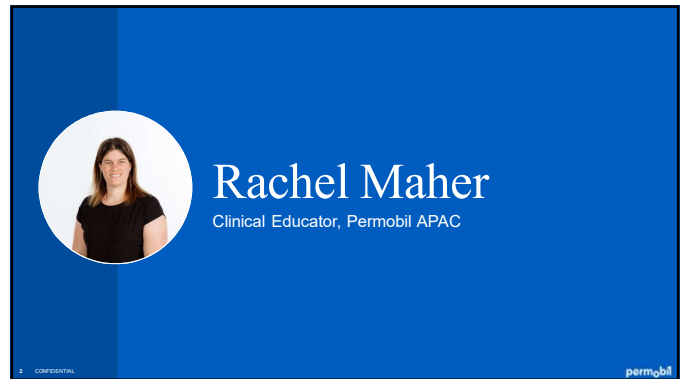
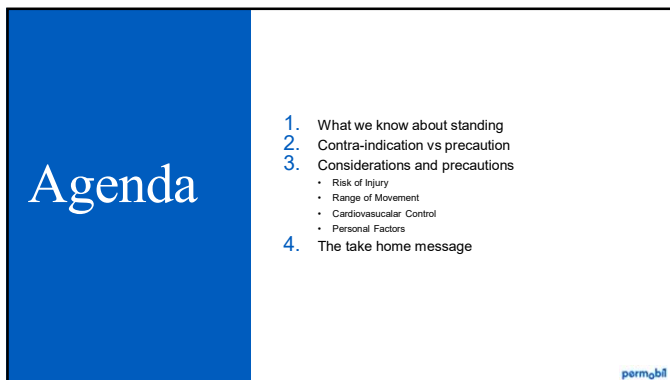




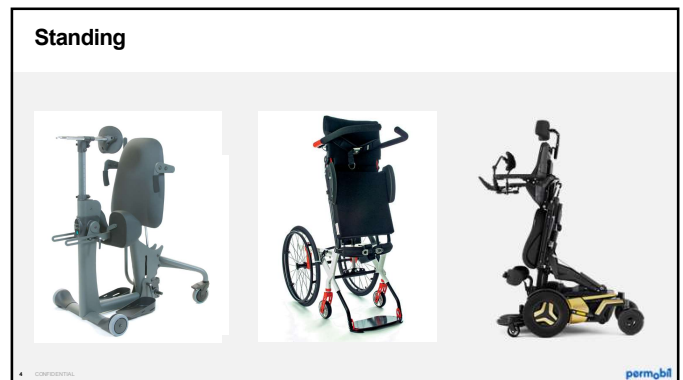
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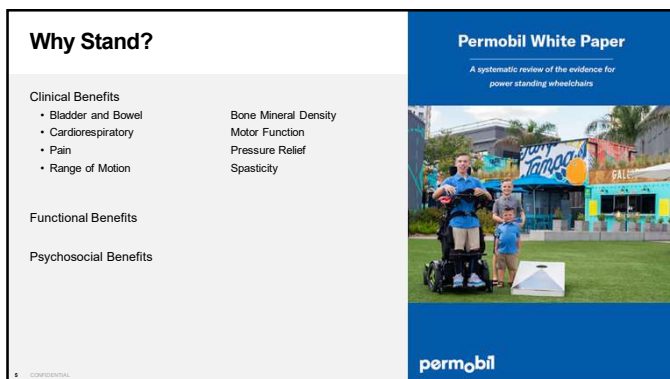
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Precaution <i>(noun)</i>	Contraindication <i>(noun)</i>
A measure taken in advance to avert possible evil or to secure good results Caution employed beforehand; prudent foresight	A factor that renders the administration of a drug or the carrying out of a medical procedure inadvisable
For example <ul style="list-style-type: none"> • Blood pressure concerns • Contractures of the lower extremities • Pressure injuries 	For example <ul style="list-style-type: none"> • Active fractures of the lower extremities

Definitions from dictionary.com

7

When should we be nervous about power standing?

8

Injury

ROM

Cardiovascular

Personal Factors

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Injuries

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Bones....

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Bone Mineral Density Test

- How the data is interpreted

Level	Definition
Normal	Bone density is within 1 SD (+1 or -1) of the young adult mean.
Low bone mass	Bone density is between 1 and 2.5 SD below the young adult mean (-1 to -2.5 SD).
Osteoporosis	Bone density is 2.5 SD or more below the young adult mean (-2.5 SD or lower).
Severe (established) osteoporosis	Bone density is more than 2.5 SD below the young adult mean, and there have been one or more osteoporotic fractures.

- T-score compares the person to a healthy young adult norm
- Normal between -1 and 1
- Below -1 begins to indicate low bone mass
- The greater the negative number the greater the risk for fracture

There is no exact T-score that says it is safe to stand.

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What do we know about bones?

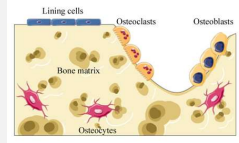
Bone is made up of collagen matrix and mineral deposits

Bone modelling process is dependent on stresses imposed on the bones by gravity and muscle tension, both stimulate osteoblastic activity

Bone activity also influences plasma calcium concentration – and vice versa

- Bone Mineral density is influenced by
- Hormones – incl Estrogen, Testosterone
 - Vit D3 (facilitates absorption of calcium from the intestine)
 - Drugs
 - Some anti-depressants
 - Anti epileptic
 - Toxic effect on bone cells – eg chemo
 - Glucocorticoids

Factors may affect non-mineralised matrix – fracture risk may not correlate with BMD



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Fractures and Wheelchair Use

Fracture patterns different from general population – distal femur, proximal tibia, ankle, lesser degree the hip
High rate of complications – pressure injury, pain, spasticity, fracture non-union, lower limb amputation, respiratory illness, delirium

Investigation into CP group who has sustained a fracture

- GMFCS Levels III were more likely to sustain high energy fracture – falls, play, sport
- GMFCS Levels III-V were more likely to sustain low energy fracture – wheelchair, transfer, limb getting stuck
- Children – Distal femur most common site, adults foot/ankle
- Higher rate of distal femur fractures in older females than older males

(Kannikeswaran, 2021)

SCI

Most fractures usually occur two years or more after injury

Decrease in BMD at proximal tibia and distal femur – often first points of contact with external forces – common site of low energy fragility fractures (Zheng et al, 2021)

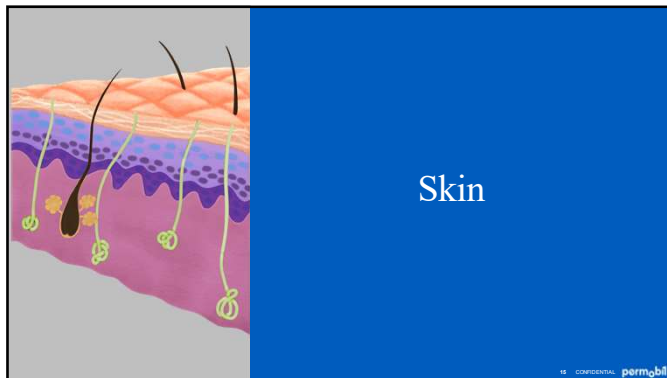
Fracture incidence increases with time since injury – esp 10 yrs +

Acute phase of bone loss – up to two years, then chronic phase

Mean time to first fracture is 9 years

(Troy & Morse, 2015)

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Pressure Injuries

Standing can be an effective means of redistributing pressure

However – the pressure needs to go somewhere!

Caution

- Areas that are now weightbearing
- Length in time in standing
- Shear



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How do we minimise the risk of injury?

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Assessment Information

Medical history

- Hormone status
- Medication use
- Nutritional status

History of condition

- Time since injury
- Weight bearing history

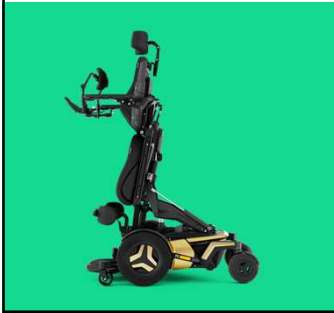
Pressure injury risk assessment

Medical review



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Power Standing Set Up



When trialling or prescribing a power standing wheelchair

- Obtain accurate user measurements to allow accurate set up of chair
- Ensure knee blocks and chest prompts are used appropriately
- Consider standing sequence used
→ Sit to Stand vs Supine to Stand

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Range of Movement



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Range of Movement

Ideally we want

- Neutral spine
- Hips at 0 degrees flexion/extension, neutral rotation
- Knees fully extended
- Ankle at plantar grade
- Feet neutral inversion/eversion

Power wheelchair set up can compensate for reduced range of movement, but how far should we go?



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The Reality

Duchenne's Muscular Dystrophy research

- Boys with more significant contractures tended to stand less
- More discomfort
- Reduced standing tolerance

DMD Consensus Statement recommends

- Ankle contracture less than 10 degrees
- Comfort and tolerance to stand for at least 10 minutes

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Considerations

Can the person stand without pain?
(Do they have good sensation)

Can they achieve their desired posture
(to achieve their goal?)



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On the topic of pain....

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Autonomic Dysreflexia

Can affect those with spinal injuries at or above T6

Typically precipitated by noxious visceral or somatic stimulation below level of injury

Activates massive sympathetic reflex - characteristics include a sudden rise in both systolic and diastolic blood pressure

If observed, recommended to move person into upright position

Pharmacotherapeutics exist to manage acute hypertensive crises



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Cardiovascular



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Cardiovascular Control

Heart rate and blood pressure controlled by inputs from autonomic nervous system – sympathetic and parasympathetic

Parasympathetic active during rest – decreases heart rate

- Vagal nerve exits brain at base of skull

Sympathetic – excitatory (fight or flight) increases heart rate, increases peripheral vascular resistance – increases blood pressure

- Neural pathways in spinal cord

SCI (or similar) disrupts descending spinal cardiovascular pathways – sympathetic hypoactivity but intact vagal parasympathetic control – results in low resting blood pressure, loss of regular adaptability of blood pressure and disturbed reflex control

- Lesions above T6 disrupt supraspinal control to the splanchnic bed predisposing to orthostatic instability

Likelihood of experiencing issues with cardiovascular control is greater in those with higher spinal cord lesions (tetraplegia)

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Orthostatic Hypotension

Sudden fall in blood pressure upon postural change (or following prolonged periods of sitting)

- Decrease of blood pressure of 20mmHg or more when moving to upright from supine

Characterised by dizziness, light headedness or even fainting.

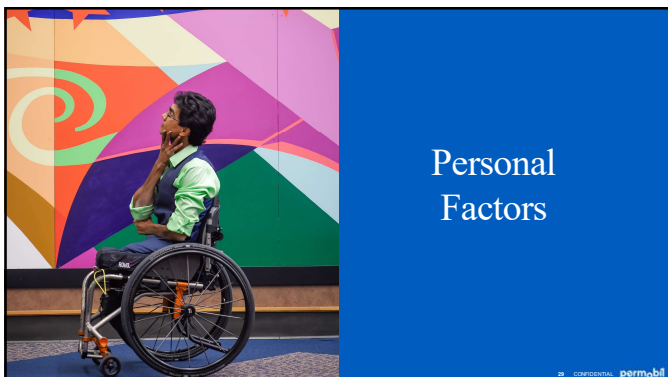
Care needed with rate of position change

Watch plasma volume, vasodilatory stresses

Frequent bouts of shorter duration can help increase tolerance

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Personal Factors



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Abandonment

- User input into device selection
- Easy device procurement
- Poor device performance
- Change in user needs or priorities

Phillips and Zhao (1993)

Chair needs to work in the environment that standing needs to occur in



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Goal Setting

- Person centred
- SMART?
- WhOM



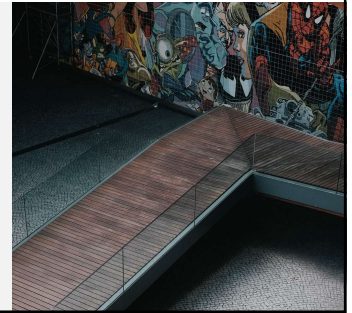
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Environment

Can the chair be used in the environment that the person needs to use it in?

- Home
- Work / school
- Community

Does the person have the ability to transport the chair if it needs to be used in more than one environment?



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Timing of Provision

Highlighted in research with boys with DMD

Progressive conditions – potentially an optimal window to maximise benefit



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Cognition

Is the person able to participate in goal setting?

Is the person motivated to stand?

Can the person communicate pain or discomfort?

Or are you combining a mobility or standing solution?



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The take home message?

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A good assessment is essential.

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*Power standing sounds like lots
of work.....*

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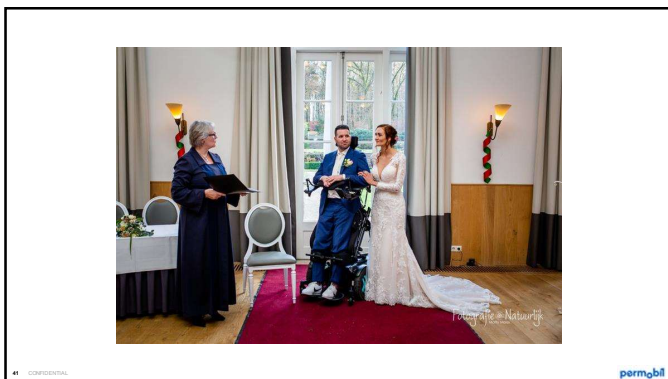
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Questions?

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Thank You!

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