If you are viewing this course as a recorded course after the live webinar, you can use the scroll bar at the bottom of the player window to pause and navigate the course.

This handout is for reference only. It may not include content identical to the powerpoint. Any links included in the handout are current at the time of the live webinar, but are subject to change and may not be current at a later date.

SEATING INTERVENTIONS

Michelle L. Lange, OTR/L, ABDA, ATP/SMS

Access to Independence

What we are Covering

- Pressure
- Angles of Support
- Strategies to address common positioning challenges

M. Lange 6.2015

Learning Objectives:

- The participant will be able to describe Stage 1 – 4 pressure ulcers.
- The participant will be able to list 3 critical angles of support and clinical indicators for angle selection.
- The participant will be able to list 3 common pelvic positioning challenges and strategies to address each.
- The participant will be able to list 3 common trunk positioning challenges.

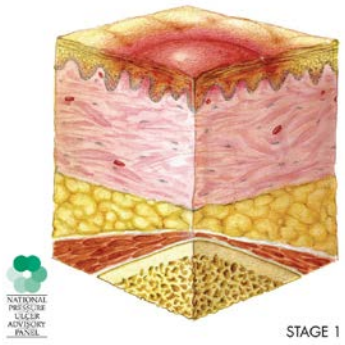
M. Lange 6.2015

PRESSURE

M. Lange 6.2015

Pressure Ulcer Definition

- National Pressure Ulcer Advisory Panel (NPUAP)
- International NPUAP-EPUAP Pressure Ulcer Definition
- "localized injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear and/or friction. "



M. Lange 6.2015

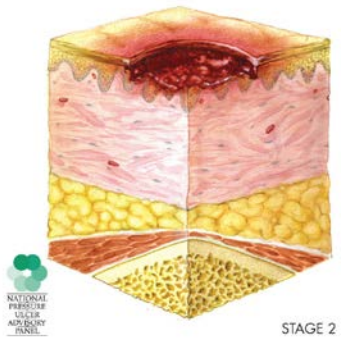
Pressure Ulcers

- 450,000+ pressure related wounds reported annually among wheelchair users and hospitalized patients
- $37,800 average cost of hospitalization due to pressure related wounds

M. Lange 6.2015

Pressure

- Contributing Factors
  - Heat
  - Moisture
  - Poor pressure distribution
  - Lack of sensation
  - Incontinence
  - Poor hygiene
  - Poor nutrition
  - Prior pressure ulcers
- Immobility
- Friction
- Shear
- Inactivity
- Decreased mental status



M. Lange 6.2015

Staging

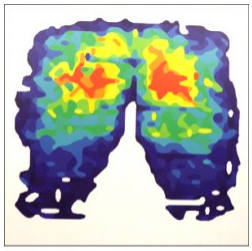
Pressure Ulcer Staging:

- Stage 1: Intact skin, red, non-blanchable
- Stage 2: Partial thickness loss of dermis
- Stage 3: Full thickness skin loss
- Stage 4: Full thickness tissue loss

M. Lange 6.2015

Seating implications

- Pressure distribution
- Pressure relief
- Reducing other causative factors
  - Heat
  - moisture



Pressure map of a seated patient showing high pressures (orange areas) over the ischial tuberosities.

M. Lange 6.2015

Pressure distribution

- Distribute pressure over as large an area as possible
  - Peak pressures at or below 80mm Hg
  - Materials that provide immersion
  - Contoured
  - Molded
- Increased immersion may interfere with transfers
- Some of these materials are less stable and so do not provide as much postural control

M. Lange 6.2015

Pressure relief

- Provide complete relief to specific areas for specific lengths of time
  - Tilt and/or recline
  - Alternating air cushions
  - Cushions that unweight key areas
  - Weight shifts
    - Forward lean
    - Push-ups
    - Lateral lean
    - wheelie

M. Lange 6.2015

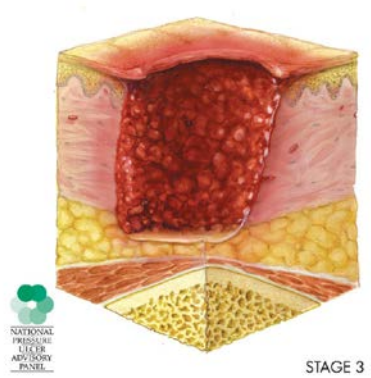
Tilt guidelines

- Consortium of Spinal Cord Medicine – PVA
- Tilt every 15-30 minutes
- Remain tilted at least 1 minute
- Tilt more than 30 degrees for pressure relief
- Optimal pressure relief:
  - 25-35 degrees tilt in combination with 120 degrees recline

M. Lange 6.2015

Heat and Moisture

- Consider seating and upholstery materials that reduce both heat and moisture



M. Lange 6.2015

SEATING BIOMECHANICS

It's all in the angles

M. Lange 6.2015

Biomechanics

- Seating systems are more than support surfaces and strapping
- Angles are essential to optimize biomechanics and subsequent function
- Stability allows for dissociation and control of movement

M. Lange 6.2015

Angles

- Pelvis: seat to back
- Knee: seat to calfrest
- Ankle: calfrest to footrest
- Position in space
  - tilt
  - recline

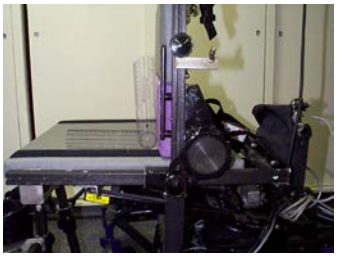
M. Lange 6.2015

Pelvis: Seat to Back Angle

M. Lange 6.2015

Pelvis: Seat to Back Angle

- Closed
  - usually 90 degrees or less
  - can inhibit extensor tone
  - can be combined with tilt to prevent falling forward
  - can be combined with anterior tilt of thighs
  - can be a “task performance” position



M. Lange 6.2015

Pelvis: Seat to Back Angle

- Open
  - usually 90 degrees or more
  - can increase extensor tone
  - can improve head and trunk control
  - provides a resting position

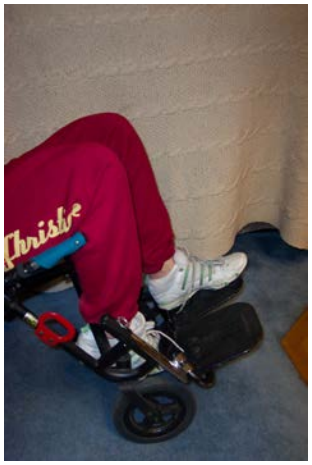
M. Lange 6.2015

Knee: Seat to Calfrest Angle

M. Lange 6.2015

Knee: Seat to Calfrest Angle

- Closed
  - relieves pull on hamstrings
  - can lead to loss of range
  - may not clear front castors



M. Lange 6.2015

Knee: Seat to Calfrest Angle

- Open
  - clears front castors
  - passive stretch on hamstrings

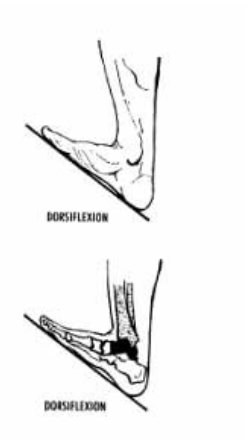
M. Lange 6.2015

Ankle: Calfrest to Footrest

M. Lange 6.2015

Ankle: Calfrest to Footrest

- Closed
  - dorsiflexion
  - range may not be available
  - can “break up” extensor tone
  - angle adjustable footplates



M. Lange 6.2015

Ankle: Calfrest to Footrest

- Open
  - plantar flexion
  - may affect ground and castor clearance

M. Lange 6.2015

Position in Space: Recline

- Open seat to back angle

M. Lange 6.2015

Position in Space: Recline

- Pros
  - easier catheterization
  - pressure redistribution
  - can do weight shifts at work surface
  - tray remains parallel to floor
  - may relieve orthostatic hypotension
  - passive range of motion at hips and knees
  - transfer may be easier

M. Lange 6.2015

Position in Space: Recline

- Pros
  - Postural management
  - Fatigue management
  - Medical management

M. Lange 6.2015

Position in Space: Recline

- Cons
  - shear forces can disrupt alignment
  - reclining increases pressure over sacral area
  - opening seat to back angle can set off spasms
  - cannot be used with contoured positioning system
  - cannot be used by positioning systems with fixed seat to back angle

M. Lange 6.2015

Position in Space: Recline

- Cons, cont.
  - clients with limited ROM at the hips or knees may be pulled out of position
  - reclining may affect the client's ability to access other assistive technology devices

M. Lange 6.2015

Position in Space: Tilt

- All angles stay the same: pelvis, knees, ankles
- Posterior
- Anterior
- Lateral

M. Lange 6.2015

Position in Space: Tilt

Posterior Tilt

M. Lange 6.2015

Position in Space: Tilt

Anterior Tilt

M. Lange 6.2015

Position in Space: Tilt

- Lateral Tilt

M. Lange 6.2015

Position in Space: Tilt

- Pros
  - redistributes pressure
  - postural management
  - fatigue management
  - maintaining angles may inhibit muscle tone and maintains posture
  - no shear forces
  - other assistive technology devices remain in position relative to the client

M. Lange 6.2015

Position in Space: Tilt

- Pros, cont.
  - tilt systems accommodate contoured positioning systems and positioning systems with fixed seat to back angle
  - range of motion limitations are accommodated

M. Lange 6.2015

Position in Space: Tilt

- Cons
  - pressure relief not as great as with recline systems
  - must move away from a work surface to tilt
  - items left on tray will slide and fall
  - maintaining the hips in flexed position can constrict the bladder
  - a leg bag can leak during a tilt

M. Lange 6.2015

Position in Space: Tilt

- Cons, cont.
  - lack of movement at hips and knees can lead to range of motion losses
  - some tilt systems have a higher seat to floor height than recline systems which can affect transfers and clearance under tables

M. Lange 6.2015

POSITIONING CHALLENGES

M. Lange 6.2015

Wheelchair Seating: Define Challenges

- Define the positioning challenges and causes
- Pelvis
- Trunk
- Lower Extremities
- Upper Extremities
- Head

M. Lange 6.2015

Overview

- This is only an overview
- For more in-depth information, please refer to other OccupationalTherapy.com courses

M. Lange 6.2015

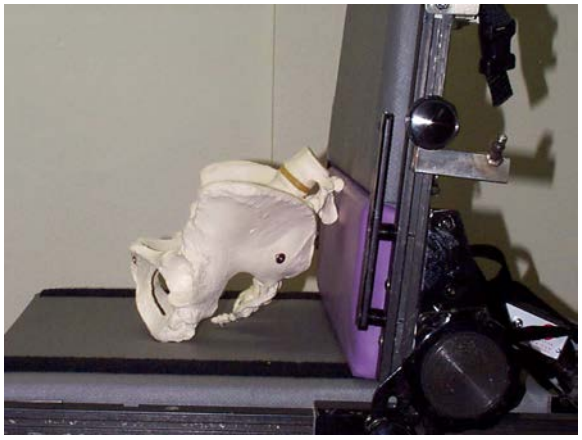
Positioning Challenges:

- Pelvis:
  - Tilt: posterior, anterior
  - Rotation
  - Obliquity

M. Lange 6.2015

Pelvic Tilt

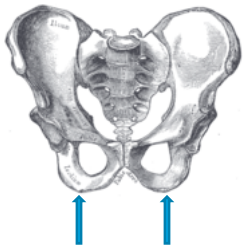
- Posterior Tilt



M. Lange 6.2015

Posterior Pelvic Tilt

- Let's try it!
- Sit up straight
- Sit on your hands, find those ITs
- Assume a posterior tilt
- Where did those ITs go?
- What is your spine doing?



M. Lange 6.2015

Posterior Pelvic Tilt

- Possible Causes:
  - low abdominal/trunk tone
  - tight hamstrings
  - seat depth too long
  - limited range of motion, particularly limited hip flexion
  - sliding forward on seat
  - extensor thrust

M. Lange 6.2015

Posterior Pelvic Tilt

- Cause:
  - Low abdominal/trunk tone
- Interventions:
  - provide support to posterior superior surface of pelvis to block backward movement
  - biangular back

M. Lange 6.2015

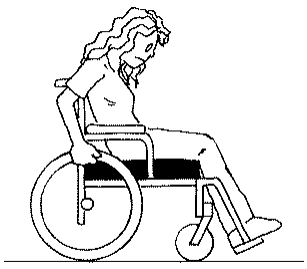
Posterior Pelvic Tilt

- Cause:
  - Tight hamstrings
- Interventions:
  - open seat to back angle
  - decrease thigh to calf angle

M. Lange 6.2015

Posterior Pelvic Tilt

- Cause:
  - Seat depth is too long.
- Intervention:
  - provide appropriate seat depth for hip and knee flexion



M. Lange 6.2015

Posterior Pelvic Tilt

- Cause:
  - Limited Range of Motion, particularly limited hip flexion.
- Interventions:
  - accommodate fixed limitation in hip flexion by opening seat to back angle
  - accommodate asymmetries with contoured or molded positioning system

M. Lange 6.2015

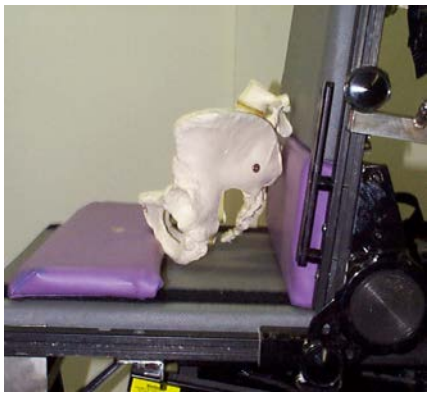
Posterior Pelvic Tilt

- Cause:
  - Sliding forward on seat.
- Interventions:
  - provide anti-thrust or aggressively contoured seat
  - stabilize pelvis using appropriately angled pelvic belt or anterior pelvic stabilizer
  - change upholstery type

M. Lange 6.2015

Anti-thrust cushion

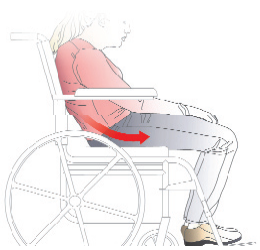
- Curb doesn't need to be high
- Too high can unweight ITs and close seat to back angle

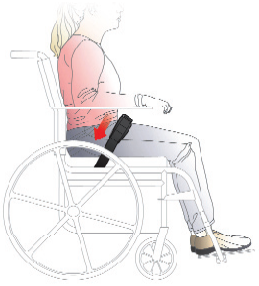


M. Lange 6.2015

Posterior Pelvic Tilt Hip Belt Position

- 60 degree angle maintains neutral pelvic tilt





M. Lange 6.2015

Pelvic Tilt

- Anterior Tilt

M. Lange 6.2015

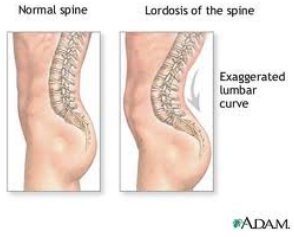
Anterior Pelvic Tilt

- Let's try it!
- Sit up straight
- Sit on your hands, find those ITs
- Assume an anterior tilt
- Where did those ITs go?
- What is your spine doing?

M. Lange 6.2015

Anterior Pelvic Tilt

- Possible causes:
  - low trunk tone
  - muscle weakness
  - lordosis



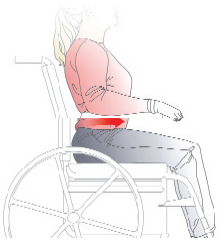
M. Lange 6.2015

Anterior Pelvic Tilt

- Interventions:
  - place pelvic positioning belt across ASIS
    - anterior superior illiac spine
  - sub ASIS bar positioned in front of ASIS
  - belly binder or corset
  - see interventions for lordosis

M. Lange 6.2015

Anterior Tilt hip belt position



30 degrees

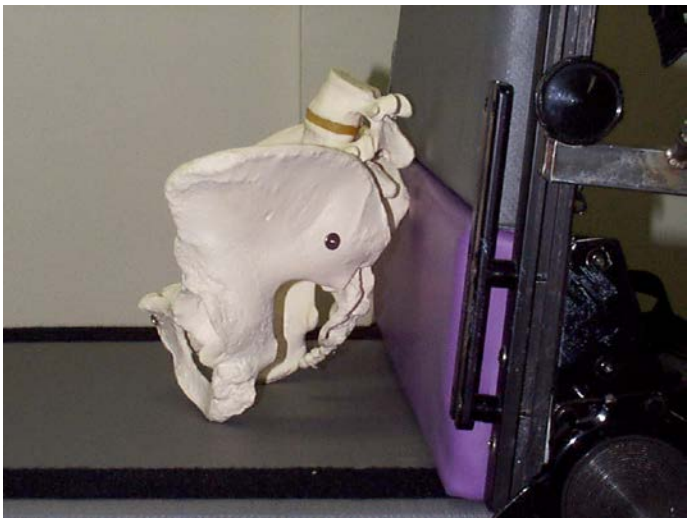
M. Lange 6.2015

Belly Binder

- Aspen Seating
- Abdominal Panel

M. Lange 6.2015

Pelvic Rotation



M. Lange 6.2015

Pelvic Rotation

- Let's try it!
- Sit up straight
- Sit on your hands, find those ITs
- Put one knee forward of the other
- Where did those ITs go?
- What is your spine doing?

M. Lange 6.2015

Pelvic Rotation

- Cause:
  - range of motion limitations in hip:
    - abduction
    - adduction
    - hip flexion
    - windswept posture
- Intervention:
  - align pelvis in neutral and accommodate any residual asymmetrical lower extremity posture

M. Lange 6.2015

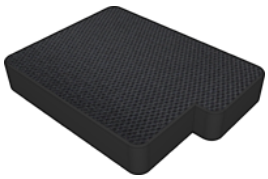
Pelvic Rotation

- Cause:
  - fixed limitations in spine, pelvis and/or femoral mobility (i.e. rotational scoliosis)
- Intervention:
  - pelvis may need to assume asymmetrical posture in order to keep head and shoulders in neutral position

M. Lange 6.2015

Pelvic Rotation

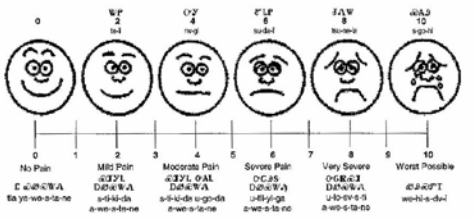
- Causes:
  - unequal thigh length
  - hip dislocation
- Interventions:
  - check measurement to confirm leg length discrepancy vs. pelvic rotation
  - asymmetrical seat depth, if fixed



M. Lange 6.2015

Pelvic Rotation

- Cause:
  - discomfort
- Intervention:
  - identify source and remediate, or refer to physician



M. Lange 6.2015

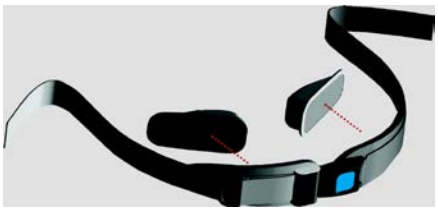
Pelvic Rotation

- Causes:
  - tone and/or reflex activity
  - ATNR
- Interventions:
  - lower extremity abduction, hip and knee flexion, ankle dorsiflexion
  - pull pelvic belt back on forward side of pelvis
  - increase thickness of padding of pelvic belt on forward side

M. Lange 6.2015

Pelvic Rotation

- A 60 degree angle is usually appropriate for rotation.
- The direction of pull is more critical than the angle. The belt should pull down on the forward side.
  - ASIS pad on the forward side can also be used



Bodypoint

M. Lange 6.2015

Pelvic Rotation

- Kelly
  - Pelvis is in neutral with pull down on forward side
  - Legs allowed to assume a windswept posture to maintain neutral pelvis

M. Lange 6.2015

Rotation due to tone and reflexes

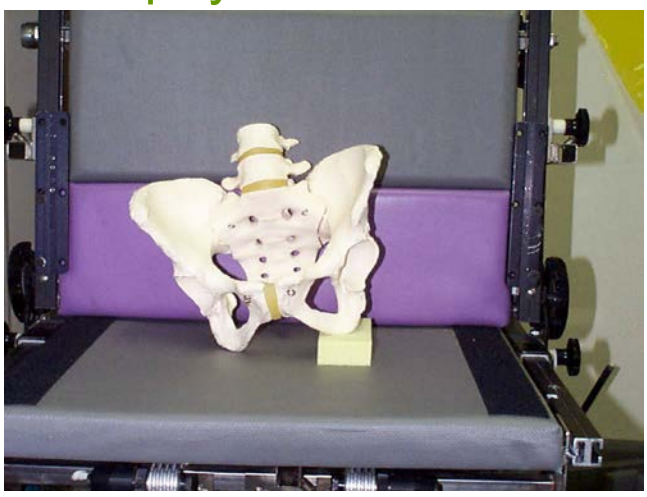
M. Lange 6.2015

Pelvic Rotation

- Interventions
  - anti-thrust seat
  - Pelvic positioning belt pulled down on forward side
  - aggressively contoured seating system, if fixed

M. Lange 6.2015

Pelvic obliquity



M. Lange 6.2015

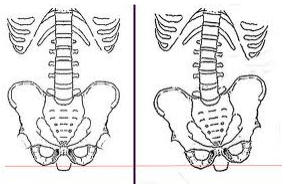
Pelvic Obliquity

- Let's try it!
- Sit up straight
- Sit on your hands, find those ITs
- Cross one leg over the other
- Where did those ITs go?
- What is your spine doing?

M. Lange 6.2015

Pelvic Obliquity

- One side of the pelvis is higher
- Causes:
  - scoliosis
  - ATNR
  - surgeries
  - discomfort



M. Lange 6.2015

Pelvic Obliquity

- Interventions:
  - change angle of pull of pelvic belt
  - wedge
    - under low side to correct (flexible)
    - under high side to accommodate (fixed)

M. Lange 6.2015

Pelvic Obliquity

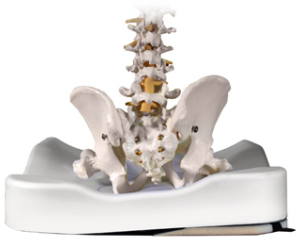
- Best pelvic positioning placement is over the lap, just in front of the ASIS, to pull the leg down on the high side, which in turn pulls the pelvis down
  - Contra-indicated for dislocated hip
- If rotation or posterior tilt are also present, a 4 point belt may be indicated

Bodypoint

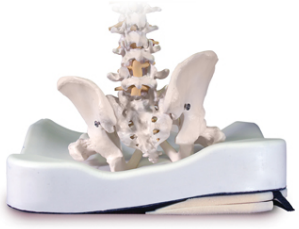
M. Lange 6.2015

Wedging a fixed pelvic obliquity

Level pelvis



Fixed obliquity, ½" wedge

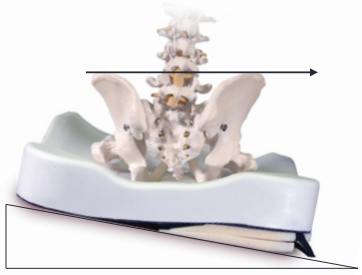


Fixed obliquity, 1" wedge

Goal: to fill in space and distribute pressure

M. Lange 6.2015

Lateral tilt to level fixed pelvic obliquity



Goal: the first wedge fills in space to distribute pressure. The second wedge, or lateral tilt, levels the pelvis for equal pressure distribution on the ITs – Make sure the head is level

M. Lange 6.2015

Positioning Challenges:

- Trunk:
  - Scoliosis
  - Kyphosis
  - Lordosis
  - Rotation

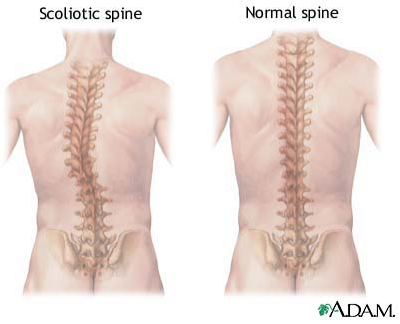
M. Lange 6.2015

Scoliosis

M. Lange 6.2015

Lateral Trunk Flexion

- Scoliosis may be C curve, S curve and/or rotational
- Scoliosis may be flexible, partially flexible or fixed



M. Lange 6.2015

Lateral Trunk Flexion

- Possible Causes:
  - increased tone on one side
  - musculature imbalance, may have pelvic involvement
  - decreased trunk strength or decreased tone, causing asymmetrical posture
  - habitual posturing for functional activity or stability
  - fixed scoliosis

M. Lange 6.2015

Lateral Flexion

- Worse with effort…

M. Lange 6.2015

Lateral Trunk Flexion

- Interventions:
  - if flexible:
    - generic contoured back
    - lateral trunk supports (may need to be asymmetrically placed, one lower at the apex of lateral convexity)
    - anterior trunk supports to correct any rotation (see forward trunk flexion interventions)

M. Lange 6.2015

Lateral Trunk Flexion

- Interventions, continued:
  - If fixed:
    - refer to physician to explore medical or surgical procedures, x-rays
    - TLSO
    - aggressively contoured or molded back to allow for fixed curvature of spine and/or rib cage
    - horizontal tilt under seat to right head, if pressure distribution is good

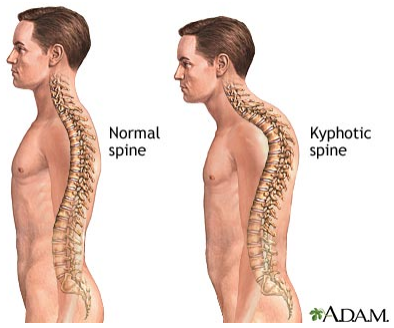
M. Lange 6.2015

Kyphosis

M. Lange 6.2015

Forward Trunk Flexion

- Kyphosis can be at various levels of the spine
- Kyphosis may be flexible, partially flexible or fixed
- May be combined with neck hyperextension



M. Lange 6.2015

Forward Trunk Flexion

- Possible Causes:
  - flexion at hips
  - flexion at thoracic area
  - flexion at shoulder girdle with gravitational pull downward
  - may occur from increased or floppy tone, abdominal weakness, poor trunk control, weak back extensors

M. Lange 6.2015

Forward Trunk Flexion

- Possible Causes, cont.
  - increased tone (i.e. hamstrings) pulling pelvis back into posterior tilt
  - posterior pelvic tilt
  - habitual seating in an attempt to increase stability
  - fixed kyphosis

M. Lange 6.2015

Forward Trunk Flexion

- Interventions:
  - if flexible:
    - anterior trunk support
    - posterior trunk support
  - if fixed:
    - open seat to back angle to match pelvis angle
    - contoured back
    - tilt seating system to allow upright head

M. Lange 6.2015

Forward Trunk Flexion

- Anterior Trunk Supports
  - chest strap
  - shoulder straps
  - shoulder retractors
  - butterfly vests
  - abdominal supports
  - TLSO

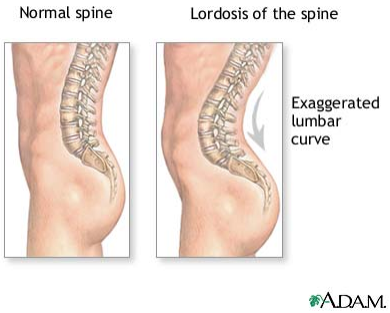
M. Lange 6.2015

Lordosis

M. Lange 6.2015

Lordosis

- Hyperextension of the lumbar area
- Often combined with anterior pelvic tilt



M. Lange 6.2015

Lordosis

- Possible Causes:
  - tight hip flexors or over correction of tight hip flexors
  - increased tone pulling pelvis forward into an anterior tilt
  - habitual posturing in an attempt to lean forward for functional activities
  - “fixing” pattern to extend trunk against gravity (e.g. in conjunction with shoulder retraction)

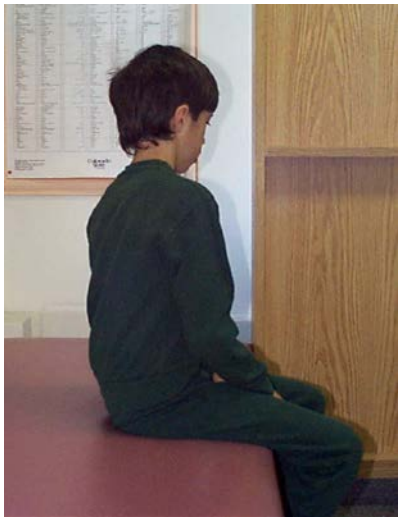
M. Lange 6.2015

Lordosis

- Interventions:
  - if flexible:
    - provide lower back support as needed
    - biangular back
    - may need to change seat to back angle
    - do not over correct limited hip flexion
    - may require anterior trunk support
  - if fixed:
    - molded seating system

M. Lange 6.2015

Rotation



M. Lange 6.2015

Trunk Rotation

- Often seen in combination with lateral flexion
- Often seen in combination with pelvic rotation
- Possible Causes:
  - pelvic rotation
  - see lateral flexion causes

M. Lange 6.2015

Trunk Rotation

- Interventions:
  - see pelvic rotation interventions
  - if flexible:
    - use anterior supports on forward side
  - if fixed:
    - consider placing pelvis asymmetrically in seating system so that trunk and head face forward
    - molded back to distribute pressure

M. Lange 6.2015

Spinal Asymmetries Combined

- Anderson has Lordosis, Kyphosis and Lateral Scoliosis

Lordosis

M. Lange 6.2015

Spinal Asymmetries Combined

- Kyphosis

M. Lange 6.2015

Spinal Asymmetries Combined

- Lateral Scoliois

M. Lange 6.2015

Molding Seating

M. Lange 6.2015

Positioning Challenges:

- Lower Extremities:
  - Hip Adduction
  - Hip Abduction
  - Hip or Knee Flexion
  - Hip or Knee Extension
  - Ankle and foot limitations

M. Lange 6.2015

Lateral Pelvic supports

- To keep pelvis in middle of seat

M. Lange 6.2015

Medial Knee Support

- To limit knee adduction
- Not to prevent posterior pelvic tilt

The groin is not a weight bearing surface!

M. Lange 6.2015

Lateral Knee Support

- To limit excessive hip abduction

M. Lange 6.2015

Foot Supports

- To limit excessive knee extension
- To prevent injury
- To increase stability

M. Lange 6.2015

Foot support

- If the foot shape is altered, different support may be required

M. Lange 6.2015

Padded Foot Box

Therafin

M. Lange 6.2015

Positioning Challenges:

- Head:
  - Decreased head control
  - No head control
  - Lateral flexion

M. Lange 6.2015

Head position is important

M. Lange 6.2015

Decreased or No Head Control

- Interventions:
  - Increase trunk extension and scapular retraction
  - neck rest
  - posterior head support
  - change pull of gravity against head by reclining or tilting seating system
  - anterior solutions
  - refer to behavioral optometrist, if appropriate

M. Lange 6.2015

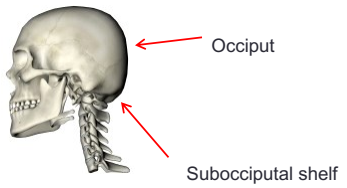
Posterior Head Supports

- Many posterior head rests or head supports are on the market
- None will be effective if the client's head never touches it!
- Tilt can be used to enlist gravity in the battle
- Ensure that pelvis and trunk are in an optimal position to facilitate head control

M. Lange 6.2015

Occipital and Suboccipital

- Occipital support contacts the upper rear of the head
- Suboccipital can actually provide postural support as it "cups" the occipital shelf
  - This also can reduce neck hyper extension



M. Lange 6.2015

Posterior Head Supports

- Wide variety to meet a client's specific needs

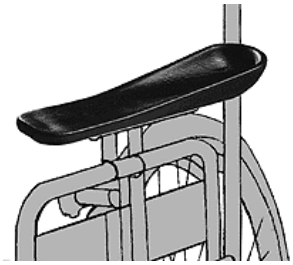
M. Lange 6.2015

Anterior Head Supports

- Forehead support
- Collars

M. Lange 6.2015

Positioning Challenges:



- Upper Extremities:
  - The need for more support
  - Shoulder retraction
  - Elbow extension
  - Uncontrolled movements

M. Lange 6.2015

Take Home Message:

- Pressure is an issue for anyone using wheelchair seating and must be considered
- The angle of support surfaces and components has a significant impact on positioning and function
- Specific seating challenges must be identified
- Intervention strategies can be applied to multiple seating system categories

M. Lange 6.2015

Resources

- RESNA Wheelchair Service Provision Guide
  - www.RESNA.org
- Positioning Chart
  - www.atilange.com, under Resources

M. Lange 6.2015

Hands-on Activity

- Contact a Seating and Mobility Clinic in your area
- Arrange to observe a Seating Evaluation

Activity Time!

M. Lange 6.2015

Thank You!

M. Lange 6.2015

Contact Information

- www.OccupationalTherapy.com
- 866-782-9924

- Michelle L. Lange, OTR/L, ABDA, ATP/SMS
- MichelleLange@msn.com
- www.atilange.com