Applying Current Evidence to Clinical Practice for Pressure Management in Wheelchairs and Seating

International Seating Symposium
Pre-conference symposium
March 1, 2016
9:00 – 12:15

Laura Titus OT Reg. (Ont.) PhD
Jennifer Birt OT Reg. (MB)

Today's topics

Current Evidence :

- Sources of evidence used in this workshop

Pressure Management in Wheelchairs and Seating:

- Sitting pressure & the research evidence
- Pressure management in sitting
  - Overview of the Canadian Best Practices for the Prevention and Management of Pressure Ulcers (Houghton, Campbell et al. 2013)

Applying to Clinical Practice

- The evidence to support pressure management in wheelchairs and seating.
- Individualizing strategies.

Break will be 10:15 – 10:30am

Who we are

- Both occupational therapists
- Both have been working in this field for a long time
- Both currently work on seating clinics/programs in rehab hospitals
- Both work in Canada but in different provinces
  - Laura – London ON at Parkwood Institute, St Joseph's Health Care, Adult Wheelchair and Seating Program
  - Jenn – Winnipeg MB at Winnipeg Health Sciences, Specialized Seating Services
- Both have a passion for silly things like reading research, working on clinical guidelines, and doing things to advance practice in this field.

Who is here today?

- Professions
- Experience
- Experience in the field of wheelchairs and seating

Why are you here?

- What do you hope to gain?
  - Some keys pieces of information you can apply to your practice
  - To confirm what you already do
  - To be informed about the evidence in this field because you don't have time to read the research yourself
  - To heckle the presenters because they think they know it all

What is evidence?

Definition:

Something that furnishes proof; a visible sign that something exists or is true.

http://www.merriam-webster.com/dictionary/evidence

Sources of Evidence

- Advanced knowledge practitioners; consensus
- Client/consumer knowledge
- Research

(Thomas & Law, 2014;Lee & Miller, 2003; Law & MacDermid, 2008)

Resources that reviewed, appraised and synthesized research evidence related to w/c and seating

Examples:

- SCIRE – Spinal Cord Injury Rehabilitation Evidence (updated 2015)
  - Wheeled mobility and seating equipment chapter
  - Pressure Ulcer chapter
- EBRSR – Evidence based review of stroke rehabilitation
  - Ch. 9 Mobility and Lower Extremity

Best Practice Guidelines
Clinical Practice Guidelines

Registered Nurses Association of Ontario (RNAO)

- Risk Assessment & Prevention of Pressure Ulcers (2005)
- Assessment and Management of Stage 1-4 Pressure Ulcers (2007)

European and National Pressure Ulcer Advisory Panel

- Prevention and Treatment of Pressure Ulcers; a Clinical Practice Guideline (2014)
  - Rated level of evidence AND strength of recommendation
  - Special populations section

Consortium for Spinal Cord Medicine Clinical Practice Guidelines, (2000)

- Pressure ulcer prevention and treatment following a spinal cord injury

Best Practice Guidelines
Clinical guidelines

Guidelines for the prescription of a seated wheelchair or mobility scooter for people with traumatic brain injury or spinal cord injury (EnableNSW and Lifetime Care & Support Authority, 2011)

5. Goals and evaluation
6. Assessment and review
7. Capacity and performance
8. Wheelchair features
9. Propulsion
10. Scooters
11. Training
12. Transport
13. Maintenance
14. Resources

Best Practice Guidelines
Clinical guidelines

World Health Organization

- Guidelines on the provision of manual wheelchairs in less resourced settings (2008)
- Wheelchair service training package
  - Basic (2012)
  - Intermediate (2013)

Best Practice Guidelines
Clinical guidelines

World Health Organization (2012)

Stages of wheelchair and seating service delivery process:

- Referral
- Assessment
- Prescription (selection)
- Funding and ordering
- Product preparation
- Fitting
- User training
- Follow up, maintenance and repairs.

Best Practice Guidelines
Clinical guidelines

Canadian Best Practice Guidelines for the Prevention and Management of Pressure Ulcers in People with Spinal Cord Injury:

A Resource for Clinicians (Houghton & Campbell, 2013)

- Focus in on prevention
- Focus on the 24 hour approach to prevention
- 4 chapters related to extrinsic contributing factors: support surfaces, posture/positioning and mobility

Canadian Best Practice Guidelines

PURPOSE:

"To provide a common framework for spinal cord experts and wound care specialists that will enhance pressure ulcer prevention and management strategies for people with SCI across the continuum of care."

www.onf.org

Canadian Best Practice Guidelines

PROCESS:

1. Identify and invite BPG panel members
   - Professions, consumers, settings, location (province)
2. Literature Search
3. Consensus - 2 day Conference, October 2010
4. Draft Guidelines
   - Panelists: Assign Level of Evidence
   - Refine writing and clarify recommendations
5. Stakeholder review: March-May 2012
6. Production & Dissemination
7. Implementation

Canadian Best Practice Guidelines

Chapters

1. Pressure Ulcer Prevention and InterProf Team
2. Human Factors , Education & Self Management
3. Body weight, Nutrition & Haem & Biochem markers
4. Principles of Pressure management
5. Bed, Mattresses, & Recumbent Positioning
6. Wheelchairs & Seating
7. Mobility, Activity, & Conditioning
8. Assessment after a Pressure Ulcer
9. Pressure Ulcer Treatment: non surgical, surgical
10. Tele-Rehabilitation

Pressure Ulcer Definition

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

(http://www.npuap.org/pr2.htm)

Pressure Management

- Managing pressure over the 24 hour day
  - Extrinsic forces of pressure, friction and shear
  - Microclimate – temperature and moisture

"Everywhere that body has been"

Surfaces

Posture/positioning

Mobility

(Canadian Best Practice Guidelines, 2013)

Advances in Knowledge

Before

- Lack of blood supply

- Pressure

Now

- Blood flow & oxygenation
- Nutrients
- Lymphatic drainage
- Toxin build up
- Reperfusion injury

- Shear
- Friction
- Interface pressure
- Deep pressure/deep tissue injury
- Magnitude and duration
- Tissue deformation

Pressure, Shear and Friction

- Pressure = force/area x time
- Shear = tissues over tissue
- Friction = surface and skin

Considerations:

- Interface and deep
- Highest over bony prominences
- Highest proportion of body weight is through pelvis when sitting

(Duncan, 2007)

Pressure, Shear and Friction

Further considerations – introducing movement

- Tissue deformation
- Deep tissue injury
- Reperfusion injury
- Contact injury

And then time is added

- Duration
- Lifespan changes

(Gefen, 2014)

Rationale for Redistribution of Pressure

Tissue Load

Magnitude and **Duration**

Interventions:

Support Surfaces
Positioning Devices
Posture

Interventions:

Repositioning
Weight Shifting
Active surfaces

(Sprigle & Sonenblum, 2011)

Tissue Tolerance

What is it?

Tissue tolerance is the ability of tissue to tolerate different amounts of load/pressure (**magnitude**) over different lengths of time (**duration**).

Tissue Tolerance

Varies across people due to:

- Differences in condition of the tissue (e.g. skin elasticity, muscle atrophy, vascular changes, amount of fat, etc.)
- Tissue location on body
- Age
- Hydration
- Metabolism
- Mobility
- Sensation
- Micro-climate
  - Heat
  - Moisture
- Sitting posture

Understanding pressure management:

Why does it matter?

Because...

- Pressure over the bony prominences of the buttock is one of the most prevalent causes of pressure ulcers for people who require a wheelchair for their mobility
  (Drummond, et al.1985; Bolton et al. 2008).

- Pressure ulcers are a serious cause of disability (Santangelo et al. 2008)

- 1 in 4 people in the Canadian healthcare system have a pressure ulcer (Woodbury & Houghton, 2004)

Because...

- 3.2 Use proper positioning, transferring, and turning techniques.
- **Consult Occupational Therapy/Physiotherapy** (OT/PT) regarding transfer and positioning techniques and devices to reduce friction and shear and to optimize client independence.

Registered Nurses' Association of Ontario. (2007). *Assessment and Management of Stage I to IV Pressure Ulcers* (Revised)

Because...

3.8 For individuals restricted to chair:

- Utilize an interdisciplinary approach to plan care.
- Have the client shift weight every 15 minutes, if able.
- Reposition at least every hour if unable to shift weight.
- Use pressure-reducing devices for seating surfaces.
- Do not use donut type devices or products that localize pressure to other areas.
- Consider postural alignment, distribution of weight, balance, stability, support of feet and pressure reduction when positioning individuals in chairs or wheelchairs.
- **Refer to Occupational Therapy/Physiotherapy (OT/PT) for seating assessment and adaptations for special needs.**

Registered Nurses' Association of Ontario. (2007). *Assessment and Management of Stage I to IV Pressure Ulcers* (Revised).

Because...

2.6 A client with a pressure ulcer on the buttocks and/or trochanters should optimize mobilization. If pressure on the ulcer can be managed, encourage sitting as possible.

Registered Nurses' Association of Ontario. (2007). *Assessment and Management of Stage I to IV Pressure Ulcers* (Revised)..

Because...

What OTs in Canada are doing already

- Provision of seating equipment
  - Prevention73%
  - Treatment 73%
- Positioning guidelines for w/c and bed
  - Prevention 51 %
  - Treatment 76%

(Giesbrecht , E. 2006)

What does the evidence support related to pressure management?

- Use an individualized approach
- Use a team approach – advanced knowledge clinicians
- Use a 24 hour approach
- Complete a comprehensive assessment and re- assessment
  - Understand the individual
  - Perform physical assessment
  - Analyzing and interpreting the findings
  - Formulating a collaborative plan of action

(Canadian Best Practice Guidelines, 2013)

Comprehensive Ax & Re-Ax
Use a 24 hour approach

4.2: 24-hour approach to pressure ulcer risk management IV

Perform a comprehensive assessment of posture and positioning to evaluate pressure ulcer risk. Consider all surfaces in both recumbent and sitting positions that a person uses to participate in daily activities over the entire 24-hour period.

(Canadian Best Practice Guidelines, 2013)

Comprehensive Ax & Re-Ax
Use a 24-hour approach

4.5: Reassessment IV

Reassess pressure management using a 24-hour approach every 2 years, or more often if a pressure ulcer develops, or there is a significant change in health status – including weight changes or functional ability – or if there are changes in living situations or a deterioration in the support surface

(Canadian Best Practice Guidelines, 2013)

Use an individual approach Comprehensive Ax & Re-Ax

Individualize the selection and periodic re-evaluation of a seating support surface and associated equipment for posture and pressure redistribution with consideration to:

- body size and configuration;
- the effects of posture and deformity on pressure distribution; and
- mobility and lifestyle needs.

(Strength of Evidence = C; Strength of Recommendation = 👍)

(ENPUAP, 2014)

Use an individual approach
Use a 24 hour approach

- Individual differences in posture, function, abilities, lifestyle and goals are key considerations in the assessment of extrinsic risk factors.
- Positioning and support surface recommendations over a 24-hour period must be individualized.

(Canadian Best Practice Guidelines, 2013)

Use a Team approach
Comprehensive Ax & Re- Ax

4.1: Assessment of pressure and other sources of external force IV

Ensure that occupational and/or physiotherapy members who have combined specialized training and experience working with people with SCI and in seating and positioning perform a comprehensive pressure management assessment, in consultation with other interprofessional team members.

(Canadian Best Practice Guidelines, 2013)

Use a Team approach

Refer individuals to a specialist seating professional for evaluation if sitting is unavoidable.

(Strength of Evidence = C; Strength of Recommendation = 👍👍)

(ENPUAP, 2014)

Use a Team approach

3.8 For individuals restricted to chair:

- Utilize an interdisciplinary approach to plan care.
- Have the client shift weight every 15 minutes, if able.
- Reposition at least every hour if unable to shift weight.
- Use pressure-reducing devices for seating surfaces.
- Do not use donut type devices or products that localize pressure to other areas.
- Consider postural alignment, distribution of weight, balance, stability, support of feet and pressure reduction when positioning individuals in chairs or wheelchairs.
- Refer to Occupational Therapy/Physiotherapy (OT/PT) for seating assessment and adaptations for special needs.

(RNAO Risk Assessment & Prevention of Pressure Ulcers, 2007)

Use a Team approach

From Recommendation 1:

The therapist should adopt the following fundamental principles:

- Individually assess the prospective user's functioning and consider their personal variables such as age, goals, personality, co-morbid conditions and environment.
- Involve the user and relevant others such as family in decisions throughout the prescription process
- Consult with other specialists where appropriate about specific issues, for example seating specialists or speech pathologists.

(EnableNSW and Lifetime Care & Support Authority, 2011)

Use a Team Approach

Recommendation 11

- The therapist should consider referral of a patient with complex postural needs to a specialist (interdisciplinary) seating team who have expertise in specialist seating and work alongside the prescribing therapist. This could be through face-to-face consultation or other media (e.g. teleconference and photographs, video conference).

(EnableNSW and Lifetime Care & Support Authority, 2011)

Pressure Management

- Managing pressure over the 24 hour day
  - Extrinsic forces of pressure, friction and shear

"Everywhere that body has been"

Surfaces

Posture/positioning

Mobility

(Canadian Best Practice Guidelines, 2013; RNAO Risk Assessment & Prevention of Pressure Ulcers, 2007; ENPUAP, 2014)

Support surfaces

- All surfaces used over the 24 hour day
- Position/posture on support surface
- Frequency of use
- Duration of use
- Ability to maintain posture/position on support surface
- Quality of the support surface
  - Type of support offered by surface
  - Age, wear of surface
    - Cracks
    - Sharp edges
    - Roughness
  - Safety/condition of surface

(Canadian Best Practice Guidelines, 2013; SCIRE, 2014; Sprigle & Sonenblum 2011)

Posture/positioning

6.2: PRINCIPLES OF SITTING POSTURE AND POSITIONING FOR PRESSURE MANAGEMENT

Address pelvic asymmetry, postural instability, kyphosis, and spasticity using postural management and support surfaces. III

Evaluate the effects of posture, deformity, and movement on interface pressure distribution and the influence of subdermal tissue loads on sitting support surfaces. III

Consider the effects of clothing, shoes, and additional layers on the surface's microclimate, friction, shear and pressure-redistributing properties IV

(Canadian Best Practice Guidelines, 2013)

Mobility

Mobility between support surfaces
&
Movement while sitting on support surface

(World Health Organization, 2001)

- Bony prominences in play – PALPATE AND CORRELATE
- Amount of movement while on the support surface
- Quality of movement - level of ability throughout the day
- Contact impact with support surface, especially for transfers
- Movement between surfaces
- Potential points of contact with obstacles between start and finish points of movement between surfaces

(Canadian Best Practice Guidelines, 2013)

Sitting pressure is managed by weight shifting or offloading pressure from bony prominences

(Sonenblum et al. 2009; Lacoste et al.2003; Ding et al. 2008; Sprigle, et al. 2010; GIT, 2010; RNAO, 2005 and 2007; Consortium for Spinal Cord Medicine Clinical Practice Guidelines, 2000; EPUAP and NPUAP, 2009).

7.8 Individualizing Weight-Shifting Strategies III

Individualize pressure-redistribution strategies **using a variety of weight-shifting approaches** including automatic pressure redistribution with functional movement, active lifting or shifting, and dynamic weight shifts (tilt and recline) with and without power assist.

Base the duration, frequency and amount of active or power-assisted weight shifting **on the individual skin response** and the **effectiveness of the strategy across the full day**.

(Canadian Best Practice Guidelines, 2013)

Mobility, posture and support surface

- Automatic with functional movement
- Active or intentional
- Dynamic weight shift
- Frequency, duration, amount of body position change
- Efficiency of strategy

(Canadian Best Practice Guidelines 2013; SCIRE, 2014; Sprigle & Sonenblum 2011)

Frequency and duration of movement

Frequency

- Weight shift every 15 minutes; if unable to weight shift then reposition 1x per hour (RNAO 2005 and 2007; Consortium for Spinal Cord Medicine Clinical Practice Guidelines, 2000)

Duration

- Range of 30 seconds to 2 minutes (RNAO 2005 and 2007; Consortium for Spinal Cord Medicine Clinical Practice Guidelines, 2000; Coggrave & Rose, 2003, SCIRE 2014))
- More recent study are suggesting 3 minutes for skin perfusion (SCIRE 2014)
- Sacral reperfusion not affected by change in position using tilt/recline (Jan et al. 2013 in SCIRE 2014), but pressure is (Geisbrecht

Consortium for Spinal Cord Medicine Clinical Practice Guidelines, 2000

31. Evaluate the individual's postural alignment, weight distribution, balance, stability, and pressure relief capabilities to establish a proper sitting schedule.

- Avoid positioning the wheelchair-seated individual directly on a pressure ulcer.
- Allow limited sitting in individuals capable of performing **weight shifts every 15 minutes.**
- **Reposition the wheelchair-seated individual at least every hour**; if this is not possible and the individual is unable to perform weight shifts, return the individual to bed.

(Scientific evidence–II/III; Grade of recommendation–B/C;

Strength of panel opinion–Strong)

RNAO Risk Assessment & Prevention of Pressure Ulcers (2007)

3.8 For individuals restricted to chair:

- Utilize an interdisciplinary approach to plan care.
- Have the client **shift weight every 15 minutes**, if able.
- **Reposition at least every hour if unable to shift weight.**

NPUAP/EPUAP guidelines for prevention of pressure ulcers

Repositioning Frequency

2. Frequency of repositioning will **be influenced by variables concerning the individual** (Strength of Evidence = C) **and the support surface in use**. (Strength of Evidence = A)

2.1. Repositioning frequency will be **determined by the individual's tissue tolerance, his/her level of activity and mobility, his/her general medical condition, the overall treatment objectives, and assessments of the individual's skin condition**. (Strength of Evidence = C)

2.2. Assess the individual's skin condition and general comfort. If the individual is **not responding** as expected to the repositioning regime, **reconsider the frequency and method of repositioning**. (Strength of Evidence = C)

7.8 Individualizing Weight-Shifting Strategies III

Individualize pressure-redistribution strategies **using a variety of weight-shifting approaches** including automatic pressure redistribution with functional movement, active lifting or shifting, and dynamic weight shifts (tilt and recline) with and without power assist.

Base the duration, frequency and amount of active or power-assisted weight shifting **on the individual skin response** and the **effectiveness of the strategy across the full day**.

(Canadian Best Practice Guidelines, 2013)

Determining effectiveness of weight-shifting across the day

- Redistribution:
  - Movement into weight-shift position
  - Return to optimal position
    - Symmetry of pressure
    - Area of pressure distribution
  - Quality of the movement
- Duration:
  - Quality of the weight shift position sustained for the prescribed time period
- Frequency:
  - Effective redistribution and duration each time throughout the day

Effective redistribution

Tools to assist:

- Palpation of areas in question – PALPATE AND CORRELATE
  - Slider glove to assist
  - Palm to help locate areas
- Goniometer
- Pressure mapping

Use of interface pressure mapping

- 4.3 Pressure Mapping IV

  Use pressure mapping results in conjunction with clinical findings and the individual's preference to select appropriate support surfaces and to optimize the type and duration of position changes.

(Canadian Best Practice Guidelines, 2013)

Use of pressure mapping

- Caution in interpretation – relative not absolute values
- Ensure adequate settling time on surface
- Evidence supports its use on pressure redistribution surfaces to provide:

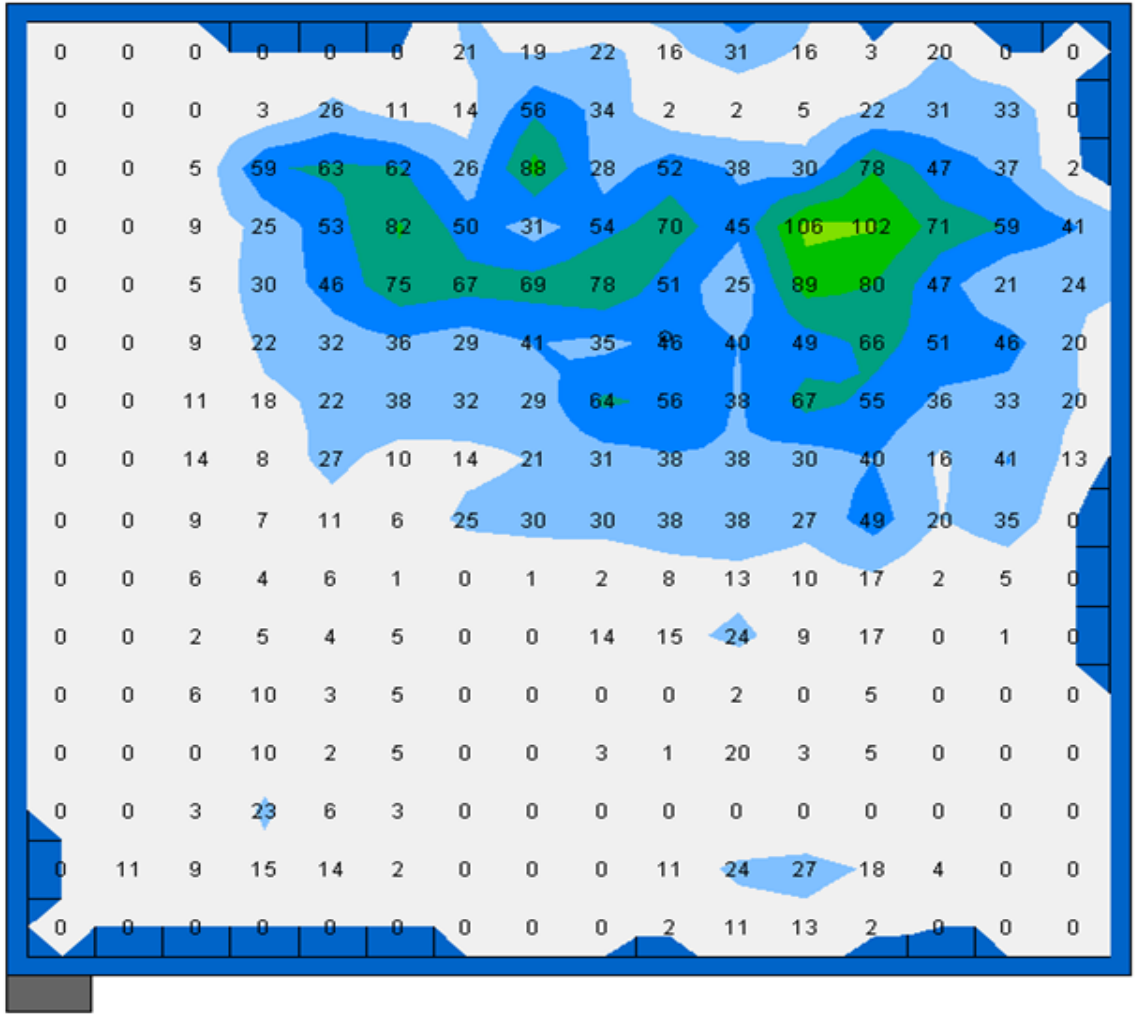
1. Visual feedback to educate
2. Relative pressure comparisons
3. Relative pressure changes with different body orientations
4. Relative pressure changes with different body positions

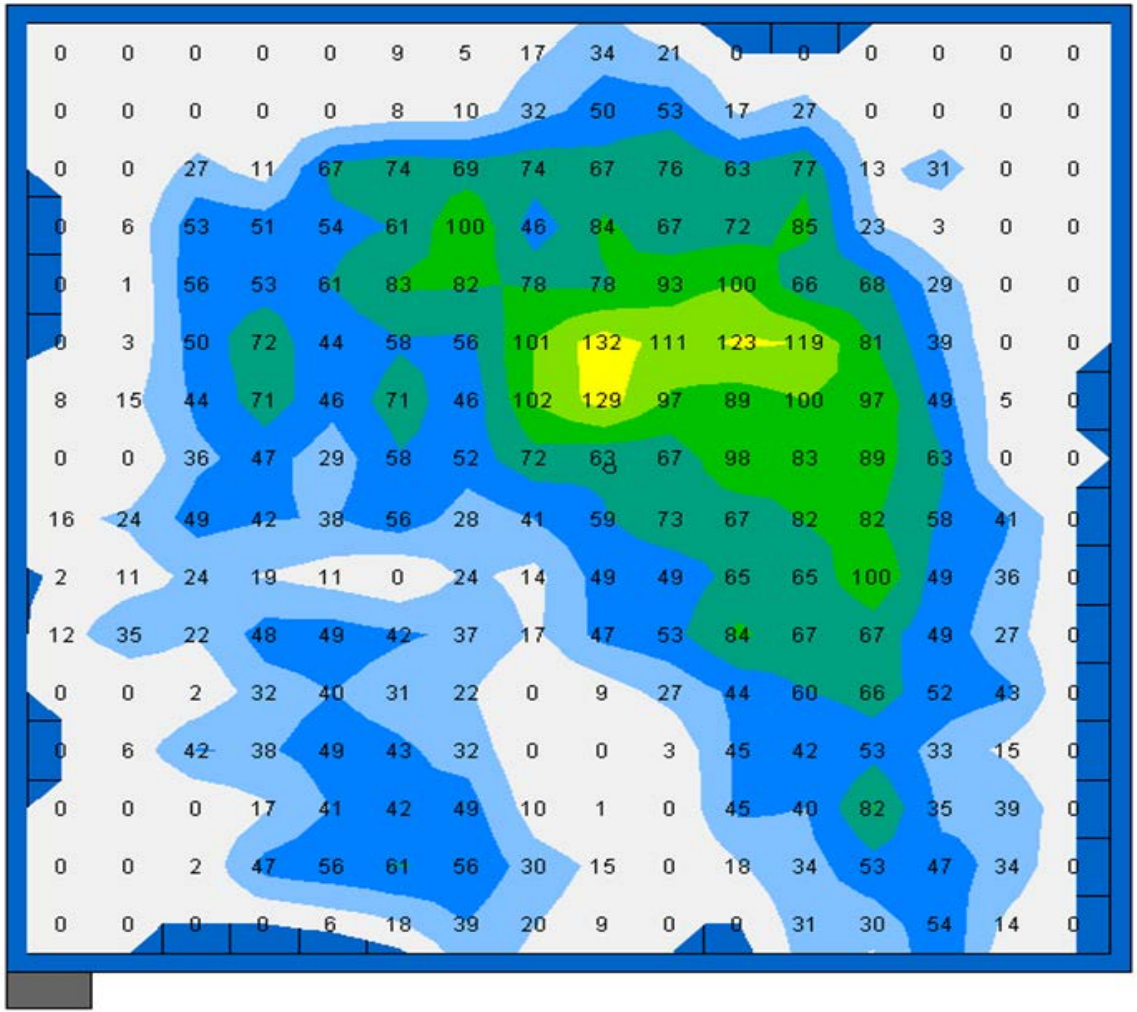
(SCIRE, 2014)

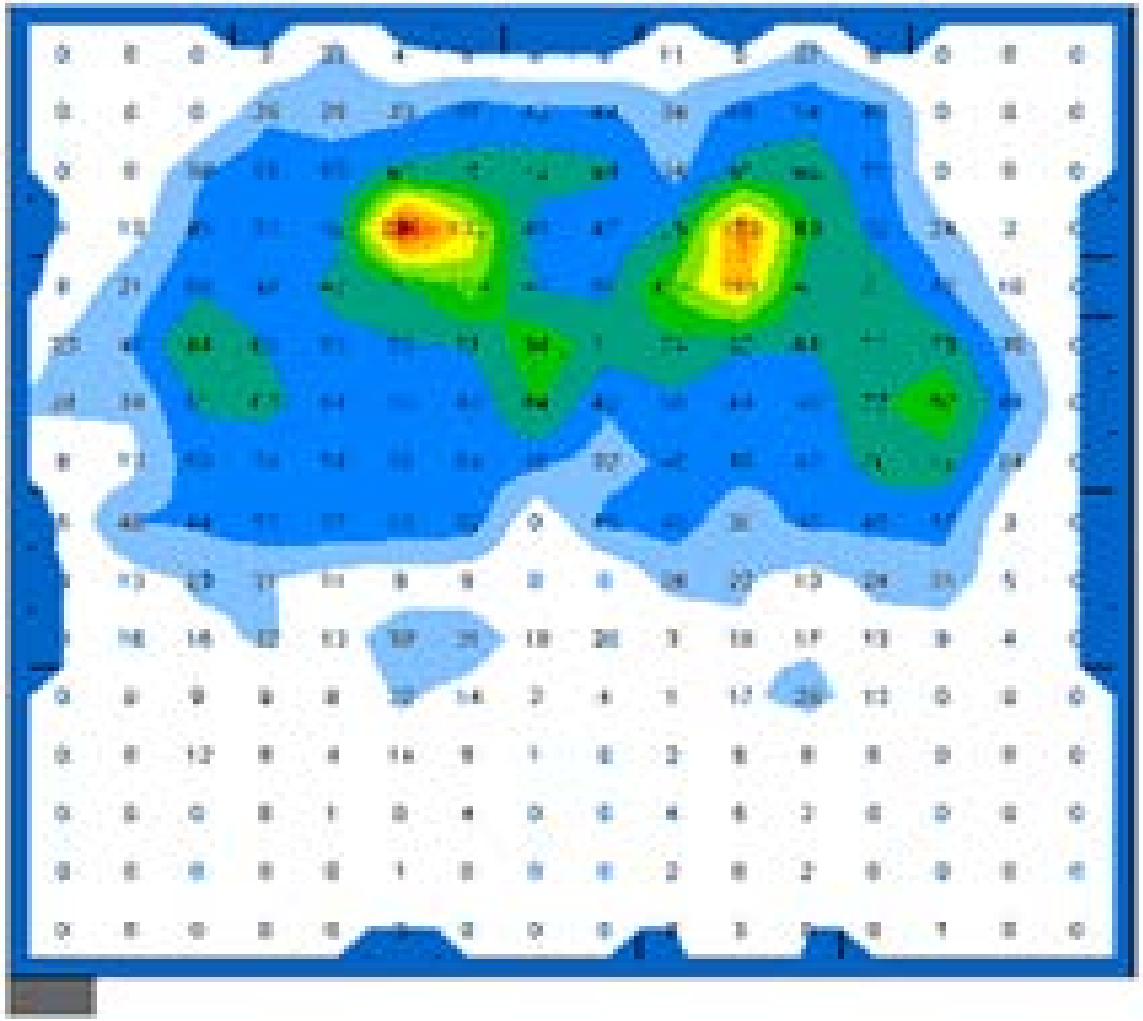
IPM – interpreting the reading

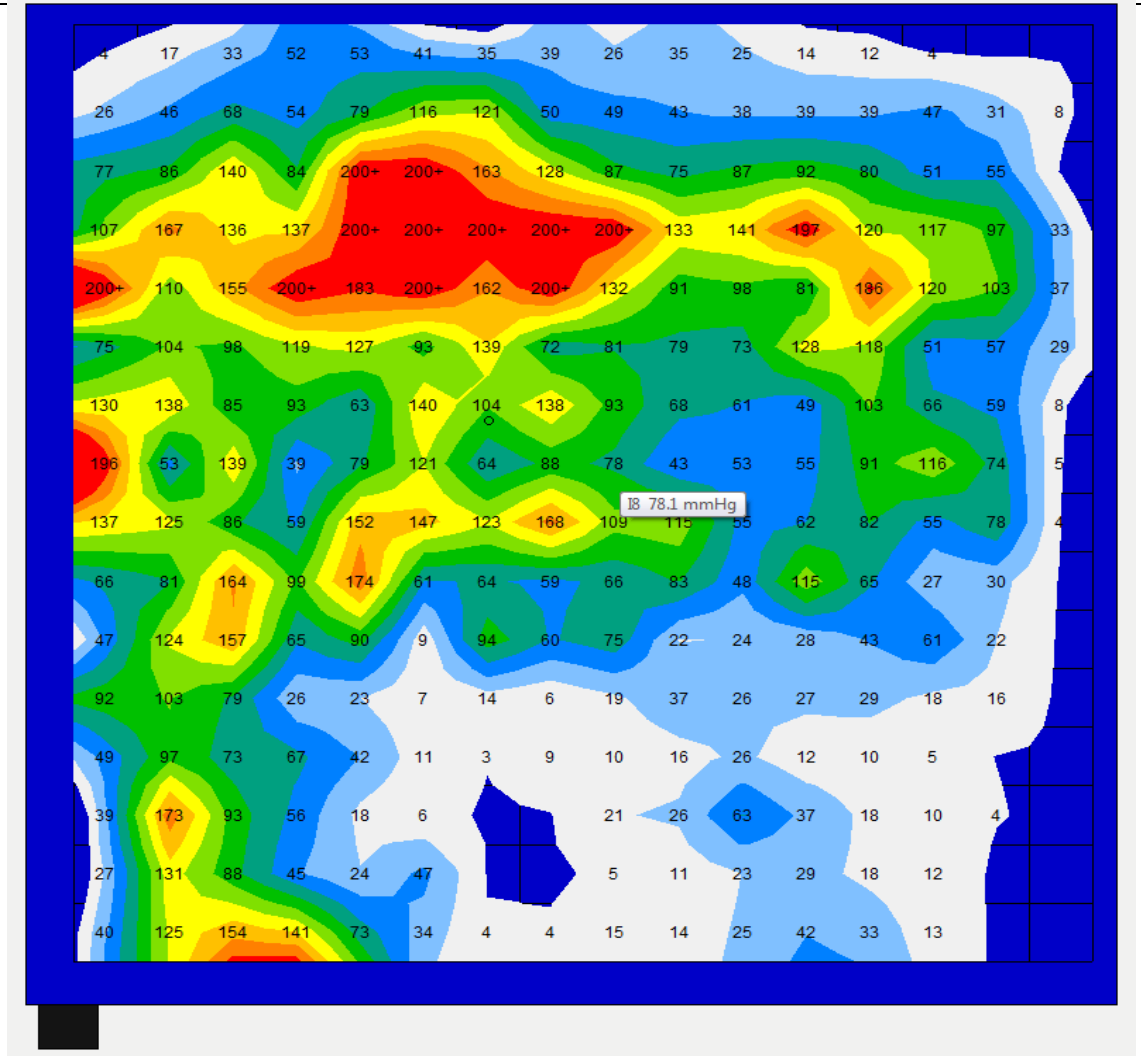
- Area of contact – bigger is better
- Symmetry of distribution
- Peak Pressure Index - Large changes in pressure readings in contacting cells are of concern
- Colour does not equate to a problem – need to consider it with all other management practices
- Be aware of effects of hammocking and creep

(Sprigle et al., 2003; Davis & Sprigle
http://mobilityrerc.catea.org/publications/ScienceInterfacePressure.pdf)


0 0 0 0 0 0 21 19 22 16 31 16 3 20 0 0
0 0 0 3 26 11 14 56 34 2 2 5 22 31 33 0
0 0 5 59 63 62 26 88 28 52 38 30 78 47 37 2
0 0 9 25 53 82 50 31 54 70 45 106 102 71 59 41
0 0 5 30 46 75 67 69 78 51 25 89 80 47 21 24
0 0 9 22 32 36 29 41 35 46 40 49 66 51 46 20
0 0 11 18 22 38 32 29 64 56 38 67 55 36 33 20
0 0 14 8 27 10 14 21 31 38 38 30 40 16 41 13
0 0 9 7 11 6 25 30 30 38 38 27 49 20 35 0
0 0 6 4 6 1 0 1 2 8 13 10 17 2 5 0
0 0 2 5 4 5 0 0 14 15 24 9 17 0 1 0
0 0 6 10 3 5 0 0 0 0 2 0 5 0 0 0
0 0 0 10 2 5 0 0 3 1 20 3 5 0 0 0
0 0 3 23 6 3 0 0 0 0 0 0 0 0 0 0
0 11 9 15 14 2 0 0 0 11 24 27 18 4 0 0
0 0 0 0 0 0 0 0 0 2 11 13 2 0 0 0


0 0 0 0 0 9 5 17 34 21 0 0 0 0 0 0
0 0 0 0 0 8 10 32 50 53 17 27 0 0 0 0
0 0 27 11 67 74 69 74 67 76 63 77 13 31 0 0
0 6 53 51 54 61 100 46 84 67 72 85 23 3 0 0
0 1 56 53 61 83 82 78 78 93 100 66 68 29 0 0
0 3 50 72 44 58 56 101 132 111 123 119 81 39 0 0
8 15 44 71 46 71 46 102 129 97 89 100 97 49 5 0
0 0 36 47 29 58 52 72 63 67 98 83 89 63 0 0
16 24 49 42 38 56 28 41 59 73 67 82 82 58 41 0
2 11 24 19 11 0 24 14 49 49 65 65 100 49 36 0
12 35 22 48 49 42 37 17 47 53 84 67 67 49 27 0
0 0 2 32 40 31 22 0 9 27 44 60 66 52 43 0
0 6 42 38 49 43 32 0 0 3 45 42 53 33 15 0
0 0 0 17 41 42 49 10 1 0 45 40 82 35 39 0
0 0 2 47 56 61 56 30 15 0 18 34 53 47 34 0
0 0 0 0 6 18 39 20 9 0 0 31 30 54 14 0




78.1 mmHg

IPM – interpreting the reading

- Essential to calibrate or it is all for not
  - The bathroom scale
- If not your IPM then ask how its being done
- Can do calibration checks
  - Map yourself on a firm surface and save
  - Re-map on same surface before each client and compare readings to saved reading

Active or intentional weight shift

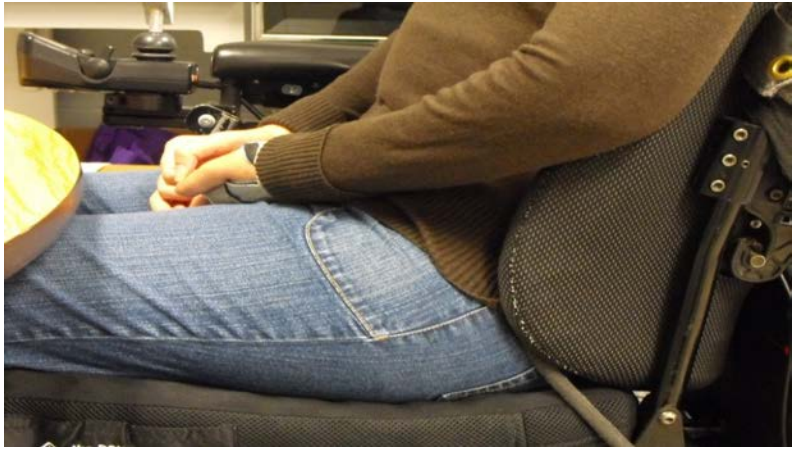
- Lift-off
  - Length of lift not sufficient – physically not able to hold long enough (SCIRE 2014)
  - 2 minutes for re-oxygenation to return to unloaded levels (SCIRE 2014)
  - Some discussion that tissue reperfusion is too fast – cell damage
  - Increased risk of shoulder, elbow, wrist injury/chronic overuse injury (SCIRE 2014)
  - Growing support to recommend not using this strategy (SCIRE, 2014)

Active or intentional weight shift

- Side lean
  - 15° of pelvic lean to side = 32-38% decrease in pressure (Hobson, 1992)
  - Increased loading on 1 side for duration but offloading for other side (Shabshin et al., 2010)
  - Impact on posture, ability to return to level pelvis
  - Potential for lateral pelvic shifting

Active or intentional weight shift

- Leaning forward
  - Can hold for 2+ minutes
  - Use movement to assist blood flow return
  - Needs to be 45° thigh to pelvis angle
    - 78% reduction in IT interface pressure
    - Increased pressure noted up to 30° of forward flexion (Henderson et al. 1994)
  - IT shifting during movement
  - Tends to be easier to return to original position
  - Easier to incorporate into daily life



Lean forward

If unable to effectively manually weight-shift, use positioning devices, preferably power to facilitate independence.

Tilt: the research

Variability across studies and across participants

- 20° tilt
  - significant change in I.T. pressure (Geisbrecht et al. 2011)
  - start of inverse relationship between tilt and pressure (Sprigle et al. 2010)
  - Significant blood flow changes starting at 15° but not for interface pressure (Sonenblum & Sprigle, 2011)
- 30° tilt
  - highly significant IT interface pressure change (Geisbrecht, Sonenblum & Sprigle)
  - significant reduction in sacral pressure (Geisbrecht)

Tilt: the research

- Blood flow changes at small tilts of 15° but not interface pressure; 30° (Sonenblum & Sprigle 2011)
- Muscle perfusion was less than skin perfusion for all tested combinations of tilt/recline (Jan et al. 2010)
- Influence of cushion type acknowledged (Sonenblum & Sprigle, SCIRE, 2014)
- 30° minimum required for pressure management (Sprigle, Geisbrecht, Sonenblum & Sprigle, SCIRE)
- Maximum redistribution is at full tilt (Sprigle, Geisbrecht. Jan, Sonenblum & Sprigle, SCIRE)

So can you tell how much is 30 degrees of tilt?

Dynamic Positioning : the research

To reduce seat forces to 60% of maximum:

- Tilt to 50°
- Stand to 50°
- Recline to 150°

(Sprigle et al. 2010)

- Standing decreases load on seat and back – feet were not measured
- This study did not measure friction/shear

- No 'effective' amount of tilt, recline or standing; no threshold of weight redistribution to prevent ulcers

Recline: the research

- 100 recline plus 35 tilt = significant increase in blood flow (Jan et al. 2010)
- 120 recline plus 15, 25 & 35 tilt = significant increase in blood flow (Jan)

(static measurements, compared to upright)

- Shear forces increased:
  - 7% at 110° recline; 25% at 120° recline (Hobson, 1992)
  - 120° recline resulted in 6 cm IT shift (Hobson)

Postural/positioning considerations

Pelvis

- Position of pelvis in sagittal plane (pelvic tilt) greater than 20° significantly influences loading and shearing particularly at sacrum and coccyx, but there are individual differences and ranges (Kemmoku, 2016)
  - Maintain pelvis towards neutral as tolerable
  - Reduce posterior pelvic tilt over time
- Position of pelvis is influenced by back support

(Maurer & Sprigle, 2004; Makhsous et al. 2007b)

Support surface considerations

Back support

- Supports pelvic position
- Increases area of contact for pressure redistribution
- Even distribution along surface of the back is important
- Influence of head forward position on buttock pressure

Lateral trunk supports (Mao et al. 2006)

- improve spinal alignment, reduce lumbar angles and reduce muscular effort for postural control

No ‘effective’ amount of tilt, recline or standing; no threshold of weight redistribution to prevent ulcers

(Sprigle et al. 2010)

Applying to clinical practice

4.4 Use a variety of pressure-redistribution strategies that are individualized to meet the person's needs and lifestyle. Provide timely and targeted education and reinforce effective pressure management strategies at every opportunity.

(Canadian Best Practice Guidelines, 2013)

Applying to clinical practice

- Educate, trial, monitor and adjust
  - Educate about the strategies to use – start with the recommendations
  - Demonstrate
  - Observe completion
  - Ensure effective – there and back, posture
  - Skin monitoring over a time period
  - Evaluate outcomes
  - Explore how it is fit into daily life, and how it is not fit
  - Adjust depending on the outcome

Applying to clinical practice: Exploring the fit

- Daily transfers into/out of wheelchair equipment using mechanical lifts:
  - to support management of friction/shear
  - to maximize positioning to minimize effect of pressure

Exploring the fit – focus on power tilt

- Few studies looking at use of power tilt in daily life
  - Reasons
  - Mobility metrics
    - Frequency, duration, amplitude

Exploring the fit – focus on power tilt

- Less than 25% of participants tilted past 30°
  (Sonenblum et al. 2009)
- Tilt was used 19 (+/-14) times per day (Ding et al. 2008)
- Average use of power tilt was 0.7 to 8.2 tilts per hour
  (Harris et al. 2010)
- Tilt use ranged 0.1-16.6 times per hour
  (Sonenblum and Sprigle, 2011)
- Tilt frequently used through day but mostly less than 30°
  (Sonenblum & Sprigle, Ding, Harris, Sonenblum)

Exploring the fit: Reasons for using tilt

- Pressure management
- Postural alignment/positioning
- Comfort/Discomfort/Pain
- Fatigue
- Use of tilt by caregiver to support participant
- Resting/Sleeping
- Using tilt to enable function
- Address physiological issues

Exploring the fit:
Reasons for not using large amplitudes of tilt

- Social
  - Image
  - Acceptance
- Headrest
- Tilting too far interferes with:
  - Seeing
  - Ability to use arms/hands/head
  - Driving due to lockout
- Safety/fear
  - Of falling/tipping
  - Due to mechanical issues
  - Of being stuck in tilt

Suggestions for gaining knowledge and confidence in using power tilt

1. Opportunity to practice using tilt with guidance/support to establish confidence in the equipment
2. Use of pictures and mirrors to assist with instilling confidence.
3. Opportunity for self-exploration of tilt using trial and error.
4. Opportunity to use tilt as part of a wheelchair skills training program
5. Importance of early training to improve confidence in use as well as speed up the learning process

Summary

- Pressure management for sitting is complex
- Resources are available to support/guide practice, but need to appraise and synthesize into clinical practice based on N of 1.
- Individualize
- Need to more fully consider how changing body positons, not just using tilt, is being integrated into daily life as part of clinical practice
  - If it doesn't fit into their lifestyle effectiveness decreases
- Need to think about the language we use when training/discussing changing body position
- Educate to integrate

Thank you

- Questions??

- References available upon request
- laura.titus@sjhc.london.on.ca

Resource References:

- RNAO

http://rnao.ca/bpg/guidelines/assessment-and-management-stage-i-iv-pressure-ulcers

http://rnao.ca/bpg/guidelines/risk-assessment-and-prevention-pressure-ulcers

- 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; http://www.npuap.org/resources/educational-and-clinical-resources/

- Consortium for spinal cord medicine Pressure ulcer prevention and treatment following a spinal cord injury

www.pva.org

- World Health Organization Guidelines for the provision of manual wheelchairs

http://www.who.int/disabilities/publications/technology/English%20Wheelchair%20Guidelines%20(EN%20for%20the%20web).pdf

http://www.who.int/disabilities/technology/wheelchairpackage/wstpintermediate/en/

- The Canadian Best Practice Guidelines

http://onf.org/system/attachments/168/original/Pressure_Ulcers_Best_Practice_Guideline_Final_web4.pdf

- SCIRE Wheeled mobility and seating equipment chapter

http://www.scireproject.com/sites/default/files/wheelchairs_and_seating_equipment.pdf

- SCIRE Pressure Ulcers following SCI

http://www.scireproject.com/sites/default/files/pressure_ulcers.pdf

- EnableNSW and Lifetime Care & Support Authority, (2011) **Guidelines for the prescription of a seated wheelchair or mobility scooter for people with a traumatic brain injury or spinal cord injury**. EnableNSW and LTCSA Editor, Sydney.

http://www.aci.health.nsw.gov.au/__data/assets/pdf_file/0003/167286/Guidelines-on-Wheelchair-Prescription.pdf