Pathology of Pressure Ulcers

Is it all about pressure?

Reperfusion injury

- Concept originally investigated with cardiac patients
- Reperfusion after a period of ischemia results in cellular damage of tissue
- Thought that increased force would prevent blood flow and then when the force is reduced increased return of blood flow may actually disrupt the capillaries
- Also an increase in oxygen free radicals
  (Bader 1990, 1988, Houwing, 2000)

Impaired Interstitial Fluid Flow & Lymphatic Drainage

- The increased force may impair interstitial fluid flow & lymphatic drainage
- This impairment of flow may disturb the metabolic waste equilibrium in and around the cells
- This metabolic waste could cause cellular and resulting tissue death
Sustained Cell Deformation With Increased Loads

- Maybe pressure does cause pressure ulcers?
- High compressive loading not only caused ischemia but also distorted the cells and caused tissue “strain” (damage)
- Stekelenburg in 2007 concluded:
  - “2 hours of compressive loading lead to irreversible damage whereas ischemic loading results in reversible tissue changes”
  - “Large deformation, in conjunction with ischemia, provides the main trigger for irreversible muscle damage.”

(Gawlitta, 2007)

Suspected Deep Tissue Injury

- Purple or maroon localized area of discolored intact skin or blood-filled blister due to damage of underlying soft tissue from pressure and/or shear.
- The area may be preceded by tissue that is painful, firm, mushy, boggy, warmer or cooler as compared to adjacent tissue.

Suspected Deep Tissue Injury

- Deep tissue injury may be difficult to detect in individuals with dark skin tones.
- Evolution may include a thin blister over a dark wound bed. The wound may further evolve and become covered by thin eschar.
- Evolution may be rapid exposing additional layers of tissue even with optimal treatment.
Suspected Deep Tissue Injury

Localized Ischemia

- Prolonged occlusion or deformation of capillaries
- Limited blood flow – Decrease O$_2$ and nutrients
- Ischemia to cells
- Tissue necrosis

What Extrinsic Forces May Cause Capillary Deformation?
- Pressure – Trauma
- Shear
- Friction
- Moisture

Capillary Cell Wall
Pressure – Is it All Bad?

**Pressure**

\[
\text{PRESSURE} = \frac{\text{FORCE}}{\text{AREA}}
\]

- Pressure is used therapeutically
- Peak pressures are the issue!
- Need to “redistribute” pressure over larger area to decrease peak pressures in one specific area

Quantifying the Effect of Redistribution

- **Immersion** - Capability of a cushion to allow the body to sink into it
- **Envelopment** - Capability of cushion to deform around and encompass the body

**Immersion & Envelopment**

*Shows distribution of pressure*

Quantifying the Effect of Redistribution

- **Magnitude** - How much force is concentrated on the bony prominences

**Which One Redistributes Force Better?**
Innovation: So Why ROHO?

- When someone sits, there is increased force
- Increased force causes increased pressure at contact areas
- DRY FLOATATION® redistributes force over great contact area

Importance of Redistribution of Forces

- Soft tissue deformation is minimized
- Blood flow (oxygen) to tissues is maintained or improved
- Soft tissues remain healthy
- Prevention of pressure ulcers
- Healing of existing pressure ulcers

DRY FLOATATION® Technology

- Air to simulate the buoyancy of a fluid
- Why....?
  - A fluid conforms to the body more uniformly than any other medium
  - A dense enough fluid has the capability to support the weight of the body
  - The more fluid the surface, the better the conformity, the better the redistribution of forces

DRY FLOATATION® Technology

- Air rather than a fluid because…
  - Fluids are heavy
  - Fluids are messy
  - Fluid is not convenient to the user
  - Air is abundant and free
  - Air is lightweight

What Makes ROHO Unique

- Not all about air
Cellular Design Product

- Volume of air within the cushion
- Geometry of the cell
- Ability of the air to transfer from one cell to another

Volume of Air

- Adjust volume to immerse the user—everyone is different
- Adjust to create maximum contact area between user and cushion

Geometry of the cell

- Collapse with minimal resistance

Constant Restoring Forces

- Provides flotation
- Constant pressure, independent of time
- ROHO vs. fluid and foam

Constant Restoring Forces

- Offer minimal resistance to a changing shape
- Provide a controlled tracking of changing shape or seated posture

Transfer of Air from Cell to Cell
Neoprene Material

- Air tight container
- Minimal resistance to deformation under load
  - Soft and pliable
  - Minimal friction between cells
- Resistant to external environment
  - Body fluids
  - Punctures
  - Fire
- Compatible with the external environment
  - Allergic reaction
  - Contamination

Low Surface Tension

- Allows penetration into surface with little force
- Soft, pliable neoprene rubber
- Small, interconnected air cells
- Decreases tissue deformation during immersion

Which Has a Greater Surface Tension?

Shear

- Caused by the interplay of gravity & friction
- Exerts a parallel force
- Gravity pushes down on the body while resistance occurs between the patient and the surface
- Blood vessels stretch, pinch, & occlude
- Irregular shape, w/ undermining

  “Shear may be 10 times more destructive to the tissues than pressure” (Fontaine 1998)

Shear

  - Increased by:
    - Moisture
    - Pressure
    - Inappropriate handling and movement skills
    - Repetitive movements
Undermining vs. Tunneling

- Cotton applicator
- Clock method
- Measurement in centimeters

Undermining

Six Degrees of Freedom

- Small, interconnected air cells
- Each cell can independently move in any direction
  - allows the cushion to track with the client
  - decreases friction and shear

Six Degrees of Freedom

Low Friction & Shear

- Neoprene is treated to reduce friction
- Small, individual cells reduce shearing
- Cells move with the client to improve ease of movement

Low Friction & Shear
### Friction

- Occurs when 2 surfaces move across one another
- Acts in concert w/ gravity to cause shear
- Abrades the epidermis & dermis; mildest form
- Prevention: lift devices, transparent film dressings, skin prep/barriers, elbow/heel protectors

### Microclimate & Moisture

- Due to wound drainage, diaphoresis, urinary or fecal incontinence
- Removes oils from the skin- increases friability
- Increased friction between skin and surface
- Both shearing force & friction increase in the presence of mild moisture.
- Maceration causes decreased strength of connective tissues
- Alters resiliency of epidermis to external forces
- Incontinence of urine and stool increases pH, increases permeability of skin, increases irritation

### Clinical Significance

- "Severity of the resultant tissue injuries correlated with an increase in applied temperature." (Kokate, 1995)
- Moisture softens the skin making it more susceptible to breakdown (Leyden, 1977,1984 & Zimmerer, 1986)
- Increased moisture increases friction between the skin and surface materials resulting in increase shear stress (Lachenbruch, 1999)

- Kokate (1995) and Patel (1999) have suggested lower temperatures have benefit on skin
- “At a given pressure, ... lower temperatures exert a significant protective influence with respect to the development of pressure ulcers” - Kokate (1995)
- Lachenbruch (2005) stated that a 8°C decrease in skin temperature is equivalent to 29% reduction in interface pressure
Intrinsic Risk Factors

• Age
• Psychosocial
• Malnutrition - Anemia, edema, ↓ PRO stores
• Vascular compromise – Hypoxia
• Infection – Delays overall process
• Immunocompromise - Impaired immune response
• Medications - Ex. Steroids alter inflammatory response
• Smoking - Vasoconstriction, hypoxia
• Diabetes mellitus - ↓ collagen, ↓ inflammatory response
• Co-morbidities
• Obesity
• History of pressure ulcers - Poor tensile strength, ↓ elasticity

Guideline Recommendations: Prevention

1. Etiology
2. Risk assessment
3. Skin assessment
4. Nutrition
5. Repositioning
6. Support surfaces
7. Special populations: patients in the OR

Guideline Recommendations: Treatment

1. Pressure ulcer classification
2. Assessment and monitoring of healing
3. Role of nutrition in pressure ulcer healing
4. Pain assessment and management
5. Support surface for treatment of pressure ulcers
6. Wound bed preparation: cleansing, debridement, and dressings
7. Assessment and treatment of infection
8. Biophysical agents in pressure ulcer management
9. Surgery for pressure ulcers
10. Pressure ulcer management of individuals receiving palliative care
Pan Pacific Clinical Practice Guidelines

- “Ensure heels are free of the bed surface and inspect the skin of the heels frequently”
- “Any device used to prevent heel pressure injuries should be selected and fitted appropriately to ensure pressure is adequately offloaded”
- “Pillows will only be effective in offloading heel pressure when placed lengthwise under the lower limb so heels are elevated and offloaded”
  – Pan Pacific Clinical Practice Guidelines 2012

Historical Treatment of Pressure Ulcers

- Treat the “hole in the patient versus the whole patient”
- Rolling / repositioning
- Utilizing support surfaces
- Utilizing appropriate dressings
- Nutritional intervention
- Treat local and systemic infections
- Assess and treat other disease processes
- Manage moisture
- Off loading – decreasing pressure by. . . .

The Evidence. . .

“To date, however, no randomized controlled trial has conclusively shown that bed rest effectively manages pressure ulcers.”
  – Norton and Sibbald 2004

“Check your egos at the door”  Quincy Jones

“The key to life is accepting challenges. Once someone stops doing this, he’s dead.”  Bette Davis
Of these individuals, who would YOU consider sitting?

Mike

Edgar

Johnny

Mark

Critical Inquiry

If ischemia is the cause of cell death which is a result of tissue death which leads to pressure ulcers. . .if we are able to maintain blood flow while out of bed, could we (should we) consider alternative positions rather than bed rest as an appropriate method to treat pressure ulcers?
Food for thought?

- Why do orthopedic surgeons allow partial weight bearing on non displaced fractures which are in a walking cast?
- Why do therapists do scar tissue massage s/p surgery?

Physiology of Tissue Repair

A Wound Is a Wound Is a Wound

Phases of Tissue Repair

Fibroplasia During Proliferation Phase

- Laying down of the collagen matrix known as granulation tissue (type III then type I)
- Undifferentiated tissue
- Enhanced cell activity fills in the wound bed
- Angiogenesis – building of a vascular network – oxygen and nutrients
- Begin to see decrease in size

Cellular Activity of Proliferative Phase

- Fibroblasts, myofibroblasts, endothelial cells and epidermal cells are high
- Cross-linkage of collagen is formed
- New collagen matrix looks like red granules piled on top of each other – called granulation tissue

Remodeling/Epithelialization Phase

- Once area has been resurfaced by granulation tissue – collagen matrix progresses
- Type I collagen fiber bundles become thicker
- Balance between collagen lysis and collagen synthesis will give mature scar
Remodeling/Epithelialization Phase

- Too much oxygen to wound can cause collagen synthesis > lysis causing hypergranulation.
- Entire process of remodeling of wound can take from 3 weeks postinjury to 2 years.
- Studies have shown by adding tension during the healing process increases wound tensile strength of all soft tissue structures, as well as bone – and immobilization and stress deprivation have shown to produce a loss in tensile strength.

Mechanical Loads on Bone

- Yamagishi and Yoshimura in 1955 showed that intermittent compression forces applied to healing fractures in rabbits caused proliferation of cartilaginous callus.
- 1981 Wolf et al reported that when long bone fractures were treated with loading, bone strength increased more rapidly than when fractures were treated by constant compression.

AHCPR (AHRQ) / WOCN

“A patient who has a pressure ulcer on a sitting surface should avoid sitting. If pressure on the ulcer can be relieved, limited sitting may be allowed.”
Strength of evidence = C

Registered Nurses Association of Ontario

“Refer patients at RISK to appropriate interdisciplinary team members (Occupational Therapist, Physiotherapist, Enterostomal Therapist, etc.). Utilize those with expertise in seating, postural alignment, distribution of weight, balance, stability and pressure management when determining positioning for sitting individuals. Ensure support surfaces are used appropriately and are properly maintained.”
— Nursing Best Practice Guidelines, revised March 2007

Registered Nurses Association of Ontario

“A client with a pressure ulcer on the buttocks and/or trochanter should optimize mobilization. If pressure on the ulcer can be managed, encourage sitting as tolerated”
— Nursing Best Practice Guidelines, revised March 2007

Best Practice Guidelines

“However, while the need to prevent further pressure on existing ulcers on seating surfaces is recognized, the panel supports maximizing mobility in order to prevent further complications associated with prolonged bed rest, such as psychosocial isolation, muscle atrophy, decreased cardiac reserve, and respiratory compromise”
— Nursing Best Practice Guidelines, revised March 2007
Best Practice Guidelines

- “Increase activity as rapidly as the patient with a PI can tolerate”
- “Implement a schedule for progressive sitting that details frequency and duration according to tolerance and wound response”
- “Avoid seating a patient with an ischial PI in a fully upright position”
- “Position a seated patient in a posture that minimizes pressure, friction and shear forces and maintains their usual range of activity”

– Pan Pacific Clinical Practice Guidelines 2012

The Evidence Against Bed Rest

- „ . . of the 15 trials investigating bed rest as a treatment for medical conditions, including pressure ulcers, it was found that outcomes did not significantly improve, nine significantly worsened, and no evidence that bed rest as a treatment has any significant beneficial effect was presented.”
  – Allen et al 1999

The Evidence Against Bed Rest

- Multiple studies have demonstrated the decline of individuals occur very rapid
- Six to ten days can be enough time to complicate the clinical status of an individual
- It has been demonstrated within a 24 hour period bed rest may be related to specific physiological changes in individuals

Complications of Bed Rest

- Depression and anxiety
- Other cognitive and psychosocial complications
- Weakness associated with muscle atrophy
- Decreased endurance
- Development of joint contractures
- Intellectual changes
- Increased rate of UTIs

Complications of Bed Rest

- Decreased bone density
- Increased risk of DVTs
- Compromised circulatory system
- Decreased appetite – poor nutrition
- Decreased GI motility
- Decreased lung capacity
- Increased risk of pneumonia

Alternative Management Strategies

“When evidence of the serious complications of bed rest is combined with its lack of efficacy, finding alternatives to managing pressure ulcers becomes paramount. One alternative is to manage interface pressure throughout the patient’s Activities of Daily Living.”

Norton and Sibbald, 2004
Managing Pressure Throughout ADLs  
(Norton and Sibbald 2004)

General for All Surfaces
- Immediate use of pressure distribution equipment – check with pressure imaging
- Check areas of persistent redness or breakdown
- Minimize bed rest time & diminish extrinsic forces – optimize mobility
- Assess pressure points and adapt surfaces
- Look at other causes of skin breakdown

Bed
- Implement a positioning schedule
- Use good pressure redistributing products
- Avoid elevation of head of bed
- Use good techniques of movement

Client and Caregiver Education

Fully Supine on Low Air Loss Mattress

Head at 30º Elevation on Low Air Loss Mattress

Wheelchairs
- Assess postural alignment and pressure distribution
- Find best system to manage extrinsic risks – use pressure imaging
- Check the cushion daily for bottoming out

Transfers
- Diminish shearing forces – lifts, transfer boards etc.

Commode
- Attend to details of bathing and toilet rituals
- Pressure redistribution of seats and equipment
Additional suggestions

- Consider the continuum of care of where individuals may sit
- Assess and manage the system of the individual – nutrition etc.
- Consider microclimate
- Utilization of adequate equipment
- Utilization of alternative modalities

Alternative Modalities

Equipment Considerations

- Cushion selection
- Bed selection
- Alternative positions other than sitting
  - Prone carts
  - Standing frames – standing wheelchairs
- Education of pressure relief
  - Consider tilt AND recline vs. just tilt

ROHO Cushion Options

Discussion of “Look a Likes”
ROHO® PRODIGY
Mattress Overlay® System
AIR FLOATATION Mattress Overlay
Non-powered, adjustable, zoned, reactive mattress overlay

ROHO® SOFFLEX® 2
Mattress Overlay System
AIR FLOATATION Mattress Overlay
Non-powered, adjustable, zoned, reactive mattress overlay

ROHO® Neoprene
Mattress Overlay System
DRY FLOATATION Mattress Overlay
Non-powered, adjustable, zoned, reactive mattress overlay

Pressure Imaging

Alternating Pressure Feature Support Surfaces

• Alternating pressure: a feature of a support surface that provides pressure redistribution via cyclic changes in loading and unloading as characterized by frequency, duration, amplitude, and rate of change parameters

Principles of Design

• Addresses pressure
• Alternate baffles inflate and deflate
• Concept of “Reactive Hyperemia”
  – High pressure followed by no pressure
  – Little immersion or envelopment
• Standard of care in many countries
• Questionable increase in capillary damage
What’s the Evidence?

• “Currently, it is impossible to determine the most effective surface for either prevention or treatment”
  – Cullum, 2001
• “Based on the current research, it is impossible to determine the most effective support surface for the treatment of pressure ulcers.”
  – WOCN, 2010

What’s the Evidence?

• “Evidence does not support the conclusion that treatment with alternating pressure therapy results in improved outcomes for patients at risk for developing or with established pressure ulcers as compared to treatment with a preventative support surface”
  – Sharp-Pucci, 1998

Clinical Practice Guidelines and Supporting Evidence

• “The evidence provides little guidance to selection of the most appropriate high specification support surface for various patients”
• “…active (alternating pressure) support surfaces provide NO additional benefits over reactive (constant low pressure) support surfaces”
  – Pan Pacific Clinical Practice Guidelines 2012

Clinical Practice Guidelines

• “Use alternating pressure seating devices with caution in patients with existing PI’s, with consideration to benefits of offloading compared to the risk of shear forces”
• “Manage patients with existing pressure injuries on a high specification reactive (constant low pressure) or active (alternating pressure) support surfaces on beds and trolleys and when seated”
  – Pan Pacific Clinical Practice Guidelines 2012

Prone Carts

Standing Wheelchairs
Reduction of IT pressure is better accomplished with a combination of tilt and recline — Pellow, 1999 and Aissaui, 2001
- Decrease in tangential shear forces with recline where tilt preceded the recline position — Hobson, 1992

Check For Bottoming Out

It is Not a Day in the Park

So How do You Consider Other Options Versus Bed Rest?

Clinical Decision Making

- What does the patient want to do?
- Where is the location of the wound?
- What is the phase of healing of the wound?
- Can stress be applied in a controlled fashion?
- What is the size of the wound?
- What is the amount of necrotic tissue?
- Is the wound free from infection?
- Is the individual and or care givers compliant?
What about sacral pressure ulcers?

Clinical Decision Making

- What equipment is currently being utilized to manage the extrinsic risks?
- How many intrinsic risks does the individual present with?
- What is the overall medical condition of the individual?
- What is the psychological status of the individual?
- Has the wound progressed or gotten worse?

Clinical Decision Making

- What is the overall plan of care for the individual? Surgery? Conservative care?
- Where is the current individual residing?
  - rehab vs. acute vs. LTC
- What is the nutritional status of the individual?
- How long can the individual tolerate sitting?
- What is the staffing issue at the facility?

Of these individuals, who would YOU consider sitting?

Mike

- 36 yo IV drug user dx with T12 SCI & bilat. Transfemoral amputation
- Presented to acute care hospital from home
- Significant infection
- + osteo
- Non compliant with care
- Stage IV bilateral IT
- Stage IV sacral
- Stage IV bilateral GT
- Continues to sit without a cushion to go smoke

Edgar

- 17 yo male dx with acute T 4 SCI currently in rehab
- Great patient
- Rolling independent; using a power prone cart
- Good nutritional baseline
- Stage II sacral wound
- Utilizing e-stim for advanced wound care
Johnny

- 44 yo male
- Living in a LTC facility for past 10 years
- T6 Complete SCI
- Independent in transfers and all care
- Fair nutritional baseline
- Indep. bowel and bladder management
- Healing stage II left IT

Mark

- 49 yo with dx of T2 SCI x 2 years
- Readmitted to rehab with medical complications
- Bilateral healing stage III @ bilateral ITs
- Motivated individual
- Great family support
- Still requires assistance with functional activities

“If the efficacy of bed rest cannot be proven, alternatives to its use must be explored to prevent the complications of this treatment modality and improve client outcomes.”

Norton 2004

So would you now consider an alternative plan of care other than just bed rest?

Goals of Wheelchair Seating

- Clinical Reasoning
  - Skin protection
    - Manage extrinsic factors - redistribution of load
    - Heat and moisture dissipation
  - Provide dynamic stability
  - Provide positioning
  - Comfort
    - Sitting tolerance
    - Impact and vibration damping
  - Maintain optimal function
  - Ease of use and cost effective

Goals of Wheelchair Seating

- Skin
- Stability
- Positioning
- Function
- Cost Effective
- Pain / Comfort
Goals of Wheelchair Seating

Clinical Decision Making

- What level of skin protection is needed?
  - Method of load redistribution
- How much positioning is needed?
  - Accommodation versus correction
- How much stability required for function?
- Consistency of orientation to the load

Clinical Decision Making

- What changes are predicted to occur
- How capable and compliant will client be at needed maintenance?
- What are the lifestyle considerations?
  - Transferring and transporting

Can the cushion do it all?

The Impact of Equipment Choices

- The Cushion
  - Material considerations
    - Know the options
    - Understand how materials behave
    - Make smart choices
    - Consider client’s history

Decisions

Decisions
A butt for every cushion and a cushion for every butt

Clinical Tendencies
- Needs of client based upon assessment
- What we are comfortable with
- What is available at facility
- Past experiences with similar clients
- What supplier carries in stock or suggests
- What sales representative tells us
- Marketing material
- What the client wants
- What is reimbursed
- And . . . .

Challenges
- Prescribers have significantly different levels of technical knowledge
- Little or no real evidence that any product is effective or superior to another product

Principle of Design

Material Science
- Which material allows greatest immersion and envelopment
- Consider reaction force
  - Pressure
  - Shear
  - Friction
- Blood flow

Material Science - Foam
- Mechanism
  - Compression
- Force
  - Reaction
- Have to understand goal
- Ease of transfer vs. skin protection vs. comfort
Material Science - Air

- Mechanism
  - Displacement
  - Compression
- Force
  - Hydrostatic
  - Reaction
- Have to understand goal
- Ease of transfer vs. skin protection vs. comfort

Where Does ROHO Fit In?

ROHO DRY FLOATATION® Technology

- Limits the effects of extrinsic risk factors by
  - Immersion / proper adjustment is key
  - Redistribution of force / load
  - Decreases tissue deformation
- Has a dynamic nature
- Provides compression therapy (edema control)
- Provides dynamic stabilization

Management of Extrinsic Risks

- Pressure – redistribution of load
- Shear – limit/decrease forces
- Friction – limit/decrease forces
- Microclimate – provide environment where temperature and humidity is maintained to limit/decrease moisture

DRY FLOATATION Capabilities

- Pressure Distribution
  - Peak pressures are reduced
  - Consistent pressure levels are maintained, even as the client or patient moves on the cushion or mattress
  - Air, like water, is a dynamic medium. Gel and foam are not as dynamic as air.

DRY FLOATATION Capabilities

- Compression Therapy
  - Helps to reduce edema
  - Aides in prevention and healing of pressure ulcers
Management of Extrinsic Risks

Optimize Blood Flow
Prevent Skin Breakdown

For Pelvic Tilt
Images courtesy of Bodypoint, Inc.

Management of Stability With a ROHO
1. Ensuring correct inflation making sure immersion and envelopment taking place as affectively as possible
   Sitting in the cushion NOT on top of the cushion

Management of Stability With a ROHO
2. Using a HIGH PROFILE® Cushion versus a LOW PROFILE® Cushion
   - Greater immersion and envelopment capturing the GT to increase base of support and thus improving stability

Management of Stability With a ROHO
3. Select series of products inherently more stable than single valve due to air flow through ISOFLO Memory Control®
Management of Stability With a ROHO

4. Utilizing the ISOFLO Memory Control® in red without any positioning needs

Management of Stability With a ROHO

5. Consider alternative products within the ROHO family

Management of Stability With a ROHO

6. Utilization of other components of the seating system
   – Accessories – lap belts, etc.
   – Adjustability of the wheelchair
   – Back and positioning devices

Seat Contour

- Posterior contour
  – Accommodate anatomical shape
  – Help secure the ischial tuberosities
  – Discourage forward sliding
  – Match contour of pelvis for pressure distribution
  – Increase comfort

Seat Contour

- Anti-thrust
  – More aggressive contour
  – Secure ischial tuberosities and prevent forward sliding
  – Ischial tuberosities should be 1-1.5 inches away from anterior shelf

Cushion Modifications

- Wedge cushion or base
  – Help support pelvis in neutral
  – Prevent sliding forward
  – Requires appropriate hip flexion!
  – Consider transfers
What About These Wheelchair Accessories?

Pelvic Positioning Belts

• Anterior pelvic support
  – Maintain optimal pelvic position
  – Prevent forward sliding
  – 45, 60 or 90°
  – Dual pull – correct obliquity or rotation

For Pelvic Tilt

Where is the belt positioned?

Ineffective solution  Effective solution

For Pelvic Obliquity

For Pelvic Rotation

Images courtesy of Bodypoint, Inc.
Solid Back Support

- Provide trunk support
  - Proximal balance and stability allows distal mobility and functional movement
- Support posterior pelvis
- Protect skin
- Allow horizontal gaze
- Support all activities
  - ADLs, mobility, rest

Solid Back Support

General Use Backrests

Slung or old WC back upholstery is a common cause for poor posture

Solution: Backrest to optimize upholstery

Contoured Backs

- Match each individual’s shape
- Distribute pressure
- Increase comfort and stability
- Deep contour accommodates fixed kyphosis

Adjustable Back Hardware

- Depth adjustments
  - back or forward
- Angle Adjustability
  - increased balance
- Rotational Adjustability
  - Matches pelvis/trunk shape

Lateral Trunk Supports

- Maintain midline trunk
- Increase proximal stability
- Correct / accommodate scoliosis
- Do you need specific correction or just a lateral “hug”
Lateral Trunk Supports

- 3 points of force to correct scoliosis

Secondary Supports

- Lateral pelvic, thigh and/or knee supports
  - Support pelvis in neutral
  - Correct obliquity / rotation
  - Maintain LEs in midline
  - Correct flexible hip abduction

Secondary Supports

- Medial thigh support
  - Maintain LEs in midline
  - Correct flexible hip adduction
  - Size and placement are important!

Secondary Supports

- Pelvic band or supports
  - Help hold pelvis in neutral / optimal position
  - Encourage upright trunk

Secondary Supports

- Lumbar support
  - Encourages lumbar curve
  - Is it really supportive?
  - Size and positioning are very important
Other Secondary Supports
- Anterior trunk support
- Knee blocks
- Shoulder retractors
- SubASIS supports

Wheelchair Adjustment
- Camber
- Squeeze – Bucket – Dump
  - Higher front seat to floor vs. rear seat to floor
- Center of gravity

Closed Seat to Back Angle
- Secure the pelvis
- Reduce risk of sliding into PPT
- Reduce extensor spasticity
- Need hip ROM and firm back support

Tilt Versus Squeeze

Wheelchair Adjustments
- Back Angle
- Center of Gravity
- Seat Height
Functional Compromise

Wheelchair Adjustments

Adjusting leg-rest height

Wheelchair Adjustments

Solid Seat Support

• Supports pelvis in optimal position
• Prevent new postural deformities
• Prevent progression of existing deformities
• How firm does it need to be?
  – Good tight upholstery?
  – Firm cushion base?
  – Solid board or insert under cushion?
  – Solid seat?

Footrest Parameters

• Choose hanger angle to allow for optimal client knee angle
  – Accommodate hamstrings
  – Facilitate pelvic position
  – Maximize comfort
  – Optimize maneuverability
Footrest Parameters

- Using angle adjustable footplates and re-positioning footplate on hanger can also change the client’s knee angle

Footplate Parameters

- Angle adjustable footplates
- Maximize pressure distribution/weight bearing
- Affect tone/spasticity
- Accommodate fixed ankle positions
  - Dorsiflexion, plantarflexion, supination, pronation, inversion, eversion

Goals of Wheelchair Seating

- Clinical Reasoning
  - Skin protection
  - Manage extrinsic factors - redistribution of load
  - Heat and moisture dissipation
  - Provide dynamic stability
  - Provide positioning
  - Comfort
    - Sitting tolerance
    - Impact and vibration damping
  - Maintain optimal function
  - Ease of use and cost effective

Take Home Message

- The cushion can not do it all
- Have to consider the backrest to assist in positioning
- Think about wheelchair adjustments prior to adding multiple accessories
- It is called a seating “SYSTEM” for a reason
- Do NOT forget about therapeutic intervention as a plan of care!

The Benefits of ROHO

- Superior pressure distribution, and shear and friction management through shape fitting technology®
- Superior adjustable positioning and stability options while maintaining excellent force distribution
- A variety of products to meet the needs of most clients

Summary

Things to Consider
What is the weight limit on a ROHO?

- No weight limit on correctly sized neoprene products!

The Benefits of ROHO

- ROHO products are 100% neoprene and contain no latex
- Easy to clean and disinfect
- Adjustment process creates a custom fit
- Hand-made all in one location

And remember....

- ROHO has over 39 years of experience in the market!
- We have a proven, effective technology – we are the ORIGINAL!
- All of our products undergo a strict quality control process!
- ROHO offers outstanding customer service and educational support!

Thank You

Your Name
darrenh@therohogroup.com