Augmentative and Alternative Communication: Aphasia

Indexing Metadata/Description

- **Title:** Augmentative and Alternative Communication: Aphasia
- **Procedure/device:** Evaluation and therapeutic services for augmentative and alternative communication (AAC) for persons with aphasia
- **Synonyms:** Augmentative and alternative communication: dysphasia; AAC: dysphasia; AAC: aphasia; communication, augmentative and alternative: aphasia; communication, augmentative and alternative: dysphasia; aphasia: augmentative and alternative communication; aphasia: AAC; dysphasia: augmentative and alternative communication; dysphasia: AAC
- **Area(s) of specialty:** Augmentative and Alternative Communication, Adult Neurological Disorders, Pediatric Genetic and/or Neurological Disorders
- **Description/use**
  - AAC is a communication system that supplements or replaces verbal communication (speech) and includes four main components: symbols, aids, techniques, and strategies\(^{(1,2)}\)
    - Symbols include objects, drawings, photographs, and orthography\(^{(1)}\)
    - Aids can be relatively simple or complex devices (e.g., communication board, electronic speech-generating device) for transmitting or receiving messages\(^{(1)}\)
    - Techniques refer to the ways in which the messages are selected for transmission (e.g., direct selection, scanning)\(^{(1)}\)
    - Strategies refer to the methods by which symbols can be conveyed most easily and efficiently (i.e., the most effective way for the individual to combine symbols, aids, and techniques to best communicate)\(^{(1)}\)
  - Aphasia is an impairment in the ability to use or understand language that results from damage to the language areas of the brain.\(^{(2)}\) This impairment leads to difficulties communicating or understanding information, reduced ability in establishing and maintaining relationships, and impaired ability to fulfill social roles.\(^{(4)}\) (For detailed information on different types of aphasia as well as assessment and treatment for aphasia, see the series of Clinical Reviews on aphasia)
  - For patients with aphasia, the use of AAC might be temporary or permanent\(^{(1)}\)
  - Patients with aphasia who are candidates for AAC have been classified as either “partner-dependent” communicators, those who need cueing or assistance in communicating, or “independent” communicators, those who can access and use AAC without assistance\(^{(5)}\)
    - Partner-dependent communicators: These patients have significant difficulty speaking, using symbols, and responding to conversation. They seldom communicate purposefully\(^{(2)}\)
    - Independent communicators: Patients who are independent communicators can locate messages in their AAC systems and a few can formulate novel messages. They might be able to learn how to overcome communication breakdowns and to integrate AAC into real-life situations\(^{(5)}\)
CPT codes
- 92605 evaluation for prescription of a non-speech generating augmentative and alternative communication device
- 92606 therapeutic services for the use of a non-speech generating augmentative and alternative communication device, including programming and modification
- 92607 evaluation for prescription for speech-generating and alternative communication device; face-to-face with the patient
- 92609 therapeutic services for the use of a speech-generating device, including programming and modification

HCPCS codes
- E1902 communication board, nonelectronic augmentative or alternative communication device
- E2500 speech generating device, digitized speech, using prerecorded messages, less than or equal to 8 minutes recording time
- E2502 speech generating device, digitized speech, using prerecorded messages, greater than 8 minutes but less than or equal to 20 minutes of recording time
- E2504 speech generating device, digitized speech, using prerecorded messages, greater than 20 minutes but less than or equal to 40 minutes of recording time
- E2506 speech generating device, digitized speech, using prerecorded messages, greater than 40 minutes of recording time
- E2508 speech generating device, synthesized speech, requiring message formulation by spelling and access by physical contact with the device
- E2510 speech generating device, synthesized speech, permitting multiple methods of message formulation and multiple methods of device access
- E2511 speech generating software program, for personal computer or personal digital assistant
- E2512 accessory for speech generating device, mounting system
- E2599 accessory for speech generating device, not otherwise specified

G-Codes
- Spoken Language Comprehension G-code set
  - G9159, Spoken language comprehension functional limitation, current status at time of initial therapy treatment/episode outset and reporting intervals
  - G9160, Spoken language comprehension functional limitation, projected goal status at initial therapy treatment/outset and at discharge from therapy
  - G9161, Spoken language comprehension functional limitation, discharge status at discharge from therapy/end of reporting on limitation
- Spoken Language Expressive G-code set
  - G9162, Spoken language expression functional limitation, current status at time of initial therapy treatment/episode outset and reporting intervals
  - G9163, Spoken language expression functional limitation, projected goal status at initial therapy treatment/outset and at discharge from therapy
  - G9164, Spoken language expression functional limitation, discharge status at discharge from therapy/end of reporting on limitation
- Other Speech Language Pathology G-code set
  - G9174, Other speech language pathology functional limitation, current status at time of initial therapy treatment/episode outset and reporting intervals
  - G9175, Other speech language pathology functional limitation, projected goal status at initial therapy treatment/outset and at discharge from therapy
  - G9176, Other speech language pathology functional limitation, discharge status at discharge from therapy/end of reporting on limitation

<table>
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<tr>
<th>G-code Modifier</th>
<th>Impairment Limitation Restriction</th>
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<tr>
<td>CN</td>
<td>100 percent impaired, limited or restricted</td>
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Source: [https://www.cms.gov/](https://www.cms.gov/)

- **Reimbursement**: In the United States, applications for insurance coverage or reimbursement for AAC devices can be submitted by a speech-language pathologist (SLP) or a durable medical equipment provider to Medicare, Medicaid, vocational rehabilitation services, and other funding sources. See [http://www.aacfundinghelp.com/](http://www.aacfundinghelp.com/) for information on AAC funding and a template for a funding report. In many European countries, SLPs are able to contact AAC device manufacturers directly to initiate the evaluation and funding procedures[43].

**Indications for procedure/device**

- All patients with aphasia who have significant communication impairments are potential candidates for the use of AAC. In order to determine if a specific patient will benefit from the use of AAC, the SLP must complete a thorough evaluation of communication abilities and sometimes have the patient use AAC for a trial period.
- Two aphasia subtypes frequently benefit from AAC intervention: Broca’s aphasia and global aphasia[2].

**Guidelines for use of AAC**

- When evaluating a patient to determine if he or she is a candidate for AAC and to determine which strategies and devices might be most useful for the patient, SLPs are encouraged to consider the following:
  - The patient’s overall quality of life[1]
  - The patient’s linguistic and cognitive abilities[5]
  - Willingness of the patient and patient’s caregivers to use alternative forms of communication[5]
  - Attitude toward and acceptance of AAC[5]
  - Characteristics of the environment in which AAC will be used[5]

**Contraindications/Precautions to procedure/device**

N/A

**Examination**

- **Contraindications/precautions to examination**
  - Depression and anxiety are common among persons with aphasia and can adversely affect test performance, making patients seem more impaired than they actually are[6]. It is important that SLPs be knowledgeable of symptoms of depression (e.g., loss of interest in daily activities, problems sleeping, feelings of sadness and hopelessness) and refer to a neuropsychologist or clinical psychologist when symptoms are present.
  - During an AAC evaluation, it is of utmost importance to be aware of a patient’s pain tolerance, stamina, and level of frustration. The time of day and the number of previous evaluations can affect the patient’s alertness and performance.
  - A patient’s culture and native language should also be considered to determine the appropriateness of examination questions and materials.
  - Patients with aphasia might not be able to complete standardized tests or answer questions regarding medical history, and it is recommended that the caregiver/family be involved in the assessment procedures and decisions regarding AAC.
  - AAC support requires specialized knowledge of equipment and understanding of how different patients might interface with specific equipment. The attending SLP might need to refer the patient to an AAC specialist to assist with implementing AAC interventions and monitoring the impact of interventions[2].
Patients with severe or chronic aphasia and their caregivers sometimes fear that AAC will interfere with recovery of natural speech and language abilities. The SLP should fully explain how AAC assists in improving communication and maximizes social opportunities; the SLP should also emphasize that there is no evidence to show that it hinders oral language recovery.

History

- History of present illness/injury for which the procedure is indicated
  - Mechanism of injury or etiology of illness: When was the onset of aphasia? Refer to neurological testing (MRI, CT scan) for site and size of lesion
  - Course of treatment
    - Medical management: Document previous medical management (e.g., surgery) for underlying condition that caused aphasia as well as other comorbid medical conditions
    - Medications for current illness/injury: Obtain a comprehensive list of medications prescribed and/or being taken (including OTC drugs). The concurrent use of multiple medications is common among older adults who have complex medical conditions, and the side effects of these medications might adversely affect cognitive and communicative functioning
  - Diagnostic tests completed: Usual tests for this condition are the following:
    - AAC assessment
    - Formal and informal speech and language assessment (for further information, see Relevant tests and measures, below)
  - Home remedies/alternative therapies: Document any use of home remedies (e.g., ice or heating pack) or alternative therapies (e.g., acupuncture) and whether they help
  - Previous therapy: Document whether patient has had speech-language, occupational, or physical therapy for this or other conditions and what specific treatments were helpful or not helpful
  - Aggravating/easing factors
    - Does the patient communicate better at certain times of day?
    - Does the patient communicate better with certain persons? In certain situations?
    - Is the patient aware of communication difficulties?
    - Does the patient become frustrated when trying to communicate?
    - Is the patient’s communication impairment accompanied by a cognitive impairment?
  - Nature of symptoms: Document the patient’s and caregiver’s description of communication difficulties. Is speech halting or nonexistent? Does the patient use gesture, pantomime, or any other compensatory forms of communication? How well does the patient understand spoken, written, and visual communication?
  - Rating of symptoms: Use a visual analog scale (VAS) or 0–10 scale to assess symptoms at their best, at their worst, and at the moment
  - Pattern of symptoms: Document changes in symptoms throughout the day and night, if any (a.m., mid-day, p.m., night); also document changes in symptoms due to weather or other external variables
  - Sleep disturbance: Document number of wakings/night, if any
  - Other symptoms: Document other symptoms the patient is experiencing that could exacerbate the condition and/or symptoms that could be indicative of a need to refer to physician. Examples include hemianopia (partial blindness), depression, motor deficits, dysphagia, apraxia, dysarthria, and poor overall health status
  - Respiratory status: Note history of respiratory status and current respiratory status for any indication of aspiration. Does the patient have a tracheostomy?
  - Psychosocial status: Depression scales and psychological scales have been used to assess patients who have had a stroke. The SLP can collaborate with the psychologist to determine the appropriate evaluation with respect to the patient’s language abilities. Examples include:
    - Hospital Anxiety and Depression Scale (HADS; mild aphasia)
    - Depression Intensity Scale Circles (DISC; moderate aphasia)
    - Stroke Aphasic Depression Questionnaire (severe aphasia—to be completed by caregiver)
  - Hearing and vision: Screening for vision and hearing should always precede assessment for aphasia. An audiologist should check for impacted cerumen (i.e., ear wax) prior to a pure-tone audiometric screening and word recognition testing. Vision screening should test for visual neglect
  - Barriers to learning
    - Are there any barriers to learning? Yes__ No__
- If Yes, describe __________________________

• **Medical history**
  
  – **Past medical history**
  
  - **Previous history of same/similar diagnosis:** Document any previous communication difficulties or cognitive deficits
  
  - **Comorbid diagnoses:** Ask patient and/or caregiver about other problems the patient is experiencing, including diabetes, cancer, heart disease, complications of pregnancy, psychiatric disorders, and orthopedic disorders. Does the patient have any hemiparesis, paralysis, or other motor difficulties that might affect ability to use an AAC device?
  
  - **Medications previously prescribed:** Obtain a comprehensive list of medications prescribed and/or being taken (including OTC drugs)
  
  - **Other symptoms:** Ask patient and/or caregiver about other symptoms the patient is experiencing

• **Social/occupational history**
  
  – **Patient’s goals:** Document what the patient and caregiver hope to accomplish with AAC therapy and in general
  
  – **Vocation/avocation and associated repetitive behaviors, if any:** What are the patient’s interests and hobbies? Does the patient work? Also see *Communication needs assessment* under *Relevant tests and measures*, below
  
  – **Functional limitations/assistance with ADLs/adaptive equipment:** Does the patient need assistance with self-care or home management? How do communication deficits affect the patient’s involvement in work, community, and leisure activities? Document if the patient uses any adaptive equipment to communicate (e.g., pen/paper)
  
  – **Living environment:** Stairs, number of floors in home, with whom patient lives (e.g., family, caregivers). Identify if there are barriers to independence in the home; any modifications necessary? What language(s) does the patient speak at home, work, school, and within the community? (For detailed information on bilingual patients with aphasia, please see *Clinical Review...Language Disorders: Aphasia in Bilingual Adults*; CINAHL Topic ID Number: T708880)

  > **Relevant tests and measures:** (While tests and measures are listed in alphabetical order, sequencing should be appropriate to patient medical condition, functional status, and setting)

  • **Arousal, attention, cognition (including memory, problem solving):** Determine if there are cognitive-linguistic impairments in addition to language impairments. In order to communicate successfully with or without AAC, a person needs to be able to shift attention appropriately, recall the topic of conversation, and appropriately inhibit him- or herself (i.e., so as not to constantly interrupt his or her conversational partner). Assessment of attention, memory, and executive functioning abilities is necessary to determine the best form of AAC and to provide the best therapeutic language intervention.\(^{5}\) The following tests can be used to assess cognition; however, it is important to fully assess the patient’s language skills and consider how both receptive and expressive language skills might influence performance on language-based cognitive tasks:
  
  – **Cognitive-Linguistic Quick Test:** This screening can be used to provide information on attention, memory, executive functions, and language and visuospatial skills. Available in both English and Spanish
  
  – **Mini-Mental State Examination (MMSE):**\(^{9}\) To assess cognitive status of adults. Sections include Orientation to Time, Orientation to Place, Registration, Attention and Calculation, Recall, Naming, Repetition, Comprehension, Reading, Writing, and Drawing

  • **Assistive and adaptive devices:** The goal of an AAC assessment is to match the patient with optimal communication strategies and systems
  
  – **Communication needs assessment:** A communication needs assessment should be performed to identify the situations in which the patient communicates. An informal interview with the patient and caregiver or the following protocols can be used:
    
    - **The Social Networks:** A Communication Inventory for Individuals with Complex Communication Needs and Their Communication Partners.\(^{10}\) This tool assists the SLP in identifying the social networks of individuals (children and adults) with complex communication needs before and after the onset of aphasia. To maximize patient involvement, the tool might need to be adapted so that the patient with aphasia can participate. Please see strategies below (e.g., written choice strategy, picture prompts)
    
    - **Aphasia Needs Assessment:** This assessment can be administered to the patient to determine the types of communication situations that are most difficult, strategies that are currently being used, and ways in which the communication partner can assist the patient\(^{11}\)
  
  – **Visual screening task:** A visual screening task is used to determine the patient’s ability to read different font sizes as well as to test for the presence of visual field cuts. The Scanning/Visual Field/Print Size/Attention Screening is available online (https://cehs.unl.edu/documents/secd/aac/assessment/wordscan.pdf)\(^{12}\)
AAC–Aphasia Categories of Communicators Checklist:\(^{13}\) A checklist of communication behaviors that can be used by the SLP to determine if the patient is a partner-dependent or an independent communicator. This test is available online (https://cehs.unl.edu/documents/secd/aac/assessment/aphasiachecklist.pdf)\(^{13}\)

Multimodal Communication Screening Tool for Aphasia (MCST-A):\(^{5}\) This tool was developed to measure skills required to use AAC systems and strategies for both partner-dependent and independent communicators. It includes a sample communication book with pictures, words, sentences, letters, a map, and story sequences. This test is available online (https://cehs.unl.edu/aac/aphasia-assessment-materials/).\(^{14}\) The following skills are assessed:\(^{5}\)

- Ability to communicate concepts by selecting one or more pictorial symbols
- Ability to choose a pictorial symbol that is similar to three others in the same category
- Ability to point to pictures in a sequence to tell and retell a story
- Ability to choose pictures and phrases to complete a transaction (e.g., buying something)
- Ability to provide information about places by pointing to locations on a simple map
- Ability to use spelling or other external symbols to supplement spoken communication

Systems trials with partner-supported strategies: During an AAC assessment, communication trials might be used to determine if the patient can successfully use partner-supported strategies. An example of this type of strategy is the written choice conversation strategy (see Treatment section, below)

Speech and language examination (including reading)

Speech: A motor speech evaluation should be performed if there are signs of coexisting apraxia or dysarthria. (For detailed information on assessment and treatment of apraxia, see Clinical Review...Apraxia of Speech (Acquired); CINAHL Topic ID Number: T708586. For detailed information on assessment and treatment of dysarthria, see the series of Clinical Reviews on dysarthria)

Language: Standardized tests assess components of language that are affected by aphasia, such as word finding, auditory comprehension, reading, and writing. Many tests can be used to help determine the severity of aphasia, distinguish one type of aphasia from another, and provide guidance for remediation. Language tests for aphasia include the following:

- Boston Diagnostic Aphasia Examination\(^{15}\)
- A comprehensive speech and language assessment that provides scores for conversational and expository speech, severity ratings for speech characteristics, oral expression, automatized sequences, recitation, melody, rhythm, confrontation naming, and reading; for use with adults
- Western Aphasia Battery–Revised (WAB-R)\(^{16}\)
  - To assess oral language (verbal fluency, language information content, comprehension, repetition, and naming), nonverbal language, and reading and writing; for individuals aged 18 to 89 years
  - Contains a screening measure (Bedside WAB-R)
  - For detailed information on different types of aphasia as well as assessment and treatment for aphasia, see the series of Clinical Reviews on aphasia

Voice: Rule out or identify the presence of a voice disorder

Fluency: Note any history of a fluency disorder prior to onset of aphasia

Reading/writing: Assess reading and writing skills as part of a complete evaluation of communication abilities; determining the strength of the patient’s reading and writing (including spelling) abilities will help in deciding the type of AAC device the patient will use most effectively

Functional communication: Assessment of functional communication in patients with aphasia is necessary because a specific patient’s actual use of language in everyday, functional situations might not correspond to the degree of severity as measured by standardized language assessments.\(^{48}\) Functional communication is especially important as a baseline and outcome measure for patients with aphasia who use AAC. Tests that assess functional communication used in everyday situations (e.g., calling for help, exchanging greetings, responding to yes/no questions) include:

- Functional Communication Profile–Revised (FCP-R): An assessment, rating, and inventory of the patient’s functional communication skills (e.g., sign, nonverbal, augmentative) for persons ages 3 through adult\(^{23,48}\)

Communication Activities of Daily Living–SecondEdition (CADL-2): Assessment of the following subtests of communication: Reading, Writing, and Using Numbers; Social Interaction; Divergent Communication; Contextual Communication; Nonverbal Communication; Sequential Relationships; and Humor/Metaphor Absurdity\(^{48,49}\)
- Functional Assessment of Communication Skills for Adults (ASHA-FACS): Assessment of functional communication in four areas: social communication; communication of basic needs; reading, writing, and number concepts; and daily planning.(24,48)

- Communicative Effectiveness Index: Measure of change in functional communicative ability. Assesses four domains: Basic Need, Health Threat, Life Skill, and Social Need.(50)

**Swallow examination:** Patients with aphasia might have difficulty in any of the phases of swallowing. For detailed information on assessment and treatment of dysphagia, see the series of Clinical Reviews on dysphagia

**Tracheostomy examination:** If present, assess tracheostomy tube and document date of placement, current respiratory status, and use of speaking valve. For detailed information on assessment of a tracheostomy tube and use of a speaking valve, see *Clinical Review...Passy-Muir Tracheostomy & Ventilator Swallowing and Speaking Valve*; CINAHL Topic ID Number: T708919. For detailed information on assessment of patients with tracheostomies, see *Clinical Review...Dysphagia: Adults with Tracheostomy*; CINAHL Topic ID Number: T709084; and *Clinical Review...Dysphagia: Children with Tracheostomy*; CINAHL Topic ID Number: T709082

### Assessment/Plan of Care

#### Contraindications/precautions
- Only those contraindications/precautions applicable to this diagnosis are mentioned below, including with regard to modalities. Rehabilitation professionals should always use their professional judgment
- Patients with a diagnosis of aphasia accompanied by motor impairments might be at risk for falls; follow facility protocols for fall prevention and post fall-prevention instructions at bedside, if inpatient. Ensure that patient and family/caregivers are aware of the potential for falls and educated about fall-prevention strategies. Discharge criteria should include independence with fall-prevention strategies
- Patients with aphasia accompanied by dysphagia are at risk for swallowing and feeding difficulties. Ensure that the patient and family/caregivers are aware of potential aspiration risks and educated about prevention strategies when appropriate
- SLPs should follow the guidelines of their clinic/hospital and what is ordered by the patient’s physician. The summary below is meant to serve as a guide, not to replace orders from a physician or a hospital’s specific protocol

#### Diagnosis/need for procedure: A patient's need for AAC is determined by a comprehensive AAC assessment that examines the patient’s present communication skills, communication needs, and future communication goals

#### Prognosis (for use of AAC): Successful independent AAC use has been found to be correlated with patient cognitive flexibility.(17) One sign of cognitive flexibility is the ability to repair communication breakdowns.(17) Patients who demonstrate less cognitive flexibility are likely to be more dependent communicators. It has been found that many persons who are prescribed AAC devices do not use them beyond the clinical setting or use them only for a short period of time. It is important that the patient and the patient’s family have comprehensive training on how to use the device and opportunities for trial within and outside of the clinical setting to maximize success and generalization to a natural and functional setting.(18)

#### Referral to other disciplines: Refer to an occupational therapist (OT) and/or physical therapist (PT) for assistance with daily living skills and/or mobility if needed. To promote AAC generalization, the SLP might co-treat with the OT and PT, assisting the patient in using AAC during these sessions.(19) Refer to a psychologist or counselor for depression or anxiety. Refer to an AAC specialist if assistance is needed in identifying an appropriate AAC device/strategy and monitoring the AAC intervention

#### Treatment summary: Treatment should occur in natural settings with a variety of communication partners
- Computer-based AAC/speech-generating devices (SGDs): SGDs have been classified into two main types: devices that allow for formation of new messages and devices that use word or whole-phrase retrieval of prerecorded messages. Caregivers and patients should be involved in selecting the device. Factors to consider when selecting a device include:
  - Appearance: size, hardware, pictures (any pictures and text should be personally relevant when possible)(46)
  - Symbols should be culturally and individually/personally relevant (e.g., if the patient participates in religious activities, options that allow for communication in these situations should be included)(46)
  - Accessibility and ease of use: Many patients have paralysis or hemiparesis, in which case portability should be considered. Can the patient use the device while holding it at the same time? Can the patient carry the device?
  - Voice quality: Is the digitized or synthesized voice output clear? Does the patient have any difficulty perceiving or understanding the voice?
--Effectiveness: Does the device meet the patient’s needs?
--Display/layout: dynamic screen technology or static display, number of symbols per page

- In a study conducted in the United States, researchers examined the ability of 10 subjects with Broca’s aphasia and 10 control subjects to complete a series of experimental tasks with single-symbol and subject-verb-object sentence identification on an SGD in the presence or absence of competing stimuli. 

- Researchers asked the following questions:
  - What is the effect of number of symbols per screen on recognition accuracy and response time for a single symbol? 
  - What is the effect of hierarchically organizing symbols semantically according to complexity on recognition accuracy and response time for a single symbol? 
  - What is the effect of competing stimuli on recognition accuracy and response time for a single symbol? 
  - What is the effect of competing stimuli/environmental distraction on recognition accuracy and response time for symbols representing subject-verb-object sentences? 
  - Do persons with aphasia perceive task difficulty differently from the persons in the control group without disabilities? 

- Researchers’ findings
  - Both control subjects and subjects with aphasia accurately identified more single symbols in the 4-symbol-per-screen condition than in the 8, 12, and 16 symbol conditions. Response latency was shortest for 4-symbol condition and increased in a stepwise manner for 8, 12, and 16 symbols; for the control subjects, latency was the shortest for 4, then 12, 8, and 16. 
  - When organized hierarchically by complexity, patients with aphasia accurately identified significantly more symbols under level 1 condition versus levels 2 and 3. Control group accurately identified the most symbols in level 2, followed by 1 and 3. 
  - Subjects with aphasia accurately identified subject, verb, and object significantly more in focused attention conditions versus divided and sustained attention conditions; listening condition did not affect accuracy for control subjects. Listening condition did not affect accuracy for symbol selection for subjects with aphasia. 
  - Perceived task difficulty was significantly higher for subjects with aphasia versus those in the control group. 

- In a study conducted in the United States, researchers examined the effect of two different static-button layouts on SGDs for two adult patients with aphasia (one with severe nonfluent aphasia and the other with moderate fluent aphasia). The patients were trialed on two different layouts using the same content for both trials. The first layout was a “homepage” layout, which provided a set of static buttons as a homepage and each subsequent page that was opened contained a new set of symbols, along with a “home” that returned the patient to the static homepage. The second layout was a “navigation ring” layout, in which a collection of smaller, static buttons appeared around the edge of each screen, allowing the patient to jump to a new topic immediately. Each patient was trained in each of the layouts for two phases in alternating order (i.e., patient 1: navigation ring–homepage–navigation ring–homepage; patient 2: homepage–navigation ring–homepage–navigation ring). The total intervention time was 3 months, and for each phase patients received a maximum of 5 sessions. Intervention was based on the principles of errorless learning. Both patients were successful at learning how to navigate through both layouts. At the conclusion of the intervention, researchers found that both participants were more consistent and efficient in finding target sentences with the navigation-ring layout.

–Language demands: How are messages composed? Letters, single words, text plus symbols, phrases, sentences, visual scenes?

• Universal design is a relatively new concept with respect to assistive technology, including AAC; the idea of universal design is to create devices that serve the needs of a wide range of individuals, both with and without disabilities. For example, there are many apps available for download on the iPad that allow it to become a high-tech AAC device for a patient with aphasia, but it can also be used by the patient’s spouse whose language abilities are intact. For devices with universal design, no adaptations are necessary. The iPad and other commercially available computer tablets also have the advantage of being highly socially acceptable, which is appealing to many patients who do not want their AAC device to appear awkward or stand out.
• There are a limited number of research studies investigating the efficacy of technology-based AAC interventions in patients with aphasia. Authors of a review of studies involving patients with chronic and severe aphasia summarized the findings in several case studies:

– Patients with chronic and severe aphasia are able to use AAC to access, identify, manipulate, and combine computer-based graphic symbols to communicate in simple phrases and sentences in clinical settings\(^2\)

– Nouns are identified and produced more accurately than other parts of speech\(^2\)

– Individuals with Broca’s and global aphasia perform better on tasks that involve graphic symbols than they do on tasks that involve natural language\(^2\)

– Research indicates that patients with severe aphasia are able to use computer-based AAC devices in clinical settings; however, there are minimal data to support the efficacy of computer-based AAC devices in functional situations\(^2,20\)

– Before recommending the use of an AAC device, the SLP should confirm its effectiveness in substantial clinical observations\(^2\)

• Stored information systems/low-tech interventions: Stored information systems such as a communication board, book, or remnant book allow the patient to independently access items for communication or access items with a partner’s assistance. Pictures or words are personalized to meet the needs of the patient. Words can be divided into categories and placed in a small notebook or single piece of cardboard so that the patient can have easy access to them. A remnant book that contains actual items of a patient’s past experiences (e.g., photographs, tickets) can be used to engage others in conversation.\(^2\) One criticism of such devices is that they lack personalization and contextualization.\(^20\) Common needs, such as items depicting pain, hunger, and food choices, are typically included in a communication device; however, items that convey information to maintain social closeness, transfer new ideas, or express social etiquette are sometimes deemphasized. The use of personalized visual scenes can assist the patient in conversing with a partner on topics of interest.

– In all cases, patients who use AAC for communication should have a low-tech component to their AAC system.\(^44\)

Because batteries and computers fail, no patient should be trained only in the use of an electronic device to communicate.\(^44\) In addition to technology failures, the clinician must consider that one AAC device or method cannot meet all of a patient’s communication needs for all possible situations and speakers; hence, a low-tech option (or multiple low-tech options) should always be provided.\(^2,44\) There is no one low-tech option that works best for all patients; it is important to trial several different speech supplementation methods and determine which type increases speech intelligibility/functional communication the most.\(^45\)

- Low-tech options include:
  - Pen and paper
  - Iconic gestures\(^45\)
  - Pointing gestures\(^47\)
  - Low-tech eye gaze board (a board with topics, letters, pictures, or symbols spread out into different quadrants so the patient can use eye gaze with a partner to communicate)\(^44\)
  - Alphabet supplementation board (a board with the alphabet written on it so the speaker can indicate the first letter of the word he or she is trying to say when communication breakdowns occur)\(^44,45\)
  - Topic/semantic supplementation board (a board with frequently used and personally meaningful conversation topics or pictures on it so the speaker can indicate the topic to the listener, thereby increasing listener comprehension)\(^45\)

– In a study conducted in the United States, researchers investigated visual attention patterns in 10 individuals with aphasia to determine the effect of human engagement in pictures. In adults without disabilities, research has documented that persons preferentially attend to and fixate on human figures in pictures. Researchers sought to determine if this same pattern existed for adults with aphasia and if the information could then be used to guide AAC picture selection. Researchers found a clear pattern of fixation on human figures among the adults with aphasia. Additionally, the latency to first fixation on the object of interest was significantly greater when the human in the picture was looking at the camera rather than engaging in the task. For example, if the object of interest was a computer, it took the patients with aphasia significantly longer to fixate on the computer if the person using the computer was looking at the camera rather than looking at and using the computer. Researchers suggested using this information to better tailor pictures used in AAC; patients with aphasia naturally tend to fixate on human figures, so pictures should reflect humans engaged in the target activity or with the target object in pictures used for AAC.\(^26\)
Multiple modes of communication: The patient is trained to use a combination of modes of communication, such as gestures, drawing, or writing, to convey messages\(^{(2)}\).

Authors of a systematic review of gesture treatments for a combined total of 134 adults with poststroke aphasia reported that comparative effect sizes support the benefit of combined gesture + verbal treatment for noun and verb production for some persons with aphasia. However, it is not clear if the benefit of gesture+verbal treatment is greater than for verbal treatment alone. Additionally, authors reported that symbolic gestures can be acquired by persons with aphasia, but the communicative effectiveness of these gestures necessitates further study. Overall, authors report that gestural training in aphasia, although generating some positive outcomes, is still relatively understudied and in need of large-scale research studies\(^{(34)}\).

In a study conducted in the Netherlands, researchers compared iconic (visual representations of specific idea; e.g., rapid hand movement up and down might indicate the action of chopping vegetables) and deictic (pointing gestures) co-speech gestures of persons with aphasia and found that gestures degrade in a similar manner to verbal language\(^{(28)}\)

Researchers created video clips of 25 participants with aphasia and 17 age-matched adult participants without aphasia; in the clips all participants were performing portions of an experimental version of the Scenario Test (e.g., role-playing asking a sales clerk for information about a sweater)\(^{(28)}\)

In one task, the control participants were told they could speak and gesture freely (verbal control), and in the other they were asked to only gesture (nonverbal control)\(^{(28)}\)

Researchers recruited individuals without any expertise in the area of aphasia or gesture to be raters for the video clips. For the first part of the study, each rater was exposed to the clips of the participants with aphasia (moderate or severe) and was randomly assigned to one of three modalities—hearing audio without video, seeing video without audio, and seeing both audio and video simultaneously.\(^{(28)}\) In the second part of the experiment, raters watched the verbal control clips, and in the third part, raters watched the nonverbal control clips.\(^{(28)}\) Each portion of the study had different raters (15–16 per condition described above)

Researchers came to the following conclusions after analyzing all of the study data:

- Speakers with moderate aphasia had more informative gestures than those with severe aphasia\(^{(28)}\)
- Speakers with aphasia and apraxia had the most difficult time producing informative gestures\(^{(28)}\)
- For speakers with moderate aphasia, rater comprehension was the highest when both gesture and verbal information was available, suggesting that gestures did provide additional information (not simply echoing what was being said)\(^{(28)}\)
- Speakers with aphasia did not necessarily make use of gestures’ full communicative potential\(^{(28)}\)
- Speakers with severe aphasia used mostly gestures that outline shapes\(^{(28)}\)

In a study conducted in the United Kingdom, researchers analyzed conversation samples from AphasiaBank (a multimedia database with samples of persons with aphasia and healthy controls, http://aphasia.talkbank.org/) from 46 adults with poststroke aphasia and 10 healthy matched controls, all of whom gestured at least once during a story retell task\(^{(31)}\).

Researchers coded 12 different types of gestures:

- Referential gestures: assigning entity to referents into the space in front of the speaker when a concrete object is absent\(^{(31)}\)
- Concrete deictic gestures: indicating a concrete referent present in a physical environment\(^{(31)}\)
- Pointing to self\(^{(31)}\)
- Iconic observer viewpoint (OVPT) gestures: depicting a concrete action, event, or object as though the person was observing it (e.g., using fingers as though they were the legs of a person running)\(^{(31)}\)
- Iconic character viewpoint (CVPT) gestures: depicting a concrete action, event, or object as though the person was doing it (e.g., moving arms back and forth as though the person was running)\(^{(31)}\)
- Pantomime gestures: a series of two or more CVPT gestures\(^{(31)}\)
- Metaphoric gestures: presenting an abstract concept\(^{(31)}\)
- Emblems: well-established gestures for specific purposes (e.g., thumbs up or “ok” hand signal)\(^{(31)}\)
- Time gestures: indicate a point in time\(^{(31)}\)
- Beats: movements without a discernible meaning that are recognized through prototypical repetitive movement timed with speech\(^{(31)}\)
Letter gestures: using hand/fingers to “write” a letter (31)
Number gestures: holding up fingers to indicate numbers (31)

Researchers reported the following findings with respect to gesture production patterns of persons with aphasia:
- Persons with Wernicke’s aphasia used the most gestures in conversation overall; additionally, the number of gestures produced in a gesture unit was highest for persons with Wernicke’s aphasia (31)
- When speech fluency was calculated, persons with Broca’s, transcortical motor, or conduction aphasia had the highest rates of gesture per 100 words spoken (31)
- Despite the high number of gestures produced by persons with Wernicke’s aphasia, the number of gestures with high semantic content was low (31)
- Gestures produced by persons with Broca’s or conduction aphasia were more meaningful (e.g., emblems, concrete deictic, iconics) (31)
- Because persons with Broca’s, conduction, or transcortical motor aphasia were capable of producing high numbers of meaningful gestures, researchers recommended that SLPs routinely consider gesture training as part of an AAC intervention for these patients (31)

In a study conducted in Australia, researchers analyzed gesture production of a group of 29 participants with aphasia and 29 control participants and found that impaired semantic knowledge in aphasia affects both iconic gestures produced during fluent speech and those produced during word-finding difficulties (32)

Researchers recorded participants describing a cartoon that they had just watched and tagged/coded all iconic gestures as “manner” (depicting the way a movement takes place; e.g., using the hands to demonstrate lifting a box), “path only” (depicting the direction of a movement; e.g., hand points up to show that a cat climbed up a tree), “shape outline” (tracing or molding the hands to show the shape of an object; e.g., cupping hands to show a bowl), or “other.” The gestures were then separated into either those occurring during fluent speech or those occurring during a moment of word-finding difficulty (32)

Researchers reported the following findings:
- Participants with aphasia produced a significantly higher frequency of iconic gestures than did the control participants overall; however, when the non-word-finding gestures were removed from the totals, there was no longer a difference (32)
- Non-word-finding gestures of both participants with aphasia and control participants were mostly path only or manner gestures (32)
- There was a significant association between proportion of word-finding moments that contained gestures and semantic knowledge of the participants with aphasia (but not with gestures produced during fluent speech); researchers suggested that this finding indicated that participants with more intact semantic knowledge were better able to produce iconic gestures during a moment of word-finding (32)

In a study conducted in Germany, researchers analyzed the gesture use of 16 participants with varying degrees of aphasia severity as they retold what they had seen in short video clips in verbal and silent conditions (asked to retell the stories by exclusively using gestures) (33)

Researchers reported the following findings:
- Some participants were able to spontaneously compensate for verbal language deficits with gesture and convey additional information via gesture (33)
- Some of the participants in the study were not fully utilizing the communicative potential of gestures, while others were able to communicate a message via gesture without any verbal input (33)
- Researchers could predict communicative efficacy of gestures by how well the participants were able to pantomime tool use (traditionally a test for apraxia) (33)

In a pilot study conducted in the United Kingdom, researchers developed and tested a computerized gesture training (GeST) program for patients with aphasia (35). In the program, level 1 modeled target gestures, level 2 presented the gestures in a 3D gaming environment, and level 3 demonstrated target gesture use in real-world scenarios. Nine persons, all of whom had severe aphasia, were recruited for the study, and each completed 6 weekly sessions of GeST. For the first 3 weeks of therapy (phase 1) an SLP was present, and for the second 3 weeks (phase 2) participants completed GeST sessions independently; 15 different gestures were targeted in each of the two phases. At the conclusion of therapy, the gestures that were included in phase 1 (with the SLP support) showed significant improvement; however, those gestures
targeted in the independent sessions did not. There was no generalization to gestures not targeted in one of the two phases.\(^{(35)}\)

In a case study, a 72-year-old patient with Broca’s aphasia who had 2 years of direct speech-language therapy followed by a 3-year hiatus participated in 6 weeks of therapy (daily interdisciplinary treatment) in which he was taught to use Amer-Ind Code (manual signs based on Native American Hand Talk) and drawing to assist him in communicating. After treatment, he was able to use 30 gestures functionally and draw basic ADL needs (90% transparency rated by his daughter).\(^{(19)}\)

**Partner-assisted communication techniques**

- **Written-choice communication:** Partner-assisted communication involves a communication partner selecting topics of interest and initiating interaction using written word choices to facilitate responses from the person with aphasia. The person with aphasia is provided with written word choices or graphic rating scales to point to when responding to questions. This method is dependent on adequate reading ability of the patient.\(^{(2)}\)

- Authors of a systematic review of the methodology of communication partner training studies for persons with aphasia found that the methodological quality of these studies is highly varied.\(^{(29)}\) Overall, authors reported that communication partner training studies had poor treatment fidelity (i.e., the methods used to examine and enhance the reliability and validity of behavioral interventions tested).\(^{(29)}\)

- In a study conducted in Finland with 34 adults with aphasia and their communication partners, researchers found that communication skills and efficiency improved after a partner-focused intervention, Communication Therapy for People with Aphasia and their Partners (APPUTE).\(^{(30)}\)

  - The aim of APPUTE is to practice functional communication strategies in a structured program with individualized guidance from an SLP. Both the person with aphasia and the communication partner are actively involved in therapy. The program involves three different types of communication tasks arranged hierarchically—pictures with objects and activities, detailed situational pictures, and events from the news.\(^{(30)}\)

  - In each session and at each level of task, the SLP and person with aphasia start the session alone, at which time the therapist explains the task and shows the person with aphasia the pictures/objects/news stories. When the partner joins the session, the SLP guides both conversation partners in strategy use to increase communication efficacy and accuracy.\(^{(30)}\)

  - In this study, the APPUTE program was provided over the course of two 14-day intensive rehabilitation periods at 6-month intervals and outcomes were measured 6 months after the end of the second rehabilitation period.\(^{(30)}\)

  - Outcomes were measured by the WAB-R, Communication Effectiveness Index (CETI), Communication Skill Evaluation (CSE), Couple Communication Scale-B, and APPUTE evaluation questionnaires for both partners.\(^{(30)}\)

  - Significant improvements in communication skills were found on the WAB-R for the persons with aphasia and the CSE for the conversation partners. Communication efficacy of the persons with aphasia as measured by the CETI improved significantly. Communication skills of the couples improved significantly as measured by the CSE. Although the goal of the program was not to improve linguistic skills of the persons with aphasia (it was to improve functional communication between partners), researchers found improvements, especially with respect to verbal naming.\(^{(30)}\)

**Facilitated communication:** In the 1990s, an AAC strategy called facilitated communication was widely promoted as method for providing assistance to a nonverbal person to indicate letters, words, phrases, or sentences using a computer, typewriter, or alphabet board. The facilitator uses manual prompting to support the communicator’s hand in selecting the letters or phrases. Multiple research studies have found that there is no scientific evidence that this method is effective or valid; blind studies in which the facilitators are asked different questions than the patient demonstrate that facilitators often unintentionally select the message for the patient rather than assist the patient in creating his or her own messages.\(^{(21)}\)

<table>
<thead>
<tr>
<th>Problem</th>
<th>Goal</th>
<th>Intervention</th>
<th>Expected Progression</th>
<th>Home Program</th>
</tr>
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\( ^{(2)} \) \( ^{(35)} \) \( ^{(19)} \) \( ^{(29)} \) \( ^{(30)} \) \( ^{(21)} \)
Limited or no verbal or written output  |  Improve communication effectiveness in functional and natural situations  |  **Computer-based AAC/speech-generating devices**  |  Progression will depend on patient’s current communicative status and needs  |  A home program for AAC use is essential for maintenance and generalization  

The patient will initiate conversation by establishing topics using AAC strategies  

The patient will communicate in a variety of settings with a variety of communication partners (familiar and unfamiliar)  

The patient will use a core picture and word notebook to support gestural communication  

**Computer-based AAC/speech-generating devices**  

**Stored information systems/low-tech interventions**  

**Multiple modes of communication**  

**Partner-assisted communication techniques**  

See Treatment summary, above, for details on specific interventions  

See Description, Indications of device/equipment, and Guidelines for use of device/equipment, above  

### Desired Outcomes/Outcome Measures

› Improved functional communication with the use of AAC devices and/or strategies  
  • ASHA FACS\(^{(24,48)}\)  
  • CADL-2\(^{(48,49)}\)  
  • FCP-R\(^{(25,48)}\)  
  • Communicative Effectiveness Index\(^{(50)}\)  

› Increased participation in life activities with the use of AAC devices and/or strategies  
  • With respect to social communication goals for patients with aphasia, researchers found in a study conducted in the Netherlands with 13 patients with aphasia that patients with aphasia do not consider “social participation” to be more satisfying if they participate in a greater quantity of activities and/or social interactions; rather, patients with aphasia sought to increase the quality of each of the activities and social interactions\(^{(22)}\)  

› Improved quality of life  
  • Quality of Communication Life Scale (ASHA QCL):\(^{(23)}\) Assesses the quality of communication life for adults with communication disorders. It includes information on how the disorder impacts participation in social, leisure, work, and education activities  

### Maintenance or Prevention

› Research and clinical reports indicate that many patients with aphasia who are prescribed AAC devices and strategies do not use them beyond the clinical setting or use them only for a short period of time.\(^{(3,7,17,18)}\) One reason for this might be that patients with aphasia and their caregivers often fear that an AAC device will hinder recovery of oral communication abilities.\(^{(7)}\) Suggestions for improving use of AAC in natural environments include:
Patient Education

- Patient and family/caregiver education should include information on the effects of aphasia, options for AAC, and training on how best to use AAC strategies and/or the AAC device. The SLP might also be involved in educating rehabilitation team members on how to communicate best with the patient.
- Providing functional AAC intervention in the patient’s natural environment (e.g., home, work)\(^{(18-27)}\)
- Monitoring AAC use beyond the training stage and making adaptations as necessary\(^{(2)}\)

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