Evidence Based Wheelchair Use: The Tilt and Recline Functions

Prescribing a wheelchair seating system for a Client is individualised to anthropometric fit, optimal ergonomics, and to provide maximal function [1].

The goal of providing wheelchair seating systems is to [1]:

- Redistribute pressure
- Minimise shear
- Provide comfort and stability
- Reduce heat and moisture
- Enhance functional activity

Tilt, recline, and elevating leg rests are functional features that can be added to wheelchair design, for benefits in pressure care, patient handling and fatigue management.

Tilt Function:

Variable positioning wheelchair with a mechanism that allows the seat to tilt posteriorly without changing the seat to back support angle [2].

This allows a change in position posteriorly without changing the predetermined hip angle.

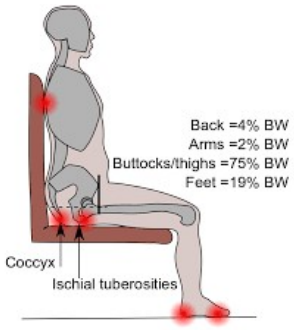
Recline Function:

Variable positioning wheelchair with a mechanism that allows the back support to pivot posteriorly, increasing the seat to back support angle [2].

This allows a change in position, opening the angle of the hip. The foot support will often raise in conjunction with the backrest recline, increasing extension at the knee and hip in unison.

These features are often medically necessary, as they enable certain individuals to [3]:

- Realign posture, regulate spasticity and enhance function
- Enhance visual orientation, speech, alertness, and arousal
- Improve physiological processes such as orthostatic hypotension,
- respiration, and bowel and bladder function
- Improve transfer biomechanics
- Accommodate and prevent contractures and orthopaedic deformities
- Manage oedema
- Redistribute and relieve pressure
- Increase seating tolerance and comfort
- Independently change position to allow dynamic movement [3]



Pressure redistribution and relief is an essential component of quality care for wheelchair users. In sitting, up to 75% of the body weight [4] is supported by only 8% of the body surface, putting increased pressure on the bony prominences of the sacrum and pelvis.

Minimising risk of the adverse effects of pressure involves minimising pressure and shear as the causation, as well as mediating extrinsic risk factors such as friction microclimate and reduced mobility.

Advice on wheelchair prescription for the prevention of pressure injury [1]:

- Obtain specific body measurements for optimal selection of seating system dimensions (postural alignment, weight distribution, balance, stability, and redistribution capabilities).
- Prescribe a power weight-shifting wheelchair system for individuals who are unable to independently perform an effective pressure relief.
- Use wheelchair tilt and/or recline devices effective enough to offload tissue pressure.
- Full-time wheelchair users with pressure injury located on a sitting surface should limit sitting time and use a gel or air surface that provides pressure redistribution.
- Maintain an offloaded position from the seating surface for at least 1 to 2 minutes every 30 minutes [1].

Guidelines for the implementation of tilt and recline [3]:

- Tilt and recline affect pressure and perfusion at the skin and muscle tissue at the ischial tuberosities, and to a minimum extent, at the sacrum.
- Tilt, when used alone, must be greater than about 25° to achieve pressure relief and/or tissue perfusion at the ischial tuberosities.
- Recline, when used alone, can increase shear but may provide reduction in pressure at the ischial tuberosities at angles greater than 90-100°.
- The greatest reductions in pressure are seen when tilt and recline are used together, either at tilt of 35° with recline 100° or tilt of 15-25° with recline of 120°.
- Greater angles of tilt and recline generally provide better pressure relief.
- 3 minutes duration of 35° tilt with recline of 120° is more effective than 1 minute.
- Lateral weight shifting may sufficiently offload the ischial tuberosities on one side, but also simultaneously increase pressure on the other [3].

Evidence base for effect of tilt and/or recline:

- Backrest recline to 120° resulted in 12% reduction in interface pressure and 25% increase in shear force; tilt to 20° resulted in 11% reduction in interface pressure and elimination of shear forces [5].
- A 27% decrease in maximum pressure over the ischial tuberosities was observed with a 35° tilt, a 47% reduction with a 65° tilt, and a 78% reduction with a forward lean weight shift [6].
- 45° tilt resulted in a 45% reduction of interface pressure over the ischial tuberosity [7].
- A 33% reduction in pressures at the ischial tuberosities was found on both the air cell and fluid cushion at 45° of tilt [7].
- At least 20° tilt is needed to effectively reduce interface pressure [8].
- When combined with 100° recline, wheelchair tilt-in-space at 35° resulted in a significant increase in skin perfusion as compared with wheelchair tilt at 15° and 25°, while no significant increase in skin perfusion occurred at 15° and 25° tilt [9].
- Tilt angle needs to be at least 35° when combined with 100° recline, or at least 25° when combined with 120° recline for enhancing skin perfusion [9].
- A combined position of 45° tilt and 120° recline reduced 40% of interface pressure [10].
- Combination of 25° tilt and 110° recline could effectively reduce interface pressure [11].
- To reduce seat forces to 60% of maximum, a person would have to tilt to 50°, stand to 50°, or recline the backrest to 60° [12].

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