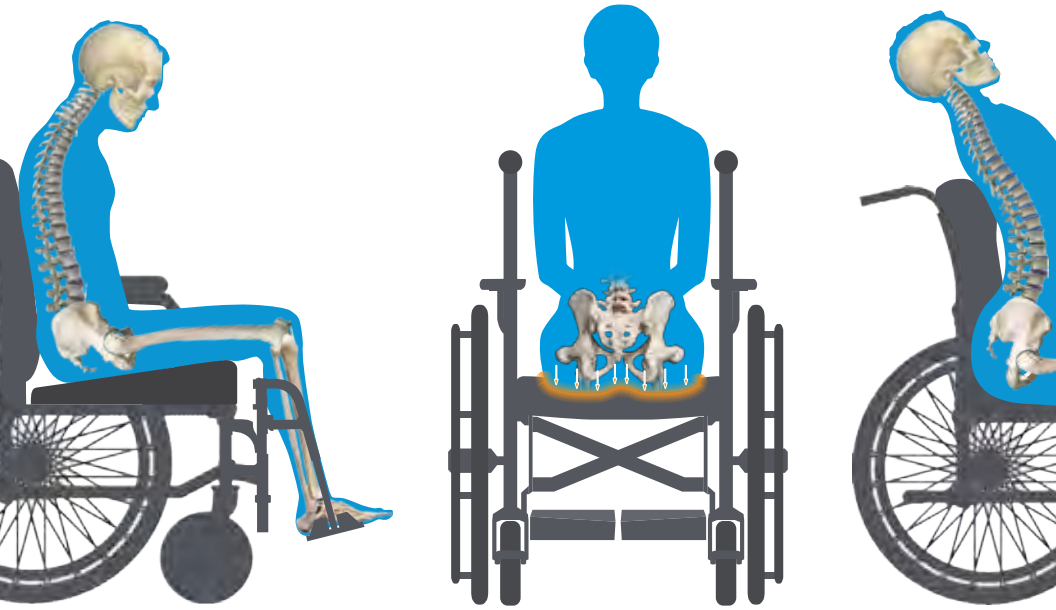
# WHEELCHAIR SEATING & POSITIONING GUIDE



COMFORT COMPANY

# MEET THE COMFORT COMPANY CLINICAL EDUCATION TEAM

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Director of Clinical Education

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Clinical Education Manager
Rehab Division

## COMFORT COMPANY MISSION

Comfort Company is committed to developing high quality resources and education related to wheelchair seating and positioning. We understand the challenges that healthcare professionals face in the provision of wheeled mobility and positioning. Our goal is to simplify the process and provide the tools needed to help you meet the needs of end users.

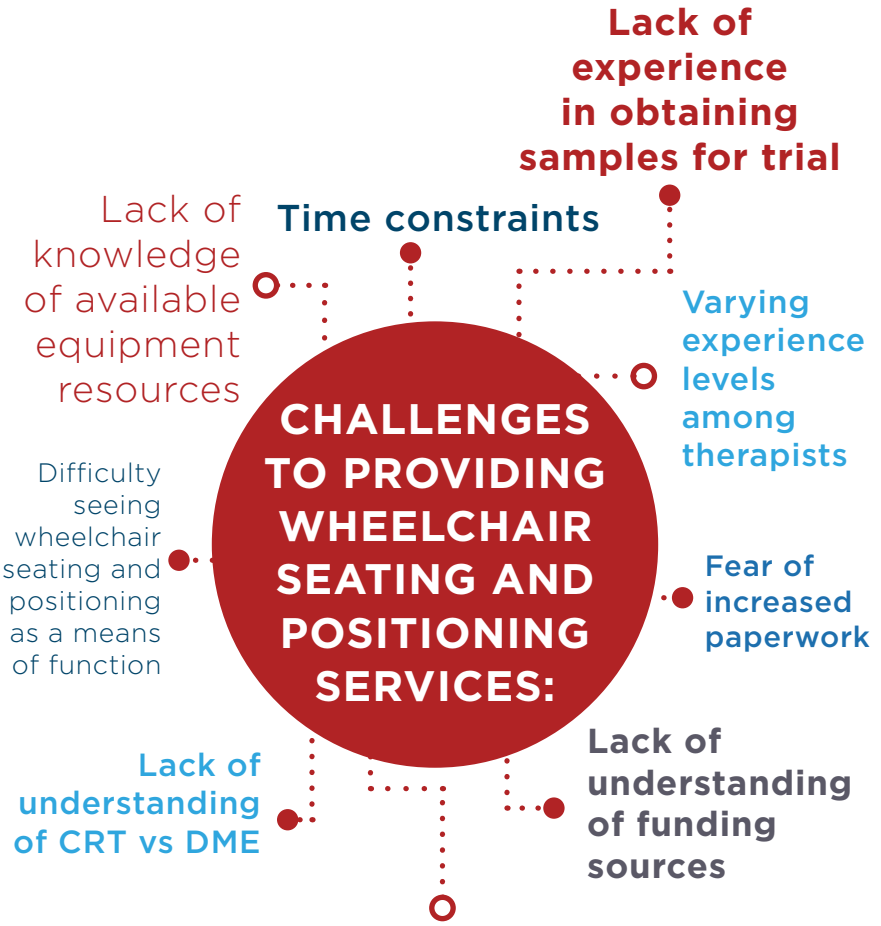
# PURPOSE OF THIS GUIDE

## This guide is intended to demystify the provision of wheelchair seating and positioning for healthcare professionals. The aim is to assist healthcare professionals in achieving optimal individualized wheelchair seating to meet the goals for each client by:

- Understanding the qualifications for both manual and power wheelchairs
- Identifying the abnormal postures and understanding how ill-fitting wheelchair components lead to abnormal postures and pressure injuries
- Understanding how to select the proper seating components
- Identifying the key components to completing a successful wheelchair evaluation

*** Look for these blue boxes throughout the guide. They're our quick tips or takeaways for that section.**

This guide uses common therapy terms to keep the concepts as relatable as possible. For the most up-to-date, standardized wheelchair terms and definitions, see reference #9, *Glossary of Wheelchair Terms and Definitions*, as listed on page 88.



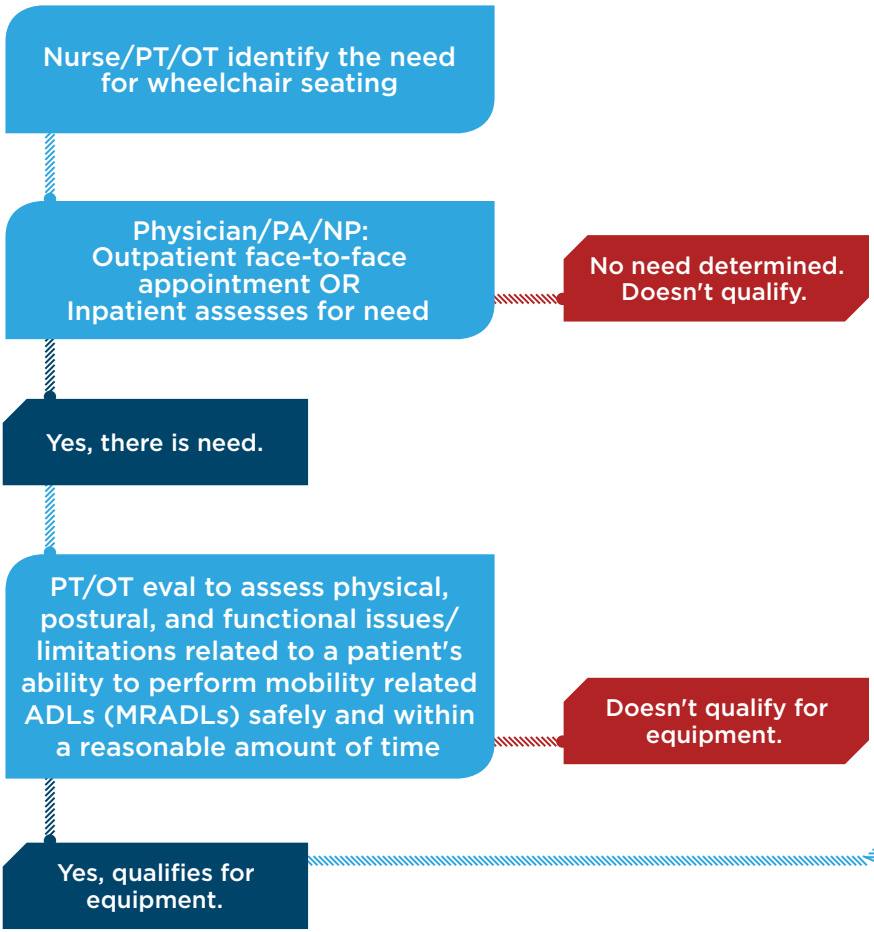

*** Despite wanting what is best for our patients, the above factors may prevent us from doing it.**

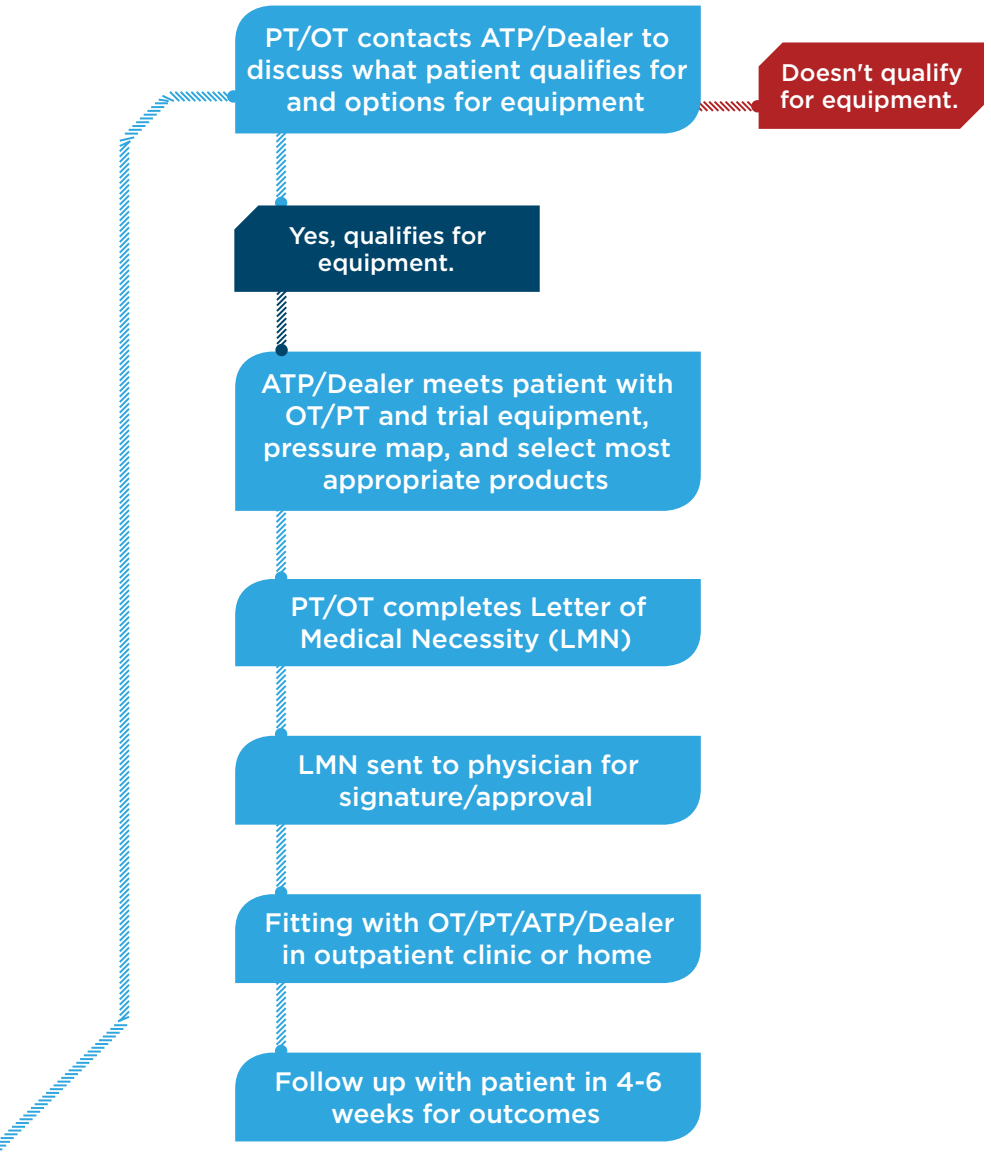
# TABLE OF CONTENTS

# THE PROCESS OF GETTING SEATING EQUIPMENT

## WHERE DO WE START?

First, let's look at the big picture of how to get wheelchair seating and positioning equipment:






*** This guide will give you tools to be able to confidently walk through this process.**

# DME VS CRT

## LET'S START WITH THE BASICS: IS ALL WHEELED MOBILITY AND SEATING EQUIPMENT CLASSIFIED THE SAME?

**NO! When it comes to seating and wheeled mobility, products are divided into two groups: Durable Medical Equipment (DME) and Complex Rehabilitation Technology (CRT).**

Patients will qualify for certain equipment based on the severity or complexity of their condition. Most products are covered based on diagnosis, and some are covered because lesser products have been tried and were found to be inappropriate.

"Complex Rehab Technology (CRT) products and services are significantly different than standard Durable Medical Equipment (DME). The DME benefit was created over forty years ago to address the medical equipment needs of elderly individuals. Over the years technology has advanced and now includes complex rehab power wheelchairs, highly configurable manual wheelchairs, adaptive seating and positioning systems, and other specialized equipment. These products are classified as Complex Rehab Technology. Suppliers who furnish CRT provide highly specialized products and services which are much different than standard DME."

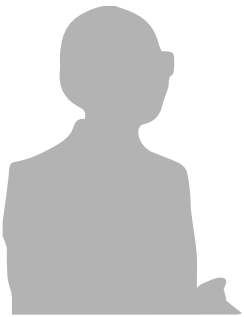
*NCARTblogger. "Why a Separate Benefit Category Is Necessary for CRT." NCART, NCART, 25 June 2015, blog.ncart.us/why-a-separate-benefit-category-is-necessary-for-crt/.*

# THE TEAM

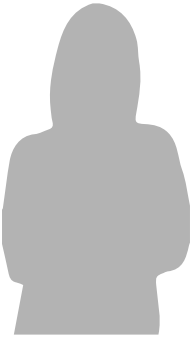
## IS IT ONLY UP TO THE PHYSICIAN AND/OR THERAPIST TO DECIDE ON A PATIENT'S EQUIPMENT?

**NO!** The most important part of successfully providing appropriate equipment is understanding that it's a team effort.

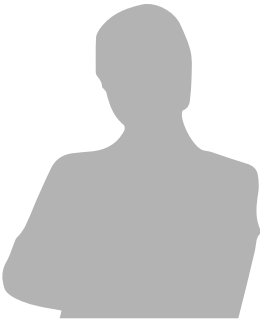
**MEET THE TEAM:** Each member plays a role in the selection and attainment of proper equipment.



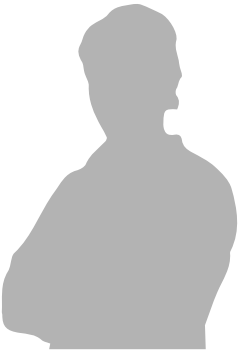
Client/Caregiver



Physician

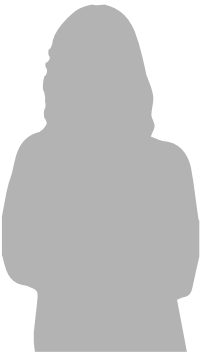


Nurse



Therapist

ATP/Supplier/Dealer



Manufacturer

## What does each team member bring to the table?

**CLIENT/CAREGIVER**
Has knowledge of their own body, functional needs, what works best for them in their day-to-day lives

**PHYSICIAN**
Determines the medical need for seating and wheeled mobility

**THERAPIST**
Provides clinical knowledge of body, tone, debility, stability vs mobility, function vs exercise, and patient advocacy

**SUPPLIER/DEALER**
Has knowledge of currently available equipment, billing/insurance issues, qualification requirements

**NURSE**
Adds wound care expertise

**ATP - ASSISTIVE TECHNOLOGY PROFESSIONAL**
Must go through an in-depth certification process

Has specialized knowledge of complex rehab products/equipment, qualification requirements, is competent in analyzing the needs of consumers with disabilities, aids in the selection of appropriate assistive technology for the consumer's needs, and provides training in the use of the devices

**MANUFACTURER**
Offers knowledge of their products, clinical applications, integration of their products with other technology, and all the pros/cons of products for various patient presentations

* **It is critical for health care professionals to develop a relationship with a reputable dealer who employs an ATP.**

# IDENTIFYING THE NEED

## HOW DO I KNOW THAT MY PATIENT NEEDS WHEELED MOBILITY?

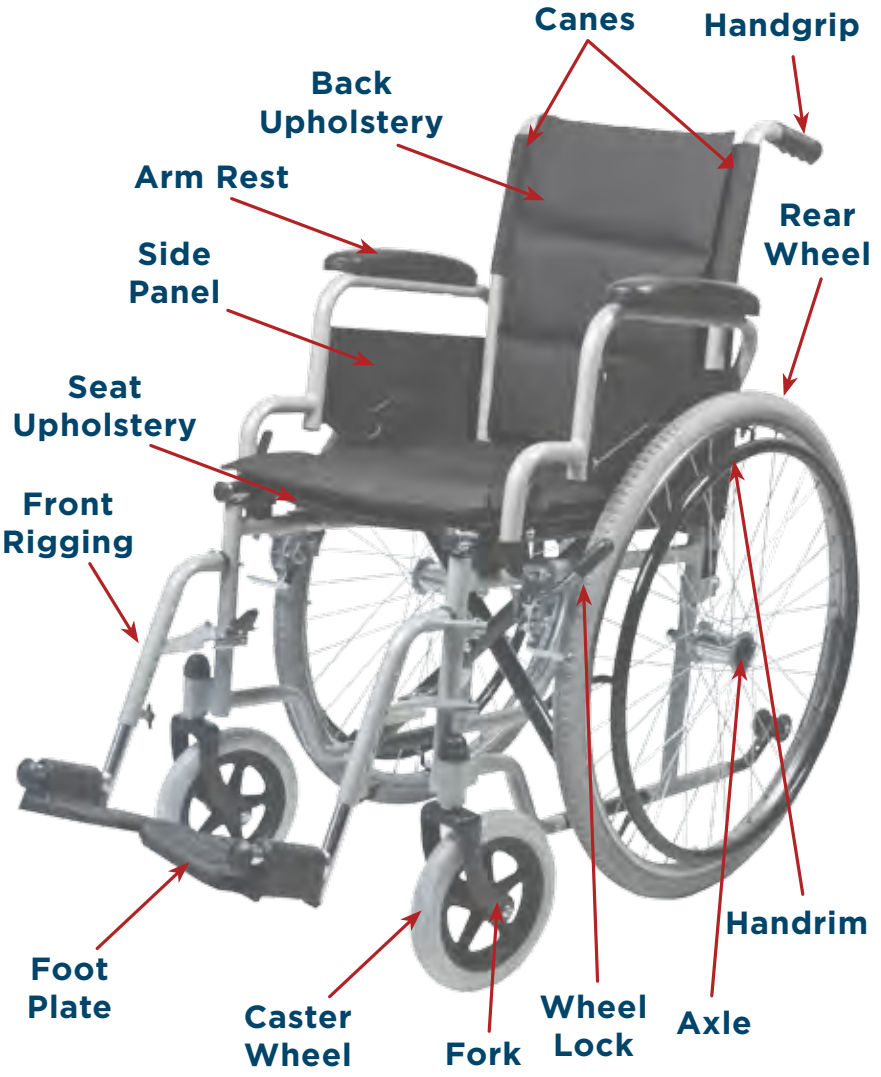
Consider your patient's quality of life. The list below provides good indicators that your patient would benefit from wheeled mobility.

1. Patient is **non-ambulatory**
2. **Demonstrates decreased safety** with ambulation or is **at risk for falls** within the home. Ask about history of falls; perform an objective balance assessment i.e. BERG, DGI
3. Requires **assistance for ambulation** within the home and wheeled mobility would allow independence
4. Requires **increased time for ambulation** within the home. Perform a gait speed test; think about performing ADLs in a reasonable amount of time
5. **Unable to consistently ambulate throughout the day** in the home which affects their ADLs. Look at a 24 hour period

*** Here are scenarios where wheeled mobility could significantly increase a person's quality of life:**

- **They can ambulate but are at high risk of falls**
- **They have frequent urge incontinence because they are unable to get to the restroom on time**
- **Their $O_2$ saturations drop below or heart rate increases above a safe range with ambulation**
- **Their day consists of sitting in a recliner and transferring to a bedside commode as needed**

# MANUAL WHEELCHAIR UNIVERSAL TERMS



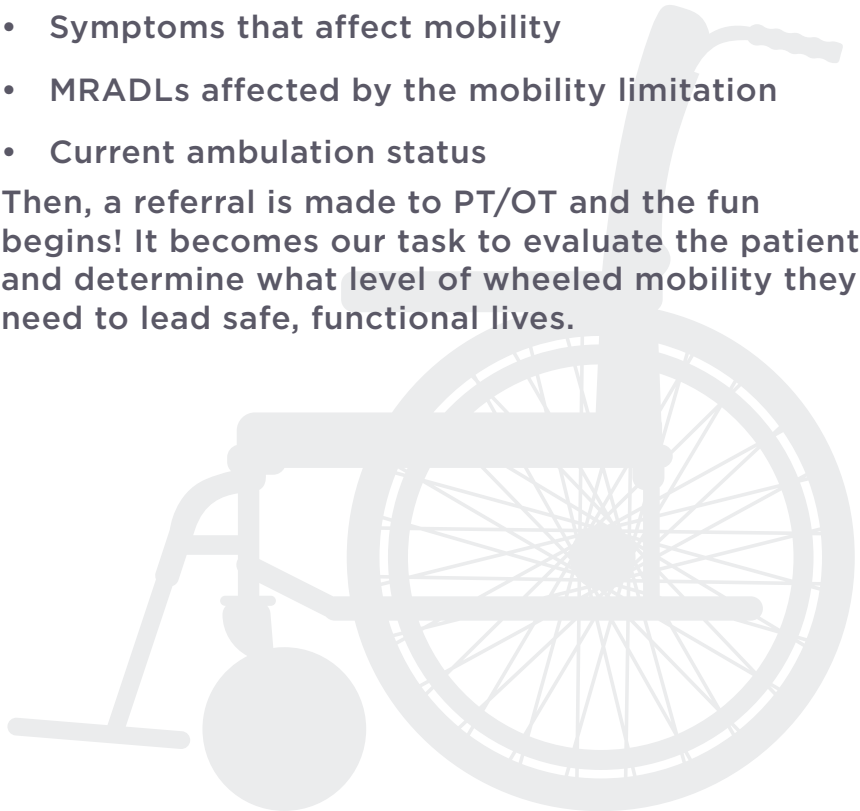
# MANUAL WHEELCHAIR JUSTIFICATION

## NOW THAT I KNOW MY PATIENT WILL BENEFIT FROM A WHEELCHAIR, WHAT DO I DO?

Wheelchair selection requires evidence of medical necessity. Step one is a physician's visit with notes that state:

- Mobility related diagnosis
- Symptoms that affect mobility
- MRADLs affected by the mobility limitation
- Current ambulation status

Then, a referral is made to PT/OT and the fun begins! It becomes our task to evaluate the patient and determine what level of wheeled mobility they need to lead safe, functional lives.



# HOW DO I JUSTIFY MY CLIENT'S NEED FOR A WHEELCHAIR?

Prior to choosing the level of wheelchair, the PT/OT needs to justify the need for a manual wheelchair. Ask yourself the following questions, and the answers will begin to guide you towards the right wheelchair:

1. Does your patient have a mobility limitation that significantly impairs his/her ability to participate in **one or more MRADLs** in the home?

   *Does it **prevent** them from doing MRADLs?*

   *Are they **unsafe** to perform MRADLs?*

   *Can they perform MRADLs in a **reasonable time frame**?*

2. Can the mobility limitation be resolved by a cane or walker?

3. Do they have the desire or capability to propel a wheelchair?

   *If they can't propel, do they have a willing caregiver?*

4. Does the patient's home have the space/layout for functional wheelchair use?

   *Measure doorways and ask your ATP for required measurements to get through doorways based on the wheelchair model selected*

*** Always document how the right equipment allows them to perform routine tasks more independently.**

# WHEELCHAIR OPTIONS: FEATURES & LIMITATIONS

## NOW THAT I'VE IDENTIFIED THE NEED, AND KNOW HOW TO JUSTIFY A MANUAL WHEELCHAIR, WHICH DO I CHOOSE?

| STANDARD WHEELCHAIR OPTIONS | | | |
|---|---|---|---|
| Very Minimal Adjustability | Minimal Adjustability | Most Basic Adjustability | Most Customizable |
| K0001/K0002 | K0003 | K0004 | K0005 |

## WHEELCHAIR KEY

**DME**

**K0001:** Standard Wheelchair

**K0002:** Standard Hemi Height Wheelchair

**K0003:** Lightweight Wheelchair

**K0004:** High Strength, Lightweight Wheelchair

**CRT**

**K0005:** Ultra Lightweight Wheelchair

**Tilt-in-Space:** Dependant Manual Wheelchair

The first question to ask is: Will my patient need this **short term** or **long term**?

## SHORT TERM USE: K0001 - K0003

- These chairs are heavier, basic manual wheelchairs with minimal adjustability and are most appropriate for short term use.

## LONG TERM USE: K0004 - K0005 - TILT

### K0004

- Patient qualifies for a basic manual chair, but requires a seat width, depth, or height that can't be accommodated by a basic MWC
- They are unable to perform all ADLs efficiently in a basic MWC
- They use a wheelchair more than two hours per day

### K0005

- Patient is a full time wheelchair user
- Patient requires customization such as axle configuration, wheel camber angle, or seat-to-back angle that can't be accommodated by a K0001-K0004
- This requires an evaluation by a PT/OT, a letter of medical necessity, and the involvement of an ATP in the equipment selection process

# MANUAL TILT-IN-SPACE

## WHEN IS TILT-IN-SPACE APPROPRIATE?

- Patient is dependent in mobility
- Patient is unable to perform independent pressure relief
- Patient requires gravity-assisted positioning/ repositioning
- Patient requires postural support, head and trunk control, and accommodation of postural asymmetries
- The goal is to increase sitting tolerance/endurance
- Patient needs improved line of sight due to forward head posture
- Patient will benefit from trunk support and open thoracic posture for increased respiratory function
- Patient requires safe positioning for feeding/gravity-assisted swallowing

*** A manual tilt-in-space chair requires an PT/ OT evaluation, justification that other manual wheelchairs are not appropriate, and have an ATP involved in the process.**

# STANDARD WHEELCHAIR COMPARISON CHART

| | K0001: Standard | K0002: Standard Hemi Height |
|---|---|---|
| **Dimensions** | | |
| Chair Weight without Leg Rests | >35 lbs | >35 lbs |
| Seat Width: Standard | 16″, 18″, 20″ | 16″, 18″, 20″ |
| Seat Depth: Standard | 16″ | 16″ |
| Weight Capacity | 300 lbs | 300 lbs |
| Back Height | 18″ | 18″ |
| Lowest Achievable Seat-to-Floor Height | 21″ | 19″ |
| **Adjustability to accommodate for postural abnormality:** | | |
| Arm Rest Height | No | No |
| Back Height | No | No |
| Seat-to-Back Angle | No | No |
| Ability to create a Fixed Tilt | No | No |
| Seat-to-Floor Height (STFH) | No | Hemi Height Only |
| **Arm Rest Options** | | |
| Desk Length | Yes | Yes |
| Full Length | Yes | Yes |
| **Leg Rest Options** | | |
| Standard | Yes | Yes |
| Elevating (ELR) | Yes | Yes |
| Swing-Away | Yes | Yes |
| **Meant for Long Term Sitting** | **No** | **No** |

**Features vary according to model.*

| | K0003: Lightweight | K0004: High Strength, Lightweight | K0005: Ultra Lightweight | Tilt-in-Space |
|---|---|---|---|---|
| | | | | |
| | 33 - 35 lbs | 30 - 34 lbs | <30 lbs | >45 lbs |
| | 16", 18", 20" | 16", 18", 20", 22" | Customizable | 16", 18", 20" |
| | 16", 18" | 16", 18", 20" | Customizable | 16", 18", 20" |
| | 300 lbs | 300 lbs | Customizable | 300 lbs |
| | 18" | 16" to 20" | Customizable | 24" |
| | 17" | 13.5" (most 14.5") | Customizable | 17" |
| | | | | |
| | No | Yes | Yes | Yes |
| | No | Yes | Yes | Yes |
| | No | Yes | Yes | Yes |
| | No | Yes | Yes | Yes |
| | Yes | Yes | Yes | 17" - 21" |
| | | | | |
| | Yes | Yes | Yes | Yes |
| | Yes | Yes | Yes | Yes |
| | | | | |
| | Yes | Yes | Yes | Yes |
| | Yes | Yes | Yes | Yes |
| | Yes | Yes | Yes | Yes |
| | No | Yes | Yes | Yes |

# POWER WHEELCHAIR JUSTIFICATION

## WHY CHOOSE A POWER WHEELCHAIR?

**All of the basic criteria for a manual wheelchair apply AND they must meet the basic power chair criteria below:**

1. They are unable to propel a manual wheelchair due to upper extremity limitations:
   - Strength
   - Coordination
   - Pain
   - Range of motion
2. The home has adequate access for maneuvering of the power chair
3. Use of the power wheelchair will significantly improve their ability to perform MRADLs

*** These all require a physician face-to-face appointment, an OT/PT evaluation, and an ATP directly involved in the equipment choice.**

## SCOOTER

**Meets all of the basic power wheelchair criteria**

## SCOOTERS VS HIGHER LEVEL BASES:

A scooter will be often ruled out due to:

- Poor trunk strength
- Difficulty with transfers
- Poor endurance
- Existing postural abnormalities
- Large turning radius

*** Very rarely does a scooter fit in the home so a Group 2 power wheelchair is the next base to consider!**

## GROUP 2 POWER

**Meets all of the basic power wheelchair criteria and:**

- Group 2 models are typically characterized by "captain's seating"
- The patient is unable to safely transfer, operate, and maintain postural stability in scooter
- The home does not provide adequate access for operating scooter

- The patient is able to safely operate a power wheelchair OR has a caregiver willing to operate, who cannot push a manual wheelchair
- Group 2 will improve the ability to participate in MRADLs in the home
- Some Group 2 models have multi power options available if they qualify for a tilt/recline system, or if they use a ventilator that is mounted on the chair

# GROUP 3 POWER

**Meets all of the criteria for a basic power wheelchair and Group 2 power.**

## Additional Criteria:

- The patient has a neurological condition, myopathy, or congenital skeletal deformity

## What's different than a Group 2?

- Group 3 allows integration of rehab seating, and typically has better drive wheel suspension
- Group 3 models offer multiple alternative drive control options
- Group 3 models offer the option of power tilt, recline, and/or power legs, and power elevate
- Tighter turning radius and increased speeds

# REASONS TO CHOOSE GROUP 3 POWER

## WHY WOULD MY PATIENT NEED A GROUP 3 RATHER THAN A GROUP 2?

### Neurological conditions are the main reason a patient would need a Group 3 power chair:

- Neurological conditions are often associated with abnormal tone and/or reflexes. Drive wheel suspension becomes important to minimize jarring forces that can trigger tone or make the user unstable
- When using a power chair all day, the distance per charge is important
- Group 3 suspension will provide the safest navigation over uneven terrain, and minimize jarring forces
- If the patient has impaired sensory-motor function, they may not sense a Group 2 base tipping during an incline or decline, which puts them at risk

# LOOKING AT ABNORMAL POSTURES

## HOW DO I KNOW IF MY PATIENT NEEDS A CUSHION OR BACK SUPPORT?

Look at the patient's posture and ask: what is the body doing that it shouldn't be doing? With prolonged sitting, patients begin to shift their bodies into what is known as abnormal postures to seek stability and/or alleviate pain and pressure.

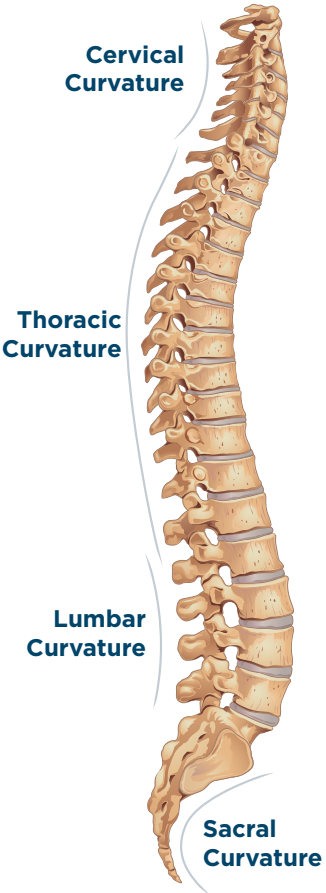
Abnormal Postures are grouped into 5 categories and are as follows:

- **Anterior Pelvic Tilt** (page 24) with lumbar lordosis with or without neck hyperextension.
- **Posterior Pelvic Tilt** (page 25-26) with thoracic kyphosis with or without forward neck flexion. Referred to as Sacral Sitting.
- **Pelvic Obliquity** (page 27) with scoliosis with or without lateral neck flexion.
- **Pelvic Rotation** (page 28) with rotation of the spine with or without lateral neck flexion.
- **Windswept Posture** (page 29)

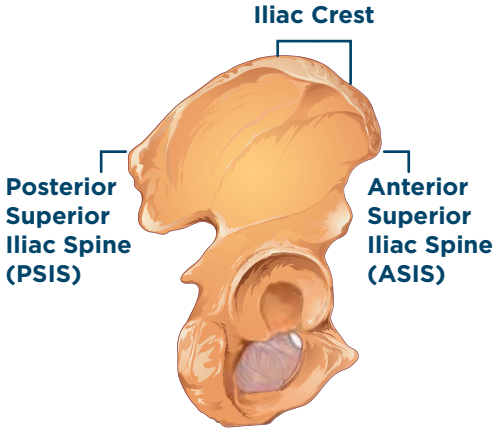
*** Understand what you are looking at and decide whether your goal is to *correct* or *accommodate for* the abnormal posture. (Page 30)**

# ANATOMY REFRESHER

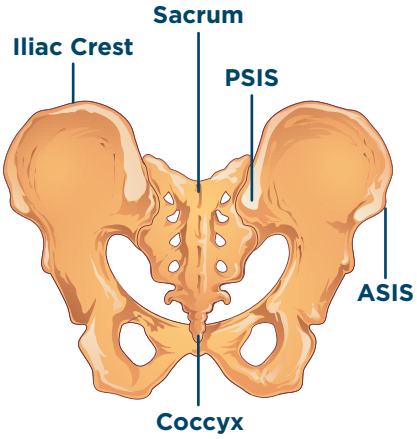
## RIGHT LATERAL VIEW OF SPINE




## RIGHT LATERAL VIEW OF PELVIC BONE




## POSTERIOR VIEW OF PELVIS



# NEUTRAL PELVIC POSTURE

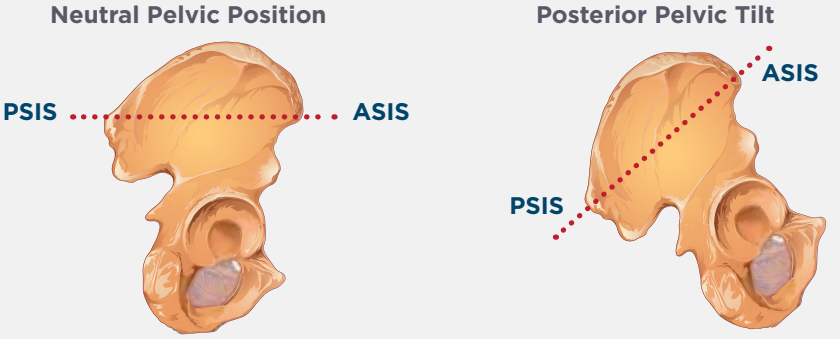
| NEUTRAL PELVIC POSTURE | |
|---|---|
| **What is the pelvis doing?** | Pelvis in midline.<br>ASIS & PSIS at equal height: no pelvic tilt<br>L ASIS & R ASIS at equal height: no obliquity<br>L ASIS & R ASIS at equal depth: no rotation |
| **What is the spine doing?** | Spine is balanced and upright, no rotation, no lateral curvature.<br>Normal lordosis in cervical and lumbar spine and normal kyphosis in thoracic spine creating the desired “S” shape. |
| **What is the head doing?** | Head is functionally upright with only mild forward/lateral flexion or rotation. |
| **Goals** | Maintain proper alignment with an appropriate cushion and back support. |

# ANTERIOR PELVIC TILT

| ANTERIOR PELVIC TILT | |
|---|---|
| **What is the pelvis doing?** | Pelvis sits with PSIS higher than the ASIS. |
| **What is the spine doing?** | Excessive lordosis of the lumbar and cervical spine: the patient hyperextends his or her back over the back of the chair, placing him or her at risk to tip the chair backwards. |
| **What is the head doing?** | Excessive lordosis of cervical spine causes hyperextension of the neck and upward eye gaze. |
| **Goals** | Utilize a cushion and back support that maximizes contact with the seat surface for optimal pelvic and spinal stability and pressure redistribution. |
| | Stability is the goal, so provide a back support that is tall enough for the patient. Measure from seat surface to the top of shoulder. |
| | Look for a moldable back support to conform to the curvature of the spine. |

# POSTERIOR PELVIC TILT

## RIGHT LATERAL VIEW OF PELVIS

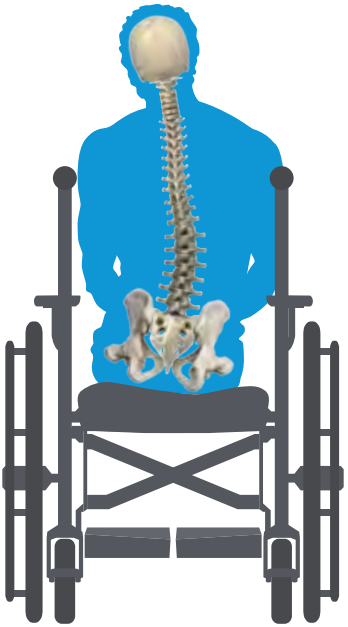


## POSTERIOR PELVIC TILT

| | |
|---|---|
| **What is the pelvis doing?** | Pelvis sits with ASIS higher than the PSIS, resulting in the posterior pelvic tilt, aka sacral sitting posture. |
| **What is the spine doing?** | Excessive thoracic kyphosis, which produces a "C" shaped spine. |
| | "Flattening out" of the lordosis of the cervical spine. |
| | "Flattening out" of the lordosis of the lumbar spine. |
| **What is the head doing?** | Decreased lordosis in cervical spine, causing forward neck flexion & downward eye gaze to the floor or lap. |
| **Goals** | Use a cushion with medial and lateral contour to promote LE alignment and pelvic stability. |
| | Ensure appropriate cushion depth to prevent patient from sliding forward, seeking reduced pressure behind the knees. |
| | Add a rigid insert to prevent hammocking of the seat and cushion and keep the pelvis from collapsing into a posterior pelvic tilt. |
| | If FLEXIBLE: Try a cushion with tapered adductors to load the trochanters, stabilizing the pelvis in the patient's most neutral alignment. |
| | If FLEXIBLE: Use a cushion with an anti-thrust component to reduce forward sliding of the pelvis into posterior pelvic tilt. |
| | If FIXED: Use an immersion style cushion that contours to the shape of the patient to maximize pressure redistribution and minimize peak pressures on the ITs, sacrum, and coccyx. |
| | If FIXED: Consider opening seat-to-back angle in conjunction with a fixed tilt in the wheelchair, to match the patient's ROM limitations and minimize forward sliding. |

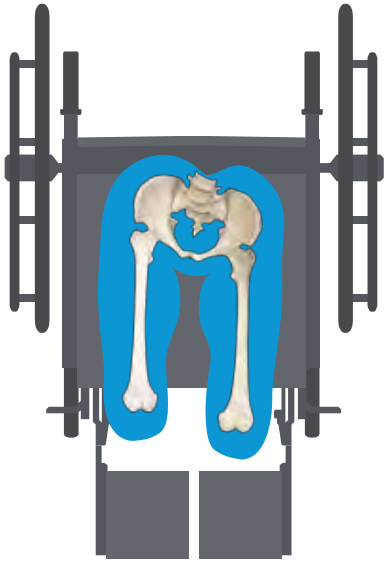
**Refer to Page 30 for more information on Fixed and Flexible postures**

# PELVIC OBLIQUITY



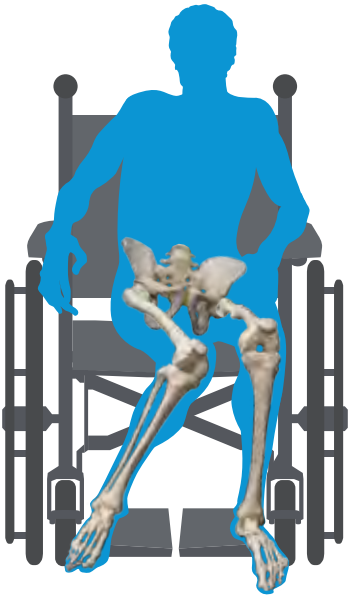
| PELVIC OBLIQUITY | |
|---|---|
| **What is the pelvis doing?** | Pelvis sits with the L or R ASIS higher than the other, causing one hip to raise. |
| **What is the spine doing?** | When one side of the pelvis is raised higher than the other, the thoracic spine curves away from the higher side, creating a scoliosis over time. |
| **What is the head doing?** | The neck will go into lateral flexion as if the person is dropping the ear to his or her shoulder. The lateral flexion will usually be towards the side where the hip is higher. |
| **Goals** | Pressure redistribution is the goal whether the deformity is FIXED or FLEXIBLE. |
| | If FLEXIBLE: level the pelvis by building up the lower side. |
| | If FIXED: accommodate for the deformity. Protect the bony prominences from pressure by "filling in" the higher side and immersing the lower side IT. |

# PELVIC ROTATION



| PELVIC ROTATION | |
|---|---|
| **What is the pelvis doing?** | Pelvis sits with L or R ASIS more forward than the other, producing the rotation in the hips. |
| **What is the spine doing?** | The thoracic spine follows and rotates in the same direction as the pelvis. Therefore, if the right side of the pelvis is rotated more forward, the right side of the spine is rotated more forward as well. |
| **What is the head doing?** | The neck will go into lateral flexion as if the person is dropping the ear to his or her shoulder. |
| **Goals** | Stabilize the pelvis in the patient's most neutral position—adjusting for flexible or fixed postures—to prevent further pelvic rotation. |
| | Consider an anti-thrust cushion to reduce forward migration of the pelvis. |
| | If FLEXIBLE: use tapered adductors and a medial abductor to create leg troughs for midline LE alignment and to maintain a pelvic neutral position. |
| | If FIXED: look for a cushion with less aggressive contouring. Protect the bony prominences with an immersion style cushion. |

# WINDSWEPT POSTURE



| WINDSWEPT POSTURE | |
|---|---|
| **What are the pelvis and LEs doing?** | Usually goes hand in hand with a rotation or an obliquity and causes one leg to adduct and the other leg to abduct, presenting as if the legs were "swept" away together to one side of the chair. |
| **What is the spine doing?** | Will present usually with a rotation or scoliosis, depending on the position of the pelvis. |
| **What is the head doing?** | The neck will go into lateral flexion and may be accompanied by forward flexion. |
| **Goals** | Look for a cushion that can be adjusted (built-up or minimized) to accommodate for internal rotation and adduction of one LE and external rotation and abduction of the opposite LE. |
| | Avoid use of ELRs that decrease femoral contact with seat surface and promote windswept posture. |
| | Windswept posture often accompanies either a rotation or an obliquity, so follow the goals for the underlying causes of this posture. |

# FIXED VS FLEXIBLE POSTURAL ABNORMALITIES

## HOW DO I KNOW WHEN TO CORRECT THE POSTURAL ABNORMALITY AND WHEN TO ACCOMMODATE FOR IT?

Each abnormality is either **FIXED** or **FLEXIBLE**. Understanding whether the postural abnormality is fixed or flexible helps decide if we need to **ACCOMMODATE** for or to **CORRECT** the postural abnormality.

### FIXED = ACCOMMODATE

When a posture is **FIXED**, the skeleton does not move out of that posture. The patient needs equipment that will **ACCOMMODATE** the fixed posture, providing optimal support and pressure redistribution.

**GOAL** = Preventing further progression

### FLEXIBLE = CORRECT

When a posture is **FLEXIBLE**, the skeleton still moves and equipment should be chosen with the goal to **CORRECT** the abnormal posture.

**GOAL** = Prevention from becoming a fixed posture

* **FYI- The standardized terms in the wheelchair seating world are *Non-reducible* for *Fixed* and *Reducible* for *Flexible*.**

- **Why? The term *non-reducible* (vs *fixed*) accounts for the potential worsening of a postural abnormality.**

# ISSUES WITH THE CURRENT WHEELCHAIR SYSTEM CAN CAUSE ABNORMAL POSTURE

## HOW DOES AN IMPROPERLY FITTING WHEELCHAIR IMPACT MY PATIENT'S POSTURE?

The wheelchair can definitely be at fault when the patient is sitting in one of the five abnormal postures. Here is a closer look into seating dimensions and how an ill-fitting wheelchair component can be the culprit behind the body moving into unwanted, harmful postures.



| What is going on? | What can you do? |
|---|---|
| Use this column as your problem list in your evals. | This column gives you ways to address the issues present. Letters referenced correspond to measuring guide on pages 46-54. Use those measurements to find the appropriate wheelchair dimension to fit your patient's body size. |

# SEAT DIMENSION

## Wheelchair seat width and depth are crucial to proper pelvic and LE alignment

### WIDTH: TOO WIDE

| What is going on? | Negative Result | What can you do? |
|---|---|---|
| Patient leans to one side to increase stability. Pelvis will be lower on that side | Pelvic obliquity | Measure hip width (C) |
| Pelvis collapses | Posterior pelvic tilt, aka sacral sitting | Measure hip width (C) |
| Pelvic collapse causes hips to internally rotate and LEs to excessively adduct | Strain & contracture risk at hip joints<br>Pressure injury risk at medial knees where knees rub together | Find a cushion with medial abduction and lateral adduction contours to maintain LE alignment |
| LEs "sweep" to one side when LE weakness is present | Windswept positioning of LEs | Measure hip width (C)<br>Find a cushion with medial abduction and lateral adduction contours to maintain LE alignment |

### WIDTH: TOO NARROW

| What is going on? | Negative Result | What can you do? |
|---|---|---|
| Excess pressure at trochanter from contact with the chair | Pressure injury risk at the trochanter | Measure hip width (C)<br>Look for a skin protection cushion that immerses the trochanters |
| Patient rotates hips to "fit" into the chair | Pelvic rotation | Measure hip width (C) |
| Patient "sweeps" LEs to one side trying to avoid a buildup of pressure on the trochanters | Windswept posture of LEs | Measure hip width (C)<br>Find a cushion with medial abduction and lateral adduction contours to maintain LE alignment |

# SEAT DIMENSION

## HAMMOCKING SEAT SLING

| What is going on? | Negative Result | What can you do? |
|---|---|---|
| Pelvis collapses | Posterior pelvic tilt, aka sacral sitting | Add Rigid Insert |
| Patient seeks out one side of wheelchair for stability | Pelvic obliquity | Add Rigid Insert |
| Patient compensates by rotating pelvis for stability | Pelvic rotation | Add Rigid Insert |
| LEs "sweep" to one side | Windswept posture of LEs | Add Rigid Insert |

## DEPTH: TOO DEEP

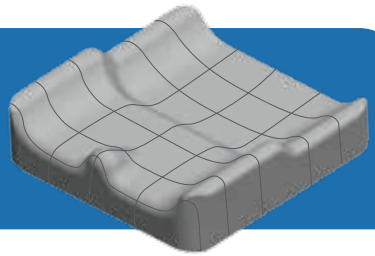
| What is going on? | Negative Result | What can you do? |
|---|---|---|
| Seat sling digs into the back of legs, causing pain<br>Patient will slide forward to alleviate the pain | Posterior pelvic tilt, aka sacral sitting | Measure upper leg length (K) minus 2" |
| Seat sling digs into the back of legs, decreasing circulation, increasing LE edema<br>Patient slides forward to alleviate numbness | Posterior pelvic tilt, aka sacral sitting | Measure upper leg length (K) minus 2" |
| Foot propulsion more difficult, patient slides forward for better heel strike | Posterior pelvic tilt, aka sacral sitting | Measure upper leg length (K) minus 2" |
| Patient slides forward immediately after repositioning | Posterior pelvic tilt, aka sacral sitting | Measure upper leg length (K) minus 2" |

*** At a minimum, use a MWC that has seat depth adjustability: K0004**

## DEPTH: TOO SHALLOW

| What is going on? | Negative Result | What can you do? |
|---|---|---|
| Decreased femoral contact and LE support | Windswept posture, abduction, or adduction of LEs | Measure upper leg length (K) minus 2”<br>Find a cushion with medial abduction and lateral adduction contours to maintain LE alignment |
| Reduced area for pressure redistribution results in increased pressure at the ITs, sacrum, and coccyx | Pressure injury risk at ITs, sacrum, and coccyx | Measure upper leg length (K) minus 2”<br>Look for a skin protection cushion that immerses and/or offloads the bony prominences |
| Pelvis collapses inward due to lack of LE support to ensure pelvic alignment<br>Hips internally rotate and LEs excessively adduct | Strain & contracture risk at hip joints<br>Pressure injury risk at medial knees where knees rub together | Measure upper leg length (K) minus 2”<br>Find a cushion with medial abduction and lateral adduction contours to maintain LE alignment |

* **When LE alignment is an issue: think CONTOURS when choosing a cushion!**



# SEAT-TO-FLOOR HEIGHT (STFH)

## STFH is crucial for proper pelvic alignment, LE alignment, and heel strike for self-propulsion

**Below is a quick reference to match lower leg length to wheelchair model for proper STFH**

| Wheelchair Model | Achievable STFH | Lower Leg Length Required to Fit MWC |
|---|---|---|
| K0001 | 21” | 23” or longer |
| K0002 | 19” | 21” or longer |
| K0003 | 17” - 19” | 19” or longer |
| K0004 | As low as 13.5” (most 14.5″) | 15.5” or longer (16.5″) |
| K0005 | Completely Customizable | Any lower leg length |

*** At minimum, use a MWC with STFH adjustability: K0004**

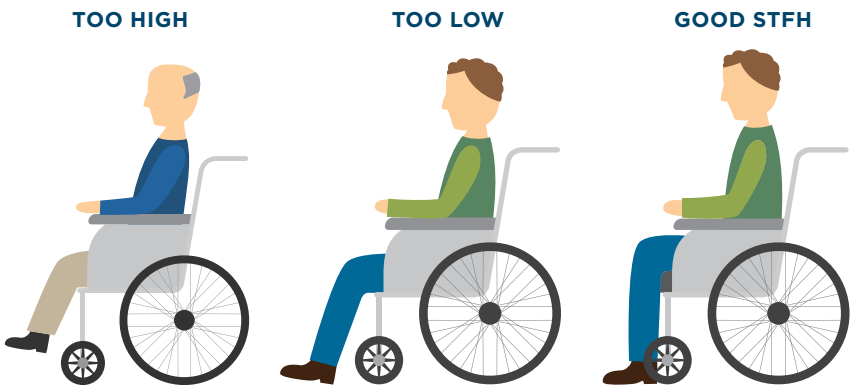
## STFH: TOO LOW

| What is going on? | Negative Result | What can you do? |
|---|---|---|
| Leg rests are shortened to compensate for lack of threshold clearance<br><br>Knees are higher than the hips, causing decreased femoral contact with the seat surface and LEs “sweep” to one side | Windswept positioning of LEs | Measure lower leg length (L)<br>Use a higher profile cushion<br>Use a wedge cushion if they can tolerate the hip flexion<br>Find a cushion with medial abduction and lateral adduction contours to maintain LE alignment |
| Knees are higher than hips, increasing peak pressure at ITs, sacrum, and coccyx | Pressure injury risk at ITs, sacrum, and coccyx | Measure lower leg length (L)<br>Use a higher profile cushion<br>Look for a skin protection cushion that immerses and/or offloads the bony prominences |
| On a chair without leg rests, feet can drag and get caught under chair during propulsion or transport | Patient can be thrown out of chair or injury to LEs can occur | Measure lower leg length (L)<br>Use a higher profile cushion |

## STFH: TOO HIGH

| What is going on? | Negative Result | What can you do? |
|---|---|---|
| Foot propulsion is more difficult so patient slides forward for better heel strike | Posterior pelvic tilt, aka sacral sitting | Measure lower leg length (L)<br>Use a lower profile cushion |
| Increased pressure at distal thigh, increasing risk of LE edema, patient slides forward to reduce numbness and pain | Posterior pelvic tilt, aka sacral sitting | Measure lower leg length (L)<br>Use a lower profile cushion |
| Patient rotates forward on one side for better heel strike of one foot | Pelvic rotation | Measure lower leg length (L)<br>Use a lower profile cushion |
| Feet "dangle" | Increased internal rotation and adduction of the hip | Measure lower leg length (L)<br>Use a lower profile cushion<br>Find a cushion with medial abduction and lateral adduction contours to maintain LE alignment |
| Patient slides forward to alleviate strain on pelvis and knees | Posterior pelvic tilt, aka sacral sitting | Measure lower leg length (L)<br>Use a lower profile cushion |

*** Choose a higher or lower profile cushion to compensate for incorrect STFH if switching out the MWC just isn't an option!**




Refer to Page 53 for more information on measuring for proper STFH

# BACK SUPPORT

## An appropriate back support can: align the spine, provide pelvic stability, decrease risk of pressure injury development and pain, and improve function.

When choosing appropriate back support height, define your **GOAL** for the patient:

- If ***positioning*** is the objective, then measure seat to top of shoulder height (G) to choose a back support that can provide optimal trunk stabilization.
- If ***self-propulsion*** for a patient with good trunk strength is the goal, measure seat to inferior angle of scapula (H) for increased freedom of movement and access to the wheels.

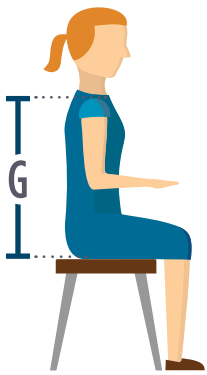
### HEIGHT: TOO LOW
**This causes insufficient stability for a patient with poor trunk strength and balance**

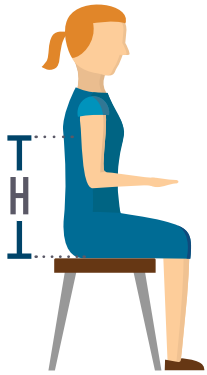
| What is going on? | Negative Result | What can you do? |
|---|---|---|
| Patient slides down in the chair, seeking more surface area for increased stability | Posterior pelvic tilt with kyphosis of the thoracic spine | Measure seat to top of shoulder (G) or Seat to inferior angle of scapula (H)<br>Provide an appropriately sized contoured back support for added stability that allows for immersion and envelopment of patient's curvature |
| Patient seeks out one arm rest to gain more stability | Pelvic obliquity with scoliosis of the spine | Measure seat to top of shoulder (G) or Seat to inferior angle of scapula (H)<br>Provide an appropriately sized contoured back support for added stability that allows for immersion and envelopment of patient's curvature |
| Patient rotates spine and pelvis to seek out more stability on one side of the body | Pelvic rotation with rotation of the spine | Measure seat to top of shoulder (G) or Seat to inferior angle of scapula (H)<br>Provide an appropriately sized contoured back support for added stability that allows for immersion and envelopment of patient's curvature |

## HEIGHT: TOO HIGH/TOO UPRIGHT

| What is going on? | Negative Result | What can you do? |
|---|---|---|
| Patient with poor core strength will slide down to alleviate fatigue | Posterior pelvic tilt with kyphosis of the thoracic spine | Measure seat to top of shoulder (G) or Seat to inferior angle of scapula (H)<br>Open seat-to-back angle either through back support hardware or by adjusting the back canes in a MWC with that option<br>Provide an appropriately sized contoured back support for added stability that allows for immersion and envelopment of patient's curvature |
| Sitting too upright pushes the trunk forward resulting in instability | Anterior pelvic tilt with lumbar lordosis initially. Eventually slides into a posterior pelvic tilt | Measure seat to top of shoulder (G) or Seat to inferior angle of scapula (H)<br>Open seat-to-back angle either through back support hardware or by adjusting the back canes in a MWC with that option<br>Provide an appropriately sized contoured back support for added stability that allows for immersion and envelopment of patient's curvature |

*** Another reason to choose a K0004 MWC at a minimum, is the ability to adjust seat-to-back angle. This helps to alleviate fatigue of the trunk muscles and reduce the sensation of being pushed out of the chair.**




Refer to Pages 51-52 for more on measuring for a proper back support

# LEG REST

**Properly fitting leg rests not only provide a place to rest the feet, they:**

- **Stabilize the LEs for optimal pelvic and spine alignment**
- **Promote femoral contact for pressure redistribution away from the bony prominences to reduce risk of pressure injuries**

## USE OF ONLY ONE LEG REST

| What is going on? | Negative Result | What can you do? |
|---|---|---|
| Pelvis is higher on the side with the leg rest | Pelvic obliquity | Add second leg rest if positioning is your goal |
| One-legged heel strike for propulsion | Pelvic rotation | Add second leg rest if positioning is your goal |
| LEs "sweep" toward the side with the leg rest | Windswept positioning of LEs | Add second leg rest if positioning is your goal |

✱ **Sometimes only one leg rest is necessary, but having only one can cause the above issues. We can't have our cake and eat it too. When considering the addition of a second leg rest, decide what is more important: one-legged propulsion OR the prevention of a postural abnormality.**

## UNEQUAL FOOT PLATE HEIGHTS

| What is going on? | Negative Result | What can you do? |
|---|---|---|
| Unequal foot plate heights cause one side of the pelvis to be higher | Pelvic obliquity | Adjust foot plate heights to be even |

## LEG REST TOO SHORT/FOOT PLATE TOO HIGH

| What is going on? | Negative Result | What can you do? |
|---|---|---|
| Decreased femoral contact, which increases peak pressure at the ITs, sacrum, and coccyx | Pressure injury risk at ITs, sacrum, and coccyx | Measure lower leg length (L)<br>Lengthen leg rest/lower foot plate<br>Look for a skin protection cushion that immerses and/or offloads the bony prominences |
| Decreased femoral contact causes LEs to "sweep" to one side | Windswept positioning of LEs | Measure lower leg length (L)<br>Lengthen leg rest/lower foot plate<br>Find a cushion with medial abduction and lateral adduction contours to maintain LE alignment |
| Decreased femoral contact increases hip flexion, pulling downward on the pelvis | Posterior pelvic tilt, aka sacral sitting<br>Shortened hamstrings | Measure lower leg length<br>Lengthen leg rest/lower foot plate |

## LEG REST TOO LONG/FOOT PLATE TOO LOW

| What is going on? | Negative Result | What can you do? |
|---|---|---|
| Patient slides forward and stretches legs to reach foot plates | Posterior pelvic tilt, aka sacral sitting | Measure lower leg length (L)<br>Shorten leg rest/raise foot plate |
| Promotes sacral sitting, adding pressure directly onto the ITs, sacrum, and coccyx | Pressure injury risk at ITs, sacrum, and coccyx | Measure lower leg length (L)<br>Shorten leg rest/raise foot plate<br>Look for a skin protection cushion that immerses and/or offloads the bony prominences |
| Patient stretches foot & ankle downward to reach a foot plate that is too low, promoting ankle plantar flexion & inversion | Contracture risk of ankle joint | Measure lower leg length (L)<br>Shorten leg rest/raise foot plate<br>Use a single or double foot support |
| Patient stretches to reach the foot plate, only the ball of the foot makes contact with the foot plate | Risk of eliciting abnormal reflexes and tone | Measure lower leg length (L)<br>Shorten leg rest/raise foot plate<br>Use a single or double foot support |

# ARM REST

## Properly adjusted arm rests serve many functions:

- A place to rest UEs
- Contribute to overall trunk stability and upright posture when muscle weakness is present
- Facilitates ease of transfers

## HEIGHT: TOO LOW

| What is going on? | Negative Result | What can you do? |
|---|---|---|
| Patient slides down in chair to make contact with arm rests | Posterior pelvic tilt with kyphosis of the thoracic spine | Measure seat to elbow (I) and adjust arm rest height accordingly |
| Patient leans to one side, seeking more support: pelvis on that side will be lower | Pelvic obliquity with scoliosis of the spine | Measure seat to elbow (I) and adjust arm rest height accordingly |
| Excessive shoulder depression to make contact with arm rest allows gravity to pull at shoulder joint | UEs are placed in in lap | Measure seat to elbow (I) and adjust arm rest height accordingly |

## HEIGHT: TOO HIGH

| What is going on? | Negative Result | What can you do? |
|---|---|---|
| Excessive elevation of shoulder to place arms on arm rests | Shoulder internal rotation and abduction causing pain, numbness, and contracture risk | Measure seat to elbow (I) and adjust arm rest height accordingly |
| Patient leans against arm rest seeking stability versus placing arm on arm rest | Lateral leaning of trunk | Measure seat to elbow (I) and adjust arm rest height accordingly |
| Patient places UEs in lap to avoid discomfort of shoulder elevation | Posterior pelvic tilt with kyphosis of the thoracic spine | Measure seat to elbow (I) and adjust arm rest height accordingly |

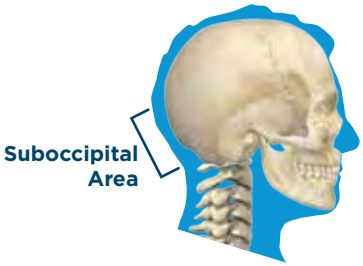
*** Use a MWC with arm rest adjustability. Choose a K0004 at a minimum.**

# HEAD SUPPORT

Proper head support is important for:

- Socialization and Communication
- Safe Swallowing
- Respiration
- Attention to Task
- Mobility

A standard posterior head support pad should be positioned in the suboccipital area with the goal to prevent excessive extension, rotation, or lateral flexion.




## TOO HIGH

| What is going on? | Negative Result | What can you do? |
|---|---|---|
| The pad will rest on the occipital area or above, causing strain on the neck | Patient will try to adjust by moving the head away from the pad | Place pad in suboccipital area |

## TOO LOW

| What is going on? | Negative Result | What can you do? |
|---|---|---|
| The pad will rest on the cervical spine, resulting in poor posterior support | Head extension | Place pad in suboccipital area |

✱ **Look for a head support that will simultaneously support the head posteriorly and laterally and is height and angle adjustable.**

# THE THERAPY EVALUATION: THE PIECES REQUIRED TO JUSTIFY WHEELED MOBILITY AND SEATING EQUIPMENT

## HOW IS A SEATING EVALUATION DIFFERENT THAN A TYPICAL OT/PT EVAL?

### Don't let the term "Seating Evaluation" scare you!!

In addition to your typical evaluation, you **MUST** assess and document the following:

**HOME ENVIRONMENT:**
Measurements of doorways, table height, bed height, stairs, etc

**TRANSPORTATION:**
Document what kind of car they drive and/or ride in

**MOBILITY SKILLS:**
How do they currently get around to perform their daily tasks? Be descriptive (efficiency, ability)

**CURRENT SEATING/ MOBILITY:**
Describe ALL current equipment and the condition of each

**MEASUREMENTS:**
Complete the 8 key patient measurements to ensure proper fitting equipment

**EQUIPMENT TRIALS:**
Explain why a lesser product will not work and how the selected product increases independence in the home

*** When documenting your evaluation, be as descriptive as possible. Describe their posture while sitting, what posture is required for optimal independence with ADLs, and how the proper equipment can maximize function and minimize pain.**

- Understand that you are doing your typical OT/PT evaluation and adding a few components to your documentation
- Assess limitations in ROM, strength, balance, and endurance and how they affect posture in the wheelchair
- Choose an appropriate wheelchair model that allows for adjustability, seat cushion, back support, head support, and accessories to address the patient's physical limitations
- Schedule a visit with your trusted ATP/Dealer to trial equipment with your patient

*** Is there a postural abnormality? Decide if that postural abnormality is flexible or fixed. Should your goal be to correct or accommodate it?**

## Goals of a therapist when fitting a patient for a wheelchair:

- Provide pelvic and trunk stability
- Optimize function for ADLs
- Protect the skin to prevent and/or heal existing pressure injuries
- Maximum comfort for patient
- Minimize unwanted movement
- Correct or accommodate for postural abnormalities
- Prevent the progression of postural abnormalities

# HOW TO MEASURE FOR PROPERLY FITTING WHEELCHAIR COMPONENTS:

## WHAT SHOULD I KNOW TO TAKE THE MEASUREMENTS NEEDED?

### Measuring Tips

- All measurements should be taken while sitting on a firm, flat surface in the posture the therapist is trying to accomplish for the patient.
- Measure using a hard measuring tape, not one that can bend and wrap around the patient's body. This will lead to measurement errors, adding circumference or length.
- All measurements should be taken straight across the body.
- Use a measurement form to remind you of the measurements needed and to record them properly.

*** Don't forget to include excess tissue in all measurements and measure the patient in their ideal posture**

*** Don't forget to look for hip contractures and tight hamstrings during the evaluation. They are often the culprits of poor pelvic positioning!**

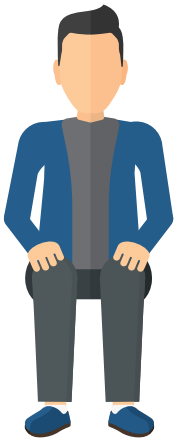
# WHAT ARE THE MEASUREMENTS THAT I NEED TO TAKE?

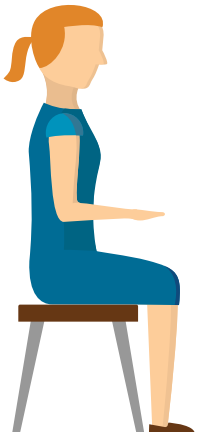
You will need to perform the following required measurements when choosing the best fitting equipment. Copy the easy to use measurement form on pages 47-48 to document your findings in the field.

## Measuring Guide

Letters refer to the measurement form on 47-48

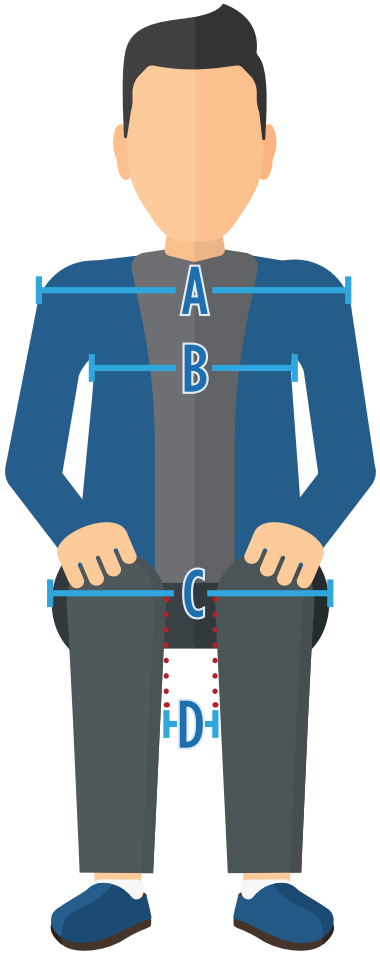
- **SHOULDER WIDTH** (A)
- **CHEST WIDTH** (B)
- **HIP WIDTH** (C)
- **BETWEEN THE KNEES** (D)
- **TOP OF HEAD** (E)
- **OCCIPUT** (F)
- **SEAT TO TOP OF SHOULDER** (G)
- **INFERIOR ANGLE OF SCAPULA** (H)
- **SEAT TO ELBOW** (I)
- **ELBOW TO TIP OF FINGERS** (J)
- **UPPER LEG LENGTH** (K)
- **LOWER LEG LENGTH** (L)
- **FOOT LENGTH** (M)





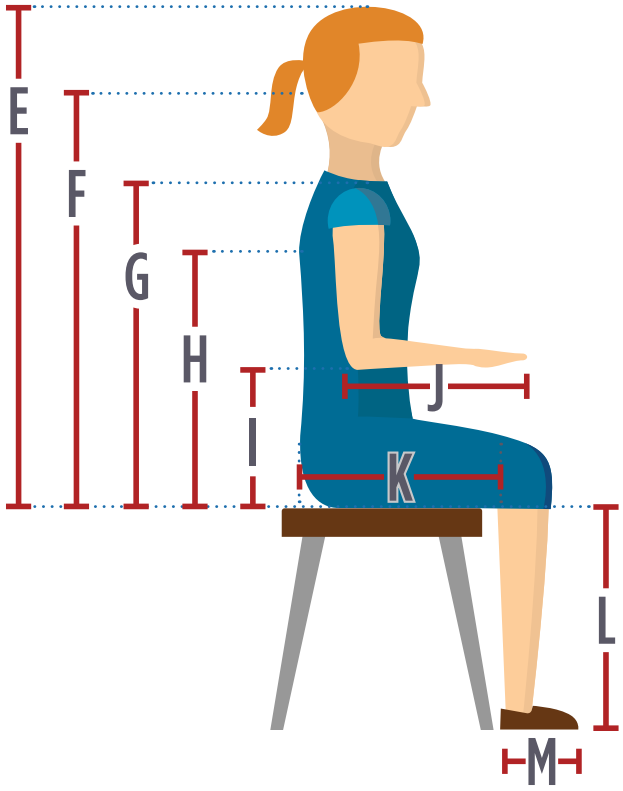
Don't worry!!! Keep reading, we will walk you through the list. And if you're short on time, we offer a solution.

# Measuring Guide




| | |
|---|---|
| **A - Shoulder Width *** | |
| **B - Chest Width *** | |
| **C - Hip Width *** | |
| D - Between Knees | |

*There are 8 MUST HAVE Measurements



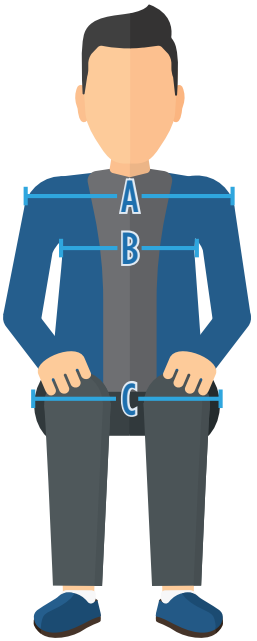

| | |
|---|---|
| E - Top of Head | |
| F - Occiput | |
| **G - Seat to Top of Shoulder *** | |
| **H - Inferior Angle of Scapula *** | |
| **I - Seat to Elbow *** | |
| J - Elbow to Tip of Fingers | |
| **K - Upper Leg Length *** | |
| **L - Lower Leg Length *** | |
| M - Foot Length | |

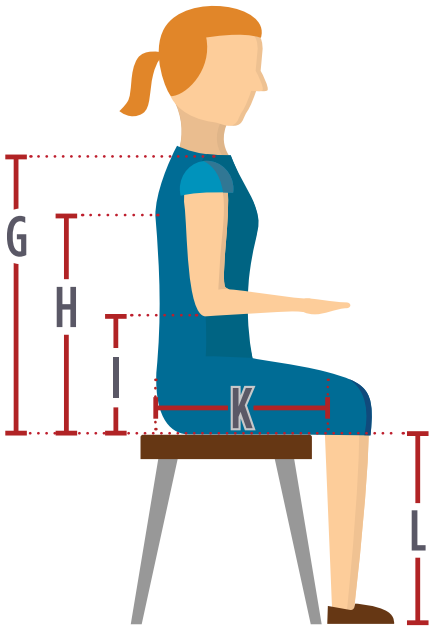
# WHAT IF I DON'T HAVE ENOUGH TIME TO TAKE ALL THE MEASUREMENTS?

Since time is a constraint, the top 8 measurements you MUST do are:

- **Shoulder Width (A)**
- **Chest Width (B)**
- **Hip Width (C)**
- **Seat to Top of Shoulder (G)**
- **Inferior Angle of Scapula (H)**
- **Seat to Elbow (I)**
- **Upper Leg Length (K)**
- **Lower Leg Length (L)**

These will allow you to match a wheelchair, including a cushion and back support, to your patient.

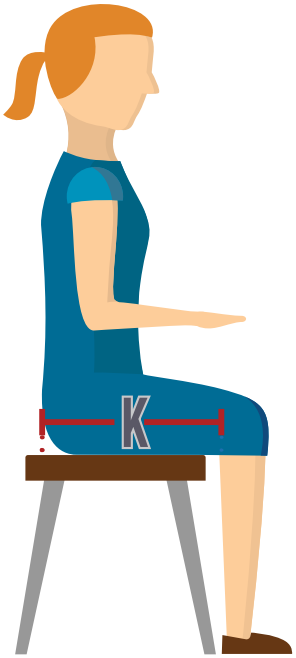


*REMEMBER TO HAVE PATIENT SITTING ON A FLAT, FIRM SURFACE FOR ACCURATE MEASUREMENTS*

# SEAT DIMENSION


WIDTH




DEPTH: K - 2"

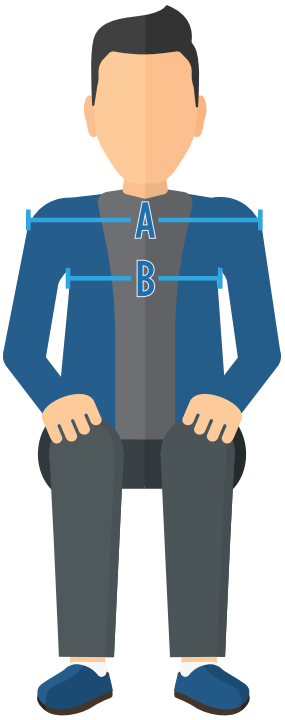
## HOW TO MEASURE WIDTH:

- Measure from widest point to widest point of the hips, including all residual tissue

## HOW TO MEASURE DEPTH:

- Measure from the buttocks, including any excess tissue, across the femur to the popliteal fossa
- Then subtract 2”

# BACK SUPPORT WIDTH



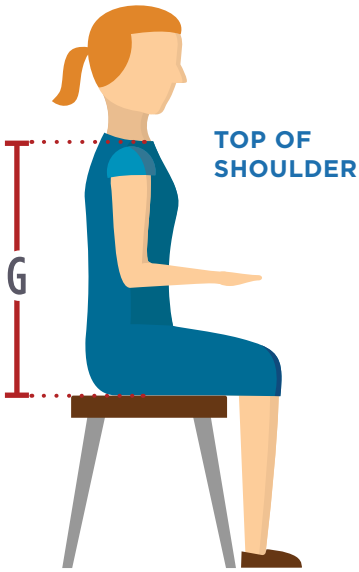

## HOW TO MEASURE SHOULDER WIDTH (A):

- Measure from humeral head to humeral head, incorporating excess tissue

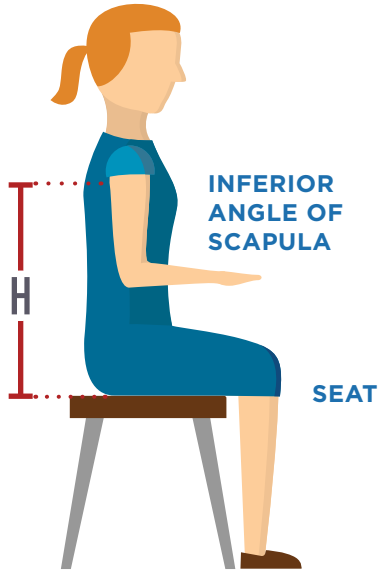
## HOW TO MEASURE CHEST WIDTH (B):

- Measure from axilla to axilla

# BACK SUPPORT HEIGHT




PATIENT NEEDS A POSITIONING BACK DUE TO POOR TRUNK STRENGTH




PATIENT IS A SELF PROPELLER WITH GOOD TRUNK STRENGTH

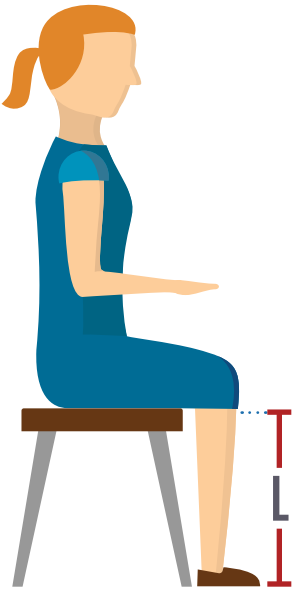
## HOW TO MEASURE HEIGHT:

- Measure the person in the position you are striving to achieve

* **Measure both sides L & R in case of scoliosis and/or a pelvic obliquity**

* **An average back support height for a self propeller is 16” tall, unless you have an active client who requires more freedom of movement and is more independent.**

# SEAT-TO-FLOOR HEIGHT
## (STFH, AKA LOWER LEG LENGTH)



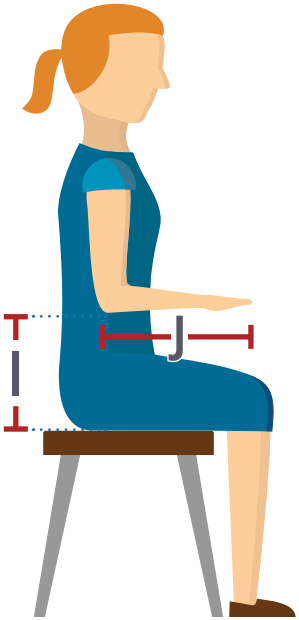
### HOW TO MEASURE:

- Measure from the top of the patient's seat (top of cushion if applicable) to the floor
- Measure with feet on floor (with shoes that they normally wear or barefoot if they do not normally wear shoes) and measure bottom of foot/shoe to popliteal fossa

*** There must be a 2" clearance between foot plate and floor to clear thresholds**

*** If providing the patient with a new cushion, remember to consider the thickness of the desired cushion and adjust STFH accordingly.**

# ARM REST



## HOW TO MEASURE HEIGHT (I):

- Seat your patient with shoulder in neutral and elbow bent at his or her side to 90°
- Measure from top of seat to under forearm/ elbow

*** Measure both side in case of pelvic obliquity/ scoliosis. This will justify the need for a model of wheelchair with adjustable height arm rests.**

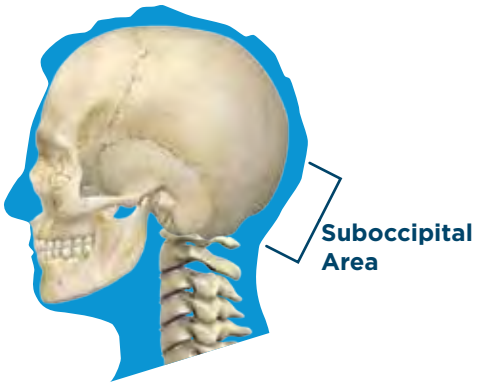
- If patient needs a specialized arm length (J), measure from end of elbow to where the therapist wants the desired replacement arm support to end

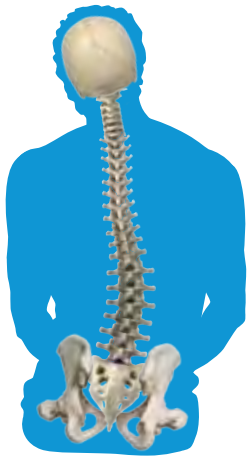
# HEAD SUPPORT

## HOW TO MEASURE HEIGHT:

## There is no miracle formula for fitting a patient for a proper head support

- The rest of the body must be in the best alignment possible before trying to fit for a head support
- Remember that head position changes constantly with the slightest body movement
- Aim to position the pad in the suboccipital area
- Choose a head support with lateral, anterior/ posterior, height, and angle adjustability



✱ **Head support hardware that has offset capabilities accommodates patients with head position out of midline.**

# CHOOSING A WHEELCHAIR SEAT CUSHION

## HOW DO I KNOW WHAT CUSHION TO CHOOSE FROM THE HUNDREDS OUT THERE?

The first step is knowing **what your client qualifies for**. This is determined by diagnosis and documented postural presentation. There are resources that can help you find the right code but don't be afraid to ask for help from your trusted ATP/dealer!

**Once you know the code, you still have so many options. What then?**

There are three areas to understand when choosing a wheelchair seat cushion:

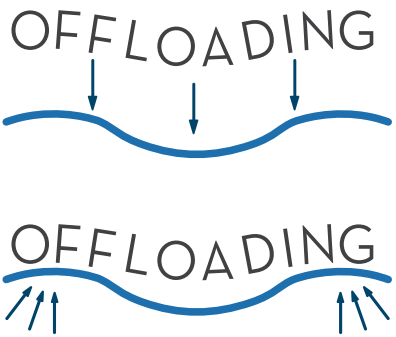
- **Methods of Pressure Redistribution**
- **Cushion Geometry**
- **Cushion Medium**

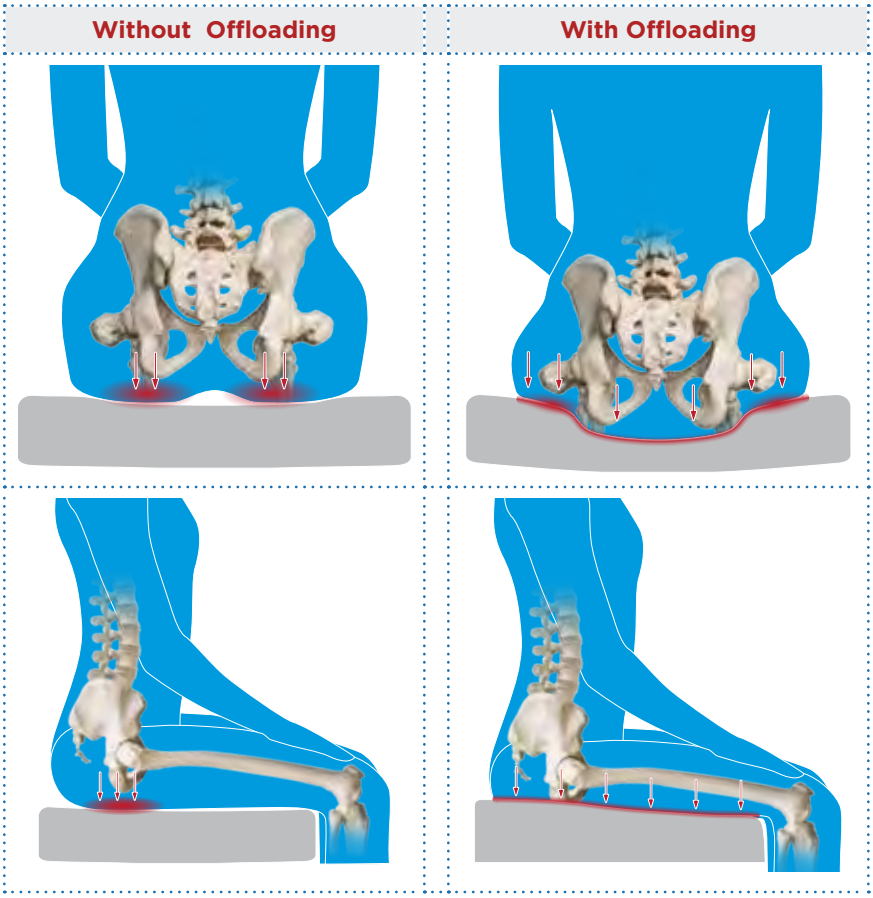
*** When choosing a cushion, always keep in mind your goals for the pelvis. For example, if the pelvis is in a *FIXED* posture, your goal is to *ACCOMMODATE* that posture through cushion geometry and medium. If the pelvis is *FLEXIBLE*, you will look for contours and a medium that can *CORRECT* the pelvic position.**

# METHODS OF PRESSURE REDISTRIBUTION

## Offloading

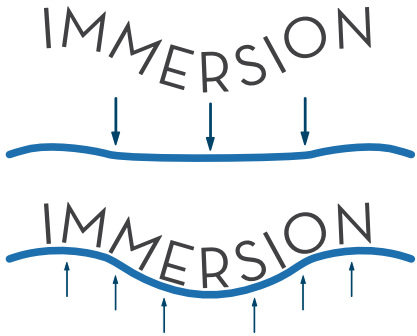
The principle of **taking pressure off of a small surface area** and **loading it onto a greater surface area** that can withstand more pressure and prevent unwanted skin breakdown

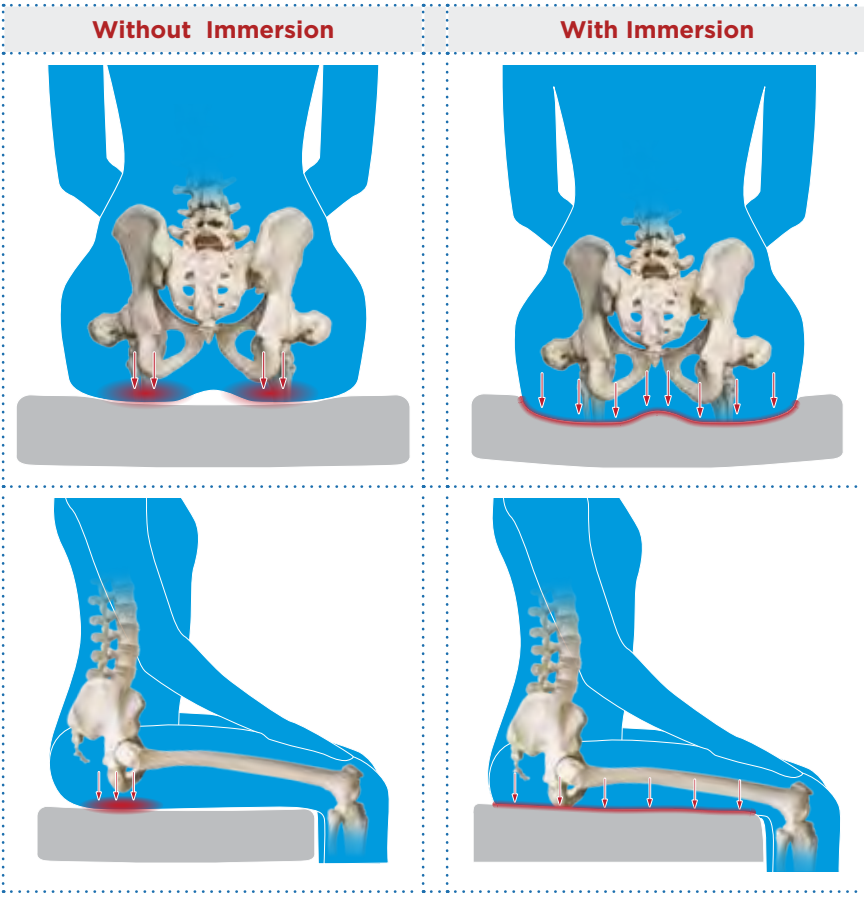


# Immersion

The principle of **conforming** to the person's curvature by "sinking the body in." We allow the cushion and/or back support to take the body's shape, **alleviating the bony prominences** from **unwanted peak pressure** to maximize **pressure redistribution**



## BENEFITS AND CONSIDERATIONS OF USING AN OFFLOADING CUSHION

| Benefits | Considerations |
|---|---|
| Firmer surface, creating a "safer" end feel for the patient | May not be suitable for someone with hypersensitivity due to the firm end feel; depends on personal preference |
| Partially or completely suspends the ITs, sacrum, and coccyx for pressure relief | Since the nature of the contours adds more stability, it may be more difficult for independent transfers |
| Redistributes pressure to the trochanters and femurs, areas with greater surface area that can withstand more pressure | Someone with significant contractures may not "fit" the pre-contoured shape |
| Provides more stability to someone lacking trunk or pelvic strength to prevent unwanted movement | Not good for patients with trochanter wounds since pressure is redistributed to that area |

## BENEFITS AND CONSIDERATIONS OF USING AN IMMERSION CUSHION

| Benefits | Considerations |
|---|---|
| Less firm surface, creating a "softer" end feel for the patient, may be an ideal solution for pain management | Less stable surface that may not be suitable for someone with trunk and pelvic weakness, causing fatigue with prolonged, upright posture |
| Envelops or captures the exact curvature of the pelvis to increase pressure redistribution over the largest area possible | May not be suitable for someone who desires proprioceptive input from a firmer surface to maintain an upright, midline posture |
| Good for any type of pressure injury at any stage, depending on the medium | |
| May be easier for independent transfers | Some immersion style cushions require more maintenance, and if not properly maintained, can increase risk of a pressure injury |
| Reduces peak pressures at the bony prominences (ITs, sacrum, and coccyx) | |

# CUSHION GEOMETRY

## Linear

- Refers to a flat seat cushion
- Can be foam layers, foam with gel, or air

LINEAR

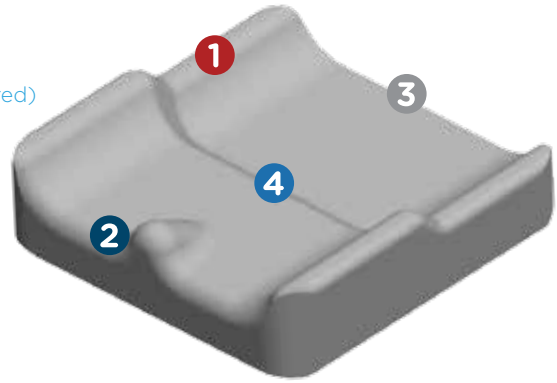


*** When choosing a linear cushion, the medium is CRITICAL! Choose a high quality medium that will allow for immersion and envelopment of the bony prominences.**

## Contoured

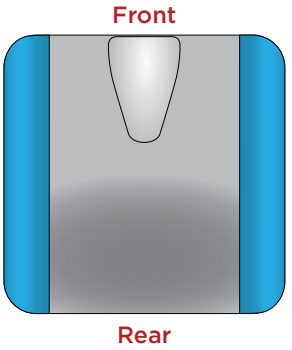
Contoured cushions are made of up various geometric components:

1. **Adductors: Tapered or Straight**
2. **Medial Abductor**
3. **Posterior Pelvic Well**
4. **Anti-Thrust**
5. **Wedge** (Not Pictured)



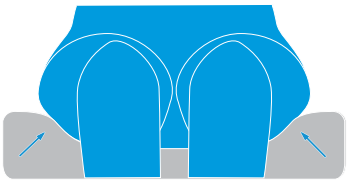

Refer to page 65 for the benefits and considerations of each style of cushion geometry

# 1 ADDUCTORS



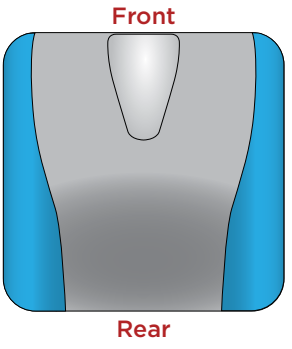

## Straight

- Can be rear, front, or entire length of cushion
- Act as a boundary to assist with LE alignment
- Minimize abduction of LEs



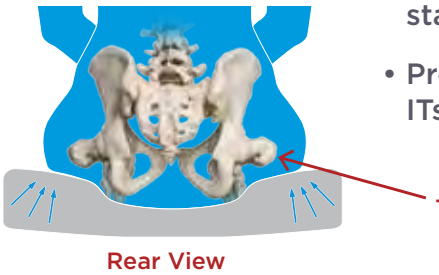

### Benefits of using Straight Adductors:

- Provides proprioceptive input and a boundary to the lateral surface of the leg to help with LE alignment




## Tapered

- Wider in the rear to form a shelf where the trochanters sit
- Allows for loading of trochanters and femurs for pressure redistribution
- Locks the head of the femur into the acetabulum, stabilizing the pelvis
- Promotes offloading of the ITs, sacrum, and coccyx

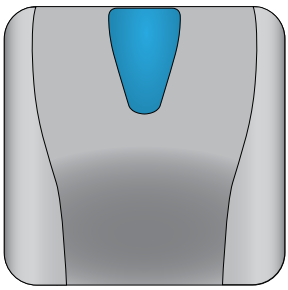


## Benefits of using Tapered Adductors:

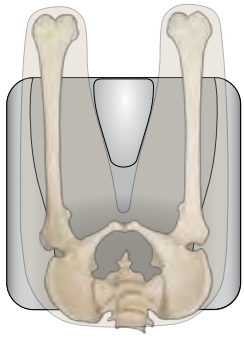
- Optimal offloading
- Pelvic stability for patients with trunk and pelvic weakness
- Prevents unwanted shifting in chair PLUS pressure redistribution

# ❷ MEDIAL ABDUCTOR

Front



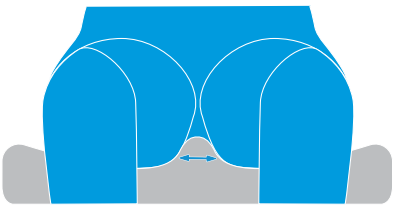
Rear



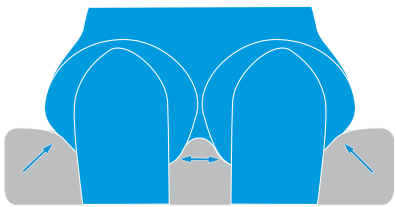
Top View

## Abductor

- Minimizes adduction of LEs and promotes LE alignment
- Helps create leg troughs when combined with adductors



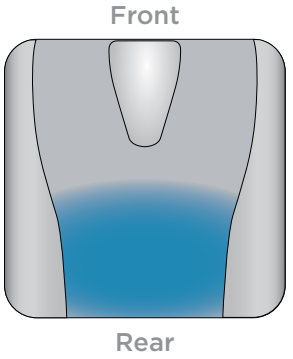
Front View



Front View

✻ Always consider the anatomical shape of your patient and whether he or she will fit in the contours.

# 3 POSTERIOR PELVIC WELL



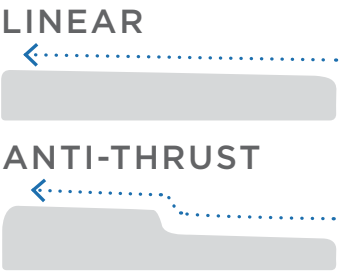


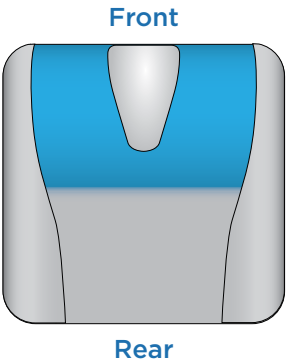
### What does a Posterior Pelvic Well do?

- Delineates where the pelvis is supposed to be on the cushion for stabilization and pressure redistribution
- Works in combination with lateral tapered adductors to create a deeper pelvic well, which will offload and suspend the ITs, sacrum, and coccyx

# 4 ANTI-THRUST

## LINEAR VS ANTI-THRUST




### What does an Anti-Thrust do?

- Provides a boundary to minimize forward migration of the ITs into a posterior pelvic tilt
- Often used when extensor tone is present
- Standard placement is half the depth of the cushion to allow for 1" – 1½" from ITs to the front edge of anti-thrust

# 5 WEDGE

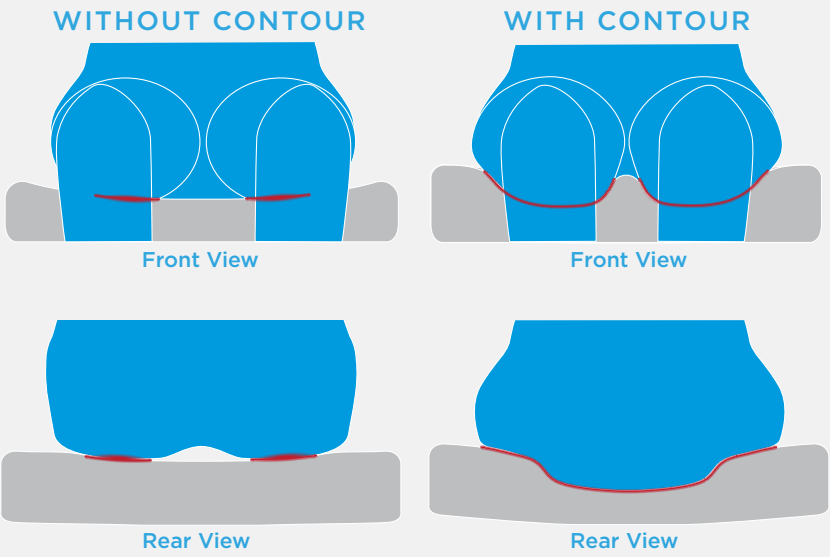
## LINEAR VS WEDGE


### What does a Wedge do?

- Used to close the seat-to-back angle and reduce extensor tone
- Used to maintain pelvic positioning for certain pelvic abnormalities
- Can be used to increase STFH for someone with long LEs

**Now take a look at what cushion contouring does for pressure redistribution**

Contours increase surface area contact with the patient minimizing peak pressures.



## BENEFITS AND CONSIDERATIONS OF USING A LINEAR CUSHION

| Benefits | Considerations |
|---|---|
| Allows freedom of movement | If using traditional gel, it disperses over time, exposing the bony prominences to peak pressures |
| Fits any body type | Over time, low quality foam compresses and loses its shape resulting in increased peak pressures |
| Can accommodate for contractures if using an immersion style | If using air, look for a cushion that provides stability through its construction and does not require frequent maintenance |
| Immersion style provides envelopment of bony prominences | Decreased stability resulting in fatigue over time |
| | Often needs to be used with a rigid insert in a sling seat |

## BENEFITS AND CONSIDERATIONS OF USING A CONTOURED CUSHION

| Benefits | Considerations |
|---|---|
| Promotes pressure redistribution to greater surface areas, reducing peak pressures | Various body shapes & sizes may not always fit in the contours |
| | May not fit someone with significant contractures |
| Increased stability, securing pelvis in optimal position | May restrict freedom of movement during ADLs |
| Can accommodate or correct abnormal postures | Aggressive contours may make independent transfers more difficult |

# CUSHION MEDIUM

Understand the available mediums when choosing a cushion. No matter the contours, the quality of the medium will affect the application of the cushion. Each has benefits and considerations, and we will look at each one.

## Cushion Mediums:

- **Foam**
- **Air**
- **Honeycomb**
- **Gel/Fluid Inserts**
- **Combination**

## Considerations

**Weight of the cushion-** Each medium has different properties, making them lighter or heavier.

**Support/Stability Needs-** Each medium has different qualities that make them more or less supportive, which impacts how long a patient can sit in their chair, ease of transfers, and pelvic posture when weakness is present. Remember to think of the functional and postural goals of your patient!

✱ **Foam is not foam is not foam! The quality and properties of foam affect the application and effectiveness of a cushion. Be an advocate for your patients and CHOOSE QUALITY PRODUCTS!**

# FOAMS TYPICALLY USED IN CUSHIONS

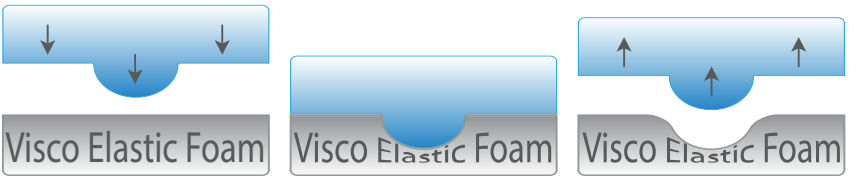
## HIGH RESILIENCY (HR) FOAM

- Instantly "springs" back to its original shape post compression
- Durable foam, can withstand repeated compression and maintains resiliency over time
- Provides structure and stability
- Great for use as the **base** of a cushion


Before Compression | During Compression | After Compression

## VISCO ELASTIC FOAM

- Memory foam, meaning it takes time to resume the original shape post compression
- Allows for the most immersion and envelopment, contouring to the unique shape of the user
- Great to use as top layer of a cushion




Before Compression | During Compression | After Compression

✱ **Density is the measure of quality for foam. A density of 1-3 pounds is considered good for heavy use. What you need to know is, you get what you pay for. WHEN THE COST OF A CUSHION SEEMS TOO GOOD TO BE TRUE, IT IS!!!**

## FOAM

| Foam Benefits | Foam Considerations |
|---|---|
| Can be designed to be as supportive/contoured as needed | Foam can be heavy. Consider the weight of the cushion |
| Can allow for offloading or immersion | Need to protect the foam from incontinence |
| Low maintenance | Most foams inherently retain heat and moisture |

## AIR

### There are different types of air cushions: Individual air cells and air bladders

| Air Benefits | Air Considerations |
|---|---|
| Offer envelopment and immersion of bony prominences, increasing pressure redistribution | Certain styles require frequent maintenance |
| Perceived as “soft” & comfortable | Certain styles are not stable, resulting in fatigue, decreased pelvic stability, and difficulty with transfers |
| Can be adjustable | Easily affected by altitude: higher altitude = firmer |

## HONEYCOMB

### These cushions are made of a thermoplastic material, using a hexagonal honeycomb shape

| Honeycomb Benefits | Honeycomb Considerations |
|---|---|
| Inherently breathable, addresses microclimate | Not adjustable and may not accommodate orthopedic deformities |
| Lightweight | |
| Allows freedom of movement | Balance and endurance of patient |
| Low maintenance | Can be perceived as “firm” and this is not adjustable |

## GEL/FLUID INSERTS

### There is a perception that gel is the best medium for skin protection: NOT TRUE!

| Gel/Fluid Benefits | Gel/Fluid Considerations |
|---|---|
| Can allow for envelopment and immersion of bony prominences for increased pressure redistribution | Their effectiveness is dependent on the geometry and stability of the cushion |
| | Not a stable surface, so provides minimal pelvic stability; transfers may be difficult |
| | Gel can migrate and result in high peak pressures |
| Some gels state that they are “cooling” to manage microclimate | Certain styles require daily maintenance or with every reposition, need to be kneaded and readjusted to provide pressure relief |
| New gel technology offers solid gel options, eliminating the problem of gel dispersion | With sun exposure, can retain heat |
| | More susceptible to damage than other mediums, can leak |

## COMBINATION

### These are a combination of foam and air or foam and gel; style is dependent on the manufacturer

| Combination Benefits | Combination Considerations |
|---|---|
| Foam provides a stable base for transfers with the skin protection of air/gel | Can be heavy depending on medium/manufacturer |
| Contours are supportive of pelvis in optimal position and provide LE alignment | With well cut outs, a migration of gel or air loss can result in ITs resting on edge of hard foam, causing peak pressure |
| | May need frequent maintenance to ensure gel packs are in position or air cells are properly inflated |

# WHEN TO CHOOSE A SEPARATE OFF-THE-SHELF BACK SUPPORT

## HOW DO I KNOW IF MY PATIENT NEEDS IT?

**There are key questions to ask yourself when deciding if the manufacturers back support should be replaced with an off-the-shelf back support:**

- Is your patient immobile?
- Does your patient have a postural abnormality that affects pelvic and trunk stability and alignment?
- Does your patient require assistance to sit unsupported?
- Does your patient complain of pain while sitting in the wheelchair?

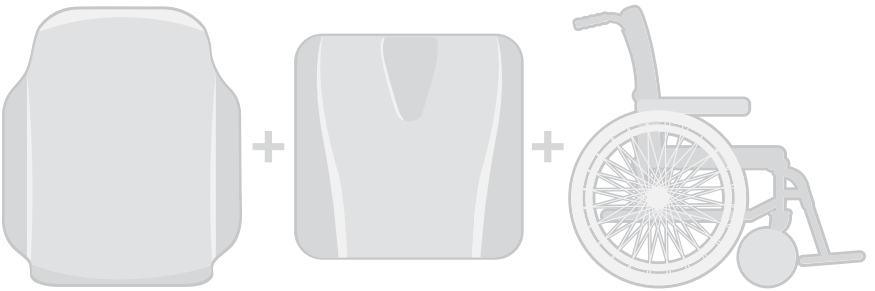
If you answered yes to any of these questions, then, without a doubt, replace the sling back with a separate off-the-shelf back support.

* **If your patient qualifies for any model wheelchair, they automatically qualify for at least a general use back support. Always consider replacing the sling back with an off-the-shelf option to provide better pelvic and trunk positioning.**

## The right back support is an essential part of an optimal seating system. Here are some of the important *ADVANTAGES* of an off-the-shelf back support:

- Provides depth and angle adjustability through **hardware**
- Provides **trunk stability** to promote functional sitting
- Works with the cushion to provide **pelvic stability**
- Provides increased **pressure redistribution** at the trunk and pelvis
- It can **minimize the progression of abnormal postures**
- **Decreases pain** by increasing stability and pressure redistribution

✱ **Even when dealing with a more "typical" spinal posture, a solid back support can provide stability to conserve energy for self-propulsion.**



Optimal Seating System

# CHOOSING A BACK SUPPORT

## WHAT DO WE NEED TO CONSIDER WHEN CHOOSING A BACK SUPPORT?

There are three areas to understand when choosing a wheelchair back support:

- **Shape of the Shell**
- **Medium**
- **Adjustability**

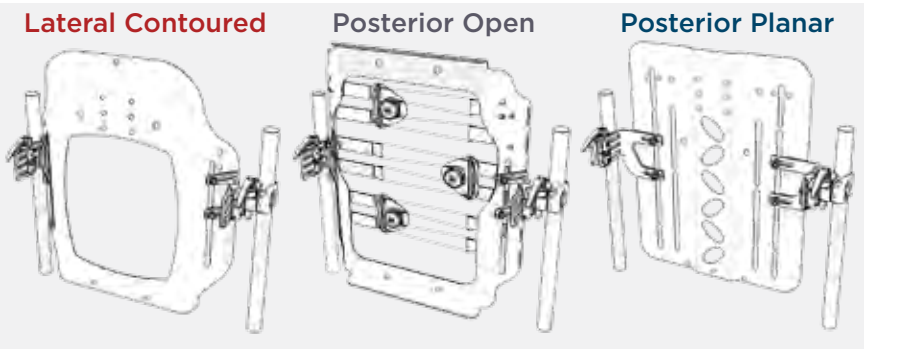
### Back Support Goals:

- The patient will function at his/her optimal capacity
- Stabilize the pelvis to maximize function of the cushion
- Provide posterior thoracic stability
- Facilitate maximum pressure redistribution to minimize high peak pressure areas
- Maintain and support natural curves of the spine

## SHAPE OF THE SHELL

Back support shells can vary in their geometry:

- **Lateral Contoured Shell**
- **Posterior Open Shell**
- **Posterior Planar Shell**




## LATERAL CONTOURED SHELL

| Benefits | Considerations |
|---|---|
| Designed to fit the anatomical shape of the user | Contour is lateral, not on the posterior shell |
| Various options depending on patient goals. Deep, upper thoracic or lower thoracic contours | |
| Look at the contour of the upper shell for scapular cut outs if your patient is a self-propeller | Look for a contoured shell with the ability to conform posteriorly |

## POSTERIOR OPEN SHELL

| Benefits | Considerations |
|---|---|
| New concept | May not be able to adjust for a significant lordosis |
| Allows for immersion posteriorly with technology that conforms to the shape of the end user | |
| Lightweight | |
| Can accommodate and/or correct for multiple postural abnormalities | |

## POSTERIOR PLANAR SHELL

| Benefits | Considerations |
|---|---|
| Certain planar styles can be adjustable for conforming to shape | Most have no ability to conform to the shape of the user, resulting in the progression of postural abnormalities |
| Flat shell | |
| Room to attach harnesses, pelvic belts, lateral trunk supports | |

# MEDIUM

**Understand the available mediums when choosing a back support. No matter the contours, the quality of the mediums will affect the application of the back support. Each has benefits and considerations, and we will look at each one.**

## BACK SUPPORT MEDIUMS:

- **Foam**
- **Air**
- **Combination**

## FOAM

| Benefits | Considerations |
|---|---|
| Most common | Can be hot |
| A high quality visco elastic foam allows immersion and envelopment of a person's shape | Consider quality and type of foam used as it affects immersion and envelopment and pressure redistribution |

## AIR

| Benefits | Considerations |
|---|---|
| Air cells that allow the transfer of air, mimicking the pressure-relieving properties of water | May require maintenance |
| Individual air cells that shift according to the shape of the user | |
| Allows for optimal envelopment and pressure redistribution | |
| Adjustable to configure the back support for optimal pressure redistribution. | |

## COMBINATION

| Benefits | Considerations |
|---|---|
| Stability of foam with the pressure relieving properties of air | May require maintenance |

# ADJUSTABILITY

## WHY IS ADJUSTABILITY IMPORTANT IN BACK SUPPORTS?

### Adjustability is important to wheelchair back supports for the following reasons:

- The human skeleton has natural curves that allow for optimal function.
- If these curves are not supported well, they will either flatten or change into an abnormal posture.
- This is especially important when providing a back support for a child to promote natural curves of the spine as he or she grows.

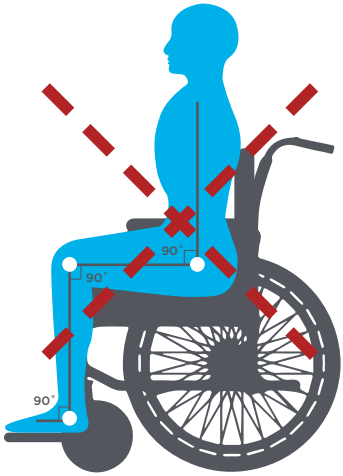
## What are ways that we can adjust a back support?

### Angle and Depth

- Using the mounting hardware

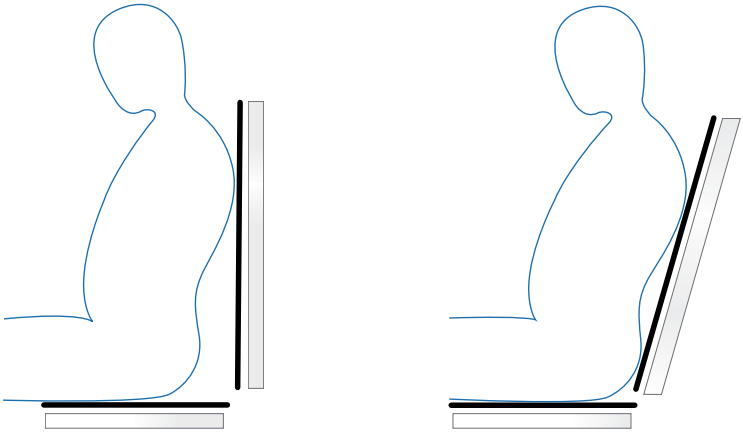
### Posterior Contours

- With moldable stays
- Using The Boa® System
- Through mounted wings or foam wedges




*** 90/90/90 will NOT allow us to match the patient's joint angles.**

# WHY IS ADJUSTING SEAT-TO-BACK ANGLE IMPORTANT?



- Back Support Surface
- Surface Contact
- Lack of Surface Contact

## Adjusting seat-to-back angle allows for:

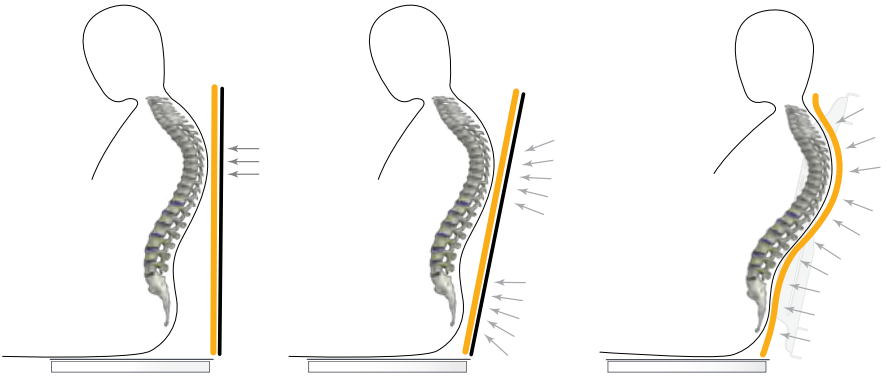
- Maximum contact between the back and seat surface
- The pelvis to reside in the intended area of the cushion
- Pressure redistribution off the bony prominences
- Stabilization at the pelvis and spine
- Accommodation of limited hip flexion

*** Hardware is key when choosing a back support. Always consider what kind of adjustability it has so you can achieve optimal pressure redistribution.**

# WHAT SHOULD WE AIM FOR WITH ADJUSTABILITY?

**Look at what the patient's body is doing and consider that seat angles depend on the individual's ROM, muscle integrity, and joint integrity.**

- Open or close the seat-to-back angle to accommodate for your patient's degree of hip ROM.
- Change seat-to-back angle to allow for more contact with the back support and seat surface.
- Use methods such as moldable stays, wings, or wedges to conform to the patient's individual curvature.



**Fixed 90°**
Peak Pressure at the Apex

**Open STBA**
More Surface Contact Match Patient ROM

**Open STBA + Contour**
Optimal Pressure Redistribution

*** When more surface area makes contact with the patient, stability and comfort increase.**

# ACCESSORIES

## WHEN WOULD I NEED TO ADD ACCESSORIES?

As in most things, ***LESS IS MORE*** and this is certainly true in wheelchair positioning. If you take your time in selecting the right model and size wheelchair and then select an appropriate cushion and back support, accessories may not be needed. Too often accessories are used as "band-aids" for a less than optimal wheelchair and seating system. When used the proper way, they can be the finishing touch to achieve the best posture possible for your patient!

### UPPER EXTREMITY SUPPORTS

Can be added onto the existing arm rest to:

- Add length
- Add additional postural support
- Decrease contracture risk
- Decrease dependent edema in UE
- Increase comfort while sitting in wheelchair
- Stabilize a weak UE in an optimal position

*** Most of us don't sit with our elbows bent to 90˚ with the forearm straight out. So why do we position our patients this way, especially when dealing with abnormal tone or decreased range of motion? Choose an upper extremity support that has angle adjustability!!**

## TYPES OF UPPER EXTREMITY SUPPORTS:

You can choose a basic non-adjustable support or you can choose a pad and hardware style to suit the needs of your patient.

### HARDWARE TYPES

- **SLIDE ON:** Pad will be aligned with existing arm rest
- **BOLT ON:** Pad will be aligned with existing arm rest
- **SWING-AWAY:** Pad can move towards or away from body as needed
- **ARTICULATING:** Pad can be positioned in any plane; most adjustable option

### PAD TYPES

- Standard trough that keeps arm from sliding off the pad in any direction
- Minimal contour for low profile support
- Moldable option at the wrist for flexion or extension of the wrist and finger abduction

## LOWER EXTREMITY SUPPORTS

Can be added to a chair to:

- Support the lower leg, foot, and ankle in optimal position
- Decrease risk of contracture
- Accommodate for contractures and protect from injury
- Manage abnormal tone and reflexes
- Support an amputated limb
- Support a post surgical limb on leg rest

* **An external fixator support provides great stability and support for a LE post hip/knee surgery, or when a LE immobilizer is in use.**

## TYPES OF LE SUPPORTS:

- Single Foot Support
- Double Foot Support
- Double Foot Support with Separator
- Calf Pads
- External Fixator Support
- Amputee Support

*** Don't forget that quality leg supports have a range of sizes or can be customized. Consider where you want the support and measure to ensure you get the right fit.**

# LATERAL TRUNK SUPPORTS

- Prevent lateral leaning caused by decreased trunk strength and balance
- Correct or accommodate for a scoliosis or trunk rotation and prevent further progression of the postural abnormality
- Decrease pressure points on the apex of the curvature that could possibly lead to skin breakdown and cause pain to the patient

## TYPES OF LATERAL SUPPORTS:

- Mounted swing-away or fixed lateral supports
- Traditional foam lateral supports

*** If your patient has tone and/or is a heavy leaner, choose mounted lateral trunk supports. Traditional foam supports cannot withstand the sustained pressure, and the foam will collapse.**

# THE ELEVATING LEG REST MYTH!

## ? ELEVATING LEG RESTS (ELRs) ARE A GOOD OPTION, RIGHT?

## NO!

Here are some common myths about ELRs that you NEED ABSOLUTE CLARIFICATION on to help you understand why standard leg rests are usually the better option:

See Page 83 for visual

### 1 ELRs keep hips back in chair: Wrong!

- ELRs do just the opposite
- When we elevate the legs, we pull on the already tightened hamstrings of the patient
- The shortened hamstrings cause a greater pull on the pelvis, bringing the pelvis into a posterior pelvic tilt
- The posterior pelvic tilt makes the pelvis slide forward, resulting in sacral sitting
- The patient begins to slide forward out of the chair, the exact opposite of keeping the hips back in the chair

### 2 ELRs decrease edema: Wrong!

- Contrary to popular belief ELRs on K0001-K0004 MWCs unfortunately CANNOT reduce edema

- In order to decrease edema, the legs must be 30 cm above heart level. The only way to achieve that degree of elevation with an ELR is when used in combination with tilt and recline, often seen in manual tilt-in-space or power chairs
- ELRs on a manual chair can actually decrease optimal circulation by cutting off blood flow at the groin area and inhibiting flow to the lower extremities

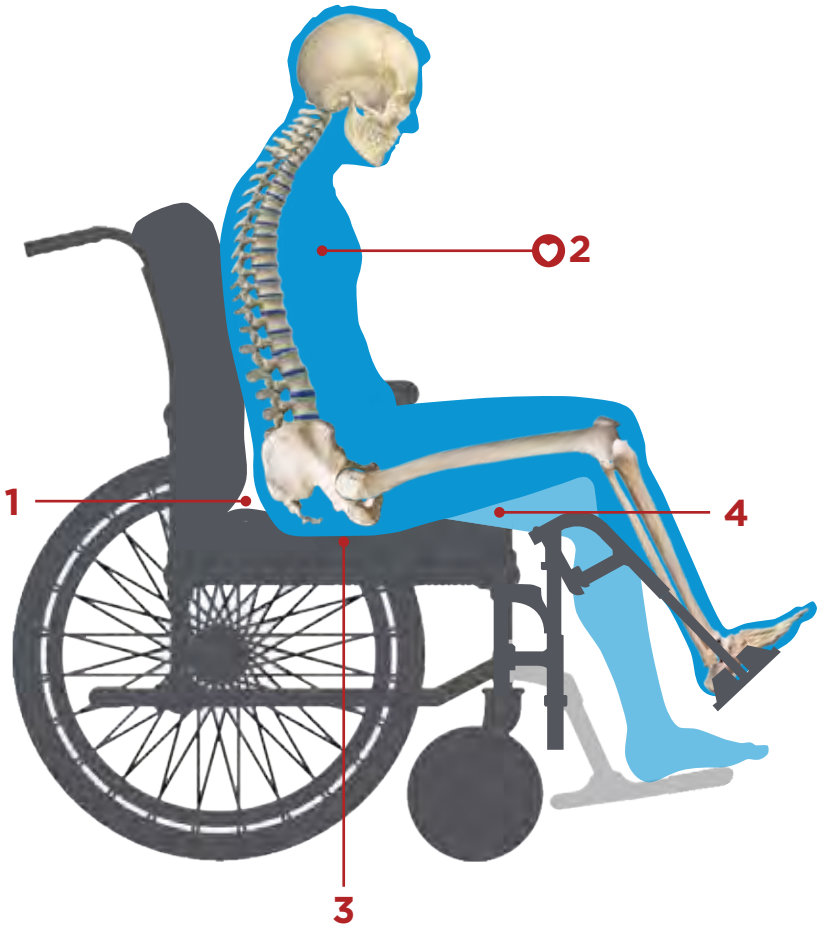
## 3 ELRs decrease pressure on the pelvis: Wrong!

- ELRs actually position the pelvis in a posterior pelvic tilt
- The forced posterior pelvic tilt increases pressure on the bony prominences of the ITs, sacrum, and coccyx
- Pressure injury development risk is increased in those areas
- Elevating the leg rest promotes knee flexion, leading to decreased femoral contact, shifting the pressure back onto the ITs and sacrum/coccyx

## 4 ELRs help with LE alignment: Wrong!

- ELRs prevent full femoral contact with the seat surface
- Since less of the leg is making contact with the seat surface, it is easier for the leg to internally/externally rotate or abduct/adduct
- Legs then fall off leg rests more easily
- Windswept posture is more prevalent
- ELRs promote flexion of knees, hips, and ankles, increasing risk of contractures at those joints

# RIGHT LATERAL VIEW - WHAT IS REALLY HAPPENING WHEN USING AN ELR




*** AVOID the use of ELRs as much as possible for optimal positioning in a wheelchair.**

# THE WEDGE MISCONCEPTION

## Often a wedge is used to prevent someone sliding out of a chair

**However, examine what a wedge actually does:**

- Closes seat-to-back angle
- Pulls shortened hamstring muscles, resulting in a posterior pelvic tilt and sliding forward
- Increases the risk of pressure injury development due to peak pressures on the ITs, sacrum, and coccyx that now rest directly on the incline of the wedge

## Using a Wedge

### So who should we **AVOID** using a wedge with?

- Someone with tightened hamstrings
- Someone who cannot tolerate a 90° or less (85°, etc) seat-to-back angle

### Better for use with:

- Someone with the goal of reducing extensor tone
- Someone with full ROM at the hips and knees
- Someone with long LEs to increase STFH

# THE PROBLEM OF SLIDING OUT OF THE WHEELCHAIR

## WHAT SHOULD I DO WHEN MY PATIENT KEEPS SLIDING OUT OF THE CHAIR?

### First, we need to find out WHY...

- Check for **tightened hamstrings** as they can pull the pelvis forward in the seated posture
- Check the **hip ROM** and see if they are trying to increase the seat-to-back angle by sliding forward
- Check the **seat depth** and see if it is too deep and digging in to the back of their legs
- Check the **seat-to-floor height**, and see if they are sliding to try and reach the floor for propulsion
- Check **trunk stability and strength**. If weakness is present, the patient may slide forward for stability

Normal Hamstring

Shortened Hamstring

## When we know why, we can look at possible SOLUTIONS:

- Accommodate tightened hamstrings by adapting the seat depth and back angle to match the patient's posture. Use an immersion style cushion to protect the sacrum and coccyx from pressure injury
- Adjust the seat-to-back angle either through the back canes or the hardware of the back support. Find their optimal seat-to-back angle based on your mat evaluation results
- Measure upper leg length (Page 50) and get a chair with the appropriate seat depth
- Lower STFH at the wheel axle, or use a drop seat
- Try a cushion with tapered adductors that will stabilize the pelvis and provide increased support for the trunk

*** A wedge cushion is not the solution to sliding forward. Be a detective and find out WHY the patient is sliding forward, and this will lead you to the appropriate solution!**

# CONCLUSION

*** Remember, there is NO cookbook solution to wheelchair seating and positioning. Use your clinical reasoning skills to figure out what's best within the given parameters.**

Keep the following goals in mind, and do the best you can!

- Maximize patient comfort
- Minimize pain
- Correct deformity when possible
- Prevent further deformity
- Prevent pressure injuries
- Increase functional safety and independence

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# GLOSSARY

**ATP:** Assistive Technology Professional

**NP:** Nurse Practitioner

**PA:** Physician Assistant

**LMN:** Letter of Medical Necessity

**DME:** Durable Medical Equipment

**CRT:** Complex Rehab Technology

**ROM:** Range of Motion

**ADLs:** Activities of Daily Living

**MRADLs:** Mobility Related ADLs

**MWC:** Manual Wheelchair

**PWC:** Power Wheelchair

**PPT:** Posterior Pelvic Tilt

**PSIS:** Posterior Superior Iliac Spine

**ASIS:** Anterior Superior Iliac Spine

**IT:** Ischial Tuberosity

**ELR:** Elevating Leg Rest

**STFH:** Seat-to-Floor Height

**LE:** Lower Extremity

**UE:** Upper Extremity

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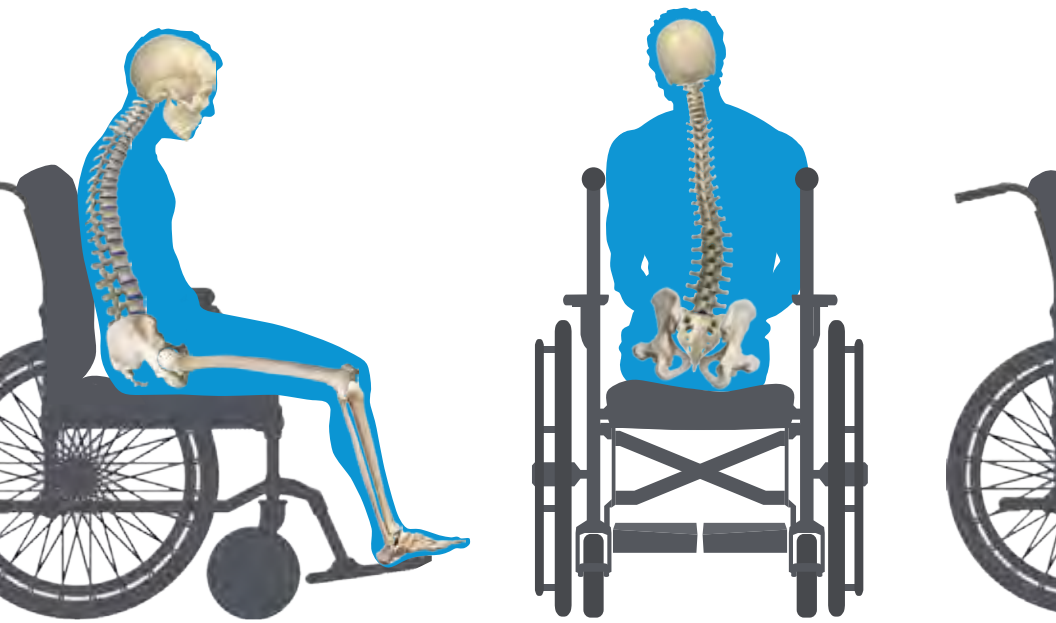

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