

# Impact of Temperature, Moisture and Shear on Pressure Ulcer Formation

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  - Moisture Management
  - Client Application
- Action Cushions (XAct Soft, XAct Lite)
  - Pressure Distribution
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  - Client Application
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# AireRx Background

- Inception in 2005
- Origin routed in car manufacturing industry
- ADP approved March 2007

# AireRx Cushions

- Designed around average adult pelvis
- Anatomically intelligent design
- Multi density foam construction
- Superior contours
- Optimal pressure distribution
- Manages temperature build up and moisture retention
- Waterproof seal

# AireRx Cushion Types

- General Use
  - Lightweight (3.2lbs)
  - \$350
- Skin Protection (SP)
  - Cool comfort chamber
  - Enhanced sculpted shape
  - Weight (4.2lbs)
  - \$595
- Skin Protection & Positioning (SPP)
  - Stronger contours & sculpted shape
  - Weight (4.3 lbs)
  - \$750.00

# AireRx Cover

- High air permeability
- Cushioned
- Light weight
- High conformity
- ↓'s shear & friction
- Machine washable

# AireRx Powered Air Circulation



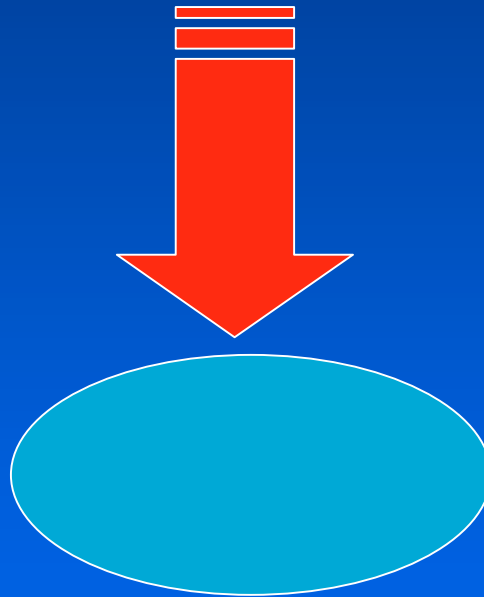
- Fan provide 27 CFM air flow across cushion surface
- Rechargeable Battery
- 18 Hours continuous use
- Battery life 3-5 years

# Why Use AireRx?

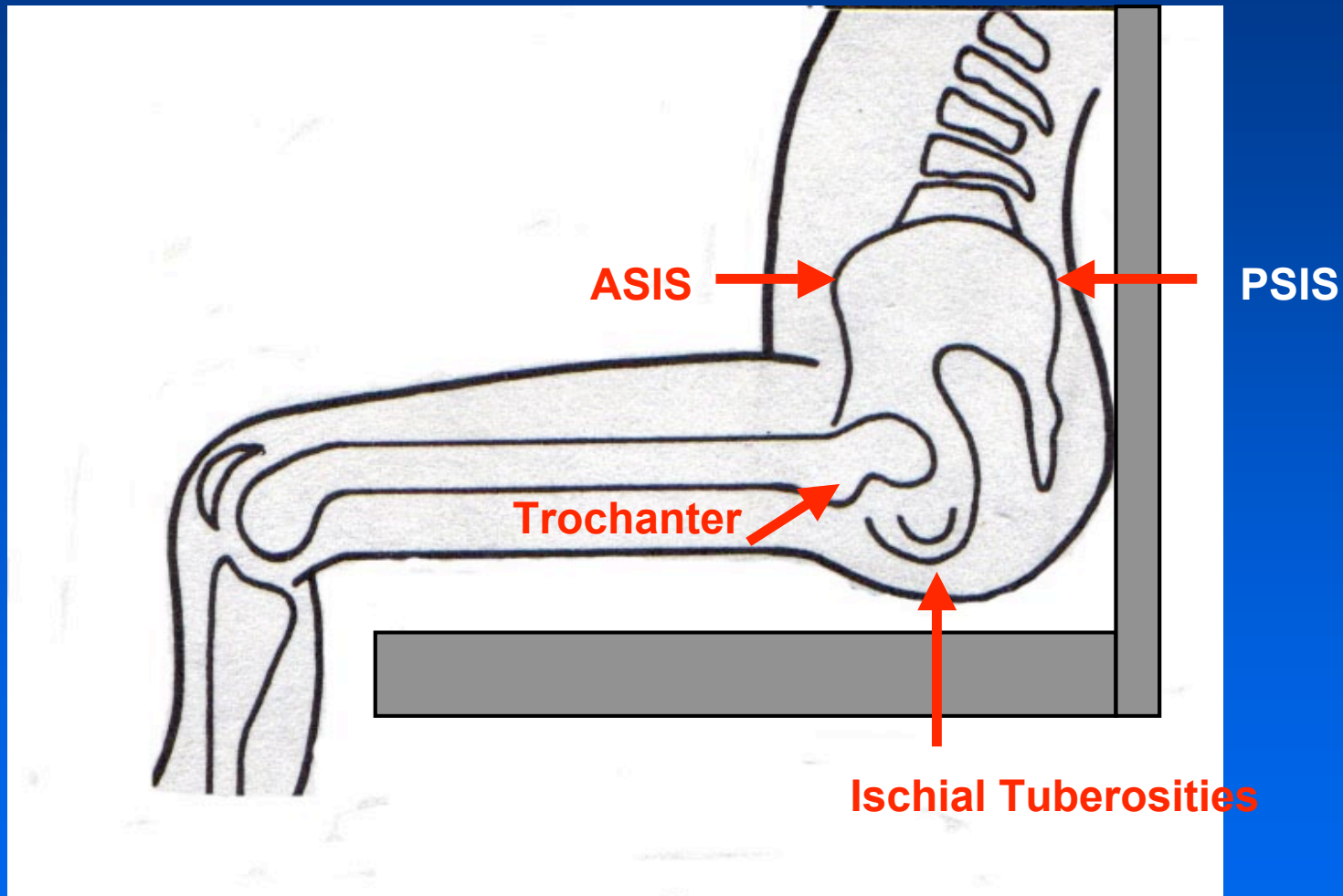
- It isolates pressure
- It manages temperature
- It manages moisture

# Why Isolate Pressure?

Compression  
Force



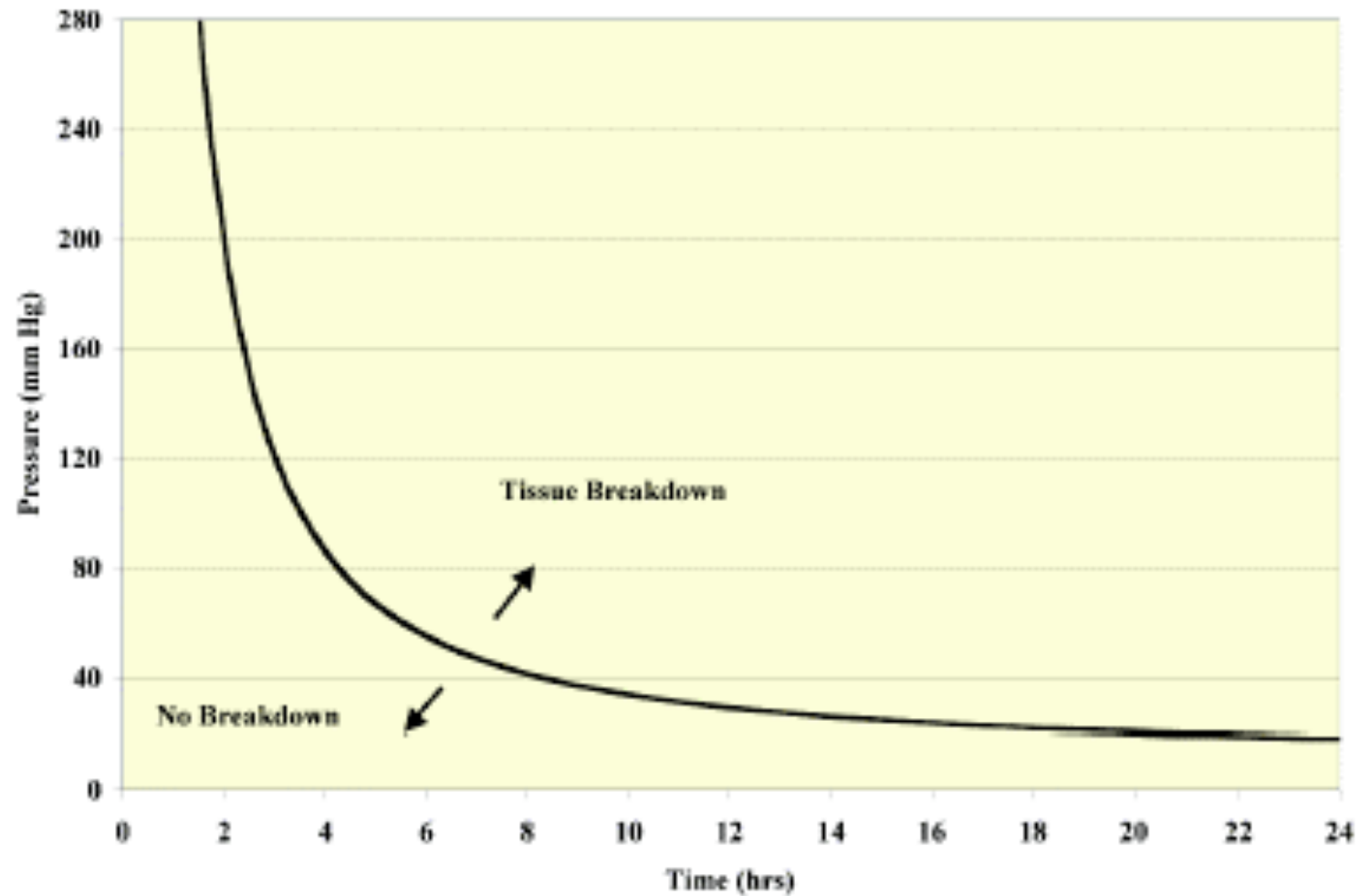
# Pelvic Anatomy



# Pressure/Time

- There is NO magic Pressure Number that is “Safe”
- Peak Pressures/Time are key factors
- Metabolism requirements must be met

# Pressure vs. Time Curve



(Reswick & Rogers, 1976; Lanchenbruch, 2005)

# How AireRx Isolates Pressure?

- Foam construction to provide support
- Highly Contoured to Isolate High Risk Areas (ischials & coccyx)
- Directs pressure to Trochanter and Thighs
- Provides Good Stability

# Why Use AireRx?

- It isolates pressure
- It manages temperature
- It manages moisture

# Why Manage Temperature?

- All cellular tissues increase their metabolic rates 10-13% for each 1° C increase in temperature
- Higher metabolic rates require more O<sub>2</sub> to sustain cellular life
- Heat increases the requirements for nutrient supply

# Impact of Heat

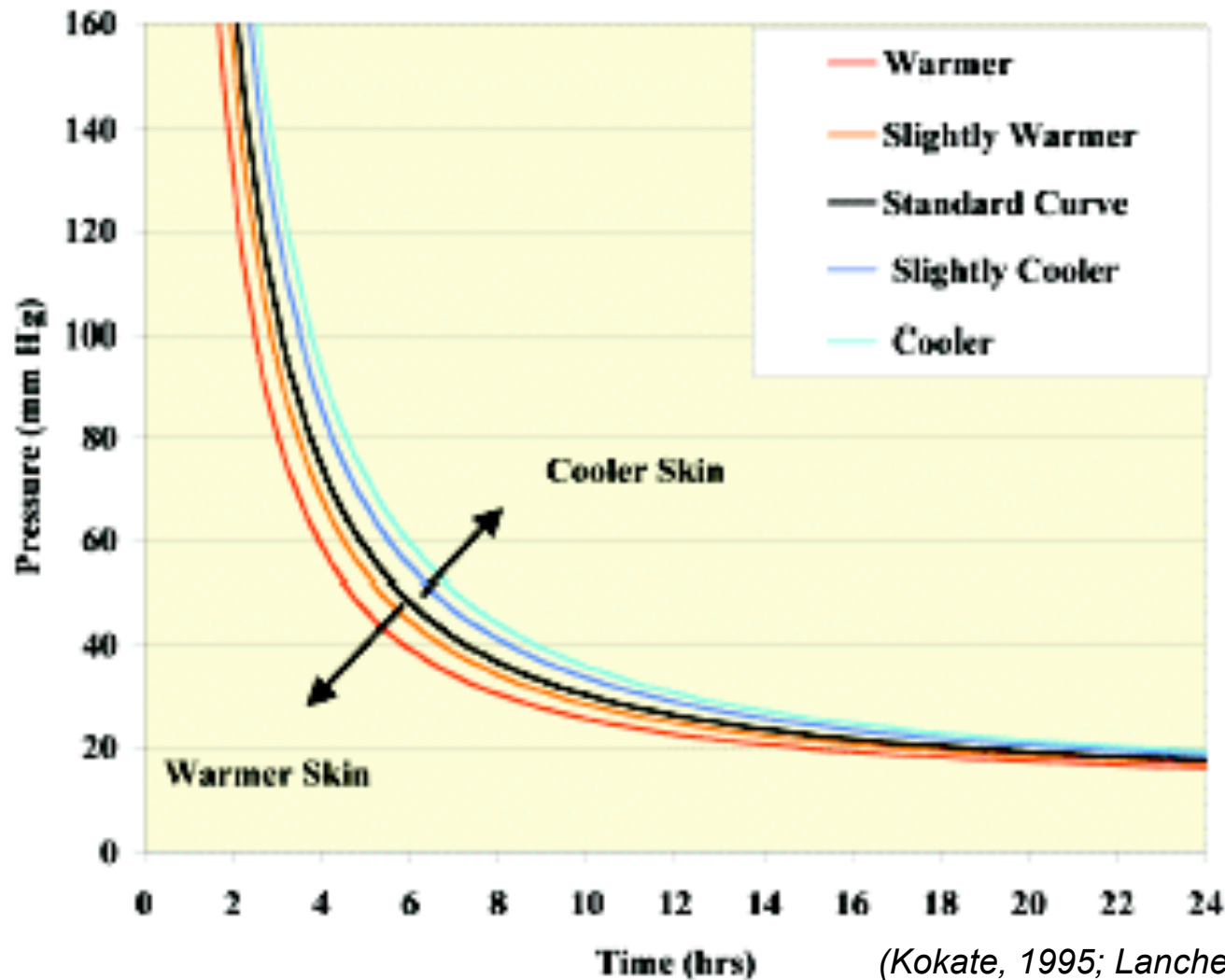
- “normal” non-insulated skin temperature 32°C to 33°C
- when seated on a cushion, heat accumulates at interface and skin temperature rises
- Rate that heat is trapped in surface determines amount of heat accumulation
- If skin temperature passes “perspiration threshold” (33° C), sweating increases markedly
- Skin temperatures has been shown to rise to 37° C to 39°C at the cushion/user interface

# Heat increases pressure ulcer susceptibility

- Pressure was applied at sites over bony vertebral prominences on swine (51 mm diameter brass indenters)
- Pressure was controlled at 100 mmHg
- Pressure was applied for 5 hours
- Pressure indenters were applied at 4 different temps
- Pressure damage after 7 days:
  - 25°C - no damage
  - 35°C - deep tissue damage
  - 40°C - deep and superficial damage
  - 45°C - more severe deep and superficial damage

Kokate, et. Al. 1995; Iuzzo, et. Al. 2004

# Pressure vs. Time Curve with Different Temperature



# How AireRx Effects Heat

Designed to minimize heat build up

- Cushion has seperation and air flow layer
- Cover designed with 3 layers of air transfer mesh
- No fan - 2° cooler than any other cushion
- With Fan – 4 – 5° cooler than any other cushion

# Why Use AireRx?

- It isolates pressure
- It manages temperature
- It manages moisture

# Why Manage Moisture?

- Sweating is triggered at 33° C
- Moisture softens the skin tissue
- Increases the risk of breakdown
- Moisture and Heat combine to support bacterial activity
- Research
  - Stewart (1980) humidity at cushion interface ↑ from 10.4% to 22.8%
  - Siekman (2007) humidity ↓ while using AireRx but increases when using other cushions

# How AireRx Effects Moisture

Designed to whisk moisture away

- Cushion designed to allow for moisture escape out the back (incline and channelling)
- Cover designed with 3 layers of air transfer mesh to allow cooling air flow to evaporate moisture

# AireRx Client Application

- Clients who have issues with heat
- Clients who have history of breakdown or are at high risk
- Dx of:
  - MS or ALS
  - Spinal Cord Injury
  - Cerebral Palsy
  - Neurological Conditions (ABI, CVA, & Elderly)

# Xact Soft

- Multi density pre-contoured foam
- lightweight yet firm ( lbs)
- Polymer cubes under the ischials to prevent bottoming out while reducing load shear
- Vacuum sealed for durability and protection
- Breathable Body Smart cover provides pelvic stability and minimizes ischial shear
- ADP Price

# Xact Lite

- Multi-density pre-contoured foam
- Akton polymer textured overlay
- Lightweight (3.2lbs)
- Pressure & shear reduction
- Vacuum sealed
- ADP Price

# Action Twister Back

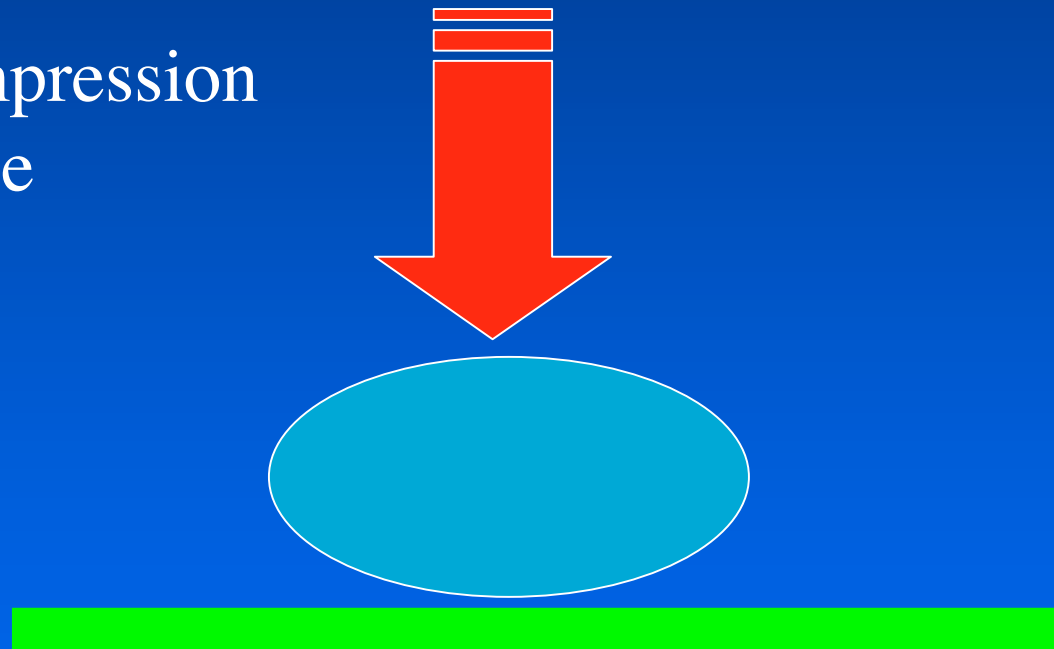
- Hybrid back support
- Uses hoop and loop technology
- Supports users with normal to severe kyphoscoliosis
- Akton polymer ensure comfort and pressure relief along the spine
- 2 heights (short  $\leq 16$ , tall  $\geq 17$ )
- ADP #
- ADP Price
- Client Application

# Why Use Action Cushions?

- They optimize pressure distribution
- They minimize friction & shear

# Why Distribute Pressure?

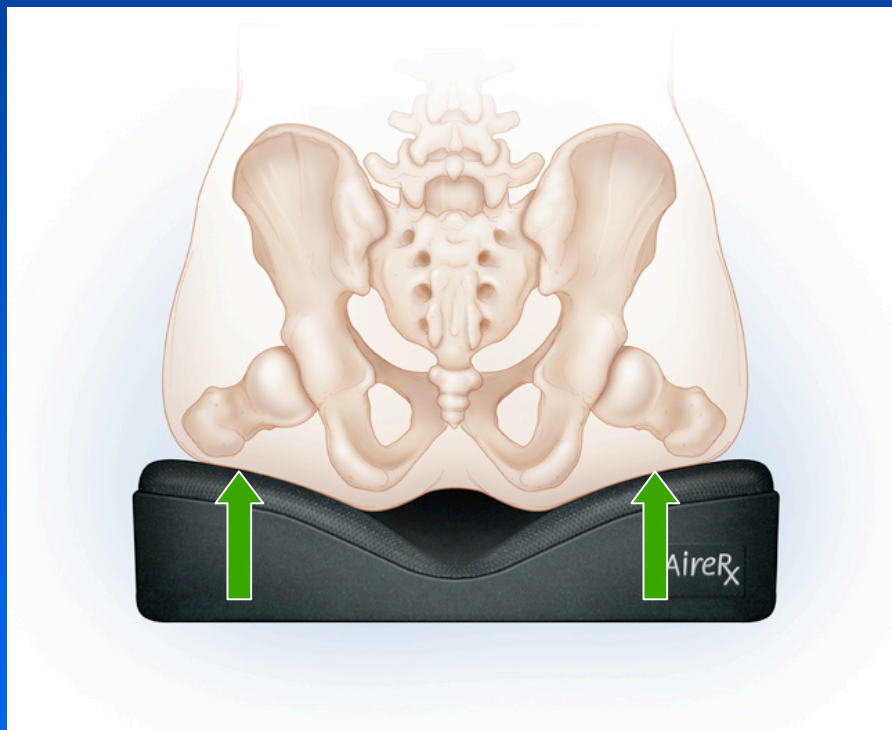
Compression  
Force



# Pressure Distribution

- Cushion conforms to body shape
- Combinations of Materials
- Goal is to Distribute Pressure over widest possible area
- Can Offer Excellent Stability

# Pressure Distribution Offloading



- Elevated Contours at Trochanteric Shelf
- Transfers load off of Ischials
- Goal is to minimize High Pressures at areas of Highest Risk

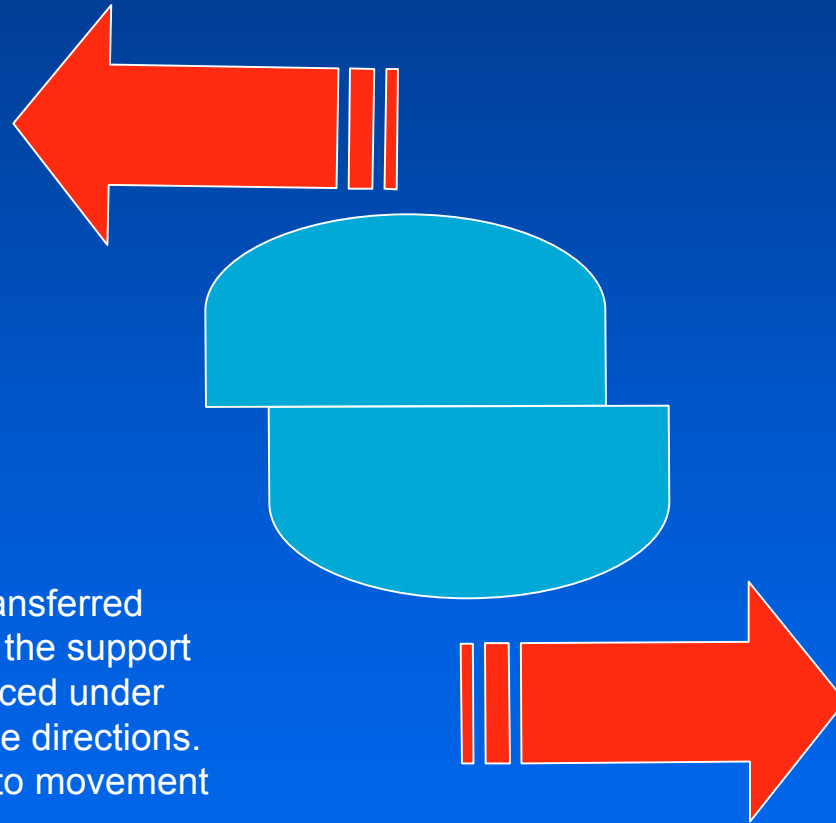
# How Action Cushions Distribute Pressure

- Multi-layer foam construction
- Action polymer cubes & highly conforming foam to be submerged in
- Elevated layers under the trochanteric shelf

# Why Use Action Cushions?

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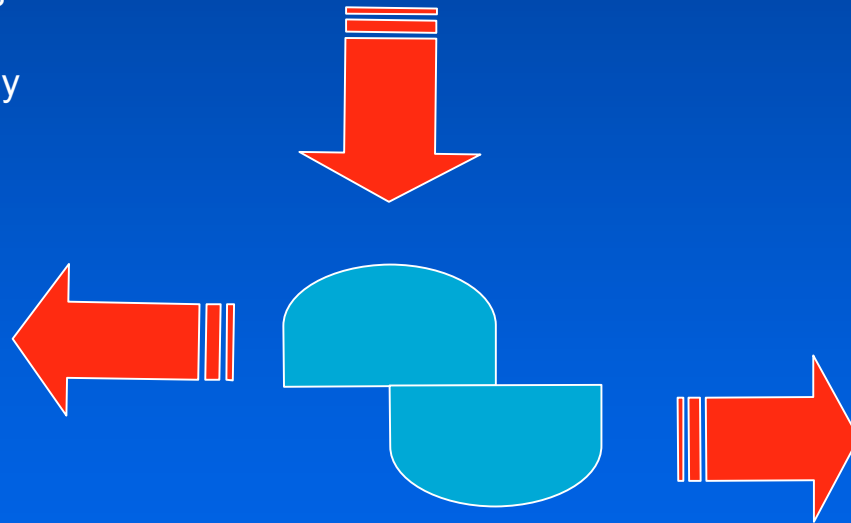
# Shear & Friction



**Shear Forces** - forces transferred internally to the client and the support surface when they are placed under load usually in the opposite directions.  
**Friction** – the resistance to movement between two surfaces

# Compression & Shear

1. Adding shear force to compression force can ↑ risk of tissue trauma
2. Capillary blood flow significantly ↓'s when both are present
3. Decreasing compression forces may not eliminate tissue trauma risk



# How Action Cushions Minimize Shear & Friction

- Akton polymer cubes
- Contouring of the foam
- cover – fabric & construction

# Action Client Application

- X-Act Soft
  - Cushion comparison
  - Elderly
  - Neurological Impairment
- X-Act Lite
  - Cushion comparison
  - Active Users