Wheelchair Back Supports

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This is the fourth slide lecture in a series of eight lectures that are intended to provide an overview of the wheelchair mobility and seating evaluation process. The lecture series contains:

- Seating Biomechanics
- Wheelchair Seat Cushions
- Pressure Mapping
- Wheelchair Backs
- Manual Wheelchair Propulsion Biomechanics
- Rehabilitation Technology Suppliers & Clinicians
- Service Delivery
- Strategies for Effective Documentation
Abstract and Presenter Bio-sketch

- Mark Schmeler is the Director of Clinical Services at the Center for Assistive Technology. He has many years of front-line clinical experience in seating and mobility with individuals with complex seating needs.

- Mary Ellen Buning is a research associate in the Rehabilitation Science and Technology Department with interest in AT education, service delivery and functional outcomes that result from AT devices and services.
The back support in a wheelchair can have a significant effect on a number of different things. Think of the spine as a stack of blocks that needs some external support. Sitting is the human posture that is least helpful to good back mobility and maintenance of functional flexibility.

There is always some risk for deformity especially when there are any neurological or orthopedic problems.

Think holistically... or with “systems” type thinking. If the trunk needs support then cushions that support the pelvis need to be considered along with support of the trunk.
The primary curves are more mobile. These are the curves at the neck and the lumbar (lower back) spine. These curves are where the spine gets the greatest mobility.
Spinal Deformities

- kyphosis
- scoliosis
- lordosis
- kyphoscoliosis

Khyphosis occurs when there is an exaggeration of the curves of the thoracic (chest) and cervical (neck) spines.

Lordosis occurs when there is an exaggeration of the curve at the lumbar spine.

Scoliosis occurs when there is an atypical lateral or sideways curve introduced to the spine. Instead of arising straight from the pelvis, the spines cures laterally. These lateral changes are usually related to greater tone on one side of the body or the trunk than the other.

Kyphoscoliosis is also known as rotoscoliosis. This deformity occurs when kyphosis combines with a scoliosis to create a deformity in 2 planes.
Severe Kyphoscoliosis

Kyphoscoliosis is a combination of deformity in both lateral and anterior/posterior planes.

This person is sitting on the edge of a mat. The pelvis is tipped sharply backward. The spine is curving laterally out to this person’s left and the right shoulder blade is forward of the left one.
This person is sitting on the edge of a mat. The pelvis is tipped sharply forward. A deep curve in the lumbar spine is creating a deep crease in the lower back. The fold in the skin will contribute to heat and moisture problems.

This is an example of lordosis that could have been better managed with the right cushion and pelvic positioning.
Characteristics of Back Supports

- Seat back vary by:
  - height
  - shape
  - stiffness

These 3 variables in back supports are the most basic characteristics. Not a lot of science has gone into back supports until just recently.
Low Back

- Allows for support in lumbar region
- Preferred by active users
- User needs good trunk strength for long term success.

A low back on a wheelchair allows increased mobility in the spine i.e., rotation of the upper spine paired with good support in the lumbar region.

This kind of back offers less stability (easier rearward tipping) and less support for the upper spine.

Most active wheelchair users would not trade their increased mobility for increased stability.
Back supports on a typical wheelchair are too high and they are not adjustable. This hinders use of the arms and upper body for mobility. In this case ability to push wheelchair is limited.

Stability is important for users with higher level injuries but all flexibility and mobility is lost. Choosing the right height through customization or proper measurement gives the maximum amounts of stability with no loss of mobility.
Flat Back

- Does not accommodate shape of the spine
- Does allow for some mobility

If the seating goal is to give a client increased freedom of movement then this type of back is good. Lateral pads can be attached to this type of back which can be helpful for a client who needs extra support.

This type of wheelchair back is often used for children’s wheelchairs.
Generically Contoured Back

- Accommodates shape of the back
- Effectiveness is sensitive to fit
- Deeper contour provides greater lateral support.

This type of back gives additional lateral support but helps the user retain the ability to move within its supporting shape.

Lumbar support is not built into these kinds of backs. Permanent lumbar support turns out not to be that much of a part of adult seating. Most adults sit with a flat back. Having a lumbar roll feels good at first but becomes painful. Therefore, it is good to have it adjustable.

It is an asset when you can add it or take it away such as is possible with an air bladder. Automotive seating is now experimenting with this type of adjustability in car seats.
Rigid Shell Back

- Provides good stability
- Generally not adjustable
- Effectiveness is sensitive to fit

The shape of a rigid shell back is NOT going to match the shape of the individual’s spine. The assumption is made with this wheelchair back that the individual has a straight spine, i.e., no scoliosis.

People with spinal abnormality should not be placed in this kind of back. A rigid shell back will force the torso posture off in another abnormal direction.
Soft Contouring

- Less stable
- Contours to shape of spine
- Adjustable
- Effective if adjusted properly

This type of seating is very useful in working with fixed deformities. It can be used to accommodate kyphosis or posterior pelvic tilt.

This wheelchair technology is adjustable and recyclable so it can be very useful in a long-term care facility. In this type of facility a fleet of wheelchairs should be able to adaptable for the seating needs of many different kinds of seating needs for the changing residents of the facility. However, staff need clinical expertise since it is important for the wheelchair back to be set up correctly for each client.
Custom Contoured

- Very specific to a particular deformity
- Labor intensive
- Dependent on skill of fitter
- Dependent on accuracy of technology

The drawback of custom contour seating is that it takes a lot of time to fabricate and finish. The quality of the end product depends on a clinician's skill in molding and shaping the back.

When working with clients with severe disability the shape of the spine can be accommodated while also giving pressure relief.

New contour seating companies offer a means to create them with CAD-CAM (computer aided design/computer aided manufacturing) so that the turn around is very quick.

This type of seat back don’t work with TSLO or body jackets. For clients with these external orthotics it is better to use a flat-type back and let the orthotic do its job.
Otto Bock Adjustable back

- Gives more involved users additional trunk support.
- Variable contour created by using different cell volumes.
- Heat moldable plastic laterals can be modified to increase support.
Scapular Cut Outs

- Provides the support of high back with cut outs at the scapula.
  - Allows for increased shoulder ROM
  - Aids propulsion as well as ADLs.

Some clients need alternatives to standard wheelchair backs. Adjustability at the scapula (shoulder blades) allows maximum support with increased range of motion (ROM) for upper extremities.
Review Questions

• What does a wheelchair back contribute to comfort and function when seated in a wheelchair?
• When do you accommodate or adapt a wheelchair back for a spinal deformity?
• Versus... when do you correct a spinal deformity?
Recommended Reading

- Products and Services section of WheelchairNet at:
  [http://www.wheelchairnet.org/ProdServ/Products/cushion.html](http://www.wheelchairnet.org/ProdServ/Products/cushion.html)

- RehabCentral- a WWW resource for clinicians on seating and mobility issues at:

- Proceedings of the International Seating Symposium & the RESNA Conference at: