IC17: Early Vs. Late Intervention with Custom Molded Seating

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Not only is custom molded seating an appropriate early intervention, it is frequently the key intervention that provides a seated environment which promotes optimal physiological, psychological and functional benefits. As we are the first generation of caregivers providing care to people with significant disabilities who have the potential to live long productive lives, we have a responsibility to provide effective seating and mobility interventions that will help prevent skin, postural, and functional deterioration over time. It is essential that we take a pro-active approach and provide early intervention to those with neuromuscular disabilities.
When providing seating for the pediatric population, the paramount objective must be optimal fit. A wheelchair seating system's mechanism for growth is only valid if that mechanism does not compromise efficacy over time. As primary growth in the pediatric population occurs distally in the long bones, the mechanism for growing a seating system should reflect this. A sliding mechanism of back support relative to seat for growth alters the contours and fit proximally in order to address growth distally. Planar seating systems are often selected for their ability to "grow" in this fashion. This can result in less than optimal fit at initial delivery and further compromise over time. A potentially more responsible seating intervention is a custom molded seating system that can be grown distally, and to provide and maintain optimal proximal stability, while adapting for the client's growth over time.

An able-bodied person uses asymmetrical postures at rest for stability and needs asymmetrical postures for stability, control, and power for function – this is a "normal" result of child development (Goyen, T., Lui, K., 2002). Pathological asymmetry occurs when stability for function and rest is sought in the absence of the ability to transition in and out of different postures. A person may get "stuck" in a certain posture due to abnormal tone, spasticity, reflexes, or as a consequence of postural habits or strategies that result in prolonged static destructive postures. Wolff's Law states that the body grows and remodels in response to the forces that are placed upon it (Wolff, 1986). Placing specific forces in specific directions to the body can help it remodel. Fulford and Brown (Fulford, G.E. Brown, J.K. 1976) state that when an individual spends many hours without moving easily and often into different positions, soft tissues shorten, ligaments stretch and gravity affects the person's body, so that slowly and gradually it becomes distorted. Eventually the body changes shape and no longer bounces back to where it started. Any person with movement impairment is at risk.
Hill and Goldsmith (Hill, S.; Goldsmith, J. 2010) state that the body is a mobile structure which is vulnerable to distortion, but also susceptible to restoration, if the correct biomechanical forces are applied. So, if people regularly spend most of a 24-hour period in a posture that does not promote balanced postural correction, they may experience chronic postural deterioration, and biomechanical forces are at the root of these body shape distortions that complicate wheelchair seating for many people (Kittleson-Aldred, T., Russell, G., 2016).

The inability to move or be moved into different positions leads to a multitude of complications, which include further immobility, increased asymmetries, skin breakdown, as well as cardio-vascular, cardio-pulmonary and gastro-intestinal dysfunction. These secondary complications can ultimately result in premature death in this fragile population with complex healthcare needs. Fortunately, accurate seating and body orientation can harness the forces of gravity to promote restoration towards upright balanced postures and sitting stability. Planar support surfaces, even generically contoured seating, often lack the accuracy and intimacy of fit, and the ability to create precise body orientations (in all planes) to counter destructive postural tendencies. Custom molded seating may prove to be the best first intervention, rather than the avenue of last intervention.

Persson-Bunke, Måns et al. (Persson-Bunke, Hagglund, Lauge-Pederson, and Westbom, 2012) state that children with cerebral palsy have an increased risk of developing scoliosis. The reported prevalence varies between 15% and 80% depending on the client's age and the severity of the cerebral palsy. Scoliosis has been associated with problems in sitting, pressure injuries, cardiopulmonary and gastrointestinal dysfunction, and pain. It has also been shown to be associated with pelvic obliquity, windswept tendency, and hip dislocation. In children with cerebral palsy, a spinal brace may slow the rate of progression of the curve magnitude, but most curves with a Cobb angle exceeding 40 ° will progress, also in adulthood, if not treated surgically (Persson-Bunke, Hagglund, Lauge-Pederson, and Westbom, 2012). This speaks to the importance of early intervention to slow or prevent postural deterioration, thereby avoiding or delaying the need for spinal surgery. Effective custom molded seating can help prevent the progression of a scoliosis, or, at the very least, slow the deterioration, allowing a child to reach an age where they are nearly full grown, healthy, stronger and more capable of recovering successfully from a spinal fusion.

Should spinal fusion surgery eventually be indicated, it is essential to provide responsible post-surgical seating. A spinal fusion typically results in a reasonable degree of postural correction, but it does not necessarily resolve the intrinsic forces that led to the scoliosis in the first place. The abnormal forces acting upon the client's spine will likely continue to be present post-operatively. It is essential to provide optimal postural support and protection to prevent failure of, or complications from, the spinal fusion. Additionally, a spinal fusion typically results in a less mobile sitter, and thus creates an elevated pressure injury risk profile. When done correctly, custom molded seating can provide the intimate protection and application of forces to protect the fusion and support good skin health.

Custom molded seating has clear advantages for people who present with consistent and persistent destructive postural tendencies that cannot be controlled by lesser planar and generic contoured seating. Justification for any custom

seating must include objective information regarding the inability of lesser technologies to control those tendencies. In addition to an objective postural assessment, further assessment of functional skills relative to seating options should also be completed.

Unfortunately, custom molded seating is too frequently a last-ditch effort to seat individuals with rapidly deteriorating posture. When the intervention is delayed, non-reversible postural deterioration and its severe sequelae may have already occurred. Historically, custom molded seating was heavy, bulky, difficult to keep clean, unable to manage heat and moisture, and had no mechanism to adjust for growth and change over time. Now, with advanced design and materials influenced by orthotic and prosthetic science, options for custom molded seating are readily available that are low in profile, adjustable for growth and change, easy to sanitize and efficient at managing heat and moisture. By addressing the shortcomings of traditional design, these new designs make custom molded seating an appropriate choice for the growing and developing child.

Similarly, relative to growing and developing children, adults with significant disabilities may exhibit a similar propensity towards destructive postural tendencies, but often have an elevated risk for pressure injuries secondary to elevated buttock-seat cushion interface pressure (Brienza, Karg, Jo Geyer, Kelsey, & Trefler, 2001), and poor postural alignment (Defloor, T., Grypdonck, 1999). Traditional custom seating systems have limited application for this population for much of the same reasons as stated above, but with the additional risk associated with the seat's inability to be adjusted/ adapted to change over time, especially when addressing weight loss and tissue atrophy. Thus, high risk users are often prescribed and fitted with immersion/envelopment style cushions. Though capable of reducing peak pressures, the improved skin performance may come with compromise of sitting stability. Incorporation of adjustable orthotic and prosthetic principles within seating has been shown to yield favorable performance in improved sitting stability and reduction of pressures at high risk bony prominences as compared to the commonly prescribed floatation style cushions (Crane, B., Wininger, M., Call, 2016).

In summary, responsible custom molded seating can be extremely beneficial to the well-being and overall support of people with significant mobility impairment, regardless of risk for pressure injury. Well-designed custom molded seating incorporating orthotic and prosthetic principles is an early intervention option for the pediatric and adult populations that fail to experience optimal seating outcomes with simpler seating technologies. Early intervention is key for more meaningful and lasting outcomes. Fit should always be the primary goal, and growth should not hinder performance throughout the useful life of the product. The capability of precise fit, coupled with a biomechanically sound mechanism for growth, creates a no-compromise custom molded seating option for the pediatric population. The ability to effectively decrease sitting pressures at high risk anatomy, even with the potential for change over time, while simultaneously providing accurate stable support, makes orthotic and prosthetic based custom molded seating a viable option for the adult user as well.

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