Skin Integrity Analysis for the Wheelchair Seated Client. Are we clinically the best we can be?

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Presenter

- Sharon Sutherland, PT – got married and changed name from Sharon Pratt, PT ☺
- Specialized in the field of Seating and Mobility for over 27 years in Canada and the USA
- Experience includes clinical assessment through prescription; funding policy, product design and development; clinical education and consultation worldwide
- Graduated from Trinity College, Dublin, Ireland.
- Presently lives in Colorado, USA

Disclosure

- I am the owner of Seating Solutions, LLC
- I do clinical consulting for Ottobock Mobility
- The opinions expressed in this program are based upon my clinical experiences over the past 27 years.

Learning Objectives:

As a result of this workshop, participants will be able to

- List the goals of seating and mobility
- List the steps involved in performing a skin integrity risk assessment for the wheelchair seated client
- Identify the relationship between posture, skin and function
- Discuss how assessment findings translate into seat cushion and mobility base (where applicable) product parameters
- Ask questions related to skin integrity and positioning properties of wheelchair seat cushions using a simple checklist
- Discuss technology in the language of application, dosage, and consequences (best practices)

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Best Practices

- What are they as they relate to skin integrity and seating/mobility/positioning? Are there any?
  - Clinicians
  - Suppliers (ATPs) (SMSs)

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Around the World Common Practices In Selecting Wheelchair Seating...

- "We tend to choose based upon
  - what we are comfortable/familiar with
  - what we have had success with prior
  - what the equipment provider tells us to use
  - what the client wants
  - What looks good on the computer screen with Interface pressure Mapping
    - And the list goes on...."

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My best practices: Wheeled mobility ; Seating/Positioning

- A thorough hands on evaluation will be conducted
  - Identify flexible versus fixed postures – or what body segments relative to each other and the seated world can achieve an optimal/functional alignment?
  - Identify the symptoms versus causes
  - **Understand the level of risk for skin integrity issues**
  - Understand functional needs/limitations
- Translate clinical findings into goals and potential product parameters recognizing that there may be more than one possible solution with varying consequences for each
- Try the proposed solution/s prior to final prescription
- Client education on equipment use...
- Knowing and understanding the funding of the product.
- Could I defend my prescription/recommendation in court if necessary?

Best Practices related to Skin Integrity

Some international best practices:

- The National Pressure Ulcer Advisory Panel · NPUAP » Resources » Educational and Clinical Resources » Pressure Ulcer Prevention Points
- http://www.npuap.org/resources/educational-and-clinical-resources/prevention-and-treatment-of-pressure-ulcers-clinical-practice-guideline/- New 2014
- What are yours?
- Are we doing the best we can with regard to best practices related to skin integrity and our wheeled mobility positioning/seating prescriptions?

What kind of Wheeled mobility/ seating referrals do we get?

- Are they in reaction to a "problem" NOW..
- Is the problem identified a series of symptoms?
- Or have the actual drivers behind the problems been identified?
- Are they predictive of future problems?

Do we prescribe by diagnosis?

- Sometimes reimbursement is driven by diagnosis in combination with postural and skin presentation
- I think in the language of
  - Posture
  - Skin and
  - Function
- I look at every client as well as every product with these headings in mind... It keeps it simple!

When we get a referral for complex seating ...

- Do we know what we are looking at or for?
- Do we understand the information we find from our observations and hands on evaluation as it relates to sitting and skin integrity?
- How do we translate the findings into optimal solutions?

Common Postural deviations related to Seating

- Posterior or Anterior Pelvic tilt
- Pelvic Obliquity: Pelvic rotation
- Trunk collapse
  - Laterally
  - Forward
- Deviated Head position – How many head positions can you think of?
- Hips abducted / externally rotated
- Hips adducted/internally rotated
- Feet toward center of foot support or all to the right or left

Some consequential functional challenges when posture is not optimally supported

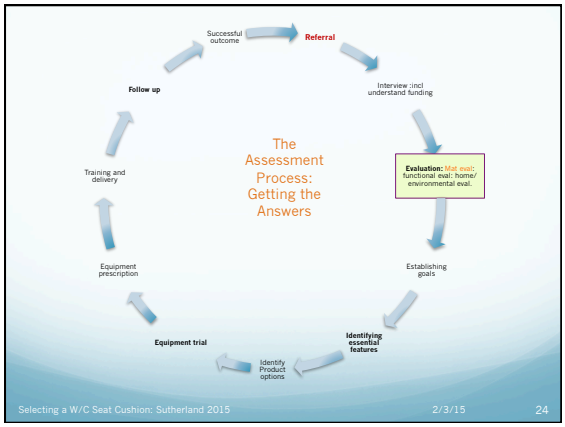
- Decreased respiratory function
- Swallowing difficulties
- Reduced voice projection
- **Skin Integrity issues**
  - **Inability to weight shift**
- Reduced upper extremity function
  - Inability to functionally propel a manual wheelchair
  - Considerations for drive mechanisms/location
- Reduced reach (consider distal and/or proximal weakness)
- Transfer technique

In an effort to take the work out of sitting for our clients and to preserve their skin integrity -We must know and understand what factors influence the relationship between the pelvis and hips and the pelvis and spine in the seated world....as early as possible...

Some review of basics

The Clinical Process From Assessment through Fitting

An example of how I manage this process every day..



My questions with every client...

- Have I identified the **cause** of the problem or only the **symptom**?
- Have I identified the flexible and or non reducible components of this clients posture?
- **Do I know their level of skin risk and all the contributing factors?**
- Are we expecting change?
- Have I maximized the potential seating footprint for optimal function and safety?
- Is the client comfortable and happy?! – Have I increased their sitting tolerance?
- Is my documentation funding ready?

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If We Don't Know These Clinical Things...

How can we determine what minimal essential features are necessary for this client to function from a seated position?

- What level of **skin protection** is needed?
  - Consider pressure distribution: shear management: microclimatic management
- How much **positioning** is needed?
  - Postures needing accommodation or correction
- How much **stability** is needed for **function**?
  - Consider lateral and forward

How do we get the answers to those questions?

- Interview
- Looking at the client in the existing system
- Looking at the client out of their existing system!
- The hands on assessment
- I like supine and sitting....
- Pressure mapping : If used correctly☺

Step 1: The Mat Exam

- **Skin Integrity analysis**
- Postural presentation analysis
- Functional analysis
- Measurements
  - Anatomical linear dimensions
  - Angles: relative and absolute
  - Existing system measurements
- Documentation all the way!

Steps 2, 3, 4 & 5

Step 2

- **Identification of Goals/Objectives**

Step 3

- **Translating assessment findings & goals into generic product parameters**

Step 4

- Trialing and Selecting product solutions

Step 5

- **Justifying,** Secure Funding, Delivery and Final Fitting

SKIN INTEGRITY

What do we need to think about?"

Excellent reference

- National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance. Prevention and Treatment of Pressure Ulcers: Quick Reference Guide. Emily Haesler (Ed.). Cambridge Media: Osborne Park, Western Australia; 2014
- The National Pressure Ulcer Advisory Panel · NPUAP » Resources » Educational and Clinical Resources » Pressure Ulcer Prevention Points
- http://www.npuap.org/resources/educational-and-clinical-resources/prevention-and-treatment-of-pressure-ulcers-clinical-practice-guideline/- New 2014

U.S. Statistics: 2007/8

- **Number affected by Pressure Sores in Hospitals:** 2.5 million patients per year.
- **Cost:** Pressure ulcers cost $9.1–$11.6 billion per year in the US. Cost of individual patient care ranges from $20,900 to 151,700 per pressure ulcer. Medicare estimated in 2007 that each pressure ulcer added $43,180 in costs to a hospital stay.
- **Lawsuits:** More than 17,000 lawsuits are related to pressure ulcers annually. It is the second most common claim after wrongful death and greater than falls or emotional distress.
- **Pain:** Pressure ulcers may be associated with severe pain.
- **Death:** About 60,000 patients die as a direct result of a pressure ulcer each year.

UK Statistics

2010

- Pressure ulcers are said to affect up to
  - 20 per cent of patients in acute care, 30 per cent of people in the community and 20 per cent of people in nursing and residential homes.
  - The NHS spends up to four billion pounds treating pressure ulcers and related conditions each year and the costs of treating the most severe cases ranges from £11,000 to as much as £40,000 per person.
-

Skin Breakdown Statistics

Prevalence values remain high

- 15.5% US healthcare facilities (Vangilder et al 2008)
  - 28% sacral
  - 17.2% buttocks
- 18% EU standard and academic hospitals (Vanderwee 2007)

Spinal Cord Injury manual Wheelchair users

- 14-84% reported prevalence (Klotz et al 2002, Rodriguez et al 1994, Thiyagarajan et al 1994)
- Most common site – ischial tuberosity

Skin Breakdown Prevelance

Acute Care – 10-17%

Home Care – 0-29%

Long Term care – 2.3 – 28%

Hartford Institute for Geriatric Nursing, College of Nursing
New York University 2007

Pressure Ulcer - Definition

NPUAP and EPUAP

"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. A number of contributing or confounding factors are also associated with pressure ulcers; the significance of these is yet to be elucidated."

EUPAP: European Pressure Ulcer Advisory Panel

NPUAP: National Pressure Ulcer Advisory Panel (USA)

- **4 yr collaboration to develop international clinical guidelines for the prevention and treatment of pressure ulcers**
- **Research based**

Pressure Ulcer Terminology

NPUAP and EPUAP 2009

Agreement reached

- **Terminology change – category instead of stage**
  - **Non-hierarchical i.e. eliminates misconception of progression of I→IV or healing progressing IV→I**
- **4 levels of tissue injury categories I – IV**
- *Unclassified/unstageable* **and** *deep tissue injury* **will remain US categories but are considered Category IV in EU**

Category/Stage I: Non-blanchable erythem

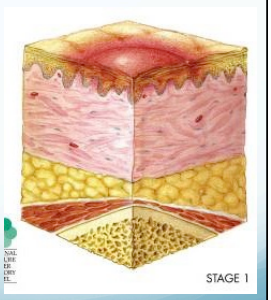
Intact skin with non-blanchable redness of a localized area usually over a bony prominence.

Darkly pigmented skin may not have visible blanching; its color may differ from the surrounding area.

The area may be painful, firm, soft, warmer or cooler as compared to adjacent tissue.

Category I may be difficult to detect in individuals with dark skin tones.

May indicate "at risk" persons.

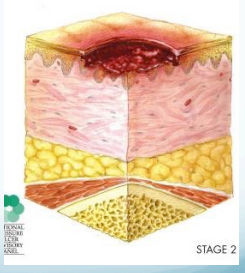


Best practices

- **Rely on assessment of skin temperature, change in tissue consistency and pain rather than identification of nonblanchable erythema when classifying Category/ Stage I pressure ulcers and suspected deep tissue injury in individuals with darkly pigmented skin.**
- **Assess skin heat, tenderness, change in tissue consistency and pain to assist in identifying the severity of Category/Stage II to IV and unstageable pressure ulcers in individuals with darkly pigmented skin.**

Category/Stage II: Partial thickness

- Partial thickness loss of dermis presenting as a shallow open ulcer with a red pink wound bed, without slough.
- May also present as an intact or open/ruptured serum-filled or sero-sanginous filled blister
- Presents as a shiny or dry shallow ulcer without slough or bruising*.
- This category should not be used to describe skin tears, tape burns, incontinence associated dermatitis, maceration or excoriation.
- *Bruising indicates deep tissue injury.



Category/Stage III: Full thickness skin loss

Full thickness tissue loss. Subcutaneous fat may be visible but bone, tendon or muscle are *not* exposed.

Slough may be present but does not obscure the depth of tissue loss.

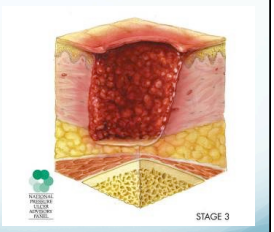
May include undermining and tunneling.

The depth of a Category/Stage III pressure ulcer varies by anatomical location.

The bridge of the nose, ear, occiput and malleolus do not have (adipose) subcutaneous tissue and Category/Stage III ulcers can be shallow.

In contrast, areas of significant adiposity can develop extremely deep Category/ Stage III pressure ulcers.

Bone/tendon is not visible or directly palpable.



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Category/Stage IV: Full thickness tissue loss

Full thickness tissue loss with exposed bone, tendon or muscle.

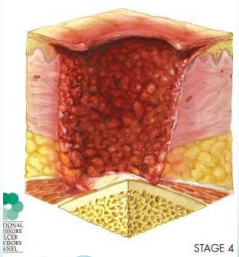
Slough or eschar may be present. Often includes undermining and tunneling.

The depth of a Category/Stage IV pressure ulcer varies by anatomical location.

The bridge of the nose, ear, occiput and malleolus do not have (adipose) subcutaneous tissue and these ulcers can be shallow.

Category/Stage IV ulcers can extend into muscle and/or supporting structures (e.g., fascia, tendon or joint capsule) making osteomyelitis or osteitis likely to occur.

Exposed bone/muscle is visible or directly palpable.



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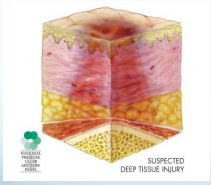
Suspected Deep Tissue Injury – depth unknown (USA)

- Purple or maroon localised area of discoloured intact skin or blood-filled blister due to damage of underlying soft tissue from pressure and/or shear
- May be painful, firm, mushy, boggy, warmer or cooler than adjacent tissue



May be difficult to detect with darker skin tones

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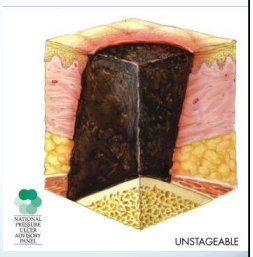
Additional Categories/Stages for the USA
1) Unstageable/Unclassified: Full thickness skin or tissue loss – depth unknown

- Full thickness tissue loss in which actual depth of the ulcer is completely obscured by slough (yellow, tan, gray, green or brown) and/or eschar (tan, brown or black) in the wound bed.
- Until enough slough and/or eschar are removed to expose the base of the wound, the true depth cannot be determined; but it will be either a Category/Stage III or IV.
- Stable (dry, adherent, intact without erythema or fluctuance) eschar on the heels serves as "the body's natural (biological) cover" and should not be removed.



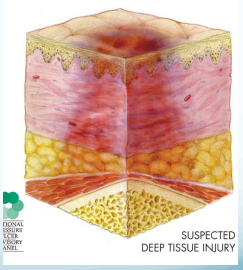
2) Suspected Deep Tissue Injury – depth unknown

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.

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.



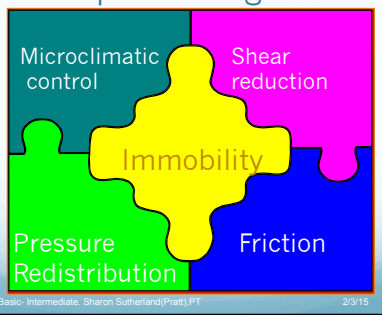
Extrinsic Risk Factors

- External physical forces
  - Pressure/immobility
  - Friction
  - Shear
  - Moisture
  - Heat

Intrinsic Factors

- Poor nutrition
- Incontinence
- Muscle atrophy
- Aging skin
- Orthopedic deformities
- Excessive body heat
- Decreased mental status
- Smoking
- Disease
  - Diabetes, cancer, Aids, Cardio-vascular
  - Radiation, drug therapy
- Impaired circulation
  - Venous insufficiency
  - Arterial insufficiency

Skin Integrity Protection from what in seating/ positioning?



Best Practices: Early Intervention

- Principle components:
  - **Identify at-risk individuals**
  - Protect against extrinsic factors
    - Pressure, friction and shear, moisture and heat
  - Affect intrinsic factors
    - Maintain and improve tissue tolerance
  - Reduce incidence through education

Risk Assessment

- Consider all bed-bound and chair-bound persons, or those whose ability to reposition is impaired, to be at risk for pressure ulcers.
- Use a valid, reliable and age appropriate method of risk assessment that ensures systematic evaluation of individual risk factors.
- Assess all at-risk patients/residents at the time of admission to health care facilities, at regular intervals thereafter and with a change in condition. A schedule is helpful and should be based on individual acuity and the patient care setting.
  - **Acute care:** assess on admission, reassess at least every 24 hours or sooner if the patient's condition changes
  - **Long-term care:** assess on admission, weekly for four weeks, then quarterly and whenever the resident's condition changes
  - **Home care:** assess on admission and at every nurse visit.
- Identify all individual risk factors (decreased mental status, exposure to moisture, incontinence, device related pressure, friction, shear, immobility, inactivity, nutritional deficits) to guide specific preventive treatments. Modify care according to the individual factors.
- Document risk assessment subscale scores and total scores and implement a risk-based prevention plan.

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Risk Assessment

- Select a valid & reliable tool
  - Braden Scale – Norton Scale & Waterlow Scale are examples
  - There is no one tool recommended for accuracy and repeatability
- Use clinical judgement
- Document and re-document often
- **Caution:** Do not rely on a total risk assessment tool score alone as a basis for risk based prevention. Risk assessment tool subscale scores and other risk factors should also be examined to guide risk-based planning.

The Mat exam: Why Bother? April 2014 2/3/15 56

Example: Braden Scale

- High Risk: Total score </= 12
- Moderate Risk: Total score 13-14
- Low Risk:Total score 15-16 under 75
- Low Risk: Total score 15-18 over 75

The Mat exam: Why Bother? April 2014 2/3/15 57

Client Evaluation -Observe

- Skin inspection
  - Weight bearing surfaces
    - areas of redness
    - open sores
- Note the following every time
  - Skin temperature
  - Edema
  - Change in tissue consistency in relation to surrounding tissue.

Client Evaluation -Observe

- Method of transfer between all surfaces
- Method of weight shifting... Is it effective and being done consistently?
- When the client is not in their chair – where are they?
  - Bathroom commode
  - Bath seat
  - Bed sleep surface-position
  - Couch
  - Armchair
  - Car seat
  - Recreational activity

My Skin Risk Analysis - Relative to Seating

For me: these are the **top 3 questions** I must know the answers to....

- Is there **presence** of non blanchable erythema or open wounds on the seated surfaces?
  - If yes = High Risk
- Is there a **history** of non blanchable erythema or open wounds on the seated surfaces?
  - If yes = High risk
- Can the client do an **independent effective weight shift consistently**?
  - If no, for any reason = High risk

These clients likely need full pressure management through the cushion, back support +/- weight shifting technology

If not at high risk...

Consider also...

- Atrophy
- A lot of movement while seated
- Moisture/heat

Perhaps shear reduction and /or microclimatic factors need to be considered

At The End Of The Assessment

- I should know If the client is
  - High Risk
  - Moderate risk , or
  - Low risk for skin breakdown
    - And why .... Remember to document the "WHY"
- With this information I know where to go on the ladder of solutions for a cushion, back support, positioning system to try

Mechanical Loading and Support Surfaces: Best practice guidelines

- Reposition bed-bound persons at least every two hours and chair-bound persons every hour consistent with overall goals of care.
- Consider postural alignment, distribution of weight, balance and stability, and pressure redistribution when positioning persons in chairs or wheelchairs.
- Teach chair-bound persons, who are able, to shift weight every 15 minutes.
- Use a written repositioning schedule.
- Place at-risk persons on pressure-redistributing mattress and chair cushion surfaces.
- Avoid using donut-type devices and sheepskin for pressure redistribution.
- Use pressure-redistributing devices in the operating room for individuals assessed to be at high risk for pressure ulcer development.

Mechanical Loading and Support Surfaces: Best practice guidelines

- Use lifting devices (e.g., trapeze or bed linen) to move persons rather than drag them during transfers and position changes.
- Use pillows or foam wedges to keep bony prominences, such as knees and ankles, from direct contact with each other. Pad skin subjected to device related pressure and inspect regularly.
- Use devices that eliminate pressure on the heels. For short-term use with cooperative patients, place pillows under the calf to raise the heels off the bed. Place heel suspension boots for long-term use.
- Avoid positioning directly on the trochanter when using the side-lying position; use the 30° lateral inclined position.
- Maintain the head of the bed at or below 30° or at the lowest degree of elevation consistent with the patient's/resident's medical condition.
- Institute a rehabilitation program to maintain or improve mobility/ activity status.

Postural Presentation Analysis

The process….
What do we need to think about?"

Observe In Existing Equipment

- Front
- Side and
- Back
- Get as much information as possible from the client / caregiver about what they perceive the negatives and positives to be
- Document everything !

The Sitting Footprint

I use this concept every day in clinical practice to help me select the best seating system for my clients.

What might a sitting Footprint look like?

- Where are all the loading surfaces? Or
  - Primary weight bearing areas of body segments in the wheelchair seated person?
    - Consider: **Inferior, Posterior: Lateral and Anterior**
    - What impact does gravity have?
- How can we maximize the footprint?
- What is the optimal footprint for each client – Is there one?

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Sitting Footprint Check List..

Primary Support Surfaces:

- ❑ Inferior
- ❑ Posterior

May need **gravity** to assist as long as its functional · How much orientation is necessary?

- ❑ 5-15°
- ❑ 45-60°

Primary Assistants….

- ❑ Anterior Supports
- ❑ Lateral Supports

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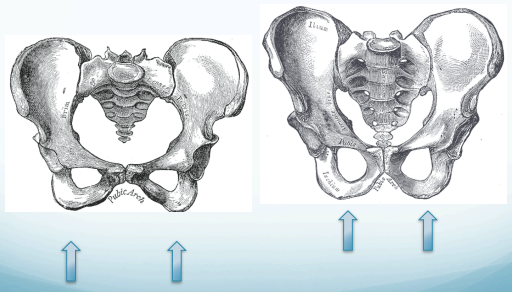
Think about all the variations in body sizes and shapes

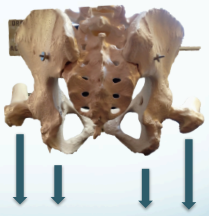
- Average sized person
- Atrophied buttocks
- Complex postural asymmetries
- Bariatric shapes
  - Body shapes and sizes vary tremendously
  - Adult Pelvic sizes vary very little.....

Female versus Male pelvis



Sitting Foundation: Important fact!

- Consider the height difference between the ischial tuberosities and the femur
  - ~ 1.75"-2.5" in an adult
  - Not as much in small children or infants
- For inferior footprint... ITs must be able to get into the cushion material so the trochanters can make contact...
- **Important consideration for**
  - **1) Lateral trunk stability – head position and /or**
  - **2) Redistributing load from the ITs to the trochanters for skin protection**



Approx. 1.75"-2.5 "

How do these things influence the inferior sitting footprint?

Ask ourselves....

- Is our client IN their cushion or ON their cushion?
- This is translated into depth of immersion.... As well as conformation/envelopment
  - Consider cushion material
  - Consider thickness of material
  - Consider cover over top of cushion material

What changes in the load bearing areas with varying postures?

- Posterior Pelvic tilt?
- Anterior Pelvic tilt?
- Pelvic obliquity?
- Pelvic rotation?

Consider also the Lower Extremities and their position as well as their load bearing capabilities in relation to the seat cushion

Postural Analysis

- For each segment of the body we need to know
  - The relationship between one segment and the next as it relates to seating
  - What ranges of motion relative to the seated position are flexible, tolerant of correction or needing accommodation
- What is the optimal seated footprint for this client?
- This has a direct influence on skin integrity

Translating assessment findings into seat cushion Parameters

What do we expect from a seat cushion?

Seating Solutions: Materials

Skin Protection

Postural Management

Functional Independence

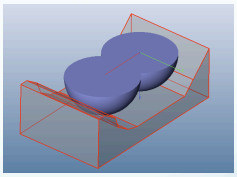
- Pressure redistribution
- Shear management
- Microclimatic management
- Contours/Shape capabilities
- Impact dampening
- Profile
- Weight

Pressure Redistribution

- Pressure redistribution: the ability of a support surface to distribute load over the contact area of the human body (NPUAP 2007)
- Pressure redistribution is achieved through immersion and envelopment..

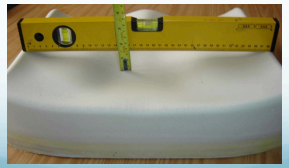
Redistribute Pressure IMMERSION

- Ability of a product to provide "depth of penetration (sinking) into a support surface"
- Without adequate depth, cushioning can not occur
- Immersion is not adequate by itself



Redistribute Pressure IMMERSION

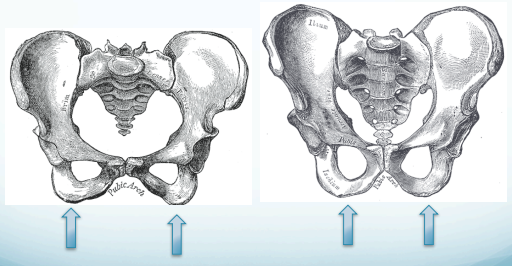
- Immersion is a measure of potential cushioning effect
- Depth of immersion is a predictor of total contact area over which a the bodies mass can be distributed
- Contours predispose to immersion, 3.5 cm in photo



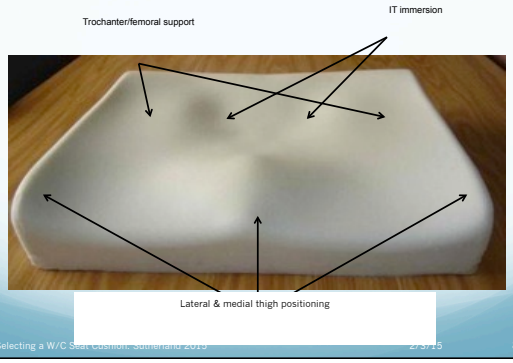
Contours: redistribution of pressure

- Contoured cushions have been shown to provide better force distribution on the skin of volunteers
  - Reduction of sitting forces with Custom Contour, Sprigle, 1990
- Low to moderate variability in human skeletons allow this principle to be applied generally to cushions

Female versus Male pelvis



Contours for Immersion



Immersion: Summary

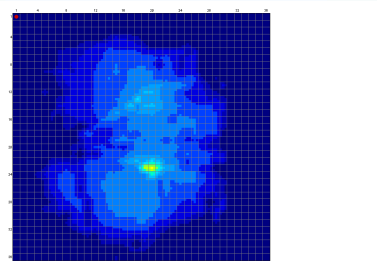
- Immersion: Depth an individual 'sinks' into a support surface in this case – a seat cushion
- Immersion helps peak pressures beneath the bony prominence to be spread over a greater area.
- Immersion depends on
  - the force-deformation characteristics of the cushion,
  - the cushion thickness and
  - the design and flexibility of the cover

Redistribute pressure: Elastic Conformation, Envelopment

Redistribute Pressure Envelopment

- The ability of a product to conform to the complex shape of the body that is placed upon it
- Envelopment increases the effective load distribution by redistributing it to the hard to reach areas
- High envelopment is the opposite of "hammocking"
- Envelopment is affected by the surface tension in both the cover and underlying materials.

How many of you use Pressure Mapping?



Pressure Mapping

- A tool that attempts to measure and display pressures occurring between a person and their seating interface
  - visualizes pressure shifts & changes
  - interface pressures in mm of HG
  - Contact area in inches or cms...

Pressure Redistribution Using Interface Pressure Mapping

- Pressure Mapping
  - Important, but be careful
  - Side by side comparisons only
- High Contact Area
- Low Peak Pressure Index
- Not a tool to replace our clinical hands and eyes...

Immersion and Envelopment

- Immersion & Envelopment reduce pressure gradients in the skin and underlying tissue in order to reduce the risk of pressure ulcer development.
- Cover hammocking can significantly reduce immersion & envelopment..... **As can the pressure mapping mat…**..

How do we know clinically about Immersion on a specific cushion?

- Tools we have to determine this...
  - Visual inspection and palpation of how much the pelvis, thighs and trochanters are immersed into the seat/back support
  - Pressure Mapping
    - Surface contact area

IPM Clinical Interpretation Contact Area

- Maximize surface contact area
- If redistribution of pressure/load is the goal:
  - make sure IPM reflects sites where less load can be tolerated (e.g. ITs)
  - Make sure redirection to other areas is safe (not to other at-risk sites)

How do we know clinically about Envelopment on a specific cushion?

- How intimate is the shape formed in the cushion with the clients shape?
- What tools have we to determine this?
  - Hands and eyes
  - Client feedback when possible
  - Pressure mapping
    - Color distribution and gradient

Shear Reduction

Shear - Distortion of tissue caused by forces working against the tissue in a parallel motion

- Caused by gravitational forces pulling client towards the ground
  - The body is pulled in one direction against the support surface which is static
  - resulting **shear** forces can cause damage to the skin and underlying tissue through distortion, deformation, capillary occlusion, and tearing.

Friction

Friction – damage to outer tissue layers due to skin sliding against support surface

- Like a "burn" from rubbing against the bed sheets

Support surfaces can provide some shear reduction to the skin by moving with the user as they shift position.

- It should be noted that some friction is needed to prevent users simply sliding off the support surface, however this can be applied away from vulnerable areas such as the bony prominences.

Shear Reduction

- Shear leads to Deep Tissue Injury (DTI) and ultimately to serious ulceration
- Lateral Energy applied to the body/cushion interface can damage tissue in shear.
  - Sliding out
  - Foot propulsion
  - Transfers
  - Active manual propulsion
- A Cushion can absorb the energy, or can reduce it by reducing friction
- Fluids are often used to manage shear
  - Example cushions with air cells or fluid inserts

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Micro-Climate

- Heat increases metabolic stress on skin and muscle cells
- Heat can reduce the cells tolerance to load and shear:
  - '8°C decrease in skin temperature is equivalent to a 29% reduction in interface pressure' Lachenbruch (2005)
- Heat generally has moisture accompanying it
  - Perceptible moisture, drops of sweat
  - Imperceptible moisture, moisture evaporates as it leaves the body
- Humidity also weakens the skin tissues making it less able to withstand load and friction.

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Microclimatic management

Temperature: Increases in tissue temperature combined with pressure is considered to increase the risk of pressure ulcer development (Stekelenberg, Oomens et al. 2005).

- Different materials used in wheelchair cushions are able to dissipate heat to differing degrees while some materials, such as phase change materials, are able to maintain a given temperature for a period of time.

Moisture: The prolonged presence of moisture from perspiration, incontinence or wound drainage weakens and softens skin (maceration) making it more vulnerable to breakdown. In addition, the coefficient of friction of skin increases dramatically when moist, which increases tissue deformation under shear

- Different materials dissipate moisture to differing degrees.
- Materials that allow airflow can reduce heat and skin moisture through convection and evaporation.

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Clinical thoughts about heat

- Think about and look for
  - Skin against skin
    - Bariatrics
    - Highly insulated environments
  - Ask what can be done to make the seating system more breathable?
    - Fabrics
    - Vents
  - Consider the value of weight shifts
    - Client education

Durability: 3 year life
Thoughts about Compression Set

- When foam is used too long or under too much load, it no longer springs back
- The height permanently changes
- Ability to take the shape of the cushioned object is lost
- Increases hammocking
- May get harder or softer
- Increases risk of Bottoming Out
  - Bottoming out is not necessarily sitting through

Effect of Aging..

- Urethane foams soften
- Visco foams harden

What impact does compression set have on the skin?

- The newly broken in foam cushion may provide optimal immersion and envelopment and therefore pressure redistribution
- Once a compression set forms, the cushion may become harder and/or bottom out
  - Higher peak pressures
  - Tissue distortion

Practical session

- Cushions that are available for hands on analysis
- Pressure mapping that's available for hands on session

Can we answer these questions about the cushions we use daily?

- Cover: How stretchable is it ?
- Material inside the cover… what is it?
  - Fluid: Foam: Elastomer? : How many different layers of materials?
- What's the immersion potential - how far can the ischials/buttocks sink in
  - Are the trochanters getting loaded - a little or a lot or not at all?
  - Are the femurs fully loaded?
- What's the envelopment potential? How does the material conform to the immersed buttocks?
- How customizable is it? How well does it accommodate for or correct postural asymmetries?

Questions continued

- How does this cushion address shear? with and without the cover
  - ·Push your elbow into the cushion in the area intended for Ischial immersion and once loaded move forward and back (simulate the ischial movement)
- Microbial factors – Heat and moisture
  - Is the outer cover moisture resistant?
  - Is the cushion with cover breathable?
  - If moisture goes through the cover · where does it go?
- What is the weight of this fully assembled cushion?

Client Education

- Even when we have the ideal cushion for our client we must still review with each client the following
  - Out of chair activities
  - Weight shift method and frequency
  - Skin Inspection frequency
  - Equipment maintenance

Clothing recommendations

- Consider using silk-like fabrics rather than cotton or cotton-blend fabrics to reduce shear and friction.
- Some clients do well with sporting type fabrics if they can tolerate lycra/spandex “moisture wicking” materials

There Is Still Much Room For Improvement & Change

- Does immersion and envelopment have any opportunity to happen when we see these things on top of our well thought out prescription
  - Incontinent pads / Slings/Diapers/Adult briefs
- We MUST take this on as part of our role in educating the consumer and caregiver with every seat cushion we prescribe

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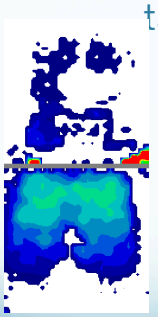
How important is a well fitted Back support to Skin Integrity?

- Very Important
- Great use of Interface pressure mapping
- A client who can be supported with optimal spinal stacking can take a lot of load on their lumbar thoracic area
- Check out the difference in seat surface interface pressures with and with out an optimally fitted back support

Selecting a W/C Seat Cushion: Sutherland 2015 2/3/15 131

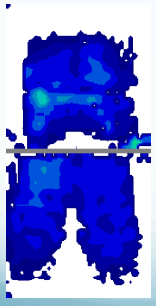
Backrest Not optimally taking Load



- Observe the increased loading on the seat surface

Sharons Seating 101 Sharon Pratt, PT 2/3/15 132

Back Support Adjusted



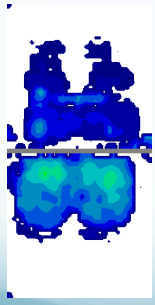
- Observe the change to the loading in the seat surface

SKIN PROTECTION

Some chair considerations

- **Tilting** the chair reduces pressure under the pelvis, andcan also reduces shear
- **Reclining** the back reduces pressures, but can increases shear => increases sliding
- Footplate set up
- Wheel alignment

Footplates Too High: Thighs Not Loaded



- Notice the critical impact to contact area and loads on seat surface as well as on back surface when footplates are not optimally configured

Footplates Too Low: Client sliding forward

- Consider the skin integrity risk when the whole chair and seating system is not optimally set up/adjusted

Pressure Management through positioning

Tilt-in-Space technology can help with reducing pressure in the following ways:

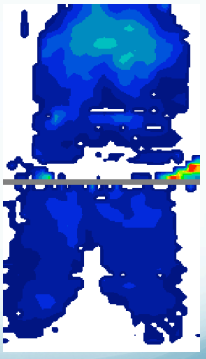
- Pressure Redistribution to spread load over a larger area. P=F/A
- Positioning and re-positioning to reduce time in a single position. (Necessary for the person who cannot do a functional independent weight shift consistently)

Research Studies –Clinical Benefits of Tilt

- Zoras
  - 30° of tilt offers postural control
  - 45° of tilt is required for effective weight shift
- Henderson
  - Showed 27% decrease IT pressure @ 35° tilt
  - Showed 47% decrease IT pressure @ 65° tilt
- Burns
  - Showed 33% decrease IT pressure @ 45° tilt
- Aissaouie and Lacoste (2001)
  - Showed that 15 degrees offered no advantage for pressure reduction

Inferior and Posterior Footprint In 45 Degrees Tilt

I love to use pressure mapping when I am evaluating the surface contact area with back supports



Positioning the Trunk: Sharon Pratt, PT 2/3/15 140

Research Studies: Pressure Management : Tilt

Summary of Findings:

- Pressure redistribution can be achieved with tilt
- There is not a specific amount of tilt that will be effective for preventing pressure ulcers
- More tilt = more shifting of load
- Different times are required for effective off-loading.

Seating & Mobility Basic- Intermediate. Sharon Sutherland(Pratt),PT 2/3/15 141

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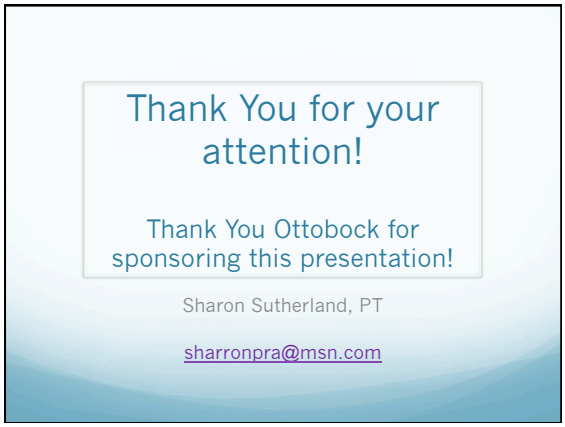
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