

WHEELCHAIR SEATING FOR POSTURE, PRESSURE, AND FUNCTION



Passionate People



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Introduction



Regardless of why you are using a wheelchair, your diagnosis or the functional difficulty you may have, your posture, protecting your skin, comfort and function are the focused goals your therapy team will help you achieve.

In this ebook, you will learn about the importance of the mechanics of body alignment that creates good posture, the effect sitting has on skin pressure, and the importance and role that the seated posture has on everyday wheelchair propulsion and functional activity.

When looking at your seating position/posture, there are **four main areas to consider**. First, you must look the position and flexibility of the pelvis, the effect it has **on the spine (your trunk)**, the position of your **head**, and the **freedom of movement of the upper body**.

The wheelchair set up, along with the cushion and backrest and positioning components will also have a direct effect on posture and pressure. Your therapy team will help match your posture to the equipment to best support your body, protect your skin and maximize function.

This book will help you be able **to better discuss your needs and participate in the therapy assessment and trial and select the best equipment to meet your personal needs**. It will provide an overview of what is available to you, so that you and your wheelchair specialist can make the best choice for your situation.

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What Does that Mean for Wheelchair Posture?

The first step is to begin to understand **Common Seated Postures**.

The seated posture always begins with the pelvis. The pelvis in a seated position is considered “neutral” when it is upright and only slightly tilted back. The spine has a natural inward curve of the lower (lumber)spine (lordosis), a slight backward curve of the mid-thoracic/mid-back (kyphosis), and a slight inward curve at the cervical/neck (lordosis). This helps to keep our head balanced on top of our spinal column. This is why we begin at the pelvis!

When muscle imbalance and other muscle tone changes occur, the position of the pelvis and spine become what therapists typically call “asymmetrical” or beyond “neutral”. It is important to select products that accommodate for, or correct asymmetrical postures, protect the skin, and promote optimal function.



Posterior Pelvic Tilt, when your pelvis and spine, due to muscle weakness or muscle tone, fall into a backward position, sometimes called a “slumped” posture. The spine takes on a “C” shape which is known as a kyphosis. A common complaint of people who exhibit this posture is they feel they slide out of their chair.

This posture will require more contour in the cushion and backrest depending on how flexible the posture is. When an asymmetrical posture is flexible this means it can be corrected or returned to “normal”. However, when an asymmetrical posture is fixed achieving a “normal” sitting posture cannot be done and the seating system then needs to accommodate the position in which the person sits.



Anterior Pelvic Tilt- where the pelvis tips forward due to muscle weakness or tone in the abdomen, or tightness of muscles in the back. Additional weight in the stomach area, common to certain diagnoses can also be a cause. The spine has more of a forward curve (lordosis) causing forces in the back and neck to develop and sitting imbalance to occur.



Pelvic Obliquity with a Scoliosis- a common posture when one side of the pelvis sits lower than the other. As the spine and pelvis are connected, a bend in the spine is also develops. Without supporting the posture it can progress and become exaggerated and fixed. This can affect sitting balance, breathing and functional use of the upper body and head.



Here's the good news! There are products designed to address these postures and improve posture and function! For example, here is a possible suggestion on how to correct a pelvic obliquity and scoliosis.



What Does It Mean for Pressure Injury Prevention?

The seated surface alone with the use of a skin protection cushion is NOT enough to prevent skin pressure building up. The evidence shows that immobility alone, is the primary reason individuals develop pressure injuries. So, ask yourself this. How often do you shift your weight in your wheelchair? How do you know if you have shifted off your bottom far enough to prevent a pressure injury? If you are unable to manually shift your weight, do you have a manual or power wheelchair that has a power tilt function? How do you know if your cushion is providing the protection it claims to give you? These are questions to discuss with your wheelchair specialist and supplier.

How often you need to shift your weight

There are some general guidelines however, these guidelines, published by different organizations are not consistent and therefore it is important to discuss a pressure management plan with your therapist. Evidence suggests that shifting your weight where you are fully “offloading” the tissues and sit bones is effective when it’s done for at least 3-5 minutes every 30 minutes to an hour. Full “offloading” means there is no contact of your body with the seat surface. Skin health depends on a vast number of internal and external factors including nutrition.

How do you know if you have shifted off your bottom far enough to maintain healthy skin?

Evidence suggests that a “push” up pressure relief which is difficult to perform and maintain for several minutes is not effective for skin protection. A side lean, where one side of the buttocks is “fully” lifted off the seated surface is one way to perform a pressure relief on your own. If you can lean forward on your legs and then return to an upright sitting position, then this is another possible way that may be effective for you to independently perform a pressure relief. There are times when this position is not recommended so check with your doctor and therapist first. If you are not able to shift your weight on your own, then a chair that provides power tilt may be suggested as this is a “mechanical” way of performing a pressure relief.

How do you know if your cushion is providing the protection you need?

Regardless of what type of cushion you have or is suggested for you, regular skin checks are recommended. Either having someone look or using a long arm mirror, inspect your skin for redness. If this disappears within a few minutes the cushion materials and design may be protecting you, but it is important to check your skin regularly, especially when changing to a new wheelchair and seating system to ensure its working for your skin. It is very important to work with your therapist in selecting the best cushion for you, and follow-up after the equipment is issued. You see, some skin injuries can develop deep in the tissues before they can be seen, so a regular pressure program is essential.

Pressure develops in different ways. From direct downward pressure (which creates a perpendicular force), or shear and friction which occur when moving and shifting on the top of the support surface.



Pressure A perpendicular force that occurs at a 90° angle.

Shear Parallel forces, sometimes described as stretching forces occurring within the tissues near bony prominences (sit bones)

Friction The resistance that arises when one surface rubs against another.



Sliding down in your seat can cause other forces such as Shear and Friction.

Shear occurs internally when the material of the seated surface doesn't move with the body. Shear can be reduced when materials move with the body. There are cushions and covers that can diminish this and it is important to ask based on your transfers and sitting needs. For instance, the Invacare Matrx Libra cushion uses two layers of fluid under the buttocks, and this reduces shear forces under the sit bones.

Friction is a "resistance" that arises when one surface rubs against another. This relates to the cushion cover and clothing on the individual which can cause friction and therefore damage to the skin and subsequent tissues of the buttocks. Talk to your health professional about the interaction of your clothing selection and cushion covers and how you transfer to minimize this.



Immersion Maximizes surface contact area to reduce peak pressures.
 $Pressure = Force / Area$



Off-Loading Transfers forces away from the ischial tuberosities (the sit bones) with greater weight bearing on the trochanters, hips and thighs.



Envelopment Fluid sac completely surrounds the bony prominences, even during position changes.

Posture and Pressure: What are My Options?

What are some of the key design features of the cushion products? We want to minimize direct pressure, shear and friction forces and support your posture. The following table describes the principles used in product design to address pressure and posture. This is the base of an Invacare Matrix Libra Cushion- which provides all three principles of product design, immersion, envelopment, and off-loading. It provides postural control and skin protection that improves function.

The solutions for Posture and Pressure range from simple to complex. The option that will work best for you will depend on how mobile you are, what type of postural support you might need, and what the condition of your skin and risk of pressure is like. Adaptations can often be made to a cushion to “customize” it to meet your individual needs.

Positioning Cushions

Typically, this type of cushion is recommended when you use a wheelchair for a limited amount of time of during the day, short-term use over several months, or you are able to maintain your posture with minimal support. This type of cushion provides improved posture compared to a flat 2”standard foam wheelchair cushion or the wheelchair upholstery alone.

Skin Protection and Positioning Cushions

This type of cushion is typically recommended when you an “asymmetrical” posture such as your pelvis being tilted too far back creating a slumped posture, and more contour is needed to help stabilise your pelvis and support you when seated. These cushions have different levels of contour and skin protection depending on your needs.

Adjustable Skin Protection and Positioning Cushions

This category refers to the ability to adjust the cushion by adding different shapes and sizes to the cushion to customize the support based on your individual postural needs.

It’s all about distributing pressure over the largest surface area - the buttocks and thighs! This helps reduce pressure to the seat bones!



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A Seating System is Incomplete without a supportive backrest!

A back support that has a hard shell, normally made from aluminum, or carbon fiber, provides **important postural stability** along with your cushion to support the pelvis and the spine! Be sure the **back**:

Matches the shape of your spine and trunk and supports it toward a midline and upright posture.

The bottom of the backrest contacts the back of the pelvis to support the pelvis from rolling back into a posterior tilt. This works together with the shape of the seat cushion.

The height of the backrest is determined by sitting balance, this depends on your level of injury, trunk strength, as you want the backrest to allow upper body movement, propulsion and reaching if you are able.

Back supports have **different levels of contouring** just like the cushions, offering mild support to more aggressive support. The Matrx Elite offers and PB offer milder support whereas they're equivalent "Deep" models offer more aggressive support. Lateral supports can be added when more postural correction is required.

Seating accessories refer to equipment such as a pelvic belt, a chest harness, foot/ankle stabilizers, hip guides, and lateral chest supports. These will be selected if the contours of the cushion and backrest still require additional support to achieve a functional posture. There are all different styles to meet different needs, and again should be trialed during the seating assessment.



Wheelchair and Seating Assessment

First and foremost, discuss with your therapist and supplier what you want to be able to do! What are your goals and the activities you want to be able to do with your wheelchair? Be sure to discuss any prior or current skin issues.

Mat Assessment hips, knees, ankles, spine

You should expect your therapist to observe your posture in your current chair (if you already have one) or on the edge of a treatment table. It is important to discuss what you like and what works about your current seating system, or what you would like to improve about how you sit and how you function in your chair.

A **“Mat Assessment”** is highly recommended. This involves **lying on your back and sitting on a flat supportive surface** (other than the wheelchair!) to determine the alignment of your spine and body without the effects of gravity. This can help determine what available range of motion you have in your spine and joints that will affect decisions about the set-up of your wheelchair and selection of seating. This should be followed by sitting up on the same flat, supportive surface to determine how “gravity” will affect your range of motion and posture. Spasticity and Tone can be very different sitting up vs lying down, and since this is the position we are aiming for its important to understand the difference. They include: Muscle strength, flexibility, tone (high and low), tremors, reflexes, joint integrity/stability, posture, balance, motor control.

Other things to be discussed are your primary diagnosis but also secondary health issues such as diabetes (which can affect the health of your skin), past and present medical history including pressure injuries, level and quality of your sensation, and functional activities. It is also important for you to share what you **like and dislike, can and cannot do** from your current chair. Or, if you are a new wheelchair user, **what you would like to be able to do!** Do not limit yourself, you would be surprised how much customization is possible with the equipment adjustments and features!

Turning Mat Assessment Findings into a Customized Fit!

When trying different wheelchairs backsupports and seat cushions, you maybe asked to describe if you feel stable and comfortable/supported whilst you are in a “resting” position. Be sure to also **“assess in motion”** by pushing your chair to see how well the cushion and back support you while moving or reaching. If you are using a power chair be sure to practice reaching for the controls and other functional movements from the chair.

What does it mean for Improving Function from my Wheelchair?

Posture is the key to function

When the pelvis is stable, then your arms are free to reach and propel the wheelchair more effectively. This can mean less assistance to reach for items and also increases propulsion efficiency in order to propel longer and/or with less fatigue.

When your trunk is not leaning to one side, then your propulsion stroke will be more equal and less steer correction will be necessary. This can also save energy throughout the day

Posture affects head position and movement. Improved posture can help you use your head to drive your chair, or access switches to access functions of the chair. So, whatever your movement is, ensuring optimal posture is the first step in determining the correct seating system for you, and how you will best access it!



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