Introduction

Seating for persons with physical disabilities often entails considering posture, comfort and pressure management. Depending on the person’s diagnosis and life goals, the priorities of their personalized seating goals will vary. This paper addresses issues related to providing persons with disabilities wheelchair seating that is primarily concerned with attaining a functional posture in the presence of considerable abnormal tone. Tonal abnormalities, high or low, that offer challenges for the seating specialist are often the result of an insult to the central nervous system (CNS) in persons such as those with a diagnosis of cerebral palsy, closed head injury or diseases that affect the CNS.

Spasticity management can include issues related to neurophysiological techniques, primitive postural reflexes, abnormal movement patterns, proximal stability, orientation in space, sensory and visual disturbances, and discomfort (Herman & Lang, 1999). Whatever the major source of the abnormal tone, the challenge is to provide seating systems that normalize tone as much as possible, prevent, delay or accommodate the deformity that often accompanies tonal disturbances that persist over time and finally to position the person in a posture in which they can attain maximal independence and function (Trefler, 1993).

People who have tonal problems and who require a wheelchair as their primary means of mobility/seating, experience unique postural problems. The damage to the brain can occur in diffuse or selective patterns and to any portion of the brain. Therefore, the patterns of tonal dysfunction will vary with every individual. Patterns of velocity, gradation of movement, patterns of movement, resistance to passive stretch, control of muscle grading and coordination and predictability of movements are all issues of tonal malfunctions (Byarm, 1996). The presence of abnormal pathology and reflexes requires that intervention first normalize the tone before a functional posture can be attained. However, factors such as sensory input, environmental factors (temperatures, noise), primitive postural reactions, postural reflexes mechanisms and general positioning in space can all have an Affect on muscle tone. High extensor tone can thrust people out of their normal seated posture. Asymmetrical tone results in postures that deviate from the midline. Full body tone can be initiated by the person’s own changes in posture, by a noise in the environment or any number of body or environmental stimuli.

The tone that results from a central nervous system dysfunction affects the body as a whole. Therefore intervention must address the posture as a whole, all limbs, trunk, head and their position in space as well as their position relative to each other. Another consideration is that persons with central nervous system dysfunction often have secondary issues. Retardation, the inability to communicate verbally, seizure disorders, cognitive deficiencies, personality changes and/or sensory abnormalities may add to the complexity of the problem of working with this population to attain a functional posture.
State of the Science

The state of science of postural seating is still in the clinical realm. There are very few publications that are peer reviewed and provide a body of evidence-based practice (Roxborough, 1995). Most documented practices are in the form of magazine case studies, book chapters containing mainly the clinical practices of the authors and conference papers again presenting best practice strategies of the authors (Bergen, 1985) (Cook & Hussey, 1995), (Cooper, 1997), (Presperin, 1990), (Taylor, 1997). These are excellent publications. The authors have years of experience solving problems related to posture and tone as related to seating and wheeled mobility systems. However, third party payers, consumers, and new professionals are now asking for documentation that proves that any intervention proposed will work and that it will work better than other options available. In summary, there is little outcome data to justify the technology, the service or the cost of seating intervention.

In a review of publications related to wheelchair seating, posture and spasticity/tone, two headings appeared in a number of papers (Fitzgerald, 2001). Most studies in the headings listed deal with the use of medication/drugs in tone management. In wheelchair seating intervention no quantitative methods or tools exists that can be used to measure outcome, with the possible exception of seat pressure mapping tools, the use of which in clinical decision making is still controversial and usually of little relevance for persons with intact sensation. Seated posture and function are largely determined qualitatively through observation using different evaluative methods in each clinical site. There are several clinical measures of functional performance that have been used in clinical research but again, the methodology has not been rigorously tested for validity and reliability. And, these measures look at wheelchair related function and not specifically at seating/posture (Axelson, 1997, Axelson and Chesney, 1996). Rudimentary attempts at quantification of the seated position in the wheelchair have been done, using terms of mild, moderate and severe as a qualitative measure of orthopedic deformity and neuromotor involvement (Trefler, 1978). However, these measures, although useful for communicating the general status of a client, are not accurate enough to record small changes in status or changes over time. They cannot provide sufficient information for informed decision-making, provide a basis for and consolidation of evidence-based practice, or quantify outcomes in support of third party expenditures. This is particularly the case when the time span between evaluations is long or the evaluator has changed. Even the terminology used in the field of seating is not yet standardized either for body motions/parts or seating technology components. Fortunately this is now happening as part of the ANSI/RESNA/ISO Seating Standards work.

Evidence-based practice is becoming increasingly important as clinicians are presented with an expanding range of treatment options, as health care funding is decreasing and the need for accountability is rising, and as health service consumers are taking more control of their own health (Roxborough & Sollazzo, 1998). At one time therapists were interpreting client needs to technical staff for custom fabrication. Now, however, there is considerable choice in the seating technology marketplace. The challenge is to assist consumers and assistive technology practitioners (ATP) and suppliers (ATS) to choose wisely from a multitude of products, many of which are marketed as having the same function. There is little research available related to either the decision making process of measuring clinical results in the application of seating and mobility technology (Minkel, 1998).
Service Delivery Issues

Service delivery generally consists of the technology that is available and used in solving the seating needs of persons with disabilities and the service system through which these same people must travel in order to be evaluated for technology and get it funded and fit. First we will present some of the issues related to the technology. Due to fluctuations in the user's tone and condition most systems must be adjustable in a simple and timely manner. Adjustments may need to occur across prolonged periods of time or on a daily basis as the user's needs fluctuate. Adjustments need to be easy to perform but at the same time must hold their adjustments against considerable force. Currently, most readily available components such as tilt in space, reclining back, elevating legrests, and adjustable height armrests are all wheelchair components. There are few positioning components that are easily adjustable. Other adjustments generally require the use of tools and some customized assembly of the system. Some of these adjustments also require the use of power components and the need for a power wheelchair if they are to be accomplished by the user. Finally, we do not have many dynamic seating/wheelchair components that move with the person during episodes of high tone and return to a resting position. Perhaps this is somewhat related to not have the evidence that dynamic components works well to assist persons with high tone have functional postures.

Durability of components is also a concern in the clinical setting. High tone obviously places a significant amount of stress on various components of the system leading to breakage and need for repeated and major repairs, often not covered by payers. The user is left without a functional system affecting their ability to attend work or other necessary activities while looking for funding for repairs. Back-up wheelchairs are also not covered due to duplication of service. This is especially the case with back supports and footrest assemblies. There is existing technology on the market to address these issues but they are often unknown to clinicians. Also, these components do not have codes in the current funding system (HCPCS). Major funding justification is often required for coverage to occur and this is very time consuming for the clinician and complicated for the consumer. The current HCPCS coding system only addresses this through the use of Heavy Duty and Extra Heavy Duty wheelchair codes (K0006 and K0007) which tend to focus more on the weight of the user rather than the need for durable adjustable and modular components for those with increased tone.

Service delivery issues range from standards of practice, clinician expertise to billable technology and services. Standards of practice related to the application of seating technology, especially as it relates to people with abnormal tone and fluctuating needs, is limited to anecdotal textbook type information. They are not an issue to the experienced clinician or those who might take the opportunity to research problems in the literature or access list serves for guidance. However; IT does becomes an issue with the average clinician who is expected to apply seating concepts in their routine areas of practice. Your generalist clinician does not see the volume of seating clients to learn appropriate technology application. They often rely on applying what is available, fundable, codeable, or documented as necessity by the Health Care Finance Administration (HCFA). If a generalist clinician were to follow the HCFA wheelchair criteria for people with increased extensor tone, they would provide their clients with a reclining back wheelchair, which is in many cases, is clinically contraindicated for people with this condition.

Standards that address terminology of seating components or possible configurations that might be at least tried or simulated prior to prescription do not exist. ISO/RESNA working groups are now working on some seating standards. Seating simulators are vital tools that can assist the clinician in conducting postural trials. But, this aspect of the clinical process is rarely available to
the generalist clinician due to their high cost lack and the fact that these clinicians have never experienced the value of a simulator. Simulation and clinical trial needs to be made a standard of practice in this field and a documented requirement by funding sources especially for HCFA. Simulation is especially important for a population in which several degrees of tilt or a small change of head position in space can alter the total posture rendering the person totally nonfunctional.

Clinicians are currently under considerable pressure to bill for every moment of their time in today’s health care environment. The time required to conduct a thorough seating assessment is not respected by many funding sources. It is expected that a generalist OT or PT evaluation should not take more than one hour. Often complicated seating evaluations for people with increased and fluctuating tone well exceeds the magical hour. Wheelchair seating and mobility assessments need their own HCPCS code and need to be considered on a continuous time basis rather than a one-time assessment basis.

Finally, the existing HCFA infrastructure for coding and funding seating technology, especially as it relates to people with multiple and complex needs is antiquated, discriminatory, and often not within sound clinical practice. HCFA policies are often adopted by State Medicaid programs and private payers. A prime example is HCFA's indicator for a reclining back wheelchair for a person who has increased extensor tone of the trunk. In most cases a reclining back would be contraindicated for this condition. It would actually increase already abnormal tone. There is no code for tilt in space seating. Tilt in space components are also being questioned by many payers as to whether they are medical necessary. The therapeutic benefit of a tilt in space system to a person with high tone is that their posture can be incrementally adjusted until the effects of gravity are minimized. There is also no mention of the need for gravitational postural realignment to prevent collapsing deformities of the spine within the HCFA coding system. Little empirical data to show that tilt in space helps to reduce tone and provide relaxation is available. The current major justification for tilt in space is mostly related to pressure relief and the prevention of pressure sores. Further research needs to be conducted to justify the need for tilt in space technology especially as it relates to people with advanced seating needs associated with tone and collapsing deformities.

Community/User Issues

Persons with high tone often have multiple challenges including the inability to communicate verbally. This one disability makes it very difficult but not impossible for them to be their own advocate. Parents, teacher, spouses and other multiple caregivers often need to be involved in the clinical service delivery process. Multiple needs, multiple caregivers, multiple environments all add to the complexity of problem solving. In a service delivery system that tries to be consumer responsive, it is very challenging to involve consumers with high tone in the decision making related to their own technology. It is even more challenging involving them in the research that will add knowledge and technological design to assist in advancing the field of specialized seating for their particular needs.

Summary of Current State of Seating for Postural Control

Clinical Status and Issues

- The service delivery system, funders in particular, do not recognize the complexity of providing seating to people with advanced needs
• There is no incentive for clinicians to conduct thorough assessments for people with high tone and complex needs. Current funding practices do not reimburse therapists for sufficient evaluation time. Reimbursement for training is not common practice.

• There is need for standardized methods of clinical postural measures. It would assist the clinician to document changes in deformity, function and posture over time. This would assist in the prediction of technology choices over time and realistic long term planning.

• Few seating/wheelchair components on the market today can survive without breakage for persons with high tone. Because of the frequency and strength of extensor thrust, especially in but not limited to an adult population, parts must be extremely strong and anchor points reinforced. Also, for persons with CHI, their tone changes sometimes rapidly over the first several years post injury. Systems need to be easily adjustable to accommodate the changing posture.

• Persons with high tone are of all ages and have various functional needs. Components that transfer from manual to powered chairs or even furniture, with ease and safety would be helpful.

• Clinicians and researchers do not do understand the effects of dynamic components and their effects on spasticity. However, more dynamic possibilities are becoming available on the market. As we better understand the effects of dynamic components, more options should be encourage.

• Asymmetry often demands aggressive midline positioners that are mounted strongly so as not to move when the person experiences high tone episodes and yet are removable or swing away for transfers or management. Therefore, the components and seating practices are often at odds with each other.

• People with abnormal tone have multiple needs. They often need to access controls for powered chairs, AAC devices, ECU’s, and so forth. They must have enough stability provided by their seating system that they can use limited motor control to operate multiple or integrated controls systems

Research Status and Issues

• There is little evidence-based practice addressing seating/mobility concepts for persons who experience abnormal tone.

• Standardized measures of posture and function while seated would assist both clinicians and researchers develop outcome measures

• Evaluation tools such as simulators that would assist the clinician with effective evaluations of seating needs

• Outcome measures to compare effectiveness (and cost effectiveness) of seating interventions are needed
- Research is required to better understand the frequency, force and natural history of episodes of high tone

- There is need for a better understanding of how posture affects function.

- A definition of good posture and how it impacts function is needed. It will provide the field with a better understanding of the effects of seating intervention on the progression of postural deformity, swallowing, respiration, digestion, cardiopulmonary status etc.
References


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