Chapter 9

Making the World Accessible for Deaf & Hard-of-Hearing Children Through Technology

Jim House & Barbara Raimondo

Today's society offers many devices and systems to make sure that D/HH individuals have access to sound-based information in their environment. What's more, today's gizmos and gadgets make it easier than ever to communicate—both aurally and visually.

Most parents of deaf and hard-of-hearing (D/HH) children are themselves hearing, and their day is full of sound. They listen to the radio, talk on their cell phone, hear the smoke detector go off. They obtain a lot of information through listening. When they find out their child can't hear, naturally they are concerned. "How will my child be able to keep up?" "How will he (or she) stay safe?" Most importantly, "Will my child be able to succeed in life?"

According to the National Institute on Deafness and Other Communication Disorders, more than 90% of D/HH children are born to hearing parents. Many of these parents may not have had previous encounters with deaf children or adults and therefore may not be familiar with the resources that D/HH people today enjoy in many areas of life.

Fortunately, today's society offers many devices and systems to make sure that D/HH individuals have access to sound-based information in their environment. What's more, today's gizmos and gadgets make it easier than ever to communicate—both aurally and visually. Even children who use hearing aids or cochlear implants benefit from visual technology. There is no reason for D/HH children to miss out on access to information. Having access with the help of technology will help D/HH children grow up to live independently.

Parents and professionals can become aware of the many tools available and help make sure they are available to their children and

NCHAM National Center for Hearing Assessment and Management Utah State University™

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the children with whom they work. D/HH children need access to information that hearing people take for granted. What's more, every experience of information access becomes an experience of language and learning. With access to information provided by technology, D/HH children can learn to function independently and make informed decisions.

Many of the technologies shown here will evolve over the years. By becoming aware of what is presently available, parents and professionals can use this guide as a starting point to research new alerting devices, telephones, captioned information, and computer applications (apps). While this guide is not all-inclusive, we hope that by following some of these links, you will find other resources and technologies. If you share your findings with us, we will consider them for inclusion in future updates of this chapter.

Technology for the Home

All-in-One Alerting Systems

Many devices in our homes alert us through sound. These sounds can be made visual or tactile through "all-in-one" alerting devices, which combine a receiver with several transmitters. Different receivers and transmitters serve a specific purpose:

- Letting you know when the telephone or doorbell is ringing.
- When the food in the microwave is cooked.
- When the clothes in the washing machine are ready.
- Receivers can be connected to lamps or vibrating bed shakers.
- Different flashing or buzzing patterns can help the user discern the source of the signal.
- Additional lamp receivers can be installed around the home to alert the user in different rooms.

You may be thinking, "Wait a minute, my 2-year-old isn't using the washing machine yet!" But seeing a light flash when the machine is finished can help make the child aware of what is happening in his environment. Similarly, the child may not be answering the door yet either, but the child may see Dad jump up in the middle of reading the child a story to answer the door, and lo and behold, the UPS driver is standing there with a package from Grandma. Being able to connect the flashing of a light with the fact that someone is at the door helps the child learn about his world.

Later the child will (we hope!) be doing his own laundry. As he gets older and starts to value his privacy, he may request that his parents let him know when they want to come into his room. For many D/HH children, knocking won't work. But parents want to be respectful. One remedy is to install a flashing doorbell at the child's door. A simple flashing doorbell mechanism can be purchased online. It can be attached to a lamp that flashes as the doorbell button is pressed.

Smoke & Carbon Monoxide Detectors

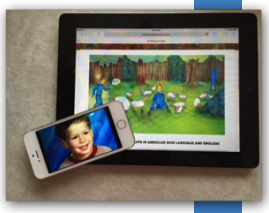
It is a difficult fact to face: according to the U.S. Fire Administration, 57% of all child fire deaths occur to those 4 or younger. Yet it is well established that smoke detectors save lives. Visual smoke and carbon monoxide detectors should be installed in the child's bedroom and in any other room used by the child. Detectors with strobe lights are the most common types. There are also devices that detect the sound of a regular smoke detector and flash a lamp when activated by the high-pitched sound of a smoke detector. These devices also can be connected to a bed shaker, a strong fan as a substitute, or to complement a flashing strobe light. Starting at a very young age, children should be taught about fire safety and what to do if they see or feel a fire alarm go off.

Advancement of the Internet has provided communication opportunities that we could only read about in science fiction novels a decade or so ago.

If you are a renter, many jurisdictions have laws that require apartment managers and other landlords to install visual smoke detectors upon request. If you are a homeowner, check with your local fire department to see if it is able to provide and install free visual smoke detectors in your home.

Telecommunications Access

Advancement of the Internet has provided communication opportunities that we could only read about in science fiction novels a decade or so ago. D/HH and even hearing people have adopted new ways of communicating, such as email, instant messaging (texting), and video communications. Families can introduce these to their children to help them stay in touch with others. While in the "old days," Grandma or Granddad may have written a letter to Grandkid, today they can send an e-mail or text. Mom or Dad can read the message to Grandkid and type the response dictated by the child. As she gets older, she can learn to send messages herself. She can also use video apps, which support sign language. For example, FaceTime allows anyone to have a real-time visual and auditory conversation. An app called Glide allows users to record a video message and send it to another. That individual can record a video message in response and send it back. Each party can read the message and respond at a convenient time.



The availability of high-quality video also means that children and families have access to American Sign Language stories and lessons. Gallaudet University's Visual Language and Visual Learning Center has produced interactive storybook apps in American Sign Language and English that are aimed at young children. Families learning to sign may want to use ASLNook, which highlights videos of a real-life family signing in natural situations. There are many, many other ASL and sign language apps available. Families can explore them and use their favorites.

Telephones

The first device that allowed D/HH people to use the telephone was the TTY—also known as the text telephone. Both parties typed to each other using abbreviations, such as GA to let the other party "go ahead" and type back and SK, "stop keying," when it was time to hang up. The TTY was slow and cumbersome by today's standards but revolutionary in its time. Although most people have moved on to digital technology, the TTY is still used where there is no Internet connection.

Andrew Saks and Dr. James Marsters watch Robert Weitbrecht type on one of the first text telephones in the mid-60s.

A more recent model of a TTY from Ultratec.

Hearing Aid Compatibility for Digital Phones

Although the Internet has opened up a world of opportunities for visual communication, the telephone is still a basic communication tool. Telephone services are more accessible than ever. Many digital phones are designed to be used with hearing aids and cochlear implants. Although you probably won't be buying your very young child a cell phone, he may be able to have that chat with Grandma on a digital phone you already own.

Phones are rated based on their compatibility with certain hearing aids that contain a switch that puts the hearing aid in "microphone" mode or in "telecoil" mode. Microphone mode is used most of the time. When on the phone or using an assistive listening device (ALD), the user switches to the telecoil mode. While in telecoil mode,

signals from the phone go directly to the hearing aid—eliminating any background noise. M ratings on digital phones identify phones with radio frequency levels that are less likely to interfere with a digital hearing aid in the microphone mode. An M4 rating is considered best. T ratings designate the capability of the phone to link with hearing aids set to telecoil and avoid electronic noise and feedback. Phones with T4 ratings are considered best when using a cell phone with hearing aids on the telecoil setting. Choosing a cell phone with a M4/T4 rating may ensure that your child will hear better with that phone than with a phone that has lower ratings or no ratings at all.

The experience of a person with a hearing or speech disability in making phone calls should be as close as possible to that of a hearing person making the same call.

However, the M and T ratings only tell part of the story. Each person hears voice transmission differently on the same phone, even if they have identical audiograms and are trying the same phone. Additionally, there are a number of ALDs, like powered neckloops or Bluetooth wireless neckloops, to assist in hearing on a cell phone.

People who cannot hear well on the phone, but still need to use the phone rather than text or e-mail, can use a telephone relay service. Title IV of the Americans with Disabilities Act (ADA) establishes access to the telephone network through the use of relay services in a manner that is "functionally equivalent." This means that the experience of a person with a hearing or speech disability in making phone calls should be as close as possible to that of a hearing person making the same call.

The Federal Communications Commission (FCC) is the agency responsible for administrating the Telecommunications Relay Service (TRS). TRS links a caller with a hearing or speech disability with another person with or without a disability using English or Spanish. There are two categories of TRSs—each having its own advantages and disadvantages (see *Table 1*).

Captioned Telephones

Captioned telephone services use specially designed phones with a read-out screen that allows the caller to speak directly to the other party. The phones come in a variety of configurations for landline users, web-browser users, and mobile users. The caller can hear the other party and read responses that are transcribed by an operator—mostly with speech recognition software. Applications for smartphones, such as Android, Windows, and iPhone, provide captioned calls, so if captions are likely to increase comprehension during telephone calls, especially using phones with M and T ratings, this combination may work well.

For more information about vendors and the types of phones they offer, go to the TDI website and download a PDF copy of *Keeping An Eye On The Call - Captioned Telephones: A Review*, *41*(4).

Videophone

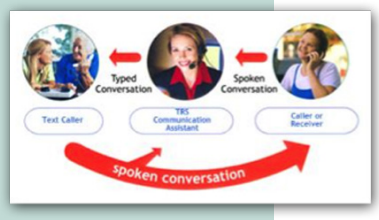
A videophone is a telephone service where each caller can see and hear the other. Many in the deaf community have a videophone, so they can communicate directly with another deaf individual who has a videophone. Some video relay service (VRS) providers install a device in the home that connects to a television set and serves as a videophone. Families can contact a VRS provider to obtain this equipment for the child. Some apps function as a videophone and allow hearing family members and friends to communicate directly to the deaf child without using a videophone.

FaceTime, From Apple

Table 1
Two Categories of Telecommunications Relay Services (TRSs)

Category 1: Statewide TRS

Every state in the U.S. provides its own TRS service through a provider for people using landline phones. The easiest way to reach the relay service in your own state is by dialing 711, whether you use a TTY or a voice telephone. Captioned telephone services are available in all states for those using landline-captioned telephones.



From USPS

Category 2: Internet Protocol-Based TRS

There now is available Video Relay Service, Captioned Telephone Service, and IP Replay. These services can be accessed by going to designated websites on the computer or downloading apps on a smartphone. Users are required to register with the Internet service provider(s) to obtain a 10-digit telephone number.

Video Relay Service

Video Relay Service allows people who know sign language to call anyone who can hear but does not know sign language with the assistance of a sign language interpreter.

From TAP Gallaudet

Captioned Telephone Service

Captioned Telephone Service permits both parties to speak directly with each other, and the D/HH person can read a transcript of the other person's words. In addition to landline phones, a captioned telephone user may use a web browser with a nearby phone or a mobile phone.

From NTID

IP Relay Service

IP Relay Service allows a deaf caller to type on a computer or mobile device to a communications assistant (CA), who then reads the typed message from the caller to the other party. The CA types the other party's spoken responses back to the deaf caller.

From Sprint

Accessible Communications for Everyone

Video telephony is poised for some dramatic improvements within the next few months. The FCC is expected to release an open source video access platform called Accessible Communications for Everyone (ACE). ACE will enable Americans who are deaf, hard of hearing, deaf-blind, or who have a speech disability to communicate directly with federal agencies, local governments, and businesses, such as Verizon or Microsoft, in American Sign Language (ASL).

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The platform will provide open source applications for mobile and desktop operating systems, which—along with direct video calling—will allow for text and high-quality voice communications. In addition, the FCC will provide applications that relay service users can download on their smartphones or desktops in order to communicate directly with agency representatives at the FCC or the U.S. Small Business Administration. An ASL user will be able to click on whom they want to talk to, and the call will be connected directly to a customer service center staffed by, most commonly, another person who is D/HH and fluent in ASL. The first release of ACE is scheduled for the spring of 2016.

Media Access

Television Captioning

(From PBS)

As your child gets older, from time to time, he may watch a television program. Did you know that nearly all television programming must be captioned? Your child may not be able to read today, but over time, he will. Captions mean that he will be able to follow what is being said. Federal Communications Commission rules mandate that television captions be:

- ***Accurate.*** Captions must match the spoken words in the dialogue and convey background noises and other sounds to the fullest extent possible.
- ***Synchronous.*** Captions must coincide with their corresponding spoken words and sounds to the greatest extent possible and must be displayed on the screen at a speed that can be read by viewers.
- ***Complete.*** Captions must run from the beginning to the end of the program to the fullest extent possible.
- ***Properly placed.*** Captions should not block other important visual content on the screen, overlap one another, or run off the edge of the video screen.

The FCC has a webpage where you can find out more about the regulations governing closed captioning on television.

The FCC also requires that emergency information broadcast on television must be visually and aurally accessible. Information about a current emergency is intended to help protect life, health, safety, or property. Examples include, but are not limited to:

- ***Immediate weather situations:*** tornadoes, hurricanes, floods, tidal waves, earthquakes, icing conditions, heavy snows, widespread fires, warnings and watches of impending weather changes
- ***Community situations***, such as discharge of toxic gases, widespread power failures, industrial explosions, civil disorders, school closings, and changes in school bus schedules resulting from such conditions.

The information provided visually and aurally must include critical details regarding the emergency and how to respond. Examples of critical details include:

- Specific details regarding the areas that may be affected by the emergency.
- Evacuation orders, detailed descriptions of areas to be evacuated, and specific evacuation routes.

There are different ways to make this information visually accessible, but captioning is used most of the time.

- Approved shelters or how to take shelter in one's home (shelter in place).
- Instructions on how to secure personal property.
- Locations of road closures.
- How to obtain relief assistance.

There are different ways to make this information visually accessible, but captioning is used most of the time. The FCC has more information about emergency video programming accessibility for viewers with hearing and visual disabilities.

Internet Captioning of Television Programming

At the time television captioning came along, no one could have predicted the expansion of the Internet and the proliferation of Internet video programming that came with it. For example, some do not "watch television" on the TV set. They watch a program that once was shown on television on the Internet.

At first, there were no requirements that Internet programming display captions. So a program shown on television would be captioned, and when it moved to the Internet, it would not always be captioned! Today, FCC rules require captioned programs that have been shown on TV to be captioned when reshown on the Internet. This covers full-length video programming, including those shown in segments, that includes substantial portions of the programming. Video clips, which are shorter, will be required to be captioned beginning in 2016.

Consumer-generated homemade video and movies shown on the Internet are exempt from the FCC requirements, unless they have been shown on TV with captions.

Captioning is not just for D/HH people. Many hearing individuals use captioning either to supplement the spoken words, to see the words when in a noisy place, or to keep the volume down when the viewer needs a quiet environment. Captioning has also proven to be an excellent literacy tool, allowing children and adults who are learning to read follow the text that is displayed as the person speaks. Cities like Portland, Oregon, and Baltimore, Maryland, now require public TV sets to display captioning during business hours.

Movie Captioning

The FCC does not regulate captioning of theatrical movies, DVDs, or video games. However, more and more of these technologies are including captions. If you want to take your child to the movies, you will find that captioned movies are much more available than they used to be. Some movies are shown with open captions, which means that the captions are displayed on the screen for everyone in the audience to see. Most D/HH organizations and advocates on captioning issues prefer this method. But other technologies are used as well. Here are two of the common technologies:

- ***Sony Entertainment Access Glasses*** (commonly used in Regal Cinemas) allow for captions to be seen "in the air" by providing a large pair of glasses that the viewer wears during the movie.

- ***CaptiView*** (used in Century Theaters) is a system that shows captions on a rectangular display held in place by a flexible goose-neck stand attached to a base that fits into the cup holder.

Other devices may be in use as well, and emerging technologies may be working their way through the pipeline. So you and your child someday may watch captions on a device that has not yet been invented!

Access to 911 Services & Emergency Notification

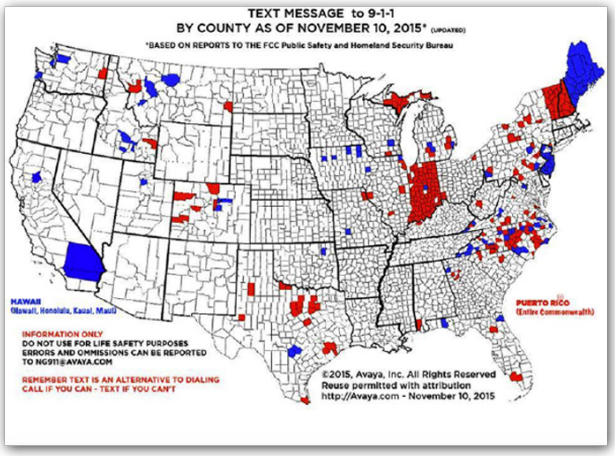
While we hope they never have to, it is important for even very young children

to know how to call 911. Preschoolers should be taught when and how to call for help in an emergency. Although many consumers rely on cellphones and do not even maintain a landline phone, a landline is important to have if there is a young child in your home. A call from a landline phone is routed to the nearest appropriate public safety answering point (PSAP). Your landline is associated with a fixed address—your home—so emergency responders see your address right away on their computer when someone from your home calls. Further, landlines do not depend on household electricity to function, as do Internet-based phones (although the phone will need a charged battery if the electricity goes out). A child can be taught to call 911, and even if the child is too afraid or confused to say anything, the emergency dispatcher will send an emergency responder. At this time, landlines are the most reliable technology for calling 911.

As your child gets older, he may be able to call for help through "Next Generation 911," which is currently being developed. When it is completed, it will allow individuals to call the nearest center on the Internet with voice, video, and/or data. If your child uses sign language, the dispatcher that answers the call will be able to summon a sign language interpreter to help with the call in real time. The same interpreter will function as a video remote interpreter after the call to assist with emergency responders after they arrive on the scene.

This future of 911 services is about 5 to 10 years from becoming a reality. *In most cases, there is no direct text or videophone access to emergency assistance. A landline phone or a TTY is the best device for calling 911 directly.*

This future of 911 services is about 5 to 10 years from becoming a reality. In the interim, some states are developing a system that will allow texting to 911. This service has already been implemented statewide in New Hampshire, Vermont, and Maine, with partial coverage in 24 other states. Many areas in the United States still remain without direct access via texting. *In most cases, there is no direct text or videophone access to emergency assistance. A landline phone or a TTY is the best device for calling 911 directly.*



Text-to-911 continues to proliferate. Around the country, more and more public safety answering points (PSAPs) are being certified as ready to receive text messages. Please note that just because a PSAP is listed on the map, it may be some time before it actually starts providing Text-to-911 services. Please check with your local PSAP management to verify if the service is in operation, and that text calls are being accepted.

Wireless Emergency Alerts

There are several types of emergency notification systems available in your community. One is the Wireless Emergency Alert (WEA), which is a service jointly operated by the FCC and Federal Emergency Management Agency (FEMA). Wireless devices made within the past few years have cell broadcast capabilities built in that will warn the user of local weather emergencies and natural or manmade disasters, as well as Amber Alerts and presidential emergency declarations. These messages are broadcast automatically to mobile devices, and no registration is required.

Another type of emergency notification service may be available from your local PSAP or 911 call centers. These services also warn you about local emergencies through email or text. Check with

The world is becoming more accessible every day. As technologies continue to improve, your child's access to information will continue to expand. The future is becoming brighter!

your local emergency management organization at home, work, or school to sign up for local notifications.

Conclusion

There are many practices, devices, and materials that do provide information visually. Regardless of your child's hearing levels, the world is becoming more accessible every day. As technologies continue to improve, your child's access to information will continue to expand. Take a look at what is available, and use any and all systems to make sure your child has as many opportunities as possible. The future is becoming brighter!

Resources

Major Wireless Carriers and Other Industry Resources

The four major U.S. wireless service providers have staff trained to maximize the accessibility of the phones you purchase from them. For more information about the vendors, their services for customers with disabilities, and other resources on wireless phones, go to the TDI website.

CTIA—a wireless industry trade association administers AccessWireless.org, an online interactive guide to help you select a phone that meets your needs.

The Wireless Rehabilitation Engineering and Research Center (RERC) does research and development on wireless phones with funding from the U.S. Department of Education.

The Technology Access Program at Gallaudet University administers several projects with the goal of improving access to technology for D/HH consumers.

The FCC's National Deaf-Blind Equipment Distribution Program addresses the availability and affordability of specialized telecommunications equipment for deaf-blind people through its I Can Connect program.

Where to Obtain Equipment

For more information about these devices and other products for the household, visit these online retailers. Other options can be found by searching for "Visual Alerting Devices."

Harris Communications

Hearing, Speech, & Deafness Center Store

HearMore.com

RehabMart.com

Telecommunications equipment, alerting devices, and other types of products may also be available to qualified individuals and households through the local telecommunications equipment distribution program (TEDP), if there is one in your state. For no charge or a nominal fee, these devices offered may vary depending on the state where you reside. To locate your nearest TEDP, go to the Telecommunications Equipment Distribution Program Association (TEDPA) website directory of state programs.

Advocacy Resources for Parents

Access to technology for D/HH individuals did not happen on its own. In the past, when new technologies were being developed, D/HH people were left out. For example, when movies were silent, D/HH and hearing people could enjoy them. When sound was added, no provisions were made for D/HH people to access the auditory information. Over the years, many D/HH consumers and their hearing allies worked to pass laws that require the kind of access we see today. The following organizations have advocated for this access. You may wish to consider joining and supporting one or more of these organizations. Further, they can provide technical assistance when you or your child experience barriers to technology in areas of telecommunications, captioning, and other issues. Some of these organizations may have state and local chapters in your community.

Alexander Graham Bell Association for the Deaf and Hard of Hearing (AGBell)

American Association of the Deaf Blind (AADB)

American Society for Deaf Children (ASDC)

Association for Late Deafened Adults (ALDA

Cerebral Palsy and Deaf Organization (CPADO)

Hearing Loss Association of America (HLAA)

National Association of the Deaf (NAD)

Telecommunications for the Deaf and Hard of Hearing, Inc. (TDI)

Filing Complaints with the Federal Communications Commission (FCC) on TRS, Advanced Communications, Hearing Aid Compatibility, Mobile Phone Internet Browsers, Telephone Services and Equipment, Access to Emergency Information, Video Description and Closed Captioning (for television and other video display equipment), and other disability issues using Form 2000C.