



Resource Manual for Commissioning and Planning Services for SLCN

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CONTEXT

The aim of this section is to set out the context for this resource. This work forms part of a range of tools which can support leaders with service planning and delivery, in line with both government and local priorities.

It is essential for service providers to demonstrate quality and productivity and to:

- show value for money
- be able to provide a strong financial argument for the need to invest in services for people with speech, language, communication and swallowing needs
- demonstrate improvements in outcomes for individuals, families and society

Value for money is not about being the cheapest option but about delivering the most return (impact, best outcomes) for a given investment over time.

The key drivers for change to services include:

1. The broad context, which can be divided according to the following factors:
 - **P**olitical and **L**egislative factors
 - **E**conomic factors
 - **S**ocial factors
 - **T**echnological factors
2. The near or local context, including:
 - Localised policies
 - Addressing local needs
 - Service provision
 - Workforce
 - The evidence base

THE BROAD CONTEXT (MACRO-ENVIRONMENTAL ANALYSIS): FACTORS FROM THE WIDER WORLD

The Macro-environmental analysis commonly takes the form of a PEST analysis:

Political and legislative factors

Economic factors

Social factors

Technological factors

Political and legislative drivers

Devolution has resulted in changes to the powers of the different institutions across the UK.

The government in power at Westminster maintains responsibility for policy and legislation in relation to key areas including: tax, benefits, foreign affairs, international development,

trade and defence for the four countries of the UK. Government in Westminster is also responsible for health, social care and education in England, but these areas are devolved for Northern Ireland, Scotland and Wales.

As a result of devolution, each country of the UK may have different parties in power, with the possibility of increasing powers in the future. The impact of this is the diversification of policy and direction of travel.

Legislative drivers

The main areas of UK-wide legislation that are relevant include the following themes:

- Human Rights
- Disability Discrimination
- Equality

Though there is different local interpretation, these far-reaching legal instruments define the rights and responsibilities of people and those commissioning and providing services for them.

Public protection has also been strengthened through the introduction of registration of professionals, for example, through the Health Professions Council.

There is separate legislation relating to health, education and social services in each of the devolved administrations in England, Northern Ireland, Scotland and Wales.

Economic

The current challenging economic backdrop will have a significant impact on the financing of public services, with local planners and commissioners prioritising services which are value for money, evidence based and releasing cash through innovation.

Social

In order to plan and deliver services, it is essential to identify the demographic factors relevant to speech and language therapy (SLT) and the challenges that these bring.

- The population is aging: people are living longer.
- The birth rate is falling: most families are having fewer children
- The infant mortality rate is also falling, with more children surviving premature birth or health problems or injury in infancy.
- The urban population is growing.
- The proportion of the population in employment is falling.
- The proportion of the population with English as an additional language is increasing, particularly in urban areas.

THE NEAR OR LOCAL CONTEXT

Localised policies

Central to the new reforms is the emphasis on local decision-making within a national framework. Across the four countries of the UK there are requirements to provide services to accord with local need and influence. In England there is a particular focus on increasing the range of potential providers (plurality of provision) with commissioners having a role to stimulate the market.

For each country, arrangements have been established to assess whether commissioners are achieving better health outcomes for the local population. Part of this process will be an assessment of how well commissioners are performing against specified competencies/indicators/targets. For example, in Northern Ireland these targets are based upon high-level outcomes linked to local strategies.

With the devolution of power to local levels, there is a focus on developing more robust accountability. There is an emphasis on joint working to support integrated commissioning, service planning and provision across health, social care and education.

There are different approaches to this development with different structures and commissioning and performance management arrangements being established across the UK. The dominant theme in strengthening accountability is “putting service users at the centre” with respect to:

- Access and self-referral
- User voice at strategic to operational to individual case management
- Population/local engagement
- Information and advice for users, parents/ carers
- Patient Rights
- Self management of conditions

Some localities will be commissioning or planning speech and language therapy services as a single service whilst others will be commissioning integrated services, cutting across traditional boundaries, with health services integrated with education or social services. In many areas, this has already happened for children's services.

It is recognised that, often, no single agency can deliver best outcomes for their service users by working in isolation. Joint commissioning is advocated wherever the meeting the needs of individuals requires contributions from a number of agencies.

Similarly, some service planners or commissioners will be organising services around disease groups, such as services for persons who have survived a stroke. In either case, it will be important for speech and language therapy managers to liaise with other services to ensure that SLT provision is incorporated in their service plans.

Special arrangements are in place for commissioning services for unusual, low incidence or costly interventions. Speech and language therapy managers should identify the specialist commissioning procedures that may be required for individuals requiring

particular interventions such as costly augmentative communication aids, protracted or intensive interventions.

Addressing local needs

In general terms, the UK is experiencing a number of long-term demographic changes (some of which are identified above).

There is significant local variation within these general trends. It is important to understand what these changes and variations imply in relation to the provision of local SLT services. Other local factors to be taken into consideration include: employment, cost of living, housing, transport and, particularly, levels of deprivation.

There are information resources available online from which planners, commissioners and providers can find out more about local and regional demographic factors. Some of these can be found signposted on the RCSLT website www.rcslt.org.

Local public health teams will also be able to sign-post local services to relevant data and information for their area.

There will also be learning from data collected by services. The RCSLT has developed an online tool called Q-SET, the Quality Self- Evaluation Tool to help you collate local SLT service derived information <http://www.rcslt.org/resources/qset>. Q-SET should be used alongside national and local data to support service planning and evaluation of service delivery.

Through completing Q-SET, provider services can:

- use the resource every 9-12 months to review progress in meeting action plans and to demonstrate service enhancement
- compare their service with other similar service types e.g. urban, rural, acute, community, adult, paediatric, education, 3rd sector
- demonstrate that their service meets the needs of the service users
- identify areas of strength and generate action plans relating to areas of development.
- submit the results as part of the evidence for a clinical audit
- retain ownership of the monitoring and development of services ensuring that strong professional standards are maintained in the context of multi-agency teams

Service providers completing Q-SET will support commissioners to:

- reduce the 'postcode lottery' of service availability and quality
- have high quality information that is relevant and accessible
- have an overview of developments, trends and initiatives within the service
- have accurate and timely statistics to support performance management and monitoring
- collect data to contribute to the debates on benchmarking. Where benchmarks do not yet exist Q-SET will enable Commissioners to contribute to this in the future
- collect examples of good practice to inform other pieces of work and the development of services as a whole.

Locally derived information will help SLT services to illustrate:

- the numbers of patients/clients seen
- sources of referral
- amount of resource used in providing a service to the client e.g. number of sessions and skill mix
- nature and severity of the disorder, disability, psychosocial impact at the onset of intervention
- nature and severity of the disorder, disability, psychosocial impact at the completion of intervention.
- level of satisfaction with the service.

Service provision

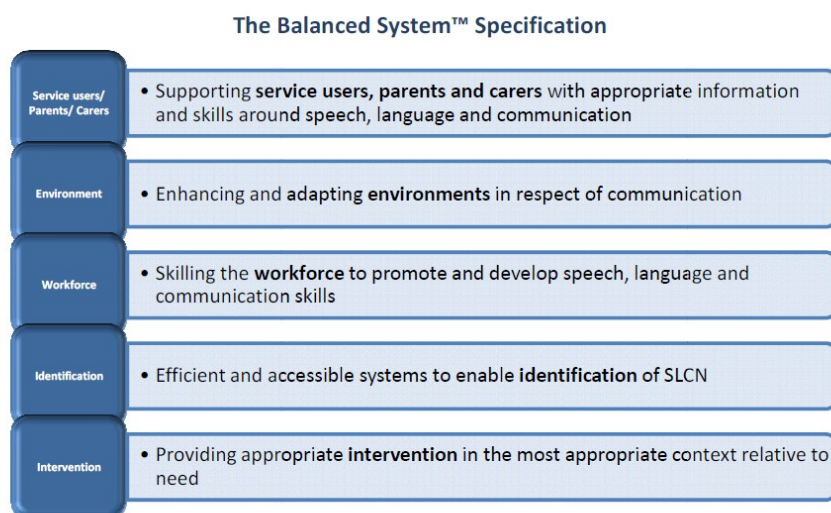
Speech and language therapists have a role in delivering specialist and targeted support to clients, carers and their families. Speech and language therapists can also reduce long-term demands on services by addressing immediate needs that arise from circumstance rather than underlying impairment. Providing training for the wider workforce is integral to the speech and language therapists core role, as outcomes for people with speech, language and communication needs SLCN are improved when the whole workforce is able to contribute appropriately to care pathways.

SLTs also work with the wider workforce contributing to the public health agenda, promoting health and well-being in respect of communication and swallowing. There is little awareness outside the profession of the role of speech and language therapists in preventing the development of speech and language impairments and the further impact and consequences of different speech, language and communication disorders upon health, education, social integration and employment.

The challenges of meeting the speech, language and communication needs (SLCN) of a given population are best understood through a social (participative) model. Key elements of a total service specification will start with:

- identifying the needs of the service user, parent or carer for support and information
- identifying/assessing and diagnosing specific SLCN and providing appropriate intervention.
- considering needs of service users within the environments they encounter
- training the wider workforce that interfaces with them to maximise opportunities for positive outcomes.

The balanced system (diagram 1) below illustrates the wider context for how SLTs contribute to this range of activities. The needs of service users should be considered in service specifications. The role of SLTs in supporting the active participation of service users in service planning, adapting the environment and enskilling the workforce is as relevant as the SLT role in identification and intervention.



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Workforce

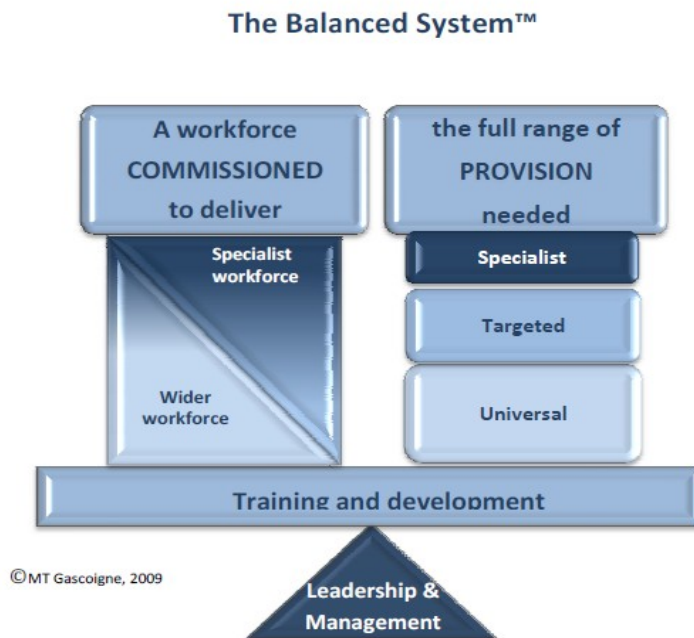
Careful planning of services, including joint commissioning, will help to shape the workforce and inform the skill mix required to deliver high quality services, improve outcomes and support value for money. Because the commissioning and planning of services relies on the evidence base for a given type of SLCN or model of practice, it is essential that clinical and managerial expertise from speech and language therapists is available to support innovation and quality of service design.

Speech and Language Therapists, as part of the wider workforce, may be employed by a range of organisations, including the third sector, social care and education or be working as private practitioners.

Equal Access to services is of importance to local decision makers. Local demographic profiling will inform workforce requirements. For example, bilingual staff and support workers are required in most areas to meet the needs of diverse communities. The appropriate skill mix should enable services to be family-centred and be culturally and linguistically appropriate and responsive. It may be necessary to consider increasing home delivered services or providing services in unusual locations.

The RCSLT also acknowledges the important role that Assistants and Support Workers have in the delivery of effective speech and language therapy services. Assistants and Support Workers are integral members of both speech and language therapy and multi-disciplinary teams, engaged in a wide range of clinical settings with diverse client groups, duties and responsibilities. http://www.rcslt.org/aboutslts/rcslt_statement_v3.pdf

In order to support more effective use of skill mix, SLT services also need to provide education and training of the wider workforce and not be focussed solely on direct patient / client care. For all services, this is critical to secure the appropriate balance of cost-effective universal, targeted and specialist services.



PRACTICAL CONSIDERATIONS

Many people involved in strategic planning, commissioning or reviewing services will not be familiar with speech and language therapy, its objectives, the needs of clients requiring speech and language therapy, the principles driving the profession, or the evidence base and the following points may support people.

- Where possible, draw on the evidence base.
- Communicate clearly and succinctly.
- Avoid using acronyms and provide a glossary of terms.
- Do not assume knowledge of local arrangements or the requirement to interface with other agencies
- Set your service in the context of local priorities.

The RCSLT's Communicating Quality 3 (CQ3) provides clear guidance on care pathways, clinical standards and issues related to quality assurance. This information should be used in submissions to support commissioning quality services.

The following guiding principles have been adopted and apply to all client groups. Services are to:

- be family centred and culturally and linguistically appropriate and responsive
- be comprehensive, coordinated and team based
- work with and communicate effectively with other services meeting the needs of the client
- be evidence based
- ensure equal access
- involve the family and carers
- include training and education of co-workers
- ensure practitioners continuing professional development and appropriate support.

Evidence of the impact of the service will be important to commissioners and providers. Providers will need to demonstrate the impact of their service, particularly when services are being reviewed. Determining the objectives of the service will support the process of outcome measurement. SLT services will need to provide information on outcomes achieved and levels of client satisfaction. Some of this information can be gathered through use of the RCSLT's Q-SET tool, as detailed above.

Managers of speech and language therapy services will need to equip themselves to engage effectively and positively with those who are commissioning or monitoring services. They will need to:

- identify who is commissioning or responsible for overseeing different services. For example, health commissioners may be working with commissioners for education/head teachers. It is important to identify who is taking the lead for each aspect of the service delivery in the locality.
- establish good working relationships and effective communication with those commissioners and planners for their area of responsibility.
- be aware of local priorities and commissioning plans and strategies.
- have a good understanding of the commissioning/planning/monitoring framework for the locality
- be equipped with local data, knowledge and evidence to the tendering process
- be clear of the unique contribution of the service to improving health, employment, education and social outcomes
- be able to clarify and demonstrate local working partnerships and collaborations
- provide data describing the service provided, (numbers and types of patients, numbers of attendances, health and social outcomes etc).

The RCSLT has developed a range of resources to support its members with Continuing Professional Development. CPD is a regulatory requirement for all SLTs and this requires all HPC Registrants to demonstrate how the CPD they have undertaken has sought to enhance service delivery and to be of benefit to service users. The RCSLT has endorsed this requirement through its own CPD standards. <http://www.rcslt.org/cpd/resources>

THE EVIDENCE BASE

The commissioning and planning of services must be informed by the evidence base of effective practices.

This Resource Manual SLCN is based on a synthesis of existing published research. The threshold for inclusion in the syntheses has favoured the most scientifically robust research methodologies which have often reflected medical (impairment) rather than social (participative) models of care.

In the section summaries, emerging practices that have not been included in the evidence synthesis, are referred to and should be considered alongside the syntheses. This tension between empirical evidence resulting from robust research, which by definition is retrospective, and the needs to encourage innovation and service re-design to support improvements in outcomes for people with speech, language, communication and swallowing difficulties is natural and unavoidable. Emerging practice will not have the same evidence base and therefore less empirically stringent measures of evidence need to be taken into account for these areas including professional consensus and measures of service user, parent or carer experience. However, because of the value of some emerging innovative practice, they have been included in this resource.

An overview of the methodologies employed in identifying practices that are included in this resource accompanies this document.

Using these resources

Speech and language therapy managers can assist commissioners by understanding their agenda and the objectives that they are to be assessed on.

The Royal College of Speech and Language Therapists is providing these resources to assist speech and language therapists in gathering the core data required to support service tendering agreements, service planning, monitoring arrangements and/or where services require specification.

Each part of these resources is focused on a specific area.

The resources provide:

- *The Contextual Synthesis*. This includes definitions, information on the incidence and prevalence of the disorder, key contribution of speech and language therapists, consideration of the implications and broader consequences of the disorder.
- *The Synthesis of Key Literature*. This summarises the evidence of the impact of speech and language therapy.

Each section within these resources gives succinct information to inform the factual content for any service planning activity. These include:

- Key points
- Topic –What is [the condition]?
- How many people have [the condition]?

- What causes [the condition]?
- How does this condition affect individuals?
- What are the aims/objectives of speech and Language therapy interventions for [this condition]?
- What is the management for people with [this condition]?
- What is the evidence for Speech and language therapy interventions in [this condition]?
- Studies
- Assessment methods
- Speech and language therapy interventions
- Summary
- References

This information will need to be put into context, using local information.

Other guidance and resource materials

It is recognised that service managers may wish to amplify or clarify, an aspect of their service by providing reference to other national or local research of relevance.

The RCSLT has a range of resources which can be used to further support and inform the commissioning, planning and provision of services for people with speech, language, communication and swallowing needs. These can be found on the RCSLT website: www.rcslt.org

The RCSLT is grateful to the experts from within the SLT community who contributed to the evidence published in this document.

METHODOLOGY FOR SYNTHESIS OF LITERATURE

Introduction

The focus of the interventional synthesis within these briefings is to provide a synopsis on the effectiveness of speech and language therapy interventions for each specific condition.

The interventional syntheses are produced by reviewers within the Information Resources Section (within the Health Economic and Decision Science Section) at the School of Health and Related Research (SchARR). Information specialists/reviewers for this bulletin were Diana Papaioannou and Anna Cantrell.

Methodology

The interventional syntheses are not intended to be a full systematic review within each topic area. However, they draw upon systematic review techniques to ensure that the syntheses are developed according to systematic, explicit and transparent methods. The intention of the syntheses is to consolidate twenty articles which represent some of the best research for each topic area.

Literature searching

Systematic literature searches were undertaken to identify a range of evidence for each interventional synthesis. The interventional syntheses do not attempt to consolidate all research within a particular topic area; rather they aim to present a careful selection of the most current research within that field. Therefore, the approach adopted for the literature search aims to be comprehensive reflecting this systematic and explicit approach.

Firstly, search terms were selected within the project team drawing on the expertise of four speech language professionals. This involved listing all possible synonyms describing the condition or population (for e.g. children/infant, stuttering/stammering) and combining those with terms to describe speech and language therapy. Terms were used in both free text and thesaurus searching. The following databases were used:

- ASSIA
- CINAHL
- The Cochrane Library (which includes the Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled trials, Database of Abstracts of Reviews of Effects, Health Technology Assessment Database and NHS Economic Evaluations Database).
- Linguistics and Language Behaviour Abstracts
- MEDLINE
- PsycInfo

All references retrieved from the literature searches were entered onto a Reference Manager Version 11 database using appropriate keywords.

Selecting and obtaining relevant articles

Articles for inclusion were selected to illustrate the range of good quality evidence within each topic area. An initial screening of articles was undertaken by the Information specialists/reviewers who adopted the following principles:

- Articles must be empirical research evaluating the effectiveness of a particular speech and language therapy intervention
- Only articles published in English language are included.
- In general, only the most current (1998-present) literature is included. However, exceptions were made to this if a particular article was felt to be important to include.
- Where possible higher level evidence was included (systematic reviews, randomised controlled trials). However, this research did not always exist in every topic area.
- Efforts were also made to seek out literature that provided a range of perspectives on interventions for each topic area, i.e. both quantitative and qualitative research.

Following initial screening, the remaining articles were examined by two members of the team; each having considerable speech and language therapy knowledge and experience. Approximately, twenty articles were selected by the two reviewers with disagreements being resolved by a third reviewer.

Assessing the quality of relevant articles

Formal quality assessment of the articles was not undertaken. Instead, quality assessment involved using checklists as a guide to give an indication of the overall quality of studies and highlight the main good and bad aspects of each study. For each interventional synthesis, the included study designs are listed and the problems with each study design noted. General observations on study quality are made and common errors within the studies, where appropriate, are specifically noted. The checklists used are one for quantitative and one for qualitative studies from the Alberta Heritage Foundation for Medical Research.¹ Additionally, when an identifiable study design was used, the appropriate Critical Appraisal Skills Programme (CASP) checklist was selected.²

Syntheses of the twenty articles

Each article was read in turn by one of the Information Specialists/reviewers. The key points were summarised including the objective of the study, the participants' characteristics, the methodology, the intervention, results and limitations. From this, articles were grouped into themes according to the factor being investigated (for e.g., length of intervention, personnel carrying out intervention, family involvement in treatment, nature of disorder). Results were summarised and drawn together within each particular theme and a summary paragraph provided at the end.

These syntheses first went out for review by selected individuals, identified by the research team, with particular expertise in the delivery or management of services to the

¹ LM Kmet, RC Lee, LS Cook (2004) Standard Quality Assessment Criteria for Evaluating Primary Research Papers from a Variety of Fields. Accessed at <http://www.ihe.ca/documents/hta/HTA-FR13.pdf> (Accessed on 25th September 2008, now no longer available)

² Critical Appraisal Skills Programme (2007) Appraisal Tools. Accessed at <http://www.phru.nhs.uk/Pages/PHD/resources.htm> on 9th January 2009.

specific client group. Comments were included in the second draft, which was then dispatched to those selected by the Royal College Speech and Language Therapists who were invited to attend a focus group day. These therapists gave detailed consideration to their specialist area and contributed to the more general discussion of one further area. Issues to be captured in the key points were also identified within the focus groups. These comments contributed to the third draft of the syntheses, which again went out to reviewers. In some cases, further work was required in order to modify the wording and reflect discussion.

Checklist for service managers involved in commissioning services

Have you presented incidence and prevalence figures and local demographic trends for the conditions in your area?

Have you provided information on local access and use of services in the context of the number expected and highlighted your approaches to inequalities?

Have you consulted systematically with users to inform development of this commissioning proposal?

Does your proposal fit/link with local cross agency priorities?

Have you outlined the range of services provided including training?

Have you made clear how this fits with future planning for your service over the next 3-5 years?

Have you stated the assumptions which underpin your thinking in the plan and for future developments?

Have you offered predictions about the likely impact of investment in the proposal?

Have you made clear where the risks are and what contingency plans you have put in place?

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RCSLT RESOURCE MANUAL FOR COMMISSIONING AND PLANNING SERVICES FOR SLCN

Augmentative and Alternative Communication (AAC)

Augmentative and Alternative Communication

1. Key Points

1. AAC should be considered as a viable option for improving the quality of life of anyone of any age with a severe communication impairment resulting from developmental, acquired, progressive, long-term or acute conditions.
2. Speech and Language Therapists (SLTs) are specialists in communication difficulties and as such are an integral part of multidisciplinary teams that support AAC assessment, provision, use, training and support.
3. SLTs who have had specific basic training on AAC acquire a basic competence in assessment and provision of AAC and require access to and support from specialist services for those people needing more in depth assessment and provision.
4. The provision of AAC can assist children and young people with severe communication problems to develop cognitive, receptive and expressive language, and literacy skills.
5. AAC needs to be introduced at the appropriate time for all those who have a communication impairment in order to improve quality of life, learning and communication opportunities.
6. AAC needs to be introduced at the appropriate time for persons with progressive neurological disease affecting their speech. Access to regular review of these individuals is required to ensure that any systems are adapted with their changing needs and abilities.
7. AAC can reduce frustration, improve autonomy and reduce strain of those with a severe communication impairment and their carers and communication partners.
8. AAC low and high tech communication aids/systems can assist those patients in intensive care units or high dependency units to communicate whilst other channels are unavailable to them.
9. AAC users themselves identified the need for one-to-one therapy to improve linguistic and functional competencies as a priority.
10. All users of AAC should have access to regular reviews by a specialist team, allowing updating of their systems.
11. Services should allow for equipment to be tried by potential users of AAC prior to provision or purchase.
12. Appropriate training and support on AAC systems and strategies are needed for successful use.
13. Speech and language therapists need access to regular training on AAC to keep them informed of technological changes and new methods of implementation.
14. Maintenance of equipment should be incorporated in service provision.

2. What is Augmentative and Alternative Communication?

The term 'Augmentative and Alternative Communication' (AAC) has been defined by International Society for Augmentative & Alternative Communication (ISAAC) 'to describe extra ways of helping people who find it hard to communicate by speech or writing. AAC helps them to communicate more easily.'

Therefore, AAC is a functional definition for systems that aim to help people with communication impairments to communicate more effectively (Loncke et al. 2006). Communication difficulties may stem from physical, sensory, intellectual, learning or cognitive disabilities. People who use AAC (pwuAAC) have unique needs that require AAC to be customised to meet their specific communication needs, physical and cognitive abilities within their personal context. Communication needs usually necessitate the pwuAAC to employ a combination of several different AAC strategies. Communication includes more than just giving someone a message, but needs to allow a person to initiate and end interactions, maintain different topics of conversations, make requests, relate information and allow a historical narrative to be maintained. Thus AAC strategies can help a person communicate wants, needs, thoughts, and ideas when that person is not able to use speech. The AAC strategies usually include both unaided and aided methods of communication. For descriptive purposes aided communication systems can be divided into two systems, powered and unpowered:

- Communication charts, symbol levels and books with no power system.
- Technology that makes use of equipment that has a power system. The device usually allows the individual to access speech output or written output. For example, a Voice Output Communication Aid (VOCA) allows the AAC speaker to communicate using speech output which may be digitised (recorded) speech or synthesised speech (Schlosser et al 2003, 2007). There are a wide variety of VOCAs available of differing shapes, sizes and weights and can store different amounts of information in different organisations. PwuAAC with physical limitations may need to use alternative access to operate a communication device. This may be a switch, joystick, touch screen or eye gaze unit. VOCAs and communication software can utilise static displays where the symbols are always on display on the device or have dynamic displays that allows the person to navigate between many sets of symbols and across levels or pages (Beukelman & Mirenda 2005).

Table 1: Examples of types of AAC

Unaided	Aided	
	No power	Power
Eye Pointing	Symbol/Pictures/ Charts/ Books	Dedicated computer systems
Facial expressions	Communication passport	Voice recognition software
Pointing	Etran frame	Software for non-dedicated computer systems
Gesture	Pointer	Voice Output Communication Aids
Signing	Paper and pencils	Assistive Technology Systems with voice

AAC can be seen as comprising of 4 strands:

- The manner of communication (e.g. medium used such as Speech Generation).
- The means of access to the medium (e.g. keyboard, touch screen, switch).
- A system of representing meanings (e.g. words, signs and symbols).
- Strategies for interaction (e.g. having a conversation using the AAC) (*Communicating Quality 3 2006*).

AAC systems include unaided and aided methods of communication:

- **Unaided Communication** includes “techniques that do not require the use of an external object” (Glennan & Decoste 1997) and includes gesture and signing, facial expression, and pointing.
- **Aided Communication** involves “the use of physical objects, typically referred to as aids or devices which are used to communicate messages” (Glennan & Decoste 1997). Aided communication

includes communication charts and books, pen and paper, Voice Output Communication Aids (VOCAs). Symbols can include objects, photographs, line drawings, detailed pictures, coloured symbols, geometric shapes, gestures, manual signs, letters, or words. Symbols can be organised in many different ways, but will always be organised into a system that suits the AAC speaker.

Those AAC systems that are described as unaided include the use of signs, gestures, facial expressions and eye pointing, none of which requires equipment or technology. AAC systems that are described as aided include use of additional equipment such as pen and paper, pictures/photos, communication books, and symbols. Symbols can include objects, photographs, line drawings, detailed pictures, coloured symbols, geometric shapes, gestures, manual signs, letters, or words and be organised across a board or into layers.

Technical devices usually allow the individual to access voice/speech output or written output. VOCAs can utilise static displays where the symbols are always on display on the device or have dynamic displays that allows the person to navigate between many sets of symbols and across levels or pages (Beukelman & Mirenda 2005). The physical design of the devices can come in differing shapes, sizes and weights and can store different amounts of information. Those people with physical limitations may need to use different access methods such as using a switch or switches to operate a communication VOCA depending on their abilities.

AAC strategies can promote social inclusion and facilitate participation so that individuals can maintain or develop communication in different settings. An unaided AAC system can be used in any environment. It is spontaneous and facilitates communication between the pwaAAC and their regular communication partner. However, it must be noted that, an unaided system requires a communication partner to understand the person's communicative meaning and the communication may not be understood by those people who are less familiar with the method. The use of aided communication in the form of VOCAs can facilitate communication to a wider group of people and across more communication settings which can increase independence, particularly for those with severe physical and communication difficulties. For example, an individual can sustain conversations, use the telephone, use electronic communication systems, send e-mails, and use Twitter, Facebook, Blogs and message boards as well as participating in education and work settings.

Speech and Language Therapists (SLTs) are specialists in communication difficulties and as such are an integral part of multidisciplinary teams that support AAC assessment, provision, use and support.

3. How many people use Augmentative and Alternative Communication?

The conditions that are associated with the requirement for AAC use may be developmental or acquired. The developmental conditions include: cerebral palsy; autism; learning difficulties/disabilities; and developmental apraxia of speech. Acquired conditions include: head and neck cancer; acquired neurological conditions, such as, stroke or head injury and progressive neurological conditions, such as, motor neurone disease; multiple sclerosis; Parkinson's' disease and degenerative cognitive conditions such as dementia. AAC is also relevant for patients in Intensive Care Units.

It is difficult to obtain specific figures of prevalence of AAC use because of the diversity conditions and the different manner of funding of AAC. Prevalence varies with the condition reported and the under-identification of potential AAC users. For example, a report on AAC use in children aged 0-19 years in England identified an under-identification of children who could benefit from using AAC (Gross 2010). The population requiring AAC systems is likely to increase with the increased survival rate of people with complex difficulties and the development of new AAC systems that can help a wider population, such as in

Autism and Dementia. For example, a study by Parrott et al (2008) reported that the numbers of young people aged 15-19 years who had a severe or complex needs had increased by 70% in the period 1998 to 2008. The figures in table 2 provide an indication as to the prevalence of use of AAC in general and in some specific populations. Incidence is less relevant when talking about AAC use, as it is difficult to pinpoint 'new cases'.

Table 2: Prevalence of AAC

Population referred to	Prevalence	Source
Children and young people needing high technology AAC in UK	0.05% or 6,200	Gross 2010
Projected adult prevalence in UK	19,710	Gross 2010
Projected need for AAC in England 61,792,000 in UK population	370,752 using Scope figure 0.6%	Office of National Statistics 2010 mid 2009 figures for UK & Scope estimate 2006
UK population who would benefit from AAC	0.4-1% 0.6% most quoted	Scope 2007
People in UK and USA who require AAC systems	0.3-1.4%	From studies in UK and America, including Beukelman and Ansel 1995, cited in Communicating Quality 3 2006 RCSLT
School population in UK needing AAC systems	0.2-0.6%	Blackstone 1990, cited in Communicating Quality 3 2006 RCSLT
Children with Special Educational Needs statement referred for AAC	18%	Wright J, Clarke M, et al. 2004.
People with cerebral palsy using AAC	Male 61% Female 39% Low tech 50% Only use in formal contexts 22%	Murphy J et al. 1995.
People in USA using AAC systems	8-12 per 1000 people	Studies reported in ASHA 2008 edition.
Cerebral palsy resulting in a speech impairment needing AAC support	31% to 88%	Beukelman & Mirenda 1998.

4. Who uses Augmentative and Alternative Communication?

Individuals who experience communication problems as a result of their speech, language and communication difficulties may benefit from using a range of AAC strategies. Table 3 shows examples of a range of developmental and acquired conditions associated with communication difficulties in adults and children by age groups who may benefit from AAC to facilitate communication.

Table 3: Examples of aetiological conditions of associated with AAC use for both adults and children

Child Group

Acquired neurological e.g.:

Stroke
Head Injury

Progressive neuromuscular e.g.:

Freidrich's Ataxia, Complex Syndromes,
Muscular dystrophy

Congenital conditions e.g.:

Cerebral Palsy
Multiple Complex Disabilities
Profound and Multiple Learning Difficulties (PMLD)
Physical Difficulties

Developmental disorders e.g.:

Learning Difficulties/Disabilities
Autistic Spectrum
Developmental delay
Speech and Language Impairment

Adult Group

Acquired neurological e.g.:

Stroke
Head injury

Progressive neuromuscular e.g.:

Progressive Neurological: Multiple Sclerosis, Motor Neurone Disease, Parkinson's disease
Muscular Dystrophy

Changes to laryngeal and oral pathology e.g.:

Voice
Head and Neck Cancer

Congenital conditions e.g.:

Cerebral Palsy
Cleft Palate & craniofacial malformations
Syndromic conditions
Profound and Multiple Learning Difficulties (PMLD)
Adults with Physical Disabilities
Adults with Learning Disabilities
Adults with Autism

Degenerative Neurological conditions e.g.:

Dementia

Individuals with aetiologies that give rise to complex communication difficulties can benefit from different AAC systems strategies and equipment to support their communication needs. Communication needs vary greatly in respect to the physical and cognitive abilities present. For example, a person with physical difficulties who cannot point will need alternative access, such as, using eye gaze to look at photos, pictures, symbols or words. A person who cannot use a keyboard or touch screen may need to use one or more switches, use a joystick instead of a mouse or eye gaze technology.

There may be a need for the use of AAC systems on a short term basis, when the person has limited communication due to delayed development or surgery. Persons with cognitive difficulties and limitations in speech or language, but where the ability to understand and formulate language is adequate, may benefit from an AAC system which makes use of graphic symbols and voice output. Individuals with lifelong developmental disabilities that affect communication may use AAC strategies to augment their speech or as an alternative means of communicate (Miranda 2003). If language, reading or writing abilities are not present, or not yet developed, then an AAC system will need to be chosen that uses the appropriate level of understanding and developmental level of language.

Persons with cognitive difficulties may be able to access AAC systems, strategies and equipment but may need more support with language structure and organisation. For example, the person may use signing or need graphic symbols to represent whole or partially complete utterances. If reading or writing abilities are not present, delayed or lost, then a graphic symbol system will be needed in a communication book or chart or on a Voice Output Communication Aid (VOCA). In selecting any AAC system, strategy or equipment, the cognitive, visual, and physical abilities of the individual's needs must be considered.

5. How does use of an Augmentative and Alternative Communication system impact on individuals?

The use of an AAC system strategy or equipment provides a means of communication for people with a severe communication impairment. The impact of using AAC systems, strategies or equipment varies with the individual circumstances and needs of the person, the level of speech and language impairment, communicative ability of the individual to facilitate their participation in society. Having an adequate communication system or equipment affects a person's ability to make choices and their overall quality of life (Bush & Scott 2009, Hamm & Miranda 2006).

The introduction of an AAC system, strategy or equipment can lead to the development of language and cognitive abilities, provided the most appropriate tools are used (Millar et al. 2006, Beukelman & Miranda 1998). There is also a strong relationship between speech and literacy skills. However, some highly skilful AAC speakers are unable to read. "The development of literacy skills in a person will open up a wider choice of AAC options" (Beukelman & Miranda 1998, p356). Parents often report that communication systems, strategies and equipment play an important developmental and educational role.

People who have an acquired speech difficulty are usually older and of an age when speech is partly or fully functioning and use speech as their primary means of communication and with a lifestyle that depends on 'spoken communication'. Whether having suddenly lost speech due to a trauma, or gradually losing speech due to a progressive neurological disorder, AAC can be used to replace or support speech based communication. AAC systems, strategies and equipment will inevitably be more restricted than being able to speak. The levels of frustration at not being able to express themselves easily will have an immense impact on someone's lifestyle and communication partners.

Hodge (2007) reporting on a project exploring the experiences of pwuAAC, found that obtaining a communication aid can transform someone's life, increasing independence and access to opportunities, helps the user to interact with those around them. Even for users who do not describe their experience in such life changing terms, AAC strategies can still be indispensable at specific times, such as, hospital appointments or communicating over the telephone.

If the introduction of appropriate AAC systems, strategies and equipment is delayed there may be difficulties in:

- social interaction
- control of environment
- development or restoration of language skills
- initiating communication
- learning
- developing life skills
- participating in education and employment

This in turn may lead to:

- lack of or loss of identity
- depression
- passivity/learned helplessness
- reduced learning opportunities
- isolation
- challenging behaviour
- risk of harm or abuse
- failure to reach potential in life (Communicating Quality 3, 2006).

6. What are the aims/objectives of Speech and Language Therapy interventions for Augmentative and Alternative Communication?

- SLTs are communication specialists who can provide an assessment of communication needs, identify areas for intervention and recommend/teach communication strategies to enable people with communication difficulties to maximise their potential.
- SLTs provide person centred approaches, aiming to observe the communication abilities and restrictions of the person their communicative needs and observing when a communication is successful or where it breaks down. The aim of intervention is to find ways of making that person a more successful communicator and where possible to be communicatively competent.
- The SLT will aim to incorporate different communication approaches that best meet the communication needs of the person. This will usually include several different methods of communication and incorporate both unaided and aided methods.
- The SLT involved in providing and developing communication using AAC strategies should have experience of working with AAC or be working and consulting with a SLT who is a specialist in AAC.
- The SLT involved in providing and developing communication using AAC strategies must know when to refer on to an appropriately skilled colleague and/or a regional AAC Service.

- Standards for AAC Services have been written by Communication Matters and are available on www.communicationmatters.org.uk
- All AAC systems, strategies and equipment need to be continuously reviewed by the treating SLT and/or local AAC specialist who are able to make appropriate revisions, if necessary, so the changing needs of the client are met. Clients who are no longer actively involved with AAC or SLT services should have information on when and how to access an SLT review of AAC needs should this be required. For clients unable to contact services directly, a review date should be set.
- The multidisciplinary team has the specialist expertise to assess, and provide suitable AAC. Furthermore, all AAC systems need to be continuously reviewed by the team and revised, if necessary, so that it can continue to meet the changing needs of the client.

The SLT aims to provide a service that meets the needs of the individual and their family. Aims and objectives will vary accordingly. The aims and objectives of using AAC with a person will depend on the stage of life the person is at:

- Pre-school – to develop vocabulary, language and interaction with family members and main communication partners, access the Early Years Curriculum and facilitate language development.
- School age – to develop vocabulary, language and interaction with peers as well as to access the curriculum.
- Throughout life – developing emotional and social skills, independence and achieving social and vocational goals (Light 1989).

Congenital communication impairments/Developmental disorders

Children with communication impairments requiring AAC need to have systems, strategies and equipment that take into account the need to support the development of understanding (input) as well as output. The child needs to see and hear people in the environment using his communication system, strategies and equipment. Modelling is key to the development of first spoken words, and this is built on the ability to understand what is said and how the message is created. Intervention with children will depend on the relationship between understanding and spoken language, symbols and referent (Smith 2006).

Acquired communication impairments

Both children and adults can acquire a speech or language impairment associated with disease or trauma. The aims and objectives of introducing AAC to a child or an adult with an acquired communication problem relate to maximising the communicative function in those areas of life that are seen as a priority by the person and to continually review the changing needs of the person as their environment and opportunities alter.

Progressive neurological diseases

People with a progressive neurological disease affecting their speech may benefit from a broad range of AAC systems. These may require adapting or changing throughout the course of the disease. For example, an individual may benefit from a voice amplifier at an earlier stage of the disease, but at later stages, they may require a sophisticated switch and symbol system. Case studies indicate that introducing AAC at an early stage is beneficial and that regular reviews are required along with training of communication partners.

AAC assessment

The aim of an AAC assessment is to identify the most effective means of communication possible for the person. This will often necessitate a multimodal approach if the person is to communicate for different

purposes and in a variety of contexts and environments. AAC assessment should be carried out with the experienced SLT as part of the team. Communication Matters have created the AAC Service Standards to include Assessment (see www.communicationmatters.org.uk)

It is necessary to:

- identify participation and communication needs
- assess capabilities in order to determine appropriate options
- identify the skills, abilities and needs of the communication partners
- assess external constraints, physical and sensory challenges and abilities
- find strategies for evaluating the success of interventions. (Beukelman & Mirenda 1998).

These factors are relevant when choosing an AAC system, strategies and equipment and to identify the amount of training required to implement and support the chosen AAC systems, strategies and equipment. It is essential for people and their communicative partners to be assessed together so appropriate and informed choices can be made (AAC-RERC White Paper 2011).

Table 5 shows a summary of areas to assess that uses the dimensions in the WHOICF (2002).

Table 5: WHO-ICF dimensions - summary of areas assessed by SLTs to be included in an AAC assessment

ICF dimension	Areas Assessed
Impairment	<p><i>Physiology</i> – motor (gross and fine motor control), sensory, auditory, and gaze/visual function and limitations</p> <p>Structures – structural integrity</p> <p><i>Cognition</i> – language, processing, memory, attention, concentration, perception, mood function and limitations</p>
Activity	<p>Intelligibility</p> <p>Use of voice in different settings</p> <p>Communication abilities</p> <p>Communication behaviours</p> <p>Organisation of communication</p> <p>Use of communication</p> <p>Literacy</p> <p>Factors/help needed to facilitate achieving successful communication</p> <p>Ability to communicate in different contexts and locations</p> <p>Ability to be understood by familiar and unfamiliar communication partners</p> <p>Ability to communicate 1-1 or in groups</p> <p>Motivation</p> <p>Learning behaviours</p> <p>Use of gross and fine motor skills</p> <p>Fatigue level</p> <p>Technical knowledge/use of technology/computer use</p>
Participation	<p>Integration</p> <p>Abilities, needs and preferences of communication partners</p> <p>Social participation - participation in differing context and settings</p> <p>Life areas – education, work, economic self-sufficiency</p> <p>Environment</p> <p>Requirement for portability of AAC device</p> <p>Requirement for durability</p>

	Requirement for capability of differing AAC systems Important/intimate relationships
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Environment

Assessment of the person's own communication environment helps to identify different communication environments and the communication systems, strategies and equipment used in each. Understanding the communication environments helps to optimise and maximise communication. Environments may include:

- close communication partners such as family members/carers and close friends
- people who know the AAC speaker, such as class mates, teachers
- friends they see less frequently
- acquaintances
- work colleagues, people they meet in everyday life, such as shop assistants, taxi drivers, strangers to them.

The SLT notes how communication partners choose to communicate with the AAC speaker in different environments. A person can only use an AAC system, strategy or equipment well if those around them are prepared to accept these means of communication. The communication partner will have different levels of understanding how AAC systems, strategies and equipment can be best used in different environments. The amount of training required to implement and support the AAC strategy is often dependant on the understanding of the communication partners. The person also needs to have the opportunity to communicate and the opportunity to develop their skills on AAC and devices. The equipment used needs to suit the environment it is used in and the person may need to suit differing strategies according to the environment and communicative needs therein.

AAC provision and support

The provision of AAC services vary across the country. The SLT aims to provide an AAC system appropriate to the needs and to give support that enables the person to access effective and timely communication support. Following assessment, the SLT will be involved in facilitating communication competence through training and support to develop the person's use of AAC. The communication needs of the individual will change over time, requiring reassessment and, in some cases, frequent adaptations to the system. Support for the ever changing communication needs of the person can mean a life-long input from services.

The SLT must be part of the team who assesses and prescribes AAC systems, strategies and equipment appropriate to the needs of the individual with the communication impairment. The team (and therefore SLT) should provide sufficient support to enable the AAC user to develop effective and efficient communication.

Referral for assessment to a regional specialist centre is usually subject to set criteria for that centre. The centre staff will liaise with the local SLT and team and discuss any aspects of assessment, training and support as required. Other individuals would need to access AAC through alternative services. As all regional specialist AAC services have different criteria, it is important to know where to refer people for the most appropriate support. Further information can be obtained from the Communication Matters AAC Service Standards.

AAC Tools for Communication Partners

The more familiar the communication partner is with the person's system of communication then the more successful communication is. Less familiar communication partners are often uncertain about how

to communicate with an AAC speaker. Different approaches can be adopted to help novel communicative partners and less familiar communication partners succeed in communicating. These take time on part of the SLT who endeavours to ensure that communication is effective in a broad range of settings. Examples of tools that can help communication succeed can include strategies that are unpowered and powered or combine the two. For example:

- 'Communication passport' (Millar & Aitken 2003) is a booklet created by those working with the individual including photographs of the setup, video footage and demonstrating AAC equipment in use in a range of situations. It can also describe the individual in terms of providing information about their family, their likes and dislikes, physical needs, eating and drinking needs, their understanding and learning needs as well as how they communicate.
- 'Communication Matrix' can help to document the different aspects of AAC used by the person. It can be used to map daily activities and then list the desired activity, along with the best communication strategy and/or communication device so that those working with the person know how best to communicate with the person at that time (Rowland & Fried-Oken 2010).

Communication partners need to be included when strategies for learning communication are being introduced, for example they will need to learn how to pace their communication interactions to allow the person time to understand and respond. There is a learning curve while learning how to use systems and devices and when adopting new symbol systems and sets. For example, 'Talking Mats' (www.talkingmats.com) symbol sets can be used to facilitate communication in people who have cognitive changes such as dementia but the method of using them successfully needs to be learned by the user and carer.

7. What is the management for people using Augmentative and Alternative Communication?

It is the role of speech and language therapists to comply with legislation, policy and guidance (which may be generic or condition specific) by promoting communication through the use and development of AAC skills for people with severe communication difficulties (Scottish Govt. Report 2011).

AAC services vary across the country (SCOPE 2009). The format of any delivery of AAC will be collaborative and the involved professionals will be those appropriate to the needs of the person and their family. Current thinking is that a 'hub' and 'spoke' model of provision is the most effective. The 'hub' is a specialist facility of different specialists, including an AAC specialist SLT (or access to one). The other members of the team should include a clinical scientist, occupational therapist, psychologist, physiotherapist, rehabilitation physician, medical physics technician and specialist teacher (to be involved with children and young people). The SLTs in the 'spokes' would have some knowledge and competencies concerning AAC systems, strategies and equipment. The proposed working relationship between the 'spokes' (local SLT services) and the 'hubs' (specialist SLTs in a team) aims to provide access to the most appropriate AAC systems, strategies and equipment to meet their individual communication needs and provide ongoing support.

In practice, the AAC service models relate to who has commissioned the service and an agreed purpose. Most local community SLT services have SLTs who have some understanding of AAC but who are not specialist in AAC SLTs. Access to local specialist SLTs is necessary before referral to a regional service. The RCSLT recognise differing levels of competencies for SLTs working with AAC and have developed a set of competencies for AAC knowledge specifically: learner, competent with support, competent and experienced, and the specialist SLT (RCSLT Competences for AAC accessed 2011). This work is being

developed further by Communication Matters to create Competencies for all those working with AAC speakers.

Assessment Services

Assessment may be at a local, specialist or regional level. For example, the assessment team may be at the local level with the local SLT working in association with the family. The local SLT may be supported by an AAC specialist SLT or specialist AAC team, according to the needs of the person, the AAC needs and the complexity of the situation that needs attention. The composition of the teams varies according to location and how teams evolved historically. Different teams may include different professionals according to the aim and purpose of the service. The staff may be employed by health, education, social care or voluntary sector/charity organisations. The AAC specialist SLTs should be employed as part of the AAC team or brought in for their expertise (AAC Service Standards for Commissioners Communication Matters 2011). For example, in a centre that assesses children, the team may comprise of a SLT, Occupational Therapist, Physiotherapist and Assistive Technologist and other relevant professionals may be co-opted as needed, such as, teachers or special needs teachers or Psychologist, while in an adult team might include a Rehabilitation or Neurological consultant.

Details of Assessment Services are set out in ‘The AAC Service Standards’ (Communication Matters accessed 2011) which cites details of good practice for assessment for AAC systems, strategies and equipment.

Table 5 shows an example of a care pathway for a specialist NHS AAC service. The West Midlands AAC Team care pathway has been described here to illustrate the type of pathway that might be followed by a person going through a specialist AAC Centre.

Table 5: Summary of an example AAC care pathway (West Midlands AAC Team)

Stage of Management	Details
Referral	Dependant on local factors
Assessment	Gathering information from the patient including: <ul style="list-style-type: none"> • background to the communication difficulty • current modes of communication • use and understanding of language • equipment and positioning • communicative environment.
Planning	A plan would need to be devised by a multidisciplinary team or professionals involved in the patients care, including short, mid and long term goals. Considerable training and support is needed within schools for children, staff and the AAC users’ peers.
Intervention	Introducing an AAC system involves decisions making as to which AAC system will be used, and if this involves a device, how this will be purchased, instruction given, and the device maintained. This process involves input from the user, family members, communication and education professionals and funding agencies. Supporting the patient in learning to use the system and applying its use in day to day living may include: <ul style="list-style-type: none"> • one to one therapy • group work

	<ul style="list-style-type: none"> • creating opportunities for communication within child’s normal environment • introduce and develop communication strategies • training and supporting communication partners • liaise with relevant professionals • Considerable training and support is needed within schools for children, staff and the AAC users peers ⁴⁾ • Safety checks to maintain the system and resolve any problems. • Advice and assistance with cleanliness of equipment.
Regular review meetings	Multidisciplinary team involved in patients care.
Onward referral process	While complete discharge from the service is unusual for AAC users, there should be in place an onward referral process for matters which beyond the scope of the Speech and Language Therapist.

The person with communication needs and their family will often seek their own solutions. This can be because the statutory bodies cannot be supportive due to financial constraints or a lack of knowledge and skills in the local team. At this point, the AAC speaker and/or their family or others may access information from websites, specialist support organisations such as Communication Matters, approach manufacturers, charities, support groups, local SLT services, Independent SLT services, GPs and other people who use AAC. As a result, these AAC speakers may not be known to their local teams.

Local teams can be approached directly by people seeking information and advice. Many local teams have resources that allow them to meet certain AAC needs but this depends on funding and ability to supply and support AAC use through supplying the appropriate AAC strategy or equipment and ongoing training. This has a significant time commitment. Referrals to a specialist Communication Aids Centre is usually via the SLT and/or GP who will supply an assessment of impairment, abilities, participation and expectations of the person and their family. The maintenance of the aid and repair is also a cost which will need to be met through funding streams or by the individual themselves if no funds are available.

‘The AAC Service Standards’ (Communication Matters 2011) describe the standards for an AAC Service. These specify what an AAC speaker can expect of an AAC Service, these include the team having the:

- appropriate skills
- knowledge of the full range of relevant currently available techniques and technology
- awareness to know limits to their competence
- ability to be objective when considering the AAC speaker’s needs
- ability to carry out a person centred assessment (consider the venue, timing etc.)
- skills to make person-centred recommendations
- ability to meet with individual needs and know when to refer on to another more appropriate service
- skills and knowledge to support the implementation of the communication systems.

(Taken from ‘The AAC Service Standards’ (Communication Matters 2011))

For AAC interventions to succeed certain maxims need to be remembered:

- AAC systems, strategies and equipment need to be focused on the individual
- individuals vary
- environments vary

- communication partners vary.

The benefit of AAC is in maintaining communication, reducing frustration, facilitating social interaction and participation in life, hobbies, interests, facilitating learning, language development, self-value and self-worth. Developing communication skills helps to reduce feelings of isolation, anger and challenging behaviour and builds self-esteem and fulfilling potential. Achieving successful outcomes, having an effective and efficient communication system through the use of appropriate AAC systems, strategies and equipment is dependent on these points (ASHA 2004).

8. What is the evidence for the use of Augmented and Alternative Communication?

What is the evidence for SLT interventions?

Evidence on SLT interventions using high technology AAC

Details of studies

Twenty two papers were included in this summary synthesis of outcomes from high technology alternative and augmentative (AAC) interventions. Work in non-peer reviewed publications was excluded, and also studies published before 2000. Study designs eligible for inclusion were those having data collected at more than one time point, and studies having more than two participants. These quality criteria excluded the large body of case study and cross-sectional work in the area.

For the purpose of this work high technology intervention (“high tech”) was defined by exclusion as those AAC methods or devices which cannot be described as low technology. Research on low technology aids encompassed: signing; gesture; communication books; communication boards; alphabet boards; writing and drawing; pictures and symbols not used in association with a computer; and amplifiers where these are not for assistive purposes. Artificial larynx aids and aids used for dysphonia were also excluded, together with the use of aids during temporary loss of communication such as immediately post-surgery. The use of computers for a treatment tool/therapy only (rather than as an assistive device) was outside the scope of the review. Technology which promotes access to computers/switches to overcome physical disabilities was also excluded.

The scope of the population under consideration was any person who has an impairment of communication not resulting from a primary auditory impairment. All age groups were included. The review also considered studies reporting data from relatives/significant others of these people with communication difficulties, together with staff delivering AAC services to this population. Studies carried out in non-communication impaired populations were outside the remit of this review, although work reporting findings from mixed populations was considered.

All studies were published in English and encompassed work from six different countries. The highest proportion of papers originated from North America (12). Two papers were from Australia, two from Germany, two from Sweden, and one each from the Netherlands and France. As will be detailed below, the study participants included people with acquired non-progressive neurological disorders, acquired progressive neurological disorders, autism/autistic spectrum disorder, cerebral palsy and other developmental disorders. High tech systems described in the included papers encompassed: voice output communication aids (VOCAs) which are also termed speech generating devices (SGDs); software on personal computers or laptops used as a communication aid to provide voice (recorded or synthesised) or written output; and technology providing access to personal computers or laptops enabling them to be used as a communication aid.

Outcomes measured

Within the papers there was a vast range of measures used to evaluate the effect of AAC intervention. This may reflect debate in the field regarding what is considered a “good outcome” from AAC provision. Many authors used multiple measures within a single study. The outcomes included those that measured the number of requests or responses, the frequency of system use, accuracy of responses, correct information units, and standardised language measures (often as part of a battery of outcomes).

Effectiveness of interventions

Acquired non-progressive neurological disorders

Aphasia

Seven papers reported the use of high tech AAC in people who have aphasia resulting from a variety of non-progressive causes. The largest group concerned aphasia resulting from a cerebro-vascular accident (CVA). Van de Sandt-Koenderman et al. (2007) investigated the use of TouchSpeak in 30 people with severe aphasia and minimal spoken output following CVA. They found that of the 26 participants, who completed the training, 13 had no functional usage of the device, five were dependent users, five were independent users and seven were extensive users. Non-users tended to score lower on a test of visual semantic association, and extensive users tended to be younger. The authors suggested that there was a need to investigate visual semantic processing requirements for AAC usage. Koul et al. (2005) explored the use of laptop computers with touch screens and speech synthesizers with the Gus software program, amongst nine people with Broca’s or global aphasia. Eight of the participants were able to produce sentences using the technology during training (although reportedly with varying success), and four participants were able to produce sentences in the generalisation phase. The authors of this work highlighted that there was a need for studies of AAC use in real-life contexts.

The distinction made in this review between use of technology for therapy/treatment rather than as an assistive device could be considered to be unclear in the following studies. Fink et al. (2008) evaluated the SentenceShaper program and found that it increased informativeness in five individuals with mild-moderate aphasia as rated by experienced listeners. The authors highlighted however that there was “virtually no” carry over from practiced stimuli to other topics. Linebarger et al. (2008) also evaluated the SentenceShaper software program with six participants who had non-fluent aphasia. The study found significant gains in narrative production, although gains in structure, content and rate varied between individuals. It was suggested that post-articulatory monitoring may play a critical role in the effectiveness of the program.

In an earlier paper Linebarger et al. (2000) described the benefits of the C-Speak Aphasia software program for six participants with agrammatic aphasia due to “various aetiologies”. Use of the software led to longer and more grammatically structured utterances for five participants. Gains were reported in particular for mean sentence length and percentage of words in a sentence, compared to closed-class measures (such as morphological complexity and number of inflectable verbs). In a third paper by these authors (Linebarger et al. 2005) also evaluated C-Speak in eight participants with Broca’s aphasia, one anomia, and one with conduction aphasia. Intervention outcomes were assessed using Quantitative Production Analysis. Six of the participants were classified as “good responders” with significant gains in expressive tasks, and four were “poor responders” whose performance remained the same or decreased. Nicholas et al. (2005) also described varying success in outcomes from the C-Speak program amongst five individuals with severe non-fluent aphasia. One participant was described as an “excellent responder” to training, two improved on some tasks, and two achieved poor improvement. It was reported that performance varied between

individuals in particular on functional communication tasks, and that participants with better preserved non-linguistic cognitive skills (executive functioning) responded better to training.

Locked in syndrome

Lancioni et al. (2010) described the use of high tech assistive technology for people with locked in syndrome post-coma. The three participants had aetiologies of brain stem, cerebellar, and ischaemic stroke, intracranial aneurysm, and traumatic brain injury. The study found that frequency of response to a preferred stimuli, using a micro-switch connected to a computer system could be increased (from a baseline of mean 3, below 3 and below 5 to post intervention of 8, 8 and 9) for the three participants. It also described that frequency of responding generally increased for two individuals.

Acquired progressive neurological disorders

Amyotrophic lateral sclerosis

Two papers reported studies using complex technology with participants who have amyotrophic lateral sclerosis (ALS). One paper (Neumann & Birbaumer, 2003) examined predictors of being able to use Brain Communication Interface (BCI) technology (slow cortical potential based BCI) to indicate a desired response. Authors of this study described that there was a significant relationship between initial and later performance in terms of the percentage of correct amplitude shifts for the five participants with ALS. Another paper including some authors from this first study (Nijboer et al. 2008) reported gains in communication potential for patients with ALS. This work used the P300-based matrix speller with Electroencephalogram (EEG) technology and found that participants could achieve a mean item selection rate of 1.2 selections per minute, with accuracy rates of 79%.

Autism/autistic spectrum disorder

Eight papers reported high tech AAC use with people who have autism or autistic-like disorders (Olive et al. 2007; Schlosser et al. 2007; Sigafoos et al. 2004; Sigafoos et al. 2003; Thunberg et al. 2007; Thunberg et al. 2009; Trembath et al. 2009 ; McMillan 2008).

The paper by Olive et al. (2007) evaluated the effect of enhance milieu teaching combined with a VOCA. The three children with autism in this study (aged 45, 48 and 66 months) all increased their instances of use of the AAC device (from zero for all three to 10.5, 7.3 and 12.8). It was also reported that one participant began vocalizing during the study. Schlosser et al. (2007) studied use of a SGD in five children with autism for requesting food at snack time or requesting "leisure objects". Outcomes were variable across participants with two increasing their percentage of correct requesting when the SGD was switched on versus switched off. However, one increased percentage of correct requesting when it was turned off. The performance of the other participants seemed to have no pattern. It was described that one participant increased vocalisation during the course of the study.

Sigafoos et al. (2003) explored requesting using an "I want more" recorded message on a BigMack switch. The three participants in this study included two with autism and one with congenital amaurosis who exhibited autistic-like behaviours. The study found that the participants learned to use the device rapidly and that requesting levels were similar for all participants. Participant's vocalisation did not vary according to whether the vocalisation on the device was turned on or off. In a later paper (Sigafoos et al. 2004) three participants learned to request the return of a Tech/Talk VOCA with "I want more" recorded when it was out of reach.

Papers by Thunberg et al. (2007, 2009) investigated use of a portable touch screen PC with Clicker 3 software, symbols, photos, and Infovox speech synthesiser output. One paper reported a study of four participants, two with autism and two with pervasive developmental disorder, and the other paper

presented data from one participant with autism and two with pervasive developmental disorder. The later paper examined use of the device in a home environment. Outcomes considered were: engagement; rate of contributions; role in turn taking; mode; and effectiveness. The authors reported in the 2007 paper that the SGD intervention increased the rate of communication effectiveness (11-19% increase) however other measures varied between participants. The 2009 paper outlined that engagement ratings were higher for all participants in at least one activity post-intervention in a home environment. The rate of responses reportedly increased in four of the six activities and effectiveness increased for all participants in all activities.

One paper explored the potential for indirect intervention with teachers to enhance AAC outcomes. McMillan et al. (2008) investigated the impact of training teachers on student use of a "SGD system with symbols". The study included four teachers involved with four children with autistic spectrum disorders. The study found that following the teacher training intervention all students increased the mean frequency for device initiations per session (4.9 to 49, 0.4 to 13.3, 2.4 to 17 and 3.1 to 16). For two students the teacher's use of time delay for instruction seemed related to a higher frequency of initiations. The authors described that there was some evidence of generalisation of these positive outcomes to other contexts.

Other developmental disorders

Three papers described interventions with other developmental disorders. Bruno & Trembath (2006) recruited nine children using AAC aged 4 to 14. They had a range of diagnoses including apraxia, schizencephaly, Down syndrome, and cerebral palsy (CP). The study investigated whether training could increase the syntactic complexity of AAC communications. It found improvements using a SGD (number of items correctly pointed to on request) for five of the participants for one test item, for three on another and for one on the third test item. It was noted that two of the participants were at ceiling at baseline for two of the test items. The authors highlighted that while there were some gains for the SGD, these were poorer than for a low tech aid (a communication board).

Lancioni et al. (2008) reported data from three young people aged 10, 11 and 15 with severe to profound intellectual disability. The work evaluated use of a micro-switch and VOCA to access "environmental stimuli". The study found a significant increase in VOCA activation responses following the intervention. Evans Cosbey & Johnston (2006) investigated use of a single switch VOCA programmed with "that looks fun can I play" in children aged 3, 4 and 6 with cerebral palsy. They found that all participants increased their unprompted use of the VOCA from baseline to intervention and during the generalisation phase to gain access to a toy or socialisation with peers. The authors commented however on limited functional use.

Bock et al. (2005) compared the effectiveness of PECS (Picture Exchange Communication System) versus a VOCA for six males aged four with developmental delay. All participants increased the number of spontaneous requests during the intervention from zero at baseline. Half acquired use of PECs earlier than a VOCA, whereas for the other half there was no difference between acquiring use of the VOCA versus PECS. It was reported that two children met the criteria to move to phase 3 using the VOCA and one achieved phase 3 using the VOCA (fewer than using PECS).

Participants with severe dysarthria

One paper included a very diverse range of participants with severe dysarthria. Laffont et al. (2007) evaluated use of a Dialo speech synthesiser amongst 10 individuals with severe dysarthria aged 9-66, who all reportedly had "good global cognition". Five individuals had cerebral palsy, three ALS, one incomplete locked in syndrome, and one cerebral anoxia. The study evaluated the device in terms of level of use over a two month period. The study found that six participants were classed as high level users (more than 15,000 keystrokes over 2 months). Four of these high level users used the word prediction function more than 300

times in that period. Overall satisfaction with the device was described as good (most were “more or less satisfied”). Dictation times however varied widely across participants, and overall there was no statistical improvement between baseline and following the intervention. It was reported that five participants continued to use the system after the study completed, and eventually purchased the device (only three of these were high level users).

Study quality

This synthesis included only papers reporting before and after (longitudinal) data. The searches found no papers reporting studies with a controlled design. Quality issues noted amongst the set in addition to the lack of controlled studies were short follow up periods, and use of descriptive data rather than detailed or statistical analysis. There was considerable heterogeneity of participants in some studies, with diversity in terms of age, diagnosis, or pattern of communication difficulties. This may have limited the demonstrated impact of interventions, and indeed some authors highlighted the effect of individual patterns of communication difficulty and response to intervention. The diversity also resulted in some participants reaching ceiling for outcomes prior to completion of the intervention in some cases.

There was considerable variation in the degree to which authors described the AAC systems. Some studies contained several pages of detailed description of the technology, while for others only a broad label such as VOCA or a SGD was provided. Many studies described their limitations in terms of a being undertaken in a highly controlled context with lack of consideration of functional use and environmental factors. Some authors also commented on issues relating to fidelity of the intervention regime, particularly in regard to interventions carried out in an educational context or where intensive training was required.

Conclusions

The findings suggest that high tech AAC may be beneficial across a range of diagnoses and age ranges including acquired progressive and non-progressive neurological conditions, autism, and other developmental disorders. The individual variation in outcome reported in many studies, however requires consideration. Differing responses described in the research may be linked to varying patterns and levels of communication needs within any single diagnostic category. There is a need for future studies to endeavour to recruit using closer matching of individual communication levels rather than the seeming tendency towards convenience sampling within broad categories. It also seems important to further understand characteristics of clients who may or may not benefit from high tech AAC technology. Some papers suggested that aspects such as visual semantic processing or cognitive functioning may impact on the response to intervention, and that for some individuals low tech interventions may be more beneficial.

The field is dominated by studies with small samples, many of which are case studies. This review examined only higher quality evidence and found only 22 papers, a relatively small number. There is currently a lack of work using controlled designs which must be a future priority, if potential sources of bias in intervention study outcomes are to be overcome. The range of outcome measures examined by the literature also requires further consideration in regard to use in structured situations versus functional usage.

Study	Research Question	AAC	Subjects
Bock et al. 2005	How effective is PECS versus a VOCA for pre-school children with complex needs?	GoTalk lightweight digitised device with BoardMaker produced pictures	6 males (M) aged 4 with developmental delay, USA
Bruno & Trembath, 2006	Can training increase syntactic complexity of AAC communications?	Dynamic display page sets used with speech generating devices – Dynamyte, Pathfinder, E-Talk & Dynavox	9 children using AAC, aged 4-14, range of diagnoses including CP, apraxia, schizencephaly, Down syndrome, USA
Evans Cosbey & Johnston, 2006	How effective is a VOCA for children with severe disabilities?	Single switch VOCA programmed with 1 sentence “that looks fun can I play”	3 female (F) aged 3, 4 & 6, all CP 1 also Pierre Robin syndrome & agenesis of the corpus callosum, USA
Fink et al. 2008	Does use of Sentence Shaper have an impact on levels of informativeness in aphasic speakers?	SentenceShaper software program	5 individuals with mild-moderate non fluent aphasia 3 F 2 M aged 32-62, USA
Koul et al. 2005	Can a computer-based AAC system be used successfully by individuals with aphasia?	Laptop computers with touch screens and speech synthesisers + Gus software program	9 people with Broca’s or global aphasia due to left hemisphere damage, + one no intelligible expressive language following brain stem stroke, aged 32-86 years, USA
Laffont et al. 2007	How useful is a speech synthesiser for people with severe dysarthria?	Dialo speech synthesiser	10 individuals with severe dysarthria aged 9-66, “good global cognition.” 5 CP, 3 ALS, one incomplete locked in syndrome, one cerebral anoxia. 4 had previously used a speech synthesiser, others used a communication board, France
Lancioni et al. 2010	Can people post-coma make requests via assistive technology?	Microswitch + computer	3 participants post-coma. F aged 81 brainstem, cerebellar and ischemic strokes 3 months post onset, M aged 22 TBI 2 years post onset, F aged 51 intracranial aneurysm 4

			months post onset, Italy
Lancioni et al. 2008	Can people with multiple disabilities access environmental stimuli via a microswitch and VOCA	Microswitch + VOCA	3 young people aged 10,11,15 severe to profound intellectual disability congenital encephalopathy, had previously been involved in microswitch programmes, Italy
Linebarger et al. 2008	What improvements can use of Sentence Shaper make to aphasic speakers?	SentenceShaper	6 participants with non fluent aphasia 1-9 years post onset aged 36-62, USA
Linebarger et al. 2000	Does using the CS software improve grammatical complexity of utterances?	The CS software – utterances are recorded and represented as a shape on screen, shapes can be moved around to form longer utterances and narratives.	6 participants with agrammatic aphasia, “various aetiologies, USA.
Linebarger et al. 2005	What is the efficacy of CS software?	CS software	10 participants, 8 with Broca’s aphasia, 1 anomia, 1 conduction aphasia
McMillan, 2008	Can training teachers impact on student use of SGDs	“SGD system” with symbols	4 M aged 8-12, autistic spectrum disorders. 4 F teachers in special classrooms for students with intellectual disabilities, 3-57 years teaching experience in SEN, Australia
Neumann & Birbaumer, 2003	Does initial performance with a BCI predict longer term outcome?	Slow cortical potential based BCI	5 participants with ALS, Germany
Nicholas et al. 2005	Can the C-Speak Aphasia computer program aid communicative ability for people with aphasia?	C-Speak Aphasia	3 M & 2 F CVA severe non fluent aphasia at least one year post onset, aged 27-67, USA
Nijboer et al. 2008	What is the efficacy of a BCI communication device?	P300-based matrix speller using EEG	3 M & 3 F, ALS, 1 bulbar, 5 spinal, aged 36-67, Germany
Olive et al. 2007	What is the effectiveness of enhanced milieu teaching combined with a VOCA?	VOCA	3 M autism aged 45, 48 and 66 months, USA
Schlosser et al. 2007	Does a speech	Vantage SGD (DECTalk	5 children with autism,

	generating device increase requesting for children with autism?	synthetic speech output with dynamic display using Lexigrams graphic symbols)	aged 8-10, 4 M 1 F, non users of SGD, USA
Sigafoos et al. 2004	Can students be taught to initiate finding behaviours when an AAC device is not present?	Tech/Talk VOCA, only 1 panel functional "I want more"	3 participants, autism, non verbal, aged 12, 16, 20, 1 F 2 M, USA
Sigafoos et al. 2003	Do children continue to use an AAC device for requesting when the speech function is turned off?	BigMack switch with "I want more" recorded	3 participants aged 3, 4 & 13, developmental disabilities. 1 Leber's Congenital Amaurosis with autistic like behaviours, 2 autism, Australia
Thunberg et al. 2007	What impact does a SGD intervention have on communication contexts in a home environment?	Portable touch screen PC with Clicker 3 software , PCS symbols, Clicker symbols, photos, Infovox speech synthesiser output	4 M participants aged 4-7. 2 autism, 2 PDD, Sweden
Thunberg et al. 2009	What impact does a SGD intervention have on communication in a home environment?	Portable touch screen PC with Clicker 3 software , PCS symbols, Clicker symbols, photos, Infovox speech synthesiser output	3 M participants aged 5-7, 1 autism, 2 PDD, Sweden
Van de Sandt - Koenderman et al, 2007	Which cognitive factors impact on successful use of TouchSpeak?	TouchSpeak	30 people with severe aphasia and minimal spoken output following CVA. 15 M 15 F, aged 33-82 mean age 61. 7-62 months post onset. 25 global, 3 Broca's, 1 conduction, 1 not classifiable, Netherlands

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