Editorial

Digital Wireless Telephones and Hearing Aids: New Challenges for Audiology

When the telephone was first invented, it was regarded as a luxury that only the wealthy could afford, and, as a result, its use grew slowly at first. More widespread use of the telephone occurred as the telephone system continued to expand, offering more people the opportunity to communicate across greater distances at lower costs. A similar trend occurred with other technological marvels of yesteryear, such as the automobile and air travel. Today, our industrialized society is critically dependent on the use of technology, and the telephone is no longer regarded as a luxury but as an essential communication tool.

The past few years have witnessed a dramatic increase in our dependence on modern technology. Innovations such as the Internet, personal computers, and wireless communication systems have had, and are continuing to have, a profound effect on virtually every aspect of society. Much of the emphasis in these emerging technologies is on increased convenience and greater efficiency. Technological advances, however, often turn out to be a double-edged sword for people with disabling conditions. The hearing aid, for example, was the direct result of advances in telephone engineering. On the other hand, engineering improvements in the design of telephone handsets so as to reduce stray magnetic fields made it much more difficult to couple a hearing aid to the telephone by means of a telecoil.

The importance of the telephone as an essential tool in our society and the need to provide people with disabling conditions with equal access to communications technology have resulted in important legislation mandating that appropriate steps be taken to achieve this goal as far as possible. It is now a requirement, for example, that all new landline telephones be hearing aid compatible (i.e., the telephone must generate a magnetic field of sufficient strength to allow for effective coupling with the telecoil of a hearing aid). With hindsight, the term "hearing aid compatible" has turned out to be a misnomer since it refers specifically to magnetic coupling with a hearing aid and overlooks the possibility that there may be other factors that may render a telephone to be incompatible with a hearing aid, as we have since discovered.

Laws are typically designed to deal with existing problems. They are seldom designed to deal with problems that may emerge in the future. The first generation of wireless telephones encoded and transmitted speech and...
other audio signals by means of analog (i.e., nondigital) techniques. These devices generated little if any audible electromagnetic interference in hearing aids. The main concern of consumer groups at this stage was to ensure that these new telephones were hearing aid compatible (in terms of magnetic coupling by means of a telecoil), and several telephone manufacturers began to produce analog wireless telephones of this type when the switch to digital wireless telephones took place.

Digital encoding and transmission of audio signals at very high carrier frequencies (such as those used by wireless telephones) can produce substantial interference in nearby audio amplifiers. Wireless telephones use relatively powerful transmitters that are held close to the ear in normal use. As a result, a person wearing a hearing aid and using a wireless telephone will have a powerful radio transmitter in close proximity to the hearing aid. If a digital wireless telephone is being used, it is very likely that a substantial amount of audible interference will be generated in the hearing aid, rendering the telephone unusable unless appropriate steps have been taken to combat this source of interference.

In 1995, consumer groups sounded the alarm that digital wireless telephones could be a long-term threat to their ability to function equitably in society. At the prodding of the Federal Communications Commission, the hearing aid industry and the wireless telephone industry began to work together on finding practical solutions to the problem. Several important developments took place, not the least of which was the high degree of cooperation among competing industries and interests. One positive outcome was the establishment of additional research studies to supplement ongoing, industry-supported studies to investigate the nature of the problem. Another significant outcome was the development of a standard for measuring and specifying electromagnetic interference in hearing aids produced by wireless telephones.

To introduce the issue to audiologic professionals, a conference was held at Gallaudet University in May 1997. Speakers at the conference summarized the results of these various activities, as well as related efforts in other countries, to audiologists and others involved in the provision of hearing aids, wireless telephones, and telephone services. These conference proceedings explain the underlying problems and background and present some of the research that has been completed during the past 5 years.

The conference and the preparation of these conference proceedings were cosponsored by the Rehabilitation Engineering Research Center on Telecommunications Access at Gallaudet University and the Rehabilitation Engineering Research Center on Hearing Enhancement at the Lexington Center for the Deaf. Both of these research centers are supported by the National Institute on Disability and Rehabilitation Research. We gratefully acknowledge the contributions of the authors and the institutions/companies sponsoring their work. We also gratefully acknowledge the assistance of Paula E. Tucker, research associate, in readying these proceedings for publication.

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