Custom Seating: Maximizing Contour to Support Function

Presented By:

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Photo and Presentation Support
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Agenda

- Keys to Success
- Sitting Simulation
- Pressure and Shear Concerns
- Seat, Back and Headrest Shape Considerations
- PRM Product Overview
- Hands on Molding
- Case Studies
Seating & Mobility is Provided to...

- Facilitate function –
  - Activity related functions
  - Physiological functions

- Support postural alignment
  - Provide balance for function
  - Provide base of support for stability
  - Slow down or correct flexible deformity
  - Accommodate fixed deformity
  - Optimize functional tone
  - Inhibit non functional tone

- Protect skin integrity
Position for Task Performance?
Positioning for Management
Maximize function

Preserve skin integrity

Increase Sitting tolerance
Where Do I Start?

Assessment
- Mat evaluation with seated posture
- medical history
- functional history
- social history
1) Observe in existing equipment

- Get as much information as possible from the client / caregiver about what they perceive the negatives and positives to be
- Front
- Side and
- Back
- Transferring
- Document everything!
- If anyone wants to have an opinion make sure they are at the assessment
The Hands on Evaluation

- Feel the force it takes to support the body sitting
- Align pelvis to provide balance
- Make gravity work for you
Mat Evaluation- Supine

- On a firm surface
- Looking for the available pelvic/spine/lower extremity joint ranges/flexibility as related to the seated position
Why Do Trochanteric Measurement?

- Lateral pelvis stability - Support the greater trochanter – consider the width of the trochanter (12”-14”) as related to IT’s (4” – 6.5”)

- Femoral loading
  - Consider the height difference between the ischial tuberosities and the femur
  - ~ 1 1/2” - 2” in an adult, not as much in small children or infants
  - Pelvic contour width no greater than 12” to accommodate most Trochanteric widths
  - IT width – 5 – 6.5” men
    - 4 – 4.5” women

Approx. 2” / 5 cms.
Seat Shape – Pelvic Contour Width

- If too wide:
  - Trochanters not supported
    - Lateral instability
    - Ischials bottom out
  - Common with pediatrics when too much growth is “built in”
  - Cushion ordered to fit overall chair, not child
  - Common with Bariatrics when cushion is ordered to fit the chair width instead of considering the bone structure width
Three circumstances...

- Tight Hamstrings
- Foot Propelling
- Active – tight front end
  - Needs space for hands to transfer legs
Sitting Evaluation

- On a firm surface with feet supported
- Accommodate for orthopedic findings:
  - Observe
    - posture
    - balance
Balance

- Independent
- Hands Dependent
- Fully Dependent
Sitting Evaluation

Pelvis – Spine/Pelvis - Hip Flexibility

- Anterior / posterior range
- ASIS level / obliquity
- Rotation

- Feeling for resistance to movement
- Looking for point of support – no resistance
Sitting Evaluation

With pelvis in optimal alignment, assess trunk:

- What is client's optimal position?
  - The happy spot!
- How much posterior support is needed?
- Is lateral support needed?
- Is there a unique shape to be accommodated?
- Even with posterior and lateral support – is orientation in space required?
Sitting Evaluation

- With pelvis and trunk in optimal alignment
  - Assess
    - Head position and balance
    - Control and Function
Sitting Evaluation

Anatomical measurements:

- Avoid loose or baggy clothing
- Use firm surface
- Keep tape straight - do not curve around the client
- Measure both right and left sides
- Use a form to record measurements
- If there is a long delay between initial evaluation and funding approval, re-measure
  - Especially with pediatric clients
ACTUAL USER MEASUREMENTS

A
B (R)
B (L)
C (R)
C (L)
D1
D2
E (R)
E (L)
F
G
H
I (R)
I (L)
J
K
L
M
N
Sitting Evaluation

Anatomical measurements in sitting:

- Widest part/hips
- Trunk width
- Back of buttock to popliteal fossa
- Popliteal fossa to heel
- Seat surface to back support height
- Seat surface to occiput
- Seat surface to flexed elbow
- Feet width
What is interface pressure?

“the force per unit area that acts perpendicularly between the body and the support surface”

This is affected by:

- Stiffness of the support surface
- Composition of the body tissue
- Geometry of the body being supported
Extrinsic Risk Factors

- Pressure – pressure gradient
- Tissue deformation
- Shear – shear force
- Friction
- Moisture
- temperature
Cell Survival Blood Flow

- Food
- Oxygen
- Waste
Pressure Relief

- Pressure relief $P = \frac{\text{Force}}{\text{Area}}$
  - Force = weight of person
  - Area = contact surface
- Maximize contact surface to lower pressure on a given spot
Immersion

- Ability of the support surface to maximize contact to clients' shape
- **Foam** – conforms to shape by compressing
  - Compression creates a reaction force
  - Force is greatest at point of maximum compression
- **Fluid** conforms perfectly to shape
  - No significant compression – **hydrostatic** force
  - Pressure is equalized over entire area of immersion
The effects of shear...

- Shear is not as easy to determine as pressure.
- Shear is not just dragging, it is the relative movement of one surface to another.
- Due to the movement of the skeleton through the tissue.
- Affected by posture:
  - Horizontal shear (dragging related to skin and surface)
  - Vertical shear (internal action between bone and tissue)
Pressure Isolation (Off Loading)

- Load safer surface on the body
  - Posterior thigh
  - Trochanteric shelf
  - Rear of buttocks

- Could create a new problem through
  - Donut effect
  - Safer surface not as safe as previously thought
Tissue integrity

- Maintained by reducing pressures near bony prominences
- Accommodating orthopedic deformities through immersion
- Enveloping irregularities at the seating interface to reduce high pressure gradients
- Controlling heat and moisture
Pressure Distribution
Cushion Characteristics

- Potential for immersion: allows pressure equalization near bony prominences
- Envelopment characteristics: the cushion’s ability to deform around irregularities without causing a substantial increase in pressure and shear in those areas
- Support through thigh and greater trochanter
...Beyond. When “normal” is not part of the equation.

“If you limit your choices only to what seems possible or reasonable, you disconnect yourself from what you truly want and all that is left is a compromise.”

Robert Fritz
Tone

- The physical capacity to perform physical functions under stress
  - Hypertonicity - More than normal tone
  - Hypotonicity - Less than normal tone

Spasticity

A sudden temporary contraction of the muscle
Don’t forget 3 point positioning

- Not just for scoliotic support
- Consider back/anterior pelvic positioning
- Headrest/shoulder supports
- Thigh guides/wind sweeping
3 Points of Pressure

You have seen this a million times, right?
3 Points of Pressure

But have you seen it like this?
Seating Components – overall design

1. Angles – angular relationship of supports with respect to anatomic angles
2. Materials – internal and external requirements for support, comfort and care of skin integrity
3. Orientation – of support surfaces with respect to gravity, mobility, functional and environment
4. Shape – of supports with respect to shape of sitter in desired posture
Cushion Priorities

- Support medium – ability to maximize surface contact area and reduce shearing
- Shape – pressure redistribution and positioning features – contours to assist with restraint reduction
Seat Shape

- Anterior shelf
- Posterior lateral shelf
- Posterior opening
- Anterior lateral support
- Anterior medial support
- Posterior depth to accommodate pelvic rotation
- Anterior depth to accommodate leg length discrepancy

Consider:
- Firmness of support required
- Areas of pressure relief required
- Area of positioning required
Back Shapes: Considerations

- Continuity between seat base and back – how much gap when mounting
- Lowest portion of back – allows for gluteal shift
- Second curve – supports the posterior superior aspect of pelvis
- Third curve – allows for thoracic extension and supports rib cage and lumbar spine
  - need to monitor protraction of shoulders based on curvature and height
Back Shape

- **Support Areas**
  - Sacral support
  - Lumbar support
  - Thoracic extension
  - Scapular movement
  - Shoulder protraction/retraction
  - Lateral support
  - Asymmetry for rib hump/rotation

- **Firmness of support required**
- **Area of positioning required**
- **Areas of pressure relief required**
Headrest shape

- Occipital shelf
- Lateral support
- Upper head support
Orientation

- Seat/back/headrest angle - hardware
- Posterior tilt for increased stability with gravity
- Anterior tilt for foot propulsion
- Lateral orientation for head positioning
Angles

- Seat to back for hip flexion contractures
- Front seat angle/bevel for tight hamstrings/knee flexion contracture
- Sacral angle of back
- Thoracic angle
- Angles of headrest
Materials

- Motility for dynamic positioning – if pelvis is on fluid what will happen to the back if it is molded – all positioning is reliant on the back
- Stability for support
- Pressure relief
- Comfort materials
- Temperature
- moisture
ADJUSTABILITY

- Determined by hardware
- can be upgraded to aluminum for heavy duty use – weight, tone, behavioral issues.
- Infinite vs. set holes, ability to gain support for rotation
- Adjustable with client in chair
- determine mounting points in order to gain full support of PSIS
Establishing Priorities (client)

Prescription Justification (therapist)

- Identify problems and potential for function
- Develop goals
- State objectives
- Identify product parameters
- Translate parameters into product
- Verify fit and use through trial
When “off the shelf” no longer works!

How do you know when to customize existing products, or prescribe a fully custom product?
When Customizing off the shelf doesn’t work

The client still slides, has pressure, is uncomfortable, has limited sitting tolerance despite:

- Adding foam
- Cutting contours
- Adding extra secondary supports
Who benefits from Customized Seating

**Indications for use**

- Accommodation of fixed moderate to severe asymmetry
- Correction of flexible moderate to severe asymmetry (high or low tone)
- History of Pressure sores
  - Off-the-shelf products have failed to properly position the individual
  - Client is overly constrained in the wheelchair
  - Progressive disease
Contraindications for Use

- Tightly contoured position will limit client’s function
- Anticipated surgeries that will change tone or asymmetry
- Growth changes expected (feeding tube use, currently in rapid rate of growth)
- Medication changes
Compromise?

- All positioning may not be best possible solution
- All pressure relief may not be best possible solution
- Positioning with accommodation for pressure relief
- Use of multiple modalities (foam, fluid, gel, etc.) to meet needs of individual
Two Product lines of customized seating

- Precision-Fit
  - Custom Measured
- Signature-Fit
  - Custom molded
Custom Measured to Fit

PRM
THE POWER OF PRECISION

PRECISION-FIT CUSTOM CUSHIONS.

INCONTINENT OUTER COVER
INCONTINENT INNER COVER
POLYMER GEL INSERT
FOAM LINER
FOAM BASE
ABS CUSHION STABILIZER

EACH CUSHION IS AS UNIQUE AS ITS OWNER
Custom Measured CushionSpecifications

• Allows you to take a generic shape and customize it for your client without going to the extent of custom molding a full seating system.
• Symmetrical shaping but client may require modifications to accommodate for mild obliquity, leg ab/adduction, pelvic rotation or greater pelvic positioning to reduce posterior pelvic tilt.
How to fit the cushion?

- Client assessment for postural needs
- Create shape desired after assessment using demo unit
- Make adjustments if needed
- Measure for back cushion
- Measure for seat cushion
Precision-Fit Cushion

- Contoured Foam based on client shape
- Consistent feel
- Multiple firmness sinking in versus bottoming out
- Stable does not move
- Easy to maintain
- Excellent postural support
- Available as drop seat to lower seat to floor height
Precision-Fit

- No need for shape sensor frame
- Seating team will determine shape required to meet client needs
- Able to see shape before purchasing
- Unlimited depth of contours
- Gel or air option to reduce shear and provide added skin protection
• Measurements taken will directly correspond to the need required to support that area.
• If the generic shape fits for a certain area, no further measurements are needed.
• Only measurements given will be altered from the original standard shape.
Precision-Fit Back

- No need for shape sensor frame
- Seating team will determine shape required to meet client need
- Measure contour through holes in back support
- Measure from back lateral depth required, fixed, hinged, or swing away laterals
- Unlimited depth of contours
- Medicare E2617 custom back cushion
PRECISION-FIT® BACK ORDER FORM

Base Foam
- Soft (STD) □ Firm □

Liner Foam
- 1/4" Soft □
- 1/4" Medium □
- 1/2" Super Soft □
- 1/2" Soft □
- 1/2" Medium □
- 1" Super Soft □
- 1" Soft □

Mount
- On Rails □
- Between Rails □
- Back Shell □

Hardware
- PRM JAL □
- 1" □ 7/8" □
- Other Type □

Outer Cover Options
- Waterproof Lycra (Std.) □
- Lycra □
- Polar Tec □
- Dantex □
- Spacer Mesh □
- Addl. Outer Zipper Cover □

T-Nut for Headrest
- Yes □
- Type □
- No □
- Universal Headrest Mount □

Date ______________
PO# ______________

Patient Name ______________
Chair Make ______________
Chair Width ______________
Phone # ______________
Order by ______________

Fill out one of the drawings below. NOTE: All measurements should be usable lateral depth.

Single Lateral □

Multiple Lateral □

PRM Inc. • 5325 Kuhl Rd. • Erie, PA 16510 • Toll Free 1-888-PRM-REHAB (788-777-7342) • Fax 814-859-2934 • www.prmrehab.com
Precision-Fit Headrest

- Angle adjustment of headrest pad
- Customization of pad shape to meet the user needs
- Customization of foams used to meet the pressure relief needs of the end user
- Three brackets included for depth adjustment
- Includes foam and cover with hardware
Molding The Client

Generally two people are required to mold

- One to position the client one to mold the beads

- Hard to mold clients often require three people to mold - The additional person helps position the client

**REMEMBER:** You are molding what you simulated – don’t forget your findings!
Transfer of Information from Client Evaluation to complete custom seating

- **REMEMBER:** You are molding what you simulated – don’t forget your findings!

- Set-up simulator to match the measurements established from simulation on mat
  - Seat depth, Footrests, seat to back angle,
Critical dimensions

- Seat Depth
- Back height
- Seat-to-back height
- Seat to floor height
- Seat to Back angle
- Overall system height
- Overall system length
- Tilt angle
Transfer the Client

- Transfer client into simulator positioning the individual in the center of the frame
- Fine tune seat to back angle, seat depth, and tilt angle
- Adjust feet and arms (height and position)
- Make sure seat depth will allow proper position of the pelvis
Communicate

- Your mold will only be as good as your evaluation which needs to be shared with others.
- Make sure everyone is aware of their role and position.
- What forces are to be added and from what direction?
- Anticipate shapes and adjust beads accordingly prior to molding.
Molding the client

- Massage and knead the beads
- Use your knuckles to mold from the center out
- Don’t make your initial movements in a pulling fashion – you are only pulling the bag and not massaging the beads into the clients shape
Molding The Client

- Most often the pelvis is molded first because it is the base of support, however you may wish to do a pre mold of the back to hold the pelvic position
- Start at the sacrum and provide proper support
- Work around body moving towards the lower extremities
Molding The Client

- Check to be sure:
  - Shoulders are level
  - Head is centered over body

- If required check:
  - Posterior pelvic wall
  - Adductor and abductor heights
  - Trochanteric shelf
  - Anti-thrust (Ischial block) for seat
Molding The Client

- Mold or remold the back once you are convinced the seat is going to provide a good base of support
Molding The Client

- Start at the bottom middle and work up and around
- Mold the lumbar/sacral area
  - Mold the side of the body requiring the greatest amount of support first and then the other side.
  - Provide lateral support by moving up and into the rib cage area, not directly sideways – follow line of rib to spine
Molding The Client

- Check to be sure:
  - Shoulders are level
  - Head is centered over body

- If required check:
  - Lateral wall depth
  - Counter support for trunk
  - Pelvic control through lower edge of back
  - Surface contact
Molding strategies

- When working with severe obliquity, scoliosis or low tone and the client is easy to manage, mold with the back off or lowered in order to maximize pelvic shape while holding in simulated pattern
Common Molding Mistakes

- Is there a compromise?
- Is the force required to maintain corrected position acceptable?
- Will the person be properly positioned by care givers?
- Use caution when providing correction to the client
- Avoid lifting the trunk such that it will collapse onto the inferior edge of the rib cage
On Delivery

Make sure the seating is mounted in the wheelchair the same way as it was measured or molded!

Check the angles, heights and critical dimensions!!!
Billy

- Age 63
- Diagnosis: CP
- Skeletal Asymmetries
  - Scoliosis
  - Obliquity
  - Pelvic Rotation
- Current System
  - Manual Wheelchair with off-the-shelf seat and back
Issues that need addressed

- Reduced ability to self propel due to lack of postural control
- Concern that aggressively contoured seating will reduce ability to self transfer
Precision-Fit Cushion with Signature-Fit Back

Effort required for stability greatly reduced, maintained independence
Fully Custom

- When a generic shape will not allow enough contact support surface
  - Chronic pressure problems
  - Severe asymmetries
  - Correction forces required
## Signature-Fit Order Form

### Client Info
- **For:** [Name]
- **Date:** [Date]
- **Technician Name:** [Name]
- **Technician Phone:** [Phone]
- **Seat Back Name:** [Name]
- **Chair Name:** [Name]

### Measurements

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<th>Seat Depth</th>
<th>Molded Dimension</th>
<th>Increase</th>
<th>Decrease</th>
<th>Finish Cushion Dimension</th>
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### Foam Liner

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<th>1/2&quot; Hard</th>
<th>1/4&quot; Soft x 1/2&quot; Bottom Hard</th>
<th>1/2&quot; Medium x 1/2&quot; Bottom Soft</th>
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### Slip Cover

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### Comments

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*NOTE: This form includes required information only. All others are optional.*
Full Custom Contoured and custom foot platform

Before
During set up
Fitting
After
Old mold …. Remold after therapeutic interventions
Custom seating helps control leg and trunk positioning
Stuffed animals do not constitute custom seating
Postural control comes from fully contoured seating which “fills the gaps”
Custom seating can help control abnormal reflexes
During the molding process
Custom seating to control obliquity and anterior pelvic tilt
Growth or aging will require changes
Over time- gravity and aging creates changes

2007
Readjust pelvic alignment for head and trunk alignment
Positioning off midline due to ATNR, High extensor tone – multiple restraint use
Lack of contouring
Steel footplate
Sub ASIS bar

Doubled headrest support
Solid foam contouring to increase stability and reduce restraint use
Midline positioning, reduced ATNR, reduced extensor tone, reduced need for chest and foot strapping
Parkinson’s Disease
Support for neurological changes – correctable kyphosis, fixed sacral tilt
Jeff

- Issues that need to be addressed
  - Increased scoliosis and pelvic obliquity
  - Chronic pressure ulcers
  - Alignment of lower extremities and trunk balance
  - Self image of twisted shape
Signature-Fit Back with Roho Insert into Signature-Fit Seat
Maintain pressure management and provide postural support for the pelvis through lateral trochanteric shelf and anterior/lateral thigh support
Seat and back provide postural support for the trunk and pelvis increasing the odds of positioning success
Avoid Frightening Outcomes
We All Need A “Little” Help At Times

Don’t Be Afraid To Ask For It!
Thank you for being here today

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