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# The Incredible Shrinking FM Receiver

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We have come a long way since the days of the body-worn FM receiver with cords, button transducers, and earmolds, the ones that Cece Bell describes in her book, El Deafo. If you have never seen one (or if you have, and are feeling nostalgic), she demonstrates her old Phonic Ear 431 system in a YouTube video talk about the book. In a 2018 issue of Canadian Audiologist, I discussed how some of these newest developments in Hearing Assistance Technology which use streaming may create challenges when adapted for classroom use. Manufacturer-specific remote microphones which use streaming technology either to neckloop-style receivers or directly to hearing devices offer wonderful opportunities for individuals with hearing loss to have better access to communication at work, at home and in the community. However, they often do not have all of the features needed for school use, such as streaming reliability, hardware reliability, necessary battery life, or the flexibility to accommodate classroom needs such as patching to sound field systems or providing multiple microphone options.

*Note: as in previous articles, I am using the term "FM" systems, realizing that very few of these*

*systems use frequency modulation technology anymore. For simplicity, and because it is still a very commonly used term in education, I will use the term personal FM system to represent systems that consist of a teacher worn transmitter, and a student-worn receiver, whether that be receivers attached to hearing aids, CIs or BAHAs or some type of neck loop. I will use the term "remote mic" to represent the small wireless microphones typically sold directly to consumers for home or work use, paired with personal hearing aids, CIs or BAHAs*

In the short two years since that article, FM system manufacturers have now introduced a new technology that eliminates an external FM receiver (integrated or with an audio shoe), with the receiver now located inside the hearing aid. These are amazing advances, offering the flexibility and options needed at school that FM system manufacturers have always provided, with the unobtrusive, cosmetically attractive technology previously available only through remote mic systems. With new technology, though, inevitably come new questions and new challenges. Thankfully, we can avoid or reduce many of these issues through timely clinic-school communication. One of the primary challenges offered by systems that use receivers which are internal to the hearing aid is the very pragmatic problem of (ideally) coordinating new hearing aids with the purchase of a new FM system. For example, consider the case of a student who received a new FM system a year ago, with a transmitter and the attached receivers (either integrated or with audio shoes) that are compatible with her current hearing aids. If this student now receives new hearing aids that allow for internal FM receivers, the school board may or may not be able to provide the newer system. Back in the day, when students received new hearing aids, it was simply a matter of ordering different audio shoes to make everything compatible again. With systems using internal FM receivers, the solution may be as simple as using loaner equipment to program the hearing aids for the short term; however, sometimes this is not available or not possible, and older external FM receivers will likely not be an option. Factors such as funding guidelines from Ministries of Education and internal school board policies may dictate whether the purchase of a new system or components of a new system are possible (for example, in some school boards, systems can only be purchased at certain times of the year). Good communication when new hearing aids are being considered, between clinical audiologists, educational audiologists or teachers of the deaf and hard of hearing, and parents, will ensure that everyone is on the same page concerning how a hearing aid change might impact FM system use at school. This is not an entirely new problem in education; in the past, it was relatively common when students had integrated FM receivers and obtained different hearing aids that required a different model of integrated receiver. However, it was possible to switch to audio shoes plus receivers until new FM receivers could be purchased – not ideal from the student's standpoint, but a solution that ensured continued personal FM system use. Without the possibility of audio shoes, however, we have fewer backup plans. It may be possible to use a neck loop style receiver with the hearing aid telecoils (and here I again suggest that clinical audiologists always consider the availability of telecoils during hearing aid evaluations, as having telecoils provides us with more options at school if needed). However, while we may be able to offer a student this option to ensure that he/she continues to have a personal FM system, understandably, the student may not be enthused about moving from integrated receivers to a neck loop during the process of updating his/her FM system. Working this out before new hearing aids are purchased is infinitely easier than having a student arrive at school on Monday with new hearing aids, assuming that the old FM system will just work, or that a new one is in the mail.

Educational audiologists and teachers of the deaf and hard of hearing certainly anticipate that advantage will be fewer breakdowns, with fewer components, fewer moving parts (for example, no audio input contact plates to wear down) and fewer pieces for students to lose or break; I believe this will be the case. However, it will be more important than ever for clinical audiologists and

families to consider excellent hearing aid warranties. With internal FM receivers, in the (hopefully) unlikely event that something does go wrong with the FM system reception, the entire hearing aid will need to be returned for repair, potentially incurring a cost for parents. We are very cognizant in the education of ensuring that no costs of the school FM system are passed on to parents, but we cannot cover the cost of personal hearing aid repairs.

An issue not specific to internal FM receivers, but which deserves our attention given the many options for wireless connectivity, is ensuring that sound is consistent across multiple devices that a student may be using. In education, we pay close attention to potential adverse interactions between personal FM systems and sound field systems when patching these two technologies together. However, we need to also ensure that the assistive device is transparent in all situations – when a transmitter is plugged into a tablet or laptop, for example, or if a student uses an FM system at school and also a remote mic system at home. Particularly for young children who may not be able to report on sound quality, we do not want students to have auditory input which changes over the day depending on which wired or wireless device is being interfaced with the hearing aids. Electroacoustical verification is ideal, but sometimes tricky and not always possible, so at minimum, a careful listening check when hearing aids are connected to an external device is crucial.

Finally, it is important to remember that while new developments in technology are exciting, not all families have access to them. Of course, older models of hearing aids are discontinued as newer models are developed. However, we need to ensure that the FM system options for these older models of hearing aids continue to be available. It is not unusual for educational audiologists and teachers of the deaf and hard of hearing to see students who are using old hearing aids which really should be replaced, but parents are not able to afford new aids, and the old ones are still functional. We still need to have access to audio shoes and/or integrated receivers for older models of hearing aids.

If there has been a theme over the past few years of Audiology in the Classrooms, I hope that it has been the importance of good clinic-school communication. Hearing technology is changing incredibly fast, and I know that for myself, it is very challenging to try to keep up with hearing aid technology when I do not prescribe or fit. I am sure it is equally challenging for clinical audiologists to keep track of FM system technology, particularly in more adult-focused practices. With parent consent, picking up the phone or sending an email to collaborate on technology choices ensures that our students have the best possible access to the world through hearing.