Posture, Proper Wheelchair Fit and Seating

Each individual has his/her own specific needs for wheelchair and seat cushion specifications depending on the level of injury, amount of mobility, and skin sensitivity/tolerance. Proper posture, seating and wheelchair fit allow each person to maximize the ease of transfers, mobility and skin protection.

Why is proper posture, wheelchair fit and seating important for individuals after a spinal cord injury?

- Protection of skin integrity
- Even distribution of pressure
- Prevention of muscle imbalances and contracture development that may develop from prolonged poor posture
- Prevention of excess and/or abnormal shear forces or pressure on the skin during sitting, mobility or transfers

Posture:

- When sitting in a chair or wheelchair, the skin overlying the ischial tuberosities (the “sitting bones”) and the tailbone are especially at risk for skin breakdown.
- Proper Posture in a Wheelchair:
  - Knees and hips positioned at right angles
  - Buttocks back in the seat
  - Buttocks centered on the seat
  - Pelvis slightly tilted forward (anterior pelvic tilt)
  - Pelvis horizontal (not leaning to one side or the other)
  - Trunk upright and following the natural curvature of the spine
  - Shoulders relaxed, elbows at right angles on the arm rests and/or free to move
  - Head upright and in midline, chin slightly tucked
The above two photographs are examples of an individual sitting with ideal upright posture. Below are examples of an individual sitting with poor upright posture that will cause him to be susceptible to pressure ulcers, pain and soreness, muscle imbalances and contractures.
Proper Wheelchair Fit:

To determine if your wheelchair is an ideal fit, the user should sit in the wheelchair with ideal upright posture (see above for examples of proper and improper sitting posture), sitting on the cushion he/she will be using and wearing shoes.

- Seat Width - Slightly wider than the user’s widest point (usually the hips or the thighs)
- Seat Depth – The wheelchair seat should end 1-2 inches before the back of the user’s knees. The front of the wheelchair seat should never rub the back of the knees.
- Seat Height – When the footplates are adjusted appropriately for the user to sit with proper sitting posture, there should still be a few inches from the footplates to the floor. NOTE: If the user will be propelling the wheelchair with his/her feet, the seat height should be such that the user’s feet rest flat on the floor.
- Backrest Height – Should be higher if the user has trouble sitting upright on his/her own to provide maximum support. A backrest should not rub the user’s arms when he/she is propelling the wheelchair.
- Backrest Width – Slightly wider than the user’s torso
- Armrest Height – The user’s forearms should rest comfortably on the arm rests the elbows bent to 90 degrees and arms at his/her side.

Wheelchair Cushions:

- The most important factor in selection of a seating system and/or wheelchair cushion is to minimize excess pressure and/or shear forces on the skin.
- There are many different types of wheelchair cushions available, all of which have advantages and disadvantages. Each individual is different in his/her body build, functional mobility and skin tolerance to pressure. Selecting the proper wheelchair cushion can help individuals with spinal cord injuries maximize these individual needs.
- Commonly used wheelchair cushions:
  - Foam
    - Made of viscoelastic foam, vary in thickness and density based on the individual’s needs
    - Advantages: light, generally do not inhibit a person’s function (i.e. transfers), are relatively inexpensive and easily modified
    - Disadvantages: usually can’t be washed, increased skin temperature at the sitting surface, must be replaced more frequently than other cushions (approx every 6 months)
- **Air-Filled**
  - Made of multiple small air-filled cushions, user's buttocks immerses into the cushion as far as possible without “bottoming out” on the seat
  - Advantages: better weight distribution when compared to foam, lowest interface pressures if inflated properly
  - Disadvantages: a heavier cushion when compared to foam, air-filled cushions are easily punctured, stability in sitting is decreased, transfers are more difficult, ineffective at reducing skin pressure if the cushions are under or over-inflated

- **Gel or Fluid**
  - Usually made of inflated pouches with gel inside on top of a foam base
  - Advantages: better weight distribution when compared to foam, minimal heat buildup on the skin, excellent for minimizing shear forces during mobility and/or transfers and is therefore a good choice for the active individual
  - Disadvantages: heavy cushion, can promote increased skin temperature and moisture build-up at the sitting surface, stability in sitting is decreased, difficulty of transfers is increased

- **Flexible matrix**
  - Made of thermoplastic urethane that is formed into open cells, “honeycomb”
  - Minimal research in the literature

Resources for Patients and Families:

- SCI Info Pages: Skin & Pressure Sore Care, Treatment, and Prevention After Spinal Cord Injury:
  http://www.sci-info-pages.com/skin_pres2.html
- Christopher and Dana Reeve Foundation Paralysis Resource Center Website: Wheelchairs, Seating, Positioning
  http://www.christopherreeve.org/site/c.mtKZKgMWKwG/b.4453477/k.3D3E/Wheelchairs_Sequencing_Positioning.htm
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Proper Wheelchair Fit:

Observe the patient sitting in the wheelchair with proper, upright posture, shoes on

- **Seat Width**
  - < 1 ¼ inches wider than the WC user’s width at greater trochanters or widest portion of the thighs
- **Seat Depth**
  - 1-2 inches less than distance between posterior buttocks and popliteal fossa
- **Seat Height**
  - Measure with wheelchair cushion that the patient will be using in place
  - There should be at least 2 inches of clearance between the floor and footplates when the footplates are at their lowest position (allows for ramp/curb clearance)
  - If patient will be propelling WC with legs: feet should rest flat on the floor
- **Backrest Height**
  - Measure with wheelchair cushion that the patient will be using in place
  - Depends on the user’s ability to stabilize his/her trunk – too high will impede shoulder motion, too low will provide inadequate postural support and lead to postural deformities
  - Observe the user propel his/her wheelchair and check for any impedence of shoulder motion/propulsion ability by the backrest. If shoulder motion is hindered, the backrest height may need to be lower
- **Backrest Width**
  - ¾ inch wider than torso width at the level of the top of the backrest
- **Footrest to Seat Distance**
  - Measure with wheelchair cushion that the patient will be using in place and the patient’s shoes on
  - At least 2 inches of clearance between the floor and footplates
o Armrest Height
  - *Measure with wheelchair cushion that the patient will be using in place.*
  - Measure with user in upright sitting posture with arms at sides and elbows flexed to 90 degrees, forearms should rest comfortably on armrests

**Additional Research/Resources:**


*Updated December 2013*