether a family returned for follow-up testing (p = 0.255, p = 0.637) (Figures 1 & 2). The impact of the COVID-19 pandemic on follow-up cannot be ignored.

Test method used during appointments was also analyzed. Audiologic testing methods are based on assumptions of typical development. For example, research has shown that >94% of typically developing children are able to complete CPA testing by age 3 (Nielson & Olson, 1997). Therefore, we tabulated which test methods were used for children over 3 and their DD status. As expected, CPA was utilized more often than VRA. Additionally, the overwhelming majority (90%) of children who utilized VRA had DD (Figure 3). This is significant because less ear-specific information is thus obtained for children with DD. This could be problematic as even a unilateral sensorineural hearing loss could impact speech-language acquisition in this group.

Overwhelmingly, children who required one or more additional visits were more likely to have a DD. Again, chi-square test of independence showed that DD was related to number of visits (p = 0.007) (Figure 5). Although audiologists are selecting the appropriate test method, based on developmental skills and not chronological age, and audiology assistants are used for these appointments, this is not sufficient to help children with DD complete the audiologic test battery. This group proposes that visual schedules and video models may be useful in familiarizing patients and families to the audiology appointment and help reduce the number of follow-up visits required.

FUTURE DIRECTIONS

1. Implement visual schedules and video models and begin data collection (McTee et al., 2020).
2. Future research may need to identify additional test procedures that are appropriate for children with DD and that yield more complete hearing assessments.

References

Hyman, S.L., Levy, S.E., & Myers, S.M. (2020). Identification, evaluation, and management of children with autism spectrum disorder. *Pediatrics*, 145(1).
Nielson, S.E. & Olson, S. (1997). Validation of Play-Conditioned Audiometry in a Clinical Setting. *Scandinavian Audiology*, 26(3).
McTee, H.M., Mood, D., Fredrickson, T., Thrasher, A., & Bonino, A.Y. (2019). Using visual supports to facilitate audiologic testing for children with autism spectrum disorder. *American Journal of Audiology*, 28(4), 823-833.

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