AAC Decision-Making and Mobile Technology: Points to Ponder

Mary Ann Abbott

Ontario Montclair School District Ontario, CA California State University Los Angeles, CA

Debby McBride

AAC TechConnect, Inc.

Evergreen, CO

Disclosures: Financial: Mary Ann Abbott previously consulted with AAC TechConnect, but is no longer doing so. Debbie McBride is the owner of AAC TechConnect.

Nonfinancial: Mary Ann Abbott and Debby McBride have no nonfinancial interests to disclose.

Abstract

The purpose of this article is to outline a decision-making process and highlight which portions of the augmentative and alternative communication (AAC) evaluation process deserve special attention when deciding which features are required for a communication system in order to provide optimal benefit for the user. The clinician then will be able to use a feature-match approach as part of the decision-making process to determine whether mobile technology or a dedicated device is the best choice for communication. The term mobile technology will be used to describe off-the-shelf, commercially available, tablet-style devices like an iPhone®, iPod Touch®, iPad®, and Android® or Windows® tablet.

A family member or caregiver brings mobile technology, which they purchased, and asks you to make it work for their person who uses augmentative and alternative communication (PWUAAC). Your school district decides that it will only purchase mobile technology because it's much less expensive than a dedicated speech-generating device (SGD). Scenarios like this illustrate the unique opportunities and challenges for clinicians posed by the availability and increased use of mobile technology for communication purposes. How do we, as clinicians, meet these challenges and still provide the most appropriate communication system for the PWUAAC?

The AAC assessment process will assist in selecting the most appropriate solution. The goal of the AAC assessment is to identify the current skill level of the individual as well as his/her participation patterns and communication needs. One must consider the communication needs of the individual (current and future) and match them to the features of the AAC system. With that knowledge, the clinician can evaluate the client's potential to use AAC systems and/or devices and identify appropriate features. The clinician needs to be sensitive to both short- and long-term goals, evaluating the effectiveness through ongoing assessment (Beukelman & Mirenda, 2005). However, there are critical elements associated with the evaluation and subsequent feature match that must be considered when deciding whether mobile technology could be a better choice than a dedicated SGD.

Sorting Through the Options

Just as there is a range of AAC devices which can be used across the continuum of communication, there is also a wide range of communication applications (apps). There is currently no formal classification system for apps, but it could be helpful to categorize them according to the

type of features they offer. AAC apps can be sorted into three basic categories: (a) symbols/pictures only; (b) symbols and text-to-speech; and (c) text-to-speech only. Symbols/pictures only apps do not provide access to a keyboard. Messages are expressed using a library of symbols (e.g., Boardmaker® or SymbolStix®) or the user's own images. Symbols and text-to-speech apps utilize the combination of both symbols and keyboard capabilities to create the desired message. Text-to-speech only apps have no symbols. The literate independent communicator uses an on-screen keyboard to type the desired messages.

Feature-matching requires that the evaluator has an understanding of the general features of AAC devices, including knowledge of the most current devices or familiarity with how to find out about the most current technology (Wasson, Arvidson, & Lloyd, 1997). Keeping current with the variety of communication solutions (especially apps) can be a challenge for the clinician; however, there are some resources available which can be helpful in navigating this process. Gosnell, Costello, and Shane (2011) provide a clinical approach of using a framework for matching apps to client needs. On the Spectronics web site (http://www.spectronicsinoz.com/) and PrAACtical AAC blog site (http://praacticalaac.org/), the reader will find a wealth of blog topics, checklists, presentations, and videos with web site links to app-specific webinars, developer's pages, support pages, and blog posts regarding specific apps. App lists comparing features (Farrall, 2014) and links to additional blogs and AAC app feature matching charts (Crawford & Watson, 2011), and checklists (Marfilius & Fonner, 2012) provide further resources to the reader.

AAC TechConnect has reviewed a variety of AAC apps and offers the ability to do a side-byside comparison of apps or SGDs with similar features using the AAC Apps Assistant and the AAC Device Assistant (AAC TechConnect, n.d.). Apps are grouped into five broad categories. First, "robust" apps contain vocabulary that includes core words, a larger amount of pre-programmed vocabulary, and the ability to formulate messages including spelling options. They may have features similar to SGDs and they are more expensive (\$150+). Second, apps with "more features" do not contain as much pre-programmed vocabulary. There may be a variety of features available, but each app is different in terms of what it provides, including access options. Message formulation (if available) varies with regard to simplicity or complexity. They are not likely to have text-to-speech capability and are moderately priced (\$15-\$100). Third, "starter" apps use a simpler presentation of vocabulary such as a digital picture and digitized speech. The options for organization and page layout are limited and they are usually minimally priced (free to less than \$5). Fourth, "simple" apps have a choice of 1 or 2 pictures and usually use digitized speech. They tend to be minimally priced unless they contain more sophisticated options (free-\$40). "Starter" and "simple" apps are primarily used for simple pre-programmed messages. Fifth and last, "spelling" apps that use spelling or text-to-speech are best for literate users. Text-to-speech apps may provide a wide range of features and may include the use of pictures. Prices vary widely (free-\$120). We will use these broad categories to discuss types of apps throughout this article.

Access Needs

One critical step in determining an appropriate communication system is to make sure that the PWUAAC can easily access the communication system. Dynamic display SGD software programs and mobile technology apps include similar methods/processes to retrieve and select vocabulary when direct selection is a viable option. Keyguards may be required for some PWUAAC to use direct selection and, if available, these are usually purchased through the SGD manufacturer. Access methods other than direct selection using finger pointing including scanning (one- or two-switch), switch interface, joystick access, and/or mouse access are features that are typically built into many high-tech SGDs, not only for use with the AAC software but for other features of the system such as internet, email, and/or environmental controls. Head/eye tracking may be accomplished with specially designed equipment that can be added to the SGD; however, not all SGDs have this capability.

If a keyguard is required for the PWUAAC to use direct selection with an AAC app, it will typically need to be purchased through a 3rd party vendor and may not be completely compatible with an existing protective case or page layout. There are some apps with scanning capabilities. Jane Farrall (2014) maintains a list of switch-accessible apps for iPads/iPhones on her website. Switch accessibility is a feature that can be selected when searching the database in the AAC Apps Assistant (AAC TechConnect, n.d.). Critical elements to consider are whether or not the iPad screen can/must be used as the switch. Can the app accommodate one-switch scanning or two-switch scanning? Does the individual require an auditory or visual cue? The organization of the scan method should be considered: automatic, linear, circular, step, inverse, row/column, column/row, group/item, group/row/column. All of these options are not offered in every switch-accessible app. Does the developer specify which switch interface is compatible with the app? Mobile technology may not be the best choice if the PWUAAC requires these options. Due to the hardware limitations of a tablet-style device, only a limited number of access options may be available. Because tabletstyle mobile technology was not designed specifically for AAC use, accessories like speakers, protective cases, and switch interface devices may need to be added. This increases the overall cost and maintenance of the system.

Navigation

Fluent use of any AAC system will require that the PWUAAC learn the sequence required to access specific vocabulary items. This will involve the use of various navigation features to move between page displays, open and close specific pages, activate the "speak" feature of the device, and clear the display or message window at the end of each communicative interaction. Most SGDs involve accessing the device and its vocabulary via touch screens. Mobile technology solutions may introduce an entirely new and different set of navigational gestures like the use of a carefully graded swiping motion to activate the device and navigate through vocabulary pages by scrolling through selections vertically and/or horizontally. Scrolling allows access to additional pages or even lists of pages. This can provide easy access to additional pages for those who may not understand categories. However, it may prove to be a distraction for those who like to swipe just to see the pictures move past. It also can present a problem if the screen moves when a symbol is touched instead of activating that symbol. In some instances this problem may be ameliorated by using a stylus. Even if the PWUAAC may be able to use direct selection, he or she may require modifications like dwell or hold time, select on release, or expand selection. Options for direct select modification are varied. These modifications may not be available in all apps thus making it of utmost importance to investigate app features before making recommendations.

Language Representation

The first critical step in determining an appropriate communication system, whether it is mobile technology or a dedicated device, is to evaluate the individual's current communication skills. After all, it's all about the language! Consider the language/linguistic features (vocabulary, organization, etc.) required by the PWUAAC. Light and Binger (1998) suggested that communication interactions serve four basic functions: expression of basic wants and needs, information transfer, social closeness, and social etiquette. The goal of communication intervention should always be to move beyond wants and needs. To do this, one must consider the software or app vocabulary content. Parker and Zangari (2012) created a rubric designed to evaluate the language content of AAC apps. The rubric allows the clinician to rank an app using a set of categories and questions on a scale from "does not support" to "fully supports." Some examples include how well an app supports requests for objects, activities, people, help, and attention. Is there social language for greeting/leave-taking, small talk, partner-focused questions, compliments, reciprocal exchanges/turn-taking, and partner-focused questions? Is there an appropriate means of initiating, maintaining, redirecting, and terminating conversations? How well does this app support the repair of

communication breakdowns? Does the app provide adequate syntax for sentence-building? Does it support language learning by allowing variations of word forms like changing verb tense, singular/plural, and possessive?

Garrett and Lasker (2006) described a continuum of adult communicators with aphasia: Emerging communicators, contextual choice communicators, transitional communicators, and independent communicators. These categories take into consideration the individual's optimal participation level, communication needs and environments, and the individual's specific cognitive-linguistic competencies. All of these factors must be taken into account when using a feature-match approach. For the purpose of this article, we will use the following continuum: Emerging, context/partner dependent, and independent communicators to help to illustrate the features to consider for each type of communicator.

Vocabulary

Emerging communicators may or may not be communicating purposefully (Garrett & Lasker, 2006). A closed vocabulary set may be used for the temporary vocabulary needed for a specific activity or for pages on a static display. Features to consider for these individuals may be a single activation surface or button like single message communicators or sequential message communicators. "Simple" or "starter" cause and effect apps and/or simple 1–2 choice apps with pre-programmed messages may be considered.

Context/partner dependent communicators are more capable than emerging communicators (Garrett & Lasker, 2006) and can readily indicate some basic wants and needs by pointing or leading the communication partner. A communication book/board, multi-key static display SGD, dynamic display SGD, or visual scene display may be viable options for this type of communicator. "Simple", "more features", or "robust" apps that can be programmed like a static display, dynamic display, or a visual scene display may be good options for context- or partner-dependent communicators. These types of AAC systems allow for the use of intervention strategies like aided language stimulation and partner-assisted scanning (auditory/visual).

However, a device with all pre-programmed phrases would take away the PWUAAC's ability to build sentences and communicate novel ideas. The utilization of visual scene displays may also be restrictive and could potentially limit the context in which the individual could effectively use the mastered vocabulary. Consequently, a better option might be to select an SGD or app that includes vocabulary that would allow the individual to build sentences in a generative fashion. This is especially important to assist the PWUACC to move towards becoming an independent communicator.

A core vocabulary set consists of a relatively small set of words with the highest frequency of use both in conversation and in written text. A number of research articles have been written, demonstrating the consistency of this vocabulary across geographic regions and demographic populations, ranging from toddlers in Louisiana to adults in Sydney, Australia (Balandin & Iacono, 1999; Banajee, Dicarlo, & Sticklin, 2003; Beukelman, Jones, & Rowan, 1989; Stuart, Beukelman, & King, 1997). Most high-performance SGDs contain pre-programmed core vocabulary. Core vocabulary may be represented with multiple meaning pictures and organized with semantic encoding, (e.g., the Unity® Minspeak® Application Programs), or with single-meaning pictures organized in page-based systems (e.g., Gateway®, SonoFlex®, or Word Power®). In addition, access to the alphabet allows PWUAAC to generate novel messages that match their thoughts without resorting to substituting the next best vocabulary word contained in their device. Several apps in the "robust" category contain page sets that are core vocabulary based. These features associated with "robust" and/or text-to-speech apps should be considered for those PWUAAC who are able to build phrases/sentences or communicate novel messages in order to provide more independence and accuracy in communication interactions.

Symbol Sets

Static display SGDs may be purchased with premade overlays; however, the clinician and/or caregivers typically chose the symbols for the display using digital photos, hand-drawn symbols, or symbols from commercially available software like Boardmaker® or SymbolStix®. Mobile technology for communication makes the option of digital photos much more accessible. You can take pictures using the device and insert them into the communication app if that is an available feature of the app. Using symbols (graphics or drawings) for communication depends on what types of symbol sets are available within the app and how many symbols are included. In the case of high-tech SGDs, the manufacturer typically provides a large amount of vocabulary from which to choose but each manufacturer will use only the symbols associated with that company. Most devices offer flexible programming options, so the team can organize the vocabulary for retrieval and generative use of the vocabulary. When selecting apps, the choice of symbols is varied. There may be no symbols, a small library of generic photos, customized symbols designed for that specific app, or the app may use a popular graphic symbol system like Boardmaker® or SymbolStix® which adds to the cost of the app. The type and availability of symbol sets for a potential communication app should be an important consideration, especially if the PWUAAC is transitioning from a communication book or an SGD that uses a particular symbol set.

Message Cell and Page Layout

It is important to determine the ideal size of the message cells and number of cells per page based on the number of pictures the individual can accurately point to given his/her motor skills, visual acuity (ability to easily discriminate between pictures/words), and cognitive ability to understand a variety of symbols presented at one time. SGDs provide a variety of page layout options, often with the option to customize the number of cells, size of cells, gap/space between cells, intermix cell sizes on the page, color the cell background, and/or color the page background. Apps may be limited in the number of different page layouts. The size of the picture is directly related to the number of pictures on the screen (i.e., the fewer the pictures on the page, the larger the size of the pictures) and the size of the screen (10", 7", 5", etc.) directly affects the number of pictures available. Therefore, more levels might be required to meet the vocabulary needs of the communicator. Decide if a message window is necessary to show the selection (either with symbols and/or words) or if it is necessary in order to formulate phrases/sentences.

Keyboard layout is especially important for learning and ease of access. SGD options may include QWERTY, ABC, AEIOU, DVORAK, or frequency of use keyboard layouts. Most apps only offer QWERTY or ABC keyboard layouts. Highly customized keyboards, such as those made for scanning or eyegaze, are usually only available on SGDs since they tend to have more alternative access options. Rate enhancement strategies like word prediction, abbreviation expansion, grammar prediction, and saved phrases/messages options may be available for SGDs and some robust apps.

Message Formulation

Emerging communicators may benefit from having a complete message programmed on a single cell, though it does limit the ability to then combine it with another cell. Single messages are good for routine phrases used for social interactions, common requests, frequently asked questions, or similar functions. Context- or partner-dependent communicators may benefit from the use of a combination of pre-programmed phases and single words which would allow the individual to combine cells to form messages like "I want + object" in addition to forming complete grammatically correct sentences. Context- or partner-dependent communicators and independent communicators may benefit from the use of some pre-programmed message cells to convey messages that must be delivered quickly in order to be efficient and effective, but access to core vocabulary and spelling will provide the most opportunities for language development and to communicate a message precisely.

Message Display

If the PWUAAC is sequencing words or spelling to create a message, a message display window is an important feature. The option of using words or words plus symbols in the message display may be important for the individual. This option varies both in SGDs and in apps. Another consideration is whether the communication system should speak each word as it goes into the message display or only speak on demand. The ability to toggle between these conditions may be an option that is important to the PWUAAC.

Voice

SGDs generally have options for both digitized (recorded) speech and synthesized speech (text-to-speech). Apps, on the other hand, may only have one option. It is important to decide which option(s) match the needs of the PWUAAC. Digitized speech is easy to use for phrases and sentences and can be recorded by an individual who matches the user's age and gender. Digitized speech may be helpful for messages that need to be delivered in another language or when the age of the listener (very young children or the elderly) requires it. Synthesized speech is required for spelling and best for generating novel messages. Be sure and evaluate the quality of the voice and the "type" of voice (i.e., male, female, child, etc.). The quality of the voice varies widely across apps especial for free or "lite" apps. Some apps provide options for in-app purchases of voice type or language.

Additional Points to Ponder

There are several other factors to consider when choosing between an SGD or mobile technology. What degree of customization is available and how easy it is to program? Can programming be done on the SGD or within the app or must it be done on a computer or online and then synced to the device? How will the AAC system be backed up? Can pages or users be shared with others? Can pages be printed and used as a low-tech backup system? Is the PWUAAC able to send messages to email or another program/app?

Technical Support

SGD manufacturers provide technical support for all of their components, both hardware and software in the form of phone contact, an online knowledge base, and in some cases the ability to "remotely access" the device through an internet connection to real-time troubleshoot the device. There may also be a field representative who can assist with technical support and follow up training when the device is delivered. When considering the purchase of an app for communication, check the developer's website to determine if and what type of technical support is available. Some developers have posted video tutorials and webinars on their web site or on YouTube. Several apps have a support manual built into the app, but this may only be available when the device is online. Many developers are available only by email and technical support for the hardware may be limited to help from someone at the Apple store for iDevices or in the case of tablets, the store that sold it.

Funding

SGDs continue to be covered by third parties like Medicare, Medicaid, and some insurance companies. The manufacturer or their local representative can assist you with the funding paperwork. Medicare funding codes are based on categories of devices determined by the "type of box" or the physical characteristics of the device itself. The American Speech-Language-Hearing Association (ASHA) maintains information specific to Medicare including a checklist of the requirements for recommending an SGD for a Medicare patient (ASHA, n.d.). This site

also contains links to the AAC Institute (http://www.aacinstitute.org/) and the Rehabilitation Engineering Research Center (http://aac-rerc.psu.edu/), which look at AAC from several perspectives, including Medicare.

Non-dedicated devices like iPads or tablet-style computers are not currently funded through Medicare or private insurance. However, some states do provide waivers through their individual state-run Department of Health Services. The reader is advised to check the regulations of his/her home state. In addition, some private insurance companies are starting to fund these types of devices and it may be worth consulting with them.

Trials

A manufacturer's representative may be able to provide access to the newest devices for assessment and/or short trials. If a longer trial is required, device rental may an option through some funding sources. It is also possible to look for loan opportunities through cooperatives or AT loan programs like your state's Tech Act Program (United States Department of Education, 2014). It may be more difficult to have access to a variety of apps for assessment and/or short trials. However, some Tech Act Programs may have iPads with AAC apps that could be borrowed for a 30-day loan period. "Lite" versions of apps may be downloaded for a trial, but they should be used with caution. Costello, Shane, and Caron (2013) write that

A lite version offers a limited feature set (e.g., no voice output, no editing options, limited word prediction, a limited vocabulary, etc.). Developers also said that a potential danger of relying on a "lite" version is the potential to adopt the limited version believing it is sufficient. (Costello, Shane, & Caron, 2013, pp. 6–7)

Clinical Application and Summary

There are advantages and disadvantages to both types of AAC systems. Dedicated SGDs typically run on the Windows® platform. The advantages of using a dedicated SGD are that most are designed for direct selection and/or scanning, have built-in speakers, switch ports, built-in shock absorption (especially important for wheelchair mounting), infrared (IR) environmental controls, technical support for both the hardware and software, and a minimum 1-year device warranty (often with an option to extend the warranty). The possible disadvantages are weight, size, cost, extra fees to allow internet access, and extra fees to unlock the features of Windows®. Tablet-style mobile technology typically uses a Windows®, Android®, or iOS® platform. The advantages of this type of technology for AAC are weight, size, and the ability to freely access all features/programs of the Windows®, Android®, or iOS® device. There are many levels of communication apps available for iPhone, iPod Touch, or iPad devices; however, there are very few apps currently available for AAC on the Android® platform. Because tablet-style mobile technology was not designed specifically for AAC use, accessories like speakers, protective cases, and switch interface devices may need to be added. Mobile technology devices typically lack the shock absorption needed if wheelchair mounting is being considered. They also have a limited warranty which only pertains to the hardware.

With the number of apps designed for communication purposes growing at an exponential rate, clinicians are challenged to recommend the best available system to meet the needs of PWUAAC and their families. In this article, we have attempted to highlight some of the critical elements associated with the evaluation and subsequent feature match that must be considered when deciding whether mobile technology could be a better choice than a dedicated SGD. We have also provided some resources for more information regarding SGD and app selection criteria. Clinicians can use this information to begin searching for SGDs and apps that match the features identified in their AAC evaluation.

Resources

AAC Institute (http://www.aacinstitute.org/)

PrAACtical AAC blog. http://praacticalaac.org/

Rehabilitation Engineering Research Center on Communication Enhancement (AAC-RERC)) (2014, January 20). *Medicare Funding of AAC Technology*. Retrieved from http://aac-rerc.psu.edu/index.php/pages/show/id/5

Spectronics (2014). http://www.spectronicsinoz.com/

References

AAC TechConnect. (n.d.). Apps assistant/device assistant page. Retrieved from http://www.aactechconnect.com

American Speech-Language-Hearing Association. (n.d.). *Medicare speech-generating devices information packet: Medicare SGD funding—Internet resources*. Retrieved from http://www.asha.org/slp/healthcare/sgd/sgdresources/

Balandin, S., & Iacono, T. (1999). A few well-chosen words. Augmentative and Alternative Communication, 14, 147–161.

Banajee, M., Dicarlo, C., & Stricklin, S. B. (2003). Core vocabulary determination for toddlers. *Augmentative and Alternative Communication*, 19, 67–73.

Beukelman, D., Jones, R., & Rowan, M. (1989). Frequency of word usage by non-disabled peers in integrated preschool classrooms. *Augmentative and Alternative Communication*, 5, 243–248.

Beukelman, D., & Mirenda, P. (2005). Principles of assessment. In D. Beukelman & P. Mirenda (Eds.), *Augmentative communication: Supporting children and adults with complex communication needs*, (3rd ed.). Baltimore, MD: Paul H. Brookes.

Costello, J., Shane, H., & Caron, J. (2013) *AAC, mobile devices and apps: Growing pains with evidence based practice* [White Paper]. Boston Children's Hospital. Retrieved from http://www.childrenshospital.org/~/mobiledevicesgrowingpains.ashx

Crawford, S., & Watson, P. (2011). AAC apps feature comparison. Retrieved from $\frac{\text{http://www.faast.org/}}{\text{sites/default/files/Crawford_Watson-Apps_Feature_Comparision-AAC.pdf}}$

Farrall, J. (2014). AAC apps. Retrieved from http://www.janefarrall.com

Garrett, K., & Lasker, J. (2006). Adults with severe aphasia. In D. Beukelman & P. Mirenda (Eds.) *Augmentative communication: Supporting children and adults with complex communication needs* (3rd ed.). Baltimore, MD: Paul H. Brookes.

Gosnell, J., Costello, J., & Shane, H. (2011). Using a clinical approach to answer "what communication Apps should we use?" *Perspectives on Augmentative and Alternative Communication*, 20, 87–96.

Light, J., & Binger, C. (1998). Building communicative competence with individuals who use augmentative and alternative communication. Baltimore, MD: Paul H. Brooks.

Marfilius, S., & Fonner, K. (2012). Feature match checklists. Retrieved from http://www.spectronicsinoz.com/conference/2012/pdfs/handouts/kelly-fonner/Feature_Match_Checklists_JAN2012.pdf

Parker, R., & Zangari, C. (n.d.). *PrAACtical AAC*. Retrieved from http://praacticalaac.org/tag/assessment/ Stuart, S., Beukelman, D., & King, J. (1997). Most frequently occurring words of older adults. *Augmentative and Alternative Communication*, 13, 40–47.

United States Department of Education. (2014). *State Grant for Assistive Technology Program*. Retrieved from http://www2.ed.gov/programs/atsg/index.html

Wasson, C. A., Arvidson, H., & Lloyd, L. (1997). AAC assessment process. In L. Lloyd, D. Fuller, & H. Arvidson (Eds.), *Augmentative and alternative communication*. Boston, MA: Allyn & Bacon.