

A Case Study Model for Augmentative and Alternative Communication Outcomes

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Abstract. Case studies are an accepted method for reporting treatment outcomes. However, to be useful and authentic, a systematic and principled approach to collecting, analyzing, and reporting case data must be observed. This paper proposes a basic case study format for documenting augmentative and alternative communication (AAC) intervention to ensure reliable and valid measurement of performance and outcomes for evidence-based practice. An example case study of an adult with cerebral palsy who relies on AAC is presented to show how the principles of evidence-based practice (EBP) and performance measurement were applied to the AAC assessment process. AAC service delivery requires performance and outcomes measurement to lead to effective communication and improved quality of life. Reliable and validated methods of reporting data allow for consistency and the comparison of performance and outcome measures so decisions are not based on impressions of effectiveness, but actual results.

Key Words: Augmentative and Alternative Communication (AAC), Evidence-Based Practice, Performance measurement, Outcomes measurement, Quality of life

“First study the science, then practice the art.”

-Leonardo Da Vinci

Introduction

Augmentative and alternative communication (AAC) teams with experience are aware that the assistive technology (AT) field has surprisingly little quantitative data regarding what is effective. Many treatment approaches and technologies in common use have never been evaluated, and many others that have been evaluated remain of uncertain benefit (Frattali, 1998). The growth in evidence-based practice (EBP) has made AAC teams aware of the importance of performance and outcome measures. Initially developed in the area of medicine, EBP is now part of every health care discipline and professional education program (Law, 2002). For AAC stakeholders, an important impetus for EBP has been the growing awareness of the limitations of expert opinion as the sole basis for decision making as indicated in the Technical Report on evidence-based practice released by the American Speech-Language-Hearing Association (ASHA, 2004a). Teams applying the principles of EBP require data that have been collected and analyzed using reliable, valid, and scientific methods.

Case studies provide a principled approach to reporting performance and outcome measures that have been accepted by the scientific community. Although case study data are not the highest level of evidence that can be collected and appraised to support decisions about AAC interventions, in some circumstances, a case study may be the best available evidence for a specific client

(Schlosser, 2004). The difficulty in conducting research studies with large numbers of participants due to the heterogeneous nature of individuals with disabilities may amplify the importance of reporting case study data for the field. Consequently, developing a model for reporting case study data for AAC performance and outcomes provides a standard to compare published and presented reports. By following a standard reporting format, AAC stakeholders can readily compare performance and outcome results, be confident that the data reflect similar standards of measurement, and find appraisal of evidence more convenient and efficient.

Improvement in quality of life is often stated as the ultimate outcome in rehabilitation services (Pain, Dunn, Anderson, Darrah, & Kratochvil, 1998). Individuals and families frequently regard maximizing potential and independence as an important outcome. When surveyed, individuals with disabilities and family members expressed a clear sense to be “the best they could be” (Pain et al.). Individuals with significant communication disabilities desire these same outcomes by achieving the most effective, independent communication. The Preferred Practice Patterns for Speech-Language Pathology document indicates that an AAC assessment is to determine and recommend methods, devices, aids, techniques, symbols, and/or strategies to represent and/or augment spoken and/or written language in ways that *optimize communication* (ASHA, 2004b). Measuring performance that leads to optimal communication, and reporting outcomes that document achieving optimal communication are expected of AAC teams conducting AAC assessment and intervention. Consequently, no additional knowledge and skills are required for case study reporting, and these skills are consistent with general AAC service expectations.

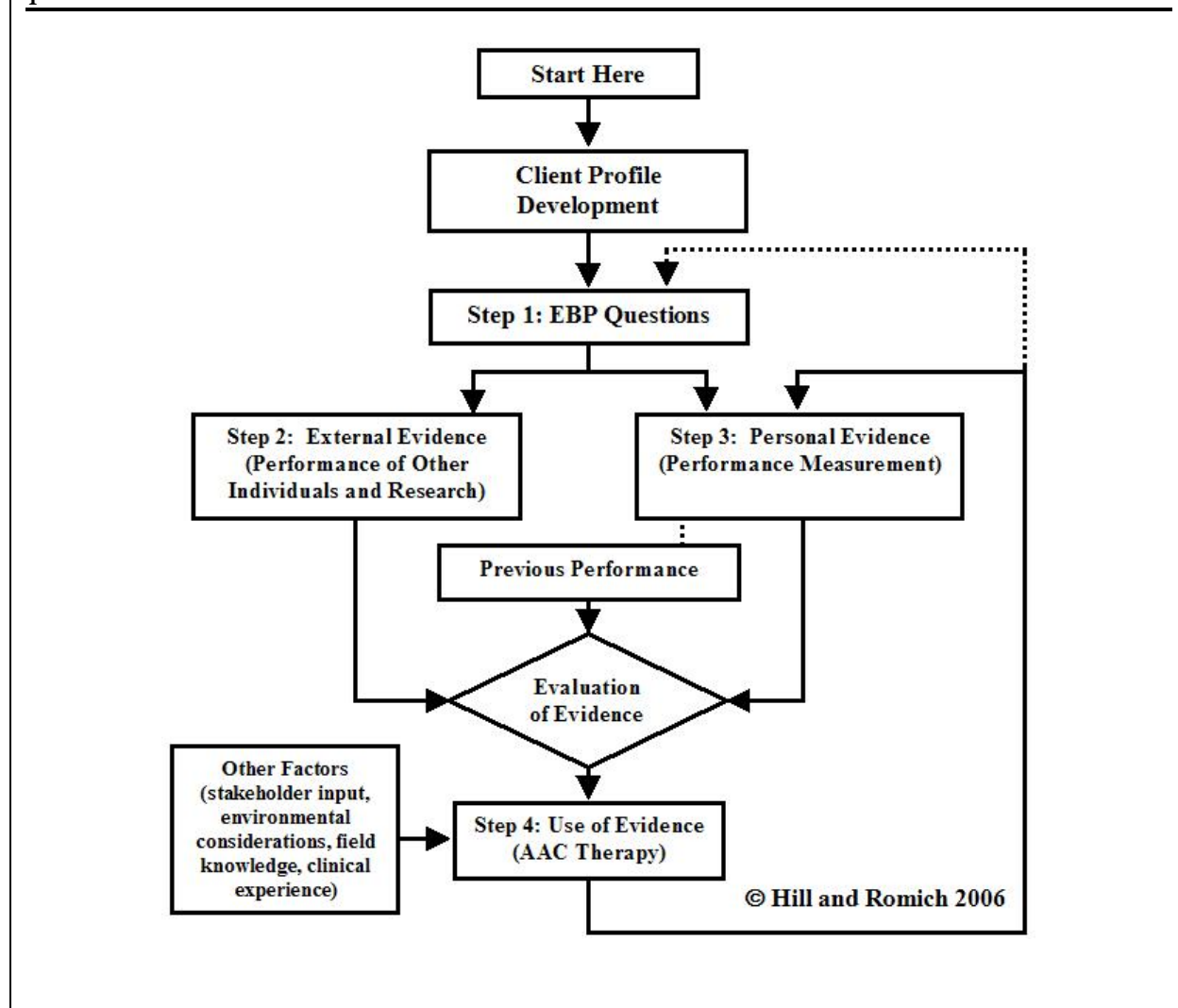
Case Study Reporting Format

The case study method developed out of clinical case histories. A case study, however, is more rigorous than the case history in making systematic observations and measurement. In addition, a case study is different from a single-subject research study in that it does not involve manipulation of any independent variables (Heiman, 1995). A thorough description of the individual, clinical problem, related conditions and variables set the foundation of a case study. Clinical practice stresses the potential power of clinical observations and the magnitude of characterizing the patient (Sackett, Haynes, Guyatt, & Tugwell, 1991). Therefore, detailed client profiles are required as a foundation for case studies to have clinical value and in order to move through the EBP process. The components of a client profile include basic or standard case history data (Alvares, 1998; Paul, 2002) in addition to data expected to be collected in a comprehensive AAC assessment (ASHA, 2001; Lloyd, Fuller, & Arvidson, 1997). Teams requesting third party funding for a speech generating device (SGD) will be documenting such information as hearing, vision, physical status, speech, language and cognition as listed in the client profile already.

A Process for Evidence-Based Practice

Figure 1 depicts a model for AAC evidence-based practice, which provides the framework for collecting and reporting case study data for field dissemination (Hill & Romich, 2002). The first section of the case study starts by reporting observations taken from characterizing the individual as part of client profile development. This client profile allows other practitioners and teams to compare their client with the client reported in the case study. The next sections of the case study report on the methods and results of collecting and analyzing data following the four steps of evidence based practice: (a)

Figure 1. Model for AAC evidence-based practice. Source: AAC Institute Press, 2006. Used with permission.



asking meaningful EBP questions; (b) locating and reviewing the external evidence; (c) collecting and reviewing the personal evidence; and (d) using the evidence for assessment and intervention (Hill, 2004). The model illustrates how the steps of EBP identified by Sackett and colleagues (1991, 1996), and others, when followed, provide for the collection of external evidence and evidence at personal level needed for decision-making.

The EBP steps in the model that follow creating the client profile are defined below along with the importance of the clinical summary for reporting case studies.

Step 1: Questions

Teams formulate the most meaningful questions based on the problems of the client. Teams need to pose specific questions of importance or questions that are considered vital to making a decision about treatment. Questions that are not client-oriented or well-formulated may fail to identify the best evidence to evaluate and apply to the decision-making. EBP questions form the basis for being able to use “client-oriented evidence that matters.”

Step 2: External Evidence Review

Teams search and appraise (evaluate) the research that answers the most important questions posed. The search process frequently involves Internet resources and electronic searches for efficiency and time savings. Teams are committed to searching fairly and honestly for disconfirming and confirming the evidence (Gibbs, 2003). Research on clients with similar profiles to the client in question that reports specific performance and outcome measures are particularly valuable as evidence. External evidence containing quantitative data can provide the reference points to gage the success of intervention with a client. Gathered research is evaluated based on levels of evidence with the highest levels of evidence identified as peer-reviewed randomized controlled trials. However, studies at lower levels of evidence can be used and justified when limited research is available. The key is not to simply find related research studies, but to identify research that the team finds most relevant and meaningful for decision-making. Teams providing results of external evidence searches provide useful information for others to consider and for teams seeking research on similar questions.

Step 3: Personal Evidence

Personal evidence includes having the client and family identify their values, goals, and expectations related to quality of life and use of AAC devices and strategies. Personal evidence also includes collecting performance data on how someone uses AAC devices and strategies. This step provides for the reporting of baseline data prior to initiating any changes to current status. Without performance data, teams cannot compare a client with the subjects in the research studies found from a search or monitor the implementation of the recommended intervention(s).

Step 4: Use of Evidence

This step involves monitoring the progress or results of implementing the recommended intervention(s). The performance and outcomes data selected and reported as baseline data are collected, analyzed, and reported to make decisions about the success of the decisions by the team. When data are being routinely reported, timely adjustments and modifications to any AAC intervention can be made to ensure the client is achieving maximum benefit from the intervention.

Clinical Summary

Reporting of the performance and outcome measures at the end of the intervention period or at a predetermined time as in the annual individualized educational program (IEP) meeting for students receiving special education allows team members to draw conclusions and discuss the benefits and any problems with the recommended methods and approaches. The summary highlights the key findings that resulted from the EBP process for other teams to gain from the experience of the reporting team.

EBP assumes that practitioners will evaluate the evidence, and use the best evidence that will provide the most benefit to the client. Once an intervention is started, then careful monitoring of the intervention is required to document performance and outcomes. Sackett, Richardson, Rosenberg, and Haynes (1997) and Schlosser (2004) discuss the dissemination of results as a part of the EBP process. This sharing of case evidence advances the knowledge base for assessment and treatment that may be applied to clients with similar profiles. The case study format presented in this paper provides for reporting conclusions about the specific decision-making process and a summary of the results. Appendix A provides an example of information and data for clinical practitioners

to complete the AAC Case Study Performance and Outcomes Summary Form. The purpose of this paper is not to provide a model specifying research designs, methodology and statistical analysis, but rather to provide a practical approach for AAC teams to maintain consistent, systematic documentation for routine clinical and educational application of the principles of EBP for reporting and dissemination.

Exemplary AAC practice becomes an ongoing process in which data are collected and information is gathered to make intervention and management decisions (Lloyd et al., 1997). This expectation goes beyond anecdotal or testimonial reporting of outcomes that frequently occur when promoting or marketing clinical programs and products. Case study reporting of the evidence used in applying the four steps of EBP should document the methods and operational processes involved so others duplicating any intervention can expect similar results.

A Case Study

The following case study is used as an example for this format. Primary emphasis is placed on the decision-making process for a high-technology AAC intervention using the approach presented in Appendix A. Depending on the referral, other case studies may focus on unaided or low and light technology AAC interventions.

Characterizing the Client

Brent was a 22 year-old sophomore in college when referred for AAC services to explore interventions to improve communication, particularly related to academic performance. He had a high school diploma and associate degree in accounting from another college when he transferred into a four-year university degree program. A review of high school and

college transcripts, medical records, and documents that included standardized testing from the Office of Vocational Rehabilitation was used to report and confirm basic background history and abilities. Standardized screening confirmed no hearing or visual acuity problems, and oral and written language samples confirmed linguistic and communication competencies.

Brent was having difficulty completing communication tasks typical of classroom interactions, group projects, and faculty conferences. Brent was diagnosed with cerebral palsy characterized by severe spastic quadriplegia. He had limited vocalizations with no intelligible speech. Brent used a power wheelchair with joystick control for mobility. He used a desktop computer with standard keyboard for homework and email. A high technology AAC system recommended in high school was mounted to his wheelchair. Brent used an alphabet-based page with a QWERTY configuration for spelling and word prediction on a touch screen AAC system. He could navigate to a few customized pages based on activities of daily living and topics of conversation. Although a university program for students with disabilities made the referral for an AAC re-evaluation, Brent recognized that his current methods of communication were not meeting his needs and were not reflective of his abilities and potential. Both university officials and Brent feared that withdrawal was unavoidable, since Brent was having difficulty completing assignments and mid-term grades were poor. Brent became the central team member driving and approving the AAC services. His active participation in the assessment process was reflective of a consumer-centered service delivery model (Hill, Lytton, & Glennen, 1999).

Information about Brent's values and needs about his communication were identified and discussed. Brent's values were consistent with

the goal of AAC, since he desired to be a “faster, more efficient” communicator. He indicated that he did not appreciate having his messages finished or “guessed” by other people, however, he understood that he took a long time to spell his messages. Finally, Brent expressed a strong preference for using his own words rather than pre-stored sentences. He said that he rarely navigated to the pre-stored messages set-up in his device.

Step 1: Questions

In order to be meaningful, EBP questions must support the values of the individual. Brent’s values included (a) optimizing communication rate, and (b) generating his own sentences. His goal was for his communication performance to support continuing his university education. A variety of resources are available to support structuring EBP questions, and practice is needed to pose specific questions that are vital to a client’s welfare (Gibbs, 2003). Well-built questions contain elements that are client-oriented, are practical, and facilitate the evidence search (Sackett, Richardson, Rosenberg, & Haynes, 1997).

Based on the information gathered during the clinical examination to characterize Brent and his identification of values and goals, the following EBP questions were formulated: (a) Is Brent’s communication rate as fast as others of similar profile? (b) Is Brent’s use of alphabet-based approaches the most effective language representation method possible? and (c) Is Brent’s use of a touch screen, page-based display the most effective technology solution?

Step 2: External Evidence Review

As professionals identified research to support decisions required by Step 2, Brent was involved in searching for and appraising evidence from other sources, which included

Internet resources. He joined the Augmentative Communication On-Line User Group (ACOLUG; links to ACOLUG as well as other AAC resources such as Achieving Success in AAC can be found at the AAC Institute web site at <http://www.aacinstitute.org> .) and observed other adults who rely on AAC.

Brent and his AAC team reviewed the external evidence. Table 1 summarizes the research appraised to support decisions about AAC systems to evaluate. Research on the communication performance using AAC touch screen technology based on individuals similar to Brent’s profile was non-existent. Other research on AAC touch screen page-based displays did not strongly support use of this technology for interactive communication. The human factors research indicated that page-based displays might not lead to automaticity, and could decrease accuracy in target selection as the array changed.

Available performance data of individuals with similar profiles to Brent indicated that, using AAC systems with all three language representation methods, Brent could expect to achieve an average communication rate of 12 words per minute with a peak communication rate up to 47 words per minute. In addition, research shows significant differences in communication rate among the AAC language representation methods (LRMs) with semantic compaction as much as 6 times faster than spelling and word prediction (Hill, Holko, & Romich, 2001). Brent’s search of the evidence led him to the conclusion that he wanted to explore a hybrid AAC device that supported all three language representation methods along with trials with alternative selection techniques.

Table 1
Research Studies Pertinent to AAC Touch Screen Systems

Authors	Participants	AAC System or Equipment	Results
Estes & Wessel (1966)	20 undergraduate Stanford students	Monitor with 8, 12, 16 letter display sizes	Advantages to reduced amount of visual information that needs to be processed by operator for accuracy and response time.
Mirenda (1985)	Review of students nonverbal, severely handicapped, yet physically able-bodied	Pictorial (single meaning picture) systems, ie communication book design and layout.	Reduce amount of visual information.
Mizuko, Reichle, Ratcliff, & Esser (1994)	Normally developing 4-yr-old children	Prentke Romich Express 3 with Picsyms. Comparing accuracy on 10, 20, 30, 40 location array size.	Having fewer symbols from which to choose in a fixed display resulted in increased accuracy.
Reichle, Ettling, Drager, & Leiter (2000)	Single-subject case study of experienced augmentative system user	Compared fixed, dynamic active, and dynamic passive displays.	Response time was the fastest and accuracy was the greatest for the fixed and dynamic active display types.
Hill (2001)	Twenty adults who rely on AAC, one subject used Vanguard	Collected language samples for 2 contexts.	Reported variety of summary measures and performance outcomes. Results available for adult who relies on Vanguard.
Drager, Light, Speltz, Fallon, & Jeffries (2003)	Thirty typically developing 2 ½-yr-old children	Compared 3 system approaches to vocabulary organization: taxonomic grid; schematic grid; schematic scene on Freestyle and Dynavox.	Poor performance across all conditions. More vocabulary located on schematic scene. Failure to generalize knowledge to learning novel vocabulary.
Hochstein, McDaniel, Nettleton, & Neufeld (2003)	8 children with cerebral palsy, 8 children without disabilities	Compared variables of single-level (Alphatalker) and dual-level (Dynavox) displays and vocabulary abstractness (concrete vs. abstract words).	Both groups demonstrated same pattern of acquisition making more errors on the dual-level display and making more abstract (category) errors in selecting symbols.
Hill (2003)	Single-subject case study of 3-year-old with cerebral palsy	Monitored performance on Vanguard with Unity One-hit.	Reported MLU-w, TNW, NDW, frequency of language representation method use, core and extended vocabulary acquisition.

Step 3: Personal Evidence

Traditional methods of observation and language activity monitoring (LAM) tools were used to collect and review personal evidence. The Performance Report Tool (PeRT, Hill & Romich, 2003) was used for analyzing language samples and generating a performance report. Although traditional methods of observation allowed for the collection of the multimodal aspects for Brent's communication, only LAM tools provided the accuracy needed to monitor change or make comparisons among interventions. Video recording is not accurate in providing data on how language and messages are generated using AAC systems.

In addition, the measurement of communication and selection rate requires a time stamp for calculating standardized units of measure (Romich & Hill, 1999; Leshner, Moulton, Rinkus, & Higginbotham, 2000).

Based on the formulated EBP questions, the following performance measures were critical to obtain: (a) average and peak communication rate, (b) communication rate of language representation methods, (c) selection rate, (d) mean length of utterance, and (e) frequency of complete utterances. Brent's performance on his current AAC system showed that he used spelling 97% of the time to generate messages averaging 3 words in length. His average communication

Table 2
Performance Data Comparing Original and Recommended AAC Systems

Performance Data & Outcomes Measurement		
	Original AAC System	New AAC System
Frequency of LRMs:		
Spelling	97%	6%
Word prediction	2%	3%
Single meaning pictures	1%	1%
Semantic compaction	not supported by system	90%
Mean length of utterance in words (MLU-w)	2.8	5.5
Average communication rate: Direct keyboard	1.0 wpm	6.5 wpm
Peak communication rate: Direct keyboard	Not able to calculate	21 wpm
Average communication rate: Optical headpointing	N/A	5.3 wpm
Peak communication rate: Optical headpointing	N/A	17.4 wpm

rate was 1 word per minute (see Table 2). Communication partners frequently completed or attempted to complete his messages. Thus he had a frequency of 25% for complete utterances.

Step 4: Using the Evidence

The fourth step involved implementing the intervention. This step involved using the evidence to support moving through a language-based assessment model which included identifying the various language representations methods (LRMs) used to generate communication using AAC systems, determining specific outcomes based on selected LRMs, and evaluating how specific LRMs were supported on available technologies (Hill, 2004). Considerations of LRMs, outcomes, and technology issues were discussed and demonstrated before any AAC devices were introduced. Since Brent had an AAC device, his current system was used first to demonstrate these components and then compared with alternative AAC language application programs and technology features. This step involves monitoring or measuring Brent's performance by collecting quantitative data. Performance measurement provided a systematic and scientific approach for trial comparisons among AAC systems. Brent

required three trial periods to make a decision about a possible recommendation for a new AAC system: (a) his current AAC device with modifications, (b) an upgraded touch screen AAC system, and (c) a hybrid AAC system. (Periodic performance measurement addresses the need to monitor the learning process. For some assistive technologies, peak performance requires training and practice. Decision-making based on short term trials or without performance data may not be valid.)

Table 3 compares the technology features between Brent's original and recommended AAC systems. In reviewing the results from the trial periods, Brent advocated for an AAC system that supported all three language representation methods. He selected the hybrid display, which included both a static keyboard and a touch screen rather than the full touch screen display. In addition, Brent wanted the option to switch between direct keyboard selection and optical head pointing depending on his physical status during the day. Other features or options on the new system that enhanced Brent's perceptions of the effectiveness and efficiency included: activity row on touch screen, infrared control for computer access and environmental control, data logging, icon prediction, icon tutor, and easy access to display status and

Table 3
Feature Comparison of Original and Recommended AAC Systems

Technology Features	AAC System	
	Original AAC System	New AAC System
Language Representation Methods	Spelling, word prediction, single meaning pictures	Semantic Compaction, spelling, word prediction, single meaning pictures
Language Application Program	None; standard alphabet display and customized pages	Unity 128 sequenced
Display Type	Grid-type touch screen display with location arrays ranging from 40 to 65 keys.	Hybrid, static display with 128 locations & touch screen display with 8 locations
Primary Voice Output	DecTalk (synthetic speech)	DecTalk (synthetic speech)
Selection Method	Direct keyboard	Direct keyboard and optical head pointing

tool box. Finally, considerations about the services offered by the manufacturer were included in Brent's choice. He rated favorably services such as access to technical support, regional professional support, and Internet training opportunities. The order of his priorities was: (a) language features to support fast and spontaneous communication, (b) other features, and (c) manufacturer services.

Finally, Step 4 involved a clinical summary that evaluated the results of the process. Brent was referred for an initial assessment session in the late fall. The trial period lasted through the winter months, with a significant break occurring between semesters. The funding request for his new AAC system was submitted in the early spring with training immediately occurring on a loaner system. Brent attended one 1-hour therapy session a week for three months.

By the end of the spring semester, performance and outcomes measurement showed that Brent was a more effective communicator. The built-in LAM or data logging feature provided an efficient and effective method for monitoring progress by both the client and the clinician, and prompted discussion about treatment outcomes (Hill & Romich, 2001). Within three months of treatment, Brent had learned his new language application program and was selecting words using semantic compaction 90% of the time with an average communication rate of 6.7 words per minute and peak communication of 21 words per minute with direct keyboard selection. For Brent, use of semantic compaction was 16 times faster than spelling. As noted in Table 2, use of PeRT allowed for precise and accurate reporting of performance measures during the intervention process. The performance reports provided an ongoing, reliable record of progress for treatment outcomes. In addition to improvements in Brent's communication performance in various social

environments, his communication in classes was also considered to be improving. With an improvement in his grades, withdrawal was no longer considered necessary. Two years later, Brent graduated from the university majoring in Speech Communication Studies.

Becoming familiar with resources and supports that promote exemplary AAC practices provides the information necessary for individuals to measure and evaluate the outcomes of rehabilitation services and the use of the assistive technology. In Brent's case, after he was shown video clips of individuals using AAC systems, he shared that he had never met another person using a device. The team conducting his previous evaluation had never performed an assessment for an AAC system. During separate conversations, Brent and his mother both related that they had no idea that persons with disabilities like Brent were communicating so effectively and fast using a voice output AAC system. They also shared that they were surprised at the number of individuals using high performance AAC systems similar to Brent or with even more significant challenges. At the first assessment session, Brent was introduced to various Internet resources with the recommendation to join on ACOLUG. He was encouraged to post questions about the AAC assessment process to members of ACOLUG to be a better advocate for himself. Internet resources can provide access to information that is current and useful when sources are carefully and prudently evaluated. Examples of Internet resources available today include information and resources on AAC evidence-based practice, methods and tools to support performance and outcomes measurement, online AAC courses, information on conferences about assistive technology, directories of resources, and online discussion groups (AAC Institute, 2006). Various professional organizations provide information on exemplary rehabilitation

practices to support consumers and advocates through web sites and/or email correspondence.

Outcomes and Benefits

According to evidence-based medicine, teams are expected to conscientiously and judiciously use the best evidence or data to support decisions (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996). EBP places the client's benefits first when applying evidence of direct practical importance to planning (Gibbs, 2003). Quality of life is defined by outcomes--outcomes which compare interventions in order to make informed decisions regarding treatment (Ninni & Brownstein, 1999). Individuals who rely on AAC believe that the fundamental, desired AAC outcome of independent communication can be achieved with appropriate technology and appropriate long-term, often intensive intervention strategies (Creech, 1995). Systematic documentation of case studies reporting performance and outcomes data will contribute to the evidence base that practitioners need for decision-making. Quality of life can be dramatically enhanced when AAC teams desire the most effective, independent communication possible for an individual with significant communication disabilities. By providing a systematic framework and opportunity to compare AAC systems using evidence (research and quantitative data), the AAC team can ensure that resources are used most effectively and efficiently to achieve the best results. As in the case example, recommendations were based on quantified evidence and not impressions of effectiveness. AAC team members, families, and augmented communicators can feel secure that the client's benefits are placed first when evidence is used judiciously and conscientiously within an organized framework.

References

- AAC Institute. (2006). *Achieving success in AAC*. Retrieved February 14, 2006, from <http://www.aac institute.org>.
- Alvares, R. L. (1998). *Laboratory workbook for assessment procedures in speech-language pathology*. Boston: Butterworth Heinemann.
- American Speech- Language- Hearing Association (ASHA). (2001). *Augmentative and alternative communication: Knowledge and skills for service delivery* (III-419). Rockville, MD: Author.
- American Speech- Language- Hearing Association. (2004a). *Evidence-based practice in communication disorders: An introduction*. [Technical Report]. Retrieved February 14, 2006, from <http://www.asha.org/members/deskref-journals/eskref/default>.
- American Speech- Language- Hearing Association. (2004b). *Preferred practice patterns for the profession of speech-language pathology*. Retrieved February 14, 2006, from <http://www.asha.org/members/deskref-journal/deskref/default>.
- Creech, R. (1995). Outcomes: Choosing our directions--our freedom is the field's reason for being. In *Proceedings of the Third Annual Pittsburgh Employment Conference* (pp. 9-12). Pittsburgh, PA: SHOUT Press.
- Drager, K. D. R., Light, J. C., Speltz, J. C., Fallon, K. A., & Jeffries, L. Z. (2003). The performance of typically developing 21/2-year-olds on dynamic display AAC technologies with different system layouts and language organizations. *Journal of Speech, Language, and Hearing Research*, 46, 298-312.
- Estes, W. K., & Wessel, D.L. (1966). Reaction time in relation to display size and correctness of response in forced

- choice signal detection. *Perception and Psychophysics*, 1, 369-373.
- Frattali, C. M. (1998). *Measuring outcomes in speech-language pathology*. New York: Thieme.
- Gibbs, L. B. (2003). *Evidence-based practice for the helping professions: A practical guide with integrated multimedia*. Pacific Grove, CA: Thompson Brooks/Cole.
- Heiman, G. A. (1995). *Research methods in psychology*. New York: Houghton Mifflin.
- Hill, K. (2001). *The development of a model for automated performance measurement and the establishment of performance indices for augmented communicators under two sampling conditions*. Unpublished doctoral dissertation, University of Pittsburgh, Pittsburgh, Pennsylvania.
- Hill, K. (2003). The use of AAC performance data to support evidence-based practice with a preschooler. In *Proceedings of the 2003 RESNA Annual Conference*. Retrieved August 21, 2006, from http://www.resna.org/ProfResources/Publications/Proceedings/2003/Papers/AAC/Hill.Katya_AAC_Use%20of%20Perf%20Data.php
- Hill, K. (2004). Evidence-based practice and language activity monitoring. *Topics in Language Disorders*, 24, 18-30.
- Hill, K., Holko, R., & Romich, B. (2001, November). *AAC performance: The elements of communication rate*. Poster presented at the American Speech-Language-Hearing (ASHA) Annual Convention, New Orleans, LA.
- Hill, K., Lytton, R., & Glennen, S. (1998, August). *The role of manufacturers' consultants in delivering AAC services*. Poster presented at the 8th ISAAC Biennial Conference, Dublin, Ireland.
- Hill, K., & Romich, B. (2001). A language activity monitor for supporting AAC evidence-based clinical practice. *Assistive Technology*, 13, 12-22.
- Hill, K., & Romich, B. (2002). *AAC evidence-based clinical practice: A model for success*. Edinboro, PA: AAC Institute Press.
- Hill, K., & Romich, B. (2003). *PeRT (Performance Report Tool): A computer program for generating the AAC Performance Report*. [Computer software]. Edinboro, PA: AAC Institute.
- Hochstein, D.D., McDaniel, M.A., Nettleton, S., & Neufeld, K.H. (2003). The fruitfulness of a nomothetic approach to investigating AAC: Comparing two speech encoding schemes across cerebral palsied and nondisabled children. *American Journal of Speech-Language Pathology*, 12, 110-120.
- Law, M. (2002). *Evidence-based rehabilitation: A guide to practice*. Thorofare, NJ: Slack Incorporated.
- Leshner, G., Moulton, B. J., Rinkus, G., & Higginbotham, D. J. (2000). A universal logging format for augmentative communication. In *Proceedings of the 2000 CSUN Conference*. Los Angeles, CA: CSUN. Retrieved January 14, 2006, from <http://www.csun.edu/cod/conf/2000/proceedings/0088Leshner.htm>
- Lloyd, L. L., Fuller, D. R., & Arvidson, H. H. (1997). *Augmentative and alternative communication: A handbook of principles and practices*. Boston: Allyn and Bacon.
- Mirenda, P. (1985). Designing pictorial communication systems for physically able-bodied students with severe handicaps. *Augmentative and Alternative Communication*, 1, 58-64.
- Mizuko, M., Reichle, J., Ratcliff, A., & Esser, J. (1994). Effects of selection techniques and array sizes on short-term visual memory. *AAC: Augmentative and Alternative Communication*, 10, 237-244.
- Ninni, K. M., & Brownstein, L. (1999). Patient outcome as a selection criterion in determining treatment mode. *Perfusion*, 14, 213-218.
- Pain, K., Dunn, M., Anderson, G., Darrah, J., & Kratochvil, M. (1998). Quality of

- life: What does it mean in rehabilitation? *Journal of Rehabilitation*, 64(2), 5-11.
- Paul, R. (2002). *Introduction to clinical methods in communication disorders*. Baltimore: Brookes.
- Reichle, J., Dettling, E.E., Drager, K.D.R., & Leiter, A. (2000). Comparison of correct responses and response latency for fixed and dynamic displays: Performance of a learner with severe developmental disabilities. *AAC: Augmentative and Alternative Communication*, 16, 154-163.
- Romich, B., & Hill, K. (1999). A language activity monitor for AAC and writing systems: Clinical intervention, outcomes measurements, and research. In *Proceedings for the RESNA '99 Annual Conference* (pp 19-21). Long Beach, CA: RESNA Press.
- Sackett, D. L., Haynes, R. B., Guyatt, G. H., & Tugwell, P. (1991). *Clinical epidemiology: A basic science for clinical medicine* (2nd ed.). Philadelphia: Lippincott Williams & Wilkins.
- Sackett, D. L., Richardson, W. S., Rosenberg, W., Haynes, R. B. (1997). *Evidence-based medicine: How to practice and teach EBM*. London: Churchill Livingstone.
- Sackett, D. L., Rosenberg, W. Mc, Gray, J. M., Haynes, R. B., & Richardson, W. S. (1996). Evidence-based medicine: What it is and what it isn't. *British Medical Journal*, 321, 71-72.
- Schlosser, R. W. (2004, June 22). Evidence-based practice in AAC: 10 points to consider. *The ASHA Leader*, pp. 6-7, 10-11.
- ACOLUG Augmentative Communication on-Line User Group) is a listserve with primary participants being people who rely on AAC at: <http://www.temple.edu/instituteondisabilities/programs/assistive/acolug/>.

Further Information

AAC Institute is a non-profit organization dedicated to the most effective communication for individuals who can not speak at <http://www.aac institute.org>.

AAC CASE STUDY PERFORMANCE & OUTCOMES SUMMARY

Client Profile Report client age, gender, ethnicity, diagnosis, disability. Describe basic characteristics such as abilities, skills, expectations, values, preferences, background, education, vocation. Identify any pertinent standardized test results or rating scales; report educational information such as grades, grade point average, test scores. Identify any accommodations and use of assistive technology. Detailed information should be provided for hearing, vision, physical, speech, language, and cognition.

Step 1: Questions Formulate 1-3 well-built questions that are client-oriented, practical, and will facilitate an evidence search. Suggested question elements include: 1) client type and problem; 2) what you might do (treatment); 3) alternative treatment options or course of action; 4) what you want to accomplish, e.g. performance and outcomes of treatment. Including specific performance data in a question to look for as dependent (outcome) variables will make appraisal of the external evidence more efficient.

Step 2: External Evidence Review Plan a search strategy to identify research and other evidence that address the questions asked. Look for both sides of an issue. Use of Internet databases is recommended. Search for research that reports the dependent (outcome) variables that are important for the client. Learn how to critically appraise the evidence. Become familiar with the levels of evidence to know the strength of the evidence you find.

Step 3: Personal Evidence Have the client confirm his or her values, expectations, preferences and concerns for baseline data. Collect performance and outcome measures for any current AAC strategies to use as baseline data. Monitor performance during any AAC device trials and interventions and measure outcomes at key decision-making points. Any qualitative and quantitative data should be distinguished and collected systematically so that the process is reliable and can be compared or duplicated.

Step 4: Using the Evidence This step involves putting decisions into action, monitoring the progress, and evaluating the results. Documents for this step may include diagnostic, treatment or lesson plans, an I.E.P., a Speech Generating Device (SGD) funding request. Principled and systematic methods of monitoring intervention allow for identifying variables that are influencing performance and outcomes and provide for timely modification to intervention when needed.

Clinical Summary Report final performance and outcomes data. Performance data should be consistent with previous data and reliable and valid measures for specific skills and goals of treatment. Comparison back to baseline data is important. Outcomes may be reported for 1) clinical results, 2) functional status, 3) quality of life, 4) satisfaction, and 5) cost. Outcomes may include perceptions reported not only by the client, but other team and family members.

References: Identify research articles from Step 2 to ensure references can be found by others or requested from original sources.