

SIMPLY CASE STUDIES

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Learning Objectives

1. Identify parameters of seating/mobility devices related to asymmetrical shapes/limited physical capacity
2. Increase awareness of the ability to modify systems to enhance function
3. Understand techniques and measurements to utilize when creating custom modified systems.

Does contour, shape, size, performance, programming, and/or set-up make a difference when determining functionality as well as comfort and pressure management of a seating and mobility system? What happens when what is available doesn't work, but you know that there is greater potential? It is important to review and understand the decision-making process utilized in determining what seating or mobility system will work when "standard off-the-shelf systems" don't. How do you know if you can change things? How do you know what is available? Can you modify, adapt and create new systems that allow your client to move or sit comfortably and functionally? It is the clinical presentation of the clients, not the diagnosis in particular that will allow you to use your assessment/simulation data, to set up trial fittings required to achieve a final result. Utilization of "off-the-shelf" is the place to start, but not necessarily the place to end when designing custom configured systems. Critical techniques must be utilized in achieving the desired end result.

When prescribing seating and mobility devices, the support surface and chair design must address physical, perceptual, cognitive and social needs. However, in order to allow the person to then become functional and complete tasks other factors must be accounted for. A secure and comfortable seated position must be created in order for a functional movement to begin. If this does not occur, a client will tend to slide out of position during function. As a result, the client no longer attempts activity and often restraints are applied to "hold" them in the chair. Often, however, sliding or lack of activity and function may also be a result of poor chair set up and design related to propulsion, seating angles, and power driving control set up.

Determining if your client requires a contoured surface is often seen as a challenge when it doesn't meet the generic shape of an "off the shelf" product, but does not need to be. Contoured seating can minimize the risk of peak pressures and shear on weight bearing surfaces, especially over bony prominences. It can also provide the best postural support and control where a generic shape does not match the client's contours. By customizing the shape, it often decreases the need for additional lateral and anterior supports. Contoured seating is good for prolonged sitting where postural support and pressure relief is required, or for clients with inadequate sensation. Specific shape contours can also prevent friction/shearing from occurring from downward migration often seen with modular systems. As a result, the client no longer needs to "hold on" and therefore this frees their hands for functional activity. By following a critical pathway from assessment to prescription you will be able to identify the steps to follow when completing a more contoured customized seating system.

Prescribing Customized Seating And Mobility Systems

- * be aware of basic postural and seating principles
- * understand ergonomic and biomechanical principles for mobility
- * complete a mat assessment
- * test out and simulate posture and the support required to maintain that posture
- * record body measurements and consider their impact on the seating and then on the mobility base
- * consider environmental factors and system functionality for the client and caregivers

* simulate movements for propulsion whether manual or for power control and determine if changes are required for postural control

*think outside the box! If standard “positioning” doesn’t work consider alternate locations. With fully supported seating do the angles or orientation of the seating system need to change to maximize the use of gravity and centre of gravity positioning for mobility. What other areas of the body may work better for REPEATED and SUSTAINED activity ie. foot propulsion vs. hand propulsion, low arm extension mounts/midline tray mounts for power control.

The seating/mobility system must respect the client’s current bio/psychological needs, while allowing for potential change in the client’s status, the orthopedic limitations of the client, the contours of the body, the client’s level of function, the lifestyle of client and family/caretaker and the environment. When assessing a client for contoured seating it is important to look for potential areas that may be affected by alterations in their seated position. This may include at risk skin areas, tonal changes or contractures from long term tonal changes, reflexes (normal/abnormal) and the client’s use of reflexes in postural support, bony protrusions, respiratory and circulatory changes or changes in body position and orientation in space, incontinence, swallowing, eating, drooling problems, the client’s ability to sit unsupported, and finally the client’s ability to reposition or weight shift.

Contoured/custom seating may begin at the basic level of adding carved foam support to an already pre fabricated back shell. This is good for the client who requires minimal accommodation to back curvatures, but the overall shape of the back shell provides adequate support. This may also be seen as customizing an off the shelf cushion by adding additional adductor, abductor or obliquity pieces, or carving back one leg trough for discrepancies. Again this is good for the client who is more actively mobile or needs minimal adjustments in shape to match their contour or maximize their surface contact. If more aggressive accommodation is required, then custom forming the seating insert from a generic back/seat shell may be the way to move forward. Always consider whether or not the seating shape and size will change the dimensions and set up in the mobility base.

Often customization of systems occurs due to secondary functional concerns which may include transfers, transportability, and attendant supervised mobility. When completing customized seating/mobility systems, transfers and use of mechanical lifts and slings can become more difficult for care givers due to the close contact of the curvatures or changes in orientation and centre of gravity as well as positioning for access to power controls. It is important to consider how the transfer is completed prior to finishing a system in order to ensure that the transfer will be able to be completed such that the client ends up being where you need them to be consistently. Customization of seating can also impinge on catheter and condom drainage or urinal use if it is too contoured or these factors are not taken into consideration. Dressing a client can be more difficult if done in the seating system as the client cannot be shifted as easily. Custom seating systems may be more difficult to move and place in/out of a mobility base. Additionally customized mobility bases may impact the capacity to move around the home, and in/out of a van/car. Therefore the transport of a system must be addressed prior to finalizing a custom script.

The wheelchair should be considered for adjustable for centre of gravity, wheel access, floor access for foot propulsion which can be increased with slight anterior tilt. Seat depth and width will affect positioning as well as seat to back angles and overall chair orientation in space. Armrest height is important for trunk control and may need to be adapted higher or lower than “standard” armrest heights. Footrest positioning is very critical. Too often this is the last “set up” of the chair when indeed it may fully change the whole seated position. Consider under cuts on the seating with a shorter wheelchair seat/frame depth to allow for foot loading on 90 degree footrests, or custom hangar attachments which allow for the footrests to be angled to accommodate a windswept position.

When considering manual wheelchair mobility one must investigate varying methods of propulsion and the benefits of each and the requirement to maximize set up for performance. Ensuring the appropriate prescription and set up of a manual wheelchair will ultimately preserve function and posture, reduce the use of restraints and promote a sense of well being and quality of life for our clients. The prescription and functionality of lightweight adjustable axle wheelchairs, as well as manual dynamic tilt wheelchairs must

be reviewed for safety, agitation reduction and self propulsion. When looking at chair frame design and weight it is important to remember the client's balance point within the chair as well as safety with propulsion. Remember that centre of gravity is affected by axle position, caster placement, and caster orientation and is with respect to the client's centre of gravity when they are sitting in their final seated orientation and seating system.

It is important that trunk stability, skin integrity and transfers are assessed to determine the use of a power wheelchair. Once a cognitive, perceptual and full MAT assessment is completed, the client must also be assessed for back and pelvic supports that will maintain posture and balance points for driving access control. An assistive technology access site must be determined based on the client's range of motion, consistency of positioning, fatigue, and repetitive coordination and strength at the access site. This site, usually at a distal point of the body, must then be supported proximally to maintain function without fatigue. However, if a site cannot be found distally...don't give up. There may be an alternate location that will provide more consistent driving capacity but may be "outside the norm" of where we traditionally consider site locations. The site access may be in more than one location if the client fatigues throughout the day and needs an alternate site of control. It is important to recognize the variety of controls available and how to mount these for maximum control of the client with respect to their wheelchair, seating and functional level. Just because there are arms on a chair, does not mean that a client may have the best control in a 90 degree elbow positioning. Driving trays, arm extension supports and drop mounts, midline positioning and lateral arm supports may all allow for improved driving capacity. Chair design (front, mid, rear wheel drive) may also influence the type of controls that are utilized based on the smoothness of drive, vibration reduction and decreased cognitive requirements, or simply for mounting equipment extras such as ventilators, oxygen, feeding poles, supply kits, etc. Utilizing secondary cognitive perceptual aids or attendant controls may be required initially to facilitate driving skills. These may include sensors for maintaining driving control for depth or peripheral perception and visual flags for depth perception/left neglect.

By considering that humans are dynamic, and function is a continual, ongoing process, customizing mobility and seating systems can allow a client to more easily travel through life's many hills and valleys, but maybe not in the "norm" that we think of day to day.

Reference:

Buck, Sheila. *More Than 4 Wheels: Applying clinical practice to seating, mobility and assistive technology*. 2009