Stroke and Traumatic Brain Injury (TBI) typically happen without warning. They can occur to anyone at any age. Stroke or TBI affects each person in a unique way, resulting in different levels of impairment and different needs. However, some common difficulties include:

- problems with talking, reading and writing;
- problems with memory or other cognitive activities that impair ability to organize tasks and follow a schedule; and
- problems with leg and/or arm weakness or paralysis that can impair mobility, balance, and the ability to do things with both hands.

Assistive technologies (AT) can contribute to rehabilitation and recovery, as well as improve and support ongoing function and activities at home, work and in the community. Use this guide to find the types of AT that might meet your individual needs. The resource section lists organizations that can help you find healthcare practitioners, providers, and peers who can assist you in finding, adapting, and operating the AT you may want.

Communications, Speech, and Language

At least one-fourth of all stroke survivors experience language impairments, involving the ability to speak, write, and understand spoken and written language. The medical term for these communication difficulties is “aphasia.” People with TBI may experience similar language issues.

Speech language pathologists (SLPs) are the healthcare practitioners who typically provide evaluation, speech therapy, and assistance with finding useful AT for aphasia, and adapting it to your needs. You can find an SLP and other resources from the American Speech-Language-Hearing Association (ASHA). ASHA also has an Online Buyers Guide. The National Aphasia Association provides links to support groups, information on assistive technology and other aphasia resources.

AT for communications has changed rapidly in recent years, with many devices and computer software products now providing an array of useful features. Tablet and smartphone capabilities and applications (apps) have also improved access and ease of use. If you want low-tech alternatives, like communication books and boards, you can develop and customize them using software templates and online resources.

Augmentative alternative communication (AAC) products

Augmentative alternative communication (AAC) devices for people with aphasia generally are speech generating devices that provide icons, pictures and key phrases that you can select with a mouse click or touch screen to say aloud. These may also be called “Voice Output Communication Aids.” Examples
of developers for such devices include Lingraphica, Dynavox, and FRS Custom Solutions.iii

These devices have grown smaller in size, to about the size of an iPad. The have enhanced software, connectivity and other features for greater personalization and usefulness in rehabilitation, as well as in everyday communications. Medicare and some private insurance may pay for these devices.

There are some speech-generating software products for aphasia that you can use on your own computer. For example, if you have difficulties thinking of words and words escape your memory before you have time to combine them into sentences, SentenceShaper may be helpful. The software allows you to record words or short phrases. Then all you need to do is click on icons that represent those words to play your recording of them and create sentences. Your words and phrases can also be transferred to other AAC devices and tablets for mobility.

For a low-tech approach, consider a communication book. You assemble key images and words from preprinted cards, templates, clip art, and personal photos into a notebook or cardholder. You can use fabric, flexible plastic, and wrist wraps to hold the cards.

Reading and Text-to-Speech

Hearing typed or printed words aloud can help you communicate and improve your reading comprehension. On the computer, you can use read-aloud functions built into various common software programs. For example, you can hear many PDF documents by using current versions of Adobe Reader’s “Read Out Loud” function, available on the “View” drop down list. Microsoft Office programs, like MS Word, provide a “Speak” command that can be added to the toolbar.

There are some screen-reader software programs that are easy for persons with aphasia/TBI to use, like Natural Reader. These will read text from email, websites, and various documents directly or by cutting and pasting the text into the reader’s box. There are screen-readers developed for people with low vision/blindness, like JAWS that have extensive features designed to read aloud the operating functions for Windows programs, as well as the text in documents.

Smartphones and tablets generally have basic built-in text-to-speech applications that allow email, text messages, and certain documents to be read aloud. Some may be included as part of the “hands-free” function.

Writing Tools Software

AT for writing helps you find words, check spelling and grammar, organize your thinking, and build sentences. For everyday writing assistance, GoQ software and WriteOnline, originally designed as educational software, are easy for many people with aphasia to use.
Computer software programs designed specifically for rehabilitation, such as Bungalow Aphasia Tutor, provide exercises with hints and read-aloud features so you can practice at home.

**Cognition, Organization, and Memory**

Some strokes and TBI result in “cognition” problems, such as trouble in timekeeping, scheduling, organizing, planning and starting tasks; problems following steps to complete tasks; difficulties in solving everyday problems; and short term memory loss. Cognitive therapy that includes how to use AT can be helpful.iv

SLPs and neuropsychologists are the healthcare practitioners who typically provide evaluation, cognitive therapy, and assistance with finding useful AT.

**Software Programs**

Software programs for cognitive rehabilitation, like those provided by the Neuroscience Center and Lash & Associates, may help you build skills in problem-solving, attention, concentration, memory, planning, and organizing. Some offer assessment features for the practitioner and exercises you can do at home.

You can learn how to use the computer calendars provided by email services like AOL and Gmail, and software like MS Outlook, to list everyday tasks and schedule appointments. If your email program is open, you can receive reminders on your computer.

For a portable, discreet device, consider using a programmable wrist watch, like the Watchminder, with an alarm that vibrates to remind you to take your medication, look at your calendar, or other action.

Consumer mobile devices such as cell phones, smartphones, music players, and tablets often come pre-loaded with calendars, alarm reminders, task lists, maps, and other useful cognitive support tools.

**Voice Recorders**

Voice recorders can be an easy-to-use memory aid. You can record your own messages, as well as comments and directions from your healthcare provider, caregiver, friends, instructors, or co-workers. There are many affordable, pocket-sized digital recorders that can hold hours of recordings which can then be downloaded to a computer for future reference.

Low-tech approaches include: a large calendar with space to write the day’s tasks and activities placed in a central location, like the Refridge-A-Minder; and a daily planner/calendar book to use when going out.

**There’s an App for That: How to Select Apps for Communication and Cognitive Functions**

Your smartphone or tablet can become your best friend and assistive device. There are hundreds of mobile apps with features to support your stroke and TBI-related needs for communication, language, organization, scheduling, healthcare treatment, and everyday activities. Some of these apps are pre-loaded on mobile devices, and most can be purchased through the app stores on the devices. The problem then becomes, how do you choose among all these apps?

Some apps, like SmallTalk and Compass are extensions of software and devices made by established AAC
providers to enhance the functions, resources, and connectivity of their current products. If you use their other products, these apps might be a good starting point. Also, if you are not a current user, these apps may be a good way to test whether you would use the more extensive features of their software and devices.

In selecting an app, you should follow these steps:

- **Define your needs.** What function or assistance do you need? What do you want to be able to do with this app? For example, do you need AAC/speech generation or do you need help in organizing and remembering tasks?

- **Find the fit.** Does this do what you need? Is it easy for you to use? Compare your needs to the functions, features and specifications of the app. There are some sites and apps that can assist you in making the comparison.

- **See it in action.** Watch demonstrations of the app on the app’s website and through YouTube demonstrations. Do you understand how it works?

- **Read reviews** by experts, commentators, and other users to see if they have successfully used the app for the same functions that you need. Did they raise concerns that might apply to you?

- **Take a test run.** Does your speech therapist, practitioner, or other user have access to the app to show you how it works? Some apps have a free or low-cost “lite” version that allows you to try out some of the features.

- **Consult apps lists.** There are a number of organizations that might help you narrow your search for communication and cognitive apps, including: the Tavistock Trust for Aphasia; Bridging Apps, from Easter Seals of Greater Houston; and Brainline.org’s Life-Changing Mobile Apps for People with Brain Injury.

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**Mobility and Balance**

Paralysis is a common result of stroke, particularly one-sided paralysis or weakness called “hemiplegia” or “hemiparesis.” The paralysis may affect either the right or left side, causing difficulty with balance, standing, walking, or grasping objects. Individuals with TBI may also experience similar balance and mobility difficulties.

Physical therapists (PTs) are the healthcare providers who typically provide evaluation, physical therapy, and assistance with finding useful AT for mobility and balance. You can find a PT and other resources from the American Physical Therapy Association.

**Mobility Rehabilitation**

After a stroke or TBI, part of mobility rehabilitation typically focuses on “gait training,” or how to align your body, arms, legs, and feet to walk safely and for longer distances. AT used to enhance physical therapy gait training includes:

- Treadmill training with partial body weight support provided by securing the user into a harness in a walking position over the treadmill.

- Transcutaneous electrical nerve stimulation (TNS or TENS), where electrodes are placed on the
skin along the leg to stimulate a movement response.

- Robotic devices that attach to the user’s legs during therapy, like the Lokomat-assisted walking device.
- Virtual reality systems that provide practice environments, like targeted therapy systems, or commercially-available systems like Nintendo’s Wii virtual golf. [vii]

Walking

AT for mobility includes a variety of canes and walkers that can increase the base of support around you, making it easier to balance and walk. These should be fitted to your needs and have rubber tips to improve traction. [viii] A 3-point or 4-point cane base will provide more stability. These bases also provide the convenience of allowing the cane to stand on its own.

If you only have the use of one hand, a cane with a wrist strap can help you hold onto the cane when you need to open a door or grasp a handrail going up stairs. There are a number of lightweight combination cane and chair devices that can provide mobility and a seat when you need to rest or wait. If you only need a cane occasionally for uneven, outdoor terrain, or crowded shopping areas, you might keep a folding cane in your car or backpack. “Hemi-walkers” are specially designed for one-handed users. These provide more support than a cane, but less than a full-sized walker.

Orthotics

Stroke-induced weakness in the leg and ankle can result in “foot drop,” which can affect your gait, cause your toes to be scuffed, and put extra strain on your knee. [ix] Lightweight leg braces and shoe inserts, called ankle-foot orthotics (AFO) and functional electrical stimulation (FES) systems with AFOs like the NESS L300 are commonly prescribed to support the foot. To reduce hyper-extension of the knee, you may need a knee orthotic or a combination knee, ankle, foot orthotic (KAFO). Certain users might be eligible for advanced computer-assisted orthotics systems, like the C-Brace Walking System, that combines the AFO support with electronics similar to those used in prosthetic limbs.

Wheeled Mobility

If you need a wheelchair, manual wheelchairs can be adapted or designed for one-handed users. Some of the modifications include: one-arm drive, unilateral brakes, adjusting the rear wheel center of gravity for increased maneuverability, and special armrests. You should carefully select the best wheelchair, power chair or scooter for your mobility needs, with guidance from healthcare professionals and suppliers who specialize in fitting wheeled mobility devices. [x]

Arm and Hand Problems

When a stroke causes one-sided paralysis in the shoulder, arm, and hand (the “upper extremities”), the resulting weakness, loss of range of motion, spasticity, pain, and numbness can lead to incoordination and loss of use.

Occupational therapists (OT) are the healthcare providers who typically provide evaluation, therapy, and assistance with finding useful AT for treating arm and hand problems, and for learning new ways to perform everyday tasks with one hand. OTs are often part of the team in rehabilitation centers, clinics, and home health agencies. You can find more information and resources on OT from the American
Occupational Therapy Association.

Upper Extremities Rehabilitation

Rehabilitation and therapy often focuses on practicing functional tasks in the clinic and at home, and might include these assistive devices:

- Wrist/hand orthosis (splints), including dynamic or active orthosis, like the Saebo-Flex and the MyoPro.
- Functional electrical stimulation (FES) devices for the arm and wrist, like the NeuroMove.
- Robotic devices that assist in moving and tracking movement of the arm and hand, like the Tyromotion devices.
- Virtual reality using targeted therapy systems or commercially-available systems like Nintendo Wii games.\(^\text{i}\)

One-Handed Aids for Daily Living

There are products to help you do things around the house with one hand. These items are generally available from medical equipment suppliers, and some hardware and home furnishing stores. Assistive devices that may help you include:

- Dressing tools designed to help reach, like dressing sticks and long-handled shoe horns, and those designed for one-handed users, like buttoning aids and elastic shoestrings.
- Kitchen tools specially designed for one-handed users, such as food preparation/cutting boards, rocker knives, can-openers, and brushes with suction cups to clean fruit or fingernails.
- Housekeeping tools include reaching sticks, long-handled sponges, stand-up dustpans, paper towel holders, and lightweight shopping carts.

Information Sources, Resources, and Organizations For Stroke and TBI

Government agencies /government-funded project

- Model Systems Knowledge Translation Center for Traumatic Brain Injury
- National Institutes of Health (NIH), National Institute of Neurological Disorders and Stroke (NINDS):
  - Stroke Information Page
  - Post-Stroke Rehabilitation Fact Sheet
  - Traumatic Brain Injury Information Page
  - Foot Drop Information Page
- Tavistock Trust for Aphasia, Software and Applications Review
• **Job Accommodation Network** (JAN):
  - Aphasia/speech/language
  - Stroke
  - Traumatic Brain Injury

• **Disability.gov**

**Professional Organizations and Centers**

• **American Speech-Language-Hearing Association** (ASHA)
• **American Physical Therapy Association**
• **American Occupational Therapy Association** (AOTA)
  - Stroke Recovery Tip Sheet
  - Traumatic Brain Injury Recovery Tip Sheet
  - Returning to Work Tip Sheet
• **United States Society for Augmentative and Alternative Communication**
• **International Society for Augmentative and Alternative Communication** (ISAAC)
• **Neuroscience Center for Cognitive Software**

**Consumer and Advocacy Organizations**

• **National Aphasia Association**
• National Stroke Association:
  - Stroke Resources
  - StrokeSmart Magazine’s Resource Center
  - Returning to work after stroke
  - Support Group listings
• **American Stroke Association**:
  - Stroke Connection magazine’s resources on adaptive recreation
• **Brain Injury Association of America** (BIAA): Resources page
• **The Brain Injury Information Network**
• **Brain Injury Resource Center**
• **WETA’s Brainline.org**
• **Easter Seals of Greater Houston, Bridging Apps**
Products listed in this guide are for illustration purposes only and are not endorsed by AbleData or NIDILRR. Additional products are listed on https://abledata.acl.gov/. This Guide is intended to provide information only. For medical advice, consult your healthcare provider.

References


