Wheelchair Seating & Positioning Guide

A comprehensive introduction to seating and wheeled mobility



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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 abnormal postures and understanding how ill-fitting wheelchair components can lead to abnormal postures and pressure injuries
- Identifying the key components to completing a successful wheelchair evaluation
- Understanding how to select proper wheelchair seating components



Look for these info boxes throughout the guide.
 They include quick tips or takeaways for that section.

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Common Challenges



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

Identifying the Need for Wheeled Mobility



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 patient'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 O₂ 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

The Team

IS IT ONLY UP TO THE PHYSICIAN AND/OR THERAPIST TO DECIDE ON A CLIENT'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.



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

WHAT DOES EACH TEAM MEMBER BRING TO THE TABLE?

CLIENT/CAREGIVER:

Has knowledge of their own body, functional needs, and 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 the body, understands optimal postures for function, and translates this to the optimal seating and mobility components and properties. Acts as a client advocate

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

The Process of Getting Seating Equipment



WHERE DO WE START?



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

Nurse/PT/OT identify the need for wheelchair seating

Physician/PA/NP: Outpatient face-to-face appointment OR Inpatient assesses for need

No need determined; doesn't qualify

Yes, there is need

PT/OT eval to assess physical, postural, and functional issues/limitations related to a client's ability to perform mobility related ADLs (MRADLs) safely and within a reasonable amount of time

Doesn't qualify for equipment

Yes, qualifies for equipment



confidently walk through this process.

Understanding DME & CRT Equipment





NO! When it comes to seating and wheeled mobility, products are divided into two groups:

Durable Medical Equipment (DME) *and* Complex Rehabilitation Technology (CRT).

Clients 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.

"CRT products include medically necessary and individually configured manual and power wheelchairs, seating and positioning systems, and other adaptive equipment such as standing devices and gait trainers. This specialized equipment requires evaluation, configuration, fitting, adjustment, or programming to meet the individual's medical needs and maximize function and independence.

CRT products must be provided by individuals who are certified, registered or otherwise credentialed by recognized organizations in the field of CRT and who are employed by a business specifically accredited by a CMS deemed accreditation organization to provide CRT."

"National Coalition for Assistive and Rehab Technology." NCART, 2019, www.ncart.us/.

DME

DME equipment must meet the following criteria:

- Used for a medical purpose
- Used in the home
- Able to withstand repeated use
- Not usually useful to someone who is not sick, injured, or disabled



WHO MIGHT BE AN APPROPRIATE USER FOR DME MOBILITY EQUIPMENT?



When it comes to DME mobility equipment such as manual and power wheelchairs or power operated vehicles (POVs), the list below can help you identify if DME is appropriate for your client.

- Has very basic mobility needs
- Propels primarily indoors for short distances
- Has limited/no need for positioning support or adjustment beyond that provided by an appropriate seat cushion or back support
- Does not have a postural deformity and is at minimal to no risk for developing one

- Sits in "standard" dimensions without compromise
- Has normal tone or minimal tonal abnormalities
- Has good sitting balance
- Does not have pain with sitting
- Sits in the wheelchair for short periods of time
- Has a non-progressive or slowprogressing condition

Medicare requirements for DME equipment:

- Physician order and recent exam documenting need for mobility device
- No PT/OT evaluation or ATP involvement is required
- Specific justification of the product may come from physician or therapist
- On-site home evaluation is not required (*but it is best to always conduct one if you are involved*)

CRT

CRT products are significantly different from standard DME. The lists below will help define the difference in the broad range of CRT products AND services:

Products

- Medically necessary, individually-configured manual and power wheelchairs, adaptive seating systems, alternative positioning systems, and other mobility devices
- Require evaluation, fitting, configuration, adjustment, and/or programming
- Designed to meet specific and unique medical, physical, and functional needs of individuals with the primary diagnosis resulting from a congenital disorder, progressive or degenerative neuromuscular disease, or from certain types of injury or trauma

Services

- Requires more knowledgeable, skilled, and experienced professionals
- Requires specialized evaluations, measurements, trials, fittings, training and education, and ongoing modifications
- CRT companies must comply with more rigorous quality standards under Medicare

 A good relationship with a quality CRT company and a knowledgeable ATP is critical to improving your confidence and efficacy in prescribing and obtaining CRT equipment.

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WHO MIGHT BE AN APPROPRIATE USER FOR CRT MOBILITY EQUIPMENT?



A seating evaluation will define if there is need for CRT equipment, but the list below can help you identify the type of user appropriate for CRT equipment.

- Uses a wheelchair as primary mobility every day
- Sits in the wheelchair for long periods of time
- Has limitations in sitting balance
- Needs specific dimensions to maintain posture and optimize function
- At risk for/has current postural deformities

- Has pain in sitting
- Needs specific support, configuration, and/or adjustments to maintain posture, protect skin, and maximize function
- Propels on varied surfaces/terrain indoors and outdoors
- Has tonal abnormalities that
 interfere with positioning/mobility
- Has a progressive condition



IF YOU PROVIDE A DME WHEELCHAIR, ARE YOU LIMITED TO DME CUSHIONS & BACK SUPPORTS?



No! You can provide ANY cushion and/or back support with DME mobility devices. The choice should depend on the client's need for seating and positioning. Even individuals with limited mobility may require postural support, stability, skin protection, and increased comfort.

Manual Wheelchair Universal Terms



Manual Wheelchair Justification

NOW THAT I KNOW MY CLIENT 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 a PT/OT and the fun begins! It becomes your task to evaluate the client 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 client have a mobility limitation that significantly impairs their 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 timeframe**?

- 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 client'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.

Manual Wheelchair Options: Features & Limitations



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

Standard Manual Wheelchair Options				
Very Minimal Adjustability	Minimal Adjustability	Most Basic Adjustability	Variable Adjustability	Most Customizable
K0001/K0002	K0003	K0004	Tilt-in-Space	K0005

DME

K0001: Standard Wheelchair

K0002: Standard Hemi Height Wheelchair

K0003: Lightweight Wheelchair

K0004: High Strength, Lightweight Wheelchair

<u>CRT</u>

Tilt-in-Space: Dependant Manual Wheelchair

K0005: Ultra-Lightweight Wheelchair



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

Short-term use manual wheelchairs

K0001 - K0003

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

K0004

- Client qualifies for a basic manual wheelchair, 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



Long-term use manual wheelchairs

Manual Tilt-in-Space

When is a Tilt-in-Space wheelchair appropriate?

- Client is dependent in mobility
- Client is unable to perform independent pressure relief
- Client requires gravity-assisted positioning/repositioning



- Client requires postural support, head and trunk control, and accommodation of postural asymmetries
- The goal is to increase sitting tolerance/endurance
- Client needs improved line of sight due to forward head posture
- Client will benefit from trunk support and open thoracic posture for increased respiratory function
- Client requires safe positioning for feeding/gravity-assisted swallowing

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

K0005

- Client is a full-time wheelchair user
- Client 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 (LMN), and the involvement of an ATP in the equipment selection process



 It is still possible to get a K0005 MWC for your clients with short rehab stays. Remember that the client can go home in a rental lower-end wheelchair while going through the qualifying process for a K0005. See page 18 for more detail.

Tips for Justifying a K0005 Manual Wheelchair

? HOW CAN I MAKE SURE THAT MY CLIENT GETS THE MWC THEY NEED?

Qualification for a K0005 is **functionally based**, not diagnosis based. Rule out a K0001-K0004 by documenting why the "least costly" alternative is not effective. Include a description of the client's routine activities and whether they are fully independent in the use of the wheelchair.

1. Use objective tests and measures such as a Wheelchair Propulsion Test.

Compare an optimally configured ultra-lightweight wheelchair vs. lower end wheelchair; time propulsion over a fixed distance, count push strokes, differentiate quality of propulsion, document pain, pulse-oximetery.

- Consider safety, efficiency, and ability to independently complete all mobility-related activities of daily living (MRADLs) all day, every day, with a lesser MWC.
- **3.** Consider the need to configure an ultra-lightweight wheelchair for **better posture and mobility.**
- 4. Document the unique features of a K0005 and <u>why</u> they are needed:
 - Axle adjustability
- Seat slope
- Adjustable front and rear seat-to-floor heights
- Rear wheel camber
- Back angle

* Examples "why" the features may be needed

- Adjustable axle plate is required for center of gravity adjustment to allow for efficient propulsion and decreased shoulder pain from 6/10 to 0/10
- Additional seat size options are required as my client of 6'6" and 170 lb does not fit the standard configurations of lower end manual wheelchairs

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HOW CAN I GO ABOUT GETTING THE APPROPRIATE MWC WHEN CLIENTS ARE DISCHARGED SO EARLY?



This is a common challenge with inpatient rehab stays getting shorter and shorter, but it is still possible.

The first thing to know is when doing your initial evaluation, be thinking about whether your client may need a wheelchair full-time when going home. If the answer is "yes", treat your evaluation as if they are going to need a K0005 wheelchair, even if they initially go home in a lower end manual wheelchair for a short period of time. **What do I do?**

- 1. In the Plan of Care, include that the client is planned to follow up after discharge with the next clinician in the continuum and the supplier, to obtain the ultra-lightweight MWC that is recommended.
- 2. Talk to your client Empower them by explaining that they are going home in a rental wheelchair that will turn into a purchase in 12 months. Encourage them to talk to the next therapist in the continuum about getting a better ultra-lightweight wheelchair.
- **3. Document!** Rule out a K0001-K0004 using the methods outlined on page 17. Documentation must show why the "least costly" alternative is not effective.

The rental wheelchair will buy time for completing the evaluation and procurement process so your client can get the wheelchair they need and deserve.

Remember to consider the 5 Year Rule. A client in a lower end wheelchair that isn't going to meet their long-term needs is not the most beneficial option to them. With the useful lifetime rules, a client must remain in the same wheelchair for 5 years (*longer with some funding sources*), unless they have a change in medical condition that warrants another new wheelchair.

 Although shorter rehab stays make it challenging to provide your clients with the most appropriate wheelchairs, it is possible when we learn the process and communicate across the continuum of care.

Manual Wheelchair Comparison Chart

	K0001: Standard	K0002: Standard Hemi Height	
Dimensions:			
Wheelchair weight without legrests	>35 lb	>35 lb	
Seat width (standard)	16", 18", 20"	16", 18", 20"	
Seat depth (standard)	16"	16"	
Weight capacity	300 lb	300 lb	
Back height	18"	18"	
Lowest achievable seat-to-floor height	21"	19"	
Adjustability to accommodate for postu	ral 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	
Legrest options:			
Standard	Yes	Yes	
Elevating (ELR)	Yes	Yes	
Swing-away	Yes	Yes	
Meant for long-term sitting?	No	No	



This chart is for reference purposes only.

Wheelchair features vary according to manufacturer and model. Always verify features, options, and/or adjustability prior to any order.

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

Power Wheelchair Justification



WHY WOULD I CHOOSE A POWER WHEELCHAIR (PWC) FOR MY CLIENT?



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

- 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 wheelchair
- **3.** Use of the power wheelchair will significantly improve their ability to perform MRADLs

Standard Power Wheelchair Options				
No Adjustability	No Adjustability	Minimal Adjustability	Most Customizable	Most Customizable
Scooter	Group 1	Group 2	Group 3	Group 4
DME			<u>CRT</u>	

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

Power Mobility Devices

DME Power Operated Vehicles (POV)/Scooter

Meets all of the basic power wheelchair criteria (page 21)

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 1 power wheelchair is the next base to consider!

DME Group 1

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

- Group 1 models are the most basic power wheelchair
- They offer a narrower turning radius than a scooter or power operated vehicle (POV) and can be used in the home



- The client has no postural abnormalities and is not at risk for pressure injury
- Have basic seating that provides no extra stability or skin protection and cannot be replaced with rehab seating
- Offer no power seat functions such as tilt or recline

Group 1 power wheelchairs are used to get around short to moderate distances on level surfaces such as the home, mall, or grocery store.

DME Group 2

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

- Group 2 models are typically characterized by "captain's seating"
- The client is unable to safely transfer, operate, and maintain postural stability in scooter



- The home does not provide adequate access for operating a scooter
- The client 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 single and multi power options available if they qualify for a tilt/recline system, or if they use a ventilator that is mounted on the wheelchair

CRT Group 3

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

Additional Medicare requirements:

 The client has a neurological condition, myopathy, or congenital skeletal deformity



What's different from 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
- Group 3 models have greater obstacle climb and battery range
- Group 3 have a tighter turning radius and increased speeds

* Group 3 wheelchairs are more adaptable and versatile than Group 2 wheelchairs.

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WHY WOULD MY CLIENT NEED A GROUP 3 RATHER THAN A GROUP 2?



Neurological conditions are the main reason a client would need a Group 3 power wheelchair:

- 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 client unstable
- When using a power wheelchair 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 client has impaired sensory-motor function, they may not sense a Group 2 base tipping during an incline or decline, which puts them at risk

CRT Group 4

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

Additional Medicare requirements:

- The client requires the improved suspension to minimize pain and/ or triggers of spasticity when driving over a variety of terrains and obstacles
- The client requires the stable base to safely use the functions of seat elevate and standing



What's different from a Group 3?

- Group 4 bases are designed for stability to accommodate power tilt, recline, elevating/articulating legrests, and standing
- Group 4 suspension is designed for multiple terrains and can decrease the transmission of bumps and vibration to the person in the wheelchair
- Group 4 batteries are more powerful and will last longer distances

* CRT Group 5 power wheelchairs are for pediatric clients. Read about the requirements and application of Group 5 devices in the Power Wheelchair Guide. See below.

Additional detailed guides are available for more on using manual and power mobility solutions to optimize your client's function.

Scan the code or visit https://hub.permobil.com/permobil-resources



Looking at Abnormal Postures

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



Look at the client's posture and ask: what is the body doing that it shouldn't be doing? With prolonged sitting, clients 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:

- **Posterior Pelvic Tilt** with thoracic kyphosis with or without forward neck flexion; may be referred to as Sacral Sitting (*pages 29-30*)
- **Pelvic Obliquity** with scoliosis with or without lateral neck flexion (*page 31*)
- **Pelvic Rotation** with rotation of the spine with or without lateral neck flexion (*page 32*)
- Windswept Posture (page 33)
- Anterior Pelvic Tilt with lumbar lordosis with or without neck hyperextension (*page 34*)

Understand what you are looking at and decide whether your goal is to correct or accommodate for the abnormal posture. See page 35 for more detail.

Spinal and Pelvic Anatomy Refresher



Neutral Pelvic Posture



What is the pelvis doing?	Pelvis is in midline ASIS & PSIS at equal height: no pelvic tilt L ASIS & R ASIS at equal height: no obliquity L ASIS & R ASIS at equal depth: no rotation
What is the spine doing?	Spine is balanced and upright, no rotation, no lateral curvature Normal lordosis in cervical and lumbar spine 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

Posterior Pelvic Tilt



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Posterior Pelv	ic Tilt with thoracic kyphosis with or without forward neck flexion
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 and downward eye gaze to the floor or lap
	Use a cushion with medial and lateral contour to promote LE alignment and pelvic stability
	Ensure appropriate cushion depth to prevent client 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
Goals	<u>If Flexible/Reducible:</u> Try a cushion with tapered adductors to load the trochanters, stabilizing the pelvis in the client's most neutral alignment
	If Flexible/Reducible: Use a cushion with an anti-thrust component to reduce forward sliding of the pelvis into posterior pelvic tilt
	If Fixed/Non-Reducible: Use an immersion style cushion that contours to the shape of the client to maximize pressure redistribution and minimize peak pressures on the ITs, sacrum, and coccyx
	If Fixed/Non-Reducible: Consider opening seat-to-back angle in conjunction with a fixed tilt in the wheelchair, to match the client's ROM limitations and minimize forward sliding

Refer to page 35 for more information on reducible and non-reducible postures.

Pelvic Obliquity



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Pelvic Obliqui	ty with scoliosis with or without lateral neck flexion
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 they are dropping their ear to their shoulder Lateral flexion will usually be towards the side where the hip is higher
	Pressure redistribution is the goal whether the deformity is flexible/ reducible or fixed/non-reducible
Goals	Pressure redistribution is the goal whether the deformity is flexible/ reducible or fixed/non-reducible <u>If Flexible/Reducible:</u> Level the pelvis by building up the cushion under the lower side
Goals	Pressure redistribution is the goal whether the deformity is flexible/ reducible or fixed/non-reducible If Flexible/Reducible: Level the pelvis by building up the cushion under the lower side If Fixed/Non-Reducible: Accommodate for the deformity Protect the bony prominences from pressure by "filling in" the higher side and immersing the lower side IT

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Pelvic Rotation

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Pelvic Rotation with spinal rotation with or without lateral neck flexion		
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 they are dropping their ear to their shoulder	
	Stabilize the pelvis in the client'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	
Goals	If Flexible/Reducible: Use tapered adductors and a medial abductor to create leg troughs for midline LE alignment and to maintain a pelvic neutral position	
	If Fixed/Non-Reducible: Look for a cushion with less aggressive contouring; protect the bony prominences with an immersion style cushion	

Windswept Posture





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Windswept Posture		
What is the pelvis 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 wheelchair	
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	
	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	
Goals	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	
Anterior Pelvic Tilt



Anterior Pelvic Tilt with lumbar lordosis with or without neck hyperextension		
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 client hyperextends his or her back over the rear of the wheelchair, placing them at risk to tip the wheelchair backwards	
What is the head doing?	Excessive lordosis of cervical spine causes hyperextension of the neck and upward eye gaze	
	Utilize a cushion and back support that maximizes contact with the seat surface for optimal pelvic and spinal stability and pressure redistribution	
Goals	Stability is the goal, so provide a back support that is tall enough for the client; measure from the seat surface to the top of shoulder	
	Look for a moldable back support to conform to the curvature of the spine	

Non-Reducible vs. Reducible Postural Abnormalities





Each abnormality is either FIXED/NON-REDUCIBLE or FLEXIBLE/REDUCIBLE.

Understanding whether the postural abnormality is non-reducible or reducible helps decide if we need to ACCOMMODATE for or to CORRECT the postural abnormality.

* The standardized terms in the wheelchair seating world are now <u>non-reducible</u> for fixed and <u>reducible</u> for flexible.

Why? The term non-reducible better accounts for the potential worsening of a postural abnormality where the previous term "fixed" did not.

Non-Reducible = Accommodate

When a posture is non-reducible, the skeleton does not move out of that posture. The client needs equipment that will accommodate the abnormal posture, providing optimal support and pressure redistribution.

GOAL = Preventing further progression

Reducible = Correct

Reducible means that the posture is flexible, or can be changed. However, not all reducible postures can be corrected to neutral.

GOAL = Prevention from becoming a non-reducible posture

Understanding Reducible Posture



The goal when correcting a reducible posture is to achieve **their most neutral** posture that can be **maintained over time** with proper support in order to optimize function.



Reducible to Neutral

Posture can be moved with support to a neutral/midline position. If they cannot maintain midline over time, the goal is to find the **most** neutral position for the client and support them to that point.

Reducible NOT to Neutral

Even if a client cannot achieve a truly neutral/midline posture, if the posture can be adjusted with support towards midline, it is considered reducible.

Reducible PAST Neutral

With support, if a posture can be moved beyond a neutral/midline position, it is reducible with the goal to position them in midline.

 If they cannot maintain the reduced posture over time, your goal may need to shift to accommodating like you would for a non-reducible posture. However, continue to provide interventions that will prevent it from becoming truly non-reducible.

Issues with the Current Wheelchair System

An improper seating system can actually cause or progress abnormal postures.

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

The wheelchair system can definitely be at fault when the client is sitting in an abnormal posture. 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.

Find out how common seating system issues can affect posture and how to potentially troubleshoot the problems:

- Seat Dimension Issues (pages 38-40)
- Seat-to-Floor Height (STFH) Issues (pages 41-42)
- Back Support Issues (pages 43-44)
- Legrest Issues (pages 45-46)
- Arm Rest Issues (page 47)
- Head Support Issues (page 48)

How to use this section:			
What is going on?	What can you do?		
Use this column as your problem list in your evaluation	This column gives you ways to address the issues present The letters referenced in this column correspond to the measuring guide on pages 51-63; use those measurements to find the appropriate wheelchair dimension to fit your client		

Seat Dimensions

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

Seat Width: Too Wide			
What is going on?	Negative result	What can you do?	
Client 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		
Pelvic collapse causes hips to internally rotate and LEs to excessively adduct	Strain & contracture risk at hip joints Pressure injury risk at medial knees where knees rub together	Measure hip width (C) Find a cushion with medial abduction and lateral	
LEs "sweep" to one side when LE weakness is present	Windswept positioning of LEs	maintain LE alignment	

Seat Width: Too Narrow			
What is going on?	Negative result	What can you do?	
Excess pressure at trochanter from contact with the wheelchair	Pressure injury risk at the trochanter	Measure hip width (C) Look for a skin protection cushion that immerses the trochanters	
Client rotates hips to "fit" into the wheelchair	Pelvic rotation	Measure hip width (C)	
Client "sweeps" LEs to one side trying to avoid a buildup of pressure on the trochanters	Windswept positioning of LEs	Measure hip width (C) Find a cushion with medial abduction and lateral adduction contours to maintain LE alignment	

Hammocking Seat

What is going on?	Negative result	What can you do?
Pelvis collapses	Posterior pelvic tilt	
Client seeks out one side of wheelchair for stability	Pelvic obliquity	
Client compensates by rotating pelvis for stability	Pelvic rotation	Add a rigid insert
LEs "sweep" to one side	Windswept positioning of LEs	

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Seat Depth: Too Deep		
What is going on?	Negative result	What can you do?
Seat sling digs into the back of legs, causing pain		
Client will slide forward to alleviate the pain		
Seat sling digs into the back of legs, decreasing circulation, increasing LE edema	Posterior pelvic tilt	Measure upper leg length (K) minus 2″
Client slides forward to alleviate numbness	pressure injury at the sacrum and coccyx	
Foot propulsion more difficult, client slides forward for better heel strike		
Client slides forward immediately after repositioning		

Seat Depth: Too Shallow			
What is going on?	Negative result	What can you do?	
Decreased femoral contact and LE support	Windswept positioning, abduction, or adduction of LEs	Massura upper log longth (K)	
Pelvis collapses inward		minus 2"	
due to lack of LE support to ensure	Strain & contracture risk at hip joints	Find a cushion with medial	
pelvic alignment	Pressure injury risk at	abduction and lateral adduction	
Hips internally rotate	medial knees where		
adduct	knees rub together		
Reduced femoral		Measure upper leg length (K)	
contact means less	Increased risk of	minus 2	
redistribution away from	sacrum, and coccyx	Look for a skin protection cushion that immerses and/or	
the bony prominences		offloads the bony prominences	

When LE alignment is an issue with a reducible posture, 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 MWC model for proper STFH

MWC 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

Note: This chart is for reference purposes only. Wheelchair features vary according to manufacturer and model. Always verify options prior to order.

***** At a minimum, use a MWC with STFH adjustability.

STFH: Too Low		
What is going on?	Negative result	What can you do?
Legrests are shortened to compensate for lack of threshold clearance Knees are higher than the hips, causing decreased femoral contact with the seat surface that would provide LE alignment	Windswept positioning of LEs	Measure lower leg length (L) Use a higher profile cushion Use a wedge cushion if they can tolerate the hip flexion Find a cushion with medial abduction and lateral adduction contours to maintain LE alignment
Knees are higher than hips reducing femoral contact and surface area for pressure redistribution	Increased risk of pressure injury at ITs, sacrum, and coccyx	Measure lower leg length (L) Use a higher profile cushion Look for a skin protection cushion that immerses and/or offloads the bony prominences
On a wheelchair without legrests, feet can drag and get caught under wheelchair during propulsion or transport	Increased risk of client being "thrown" out of wheelchair or injury to the LEs occurring	Measure lower leg length (L) Use a higher profile cushion

- -

STFH: Too High			
What is going on?	Negative result	What can you do?	
Foot propulsion is more difficult so client slides forward for better heel strike			
Increased pressure at distal thigh, increasing risk of LE edema, client slides forward to reduce numbness & pain	Posterior pelvic tilt Increased risk of	Measure lower leg length (L)	
Client slides forward to alleviate strain on pelvis and knees	sacrum and coccyx	Use a lower profile cushion	
Client rotates forward on one side for better heel strike of one foot	Pelvic rotation		
	Increased internal rotation and adduction of the hip	Measure lower leg length (L)	
		Use a lower profile cushion	
Feet "dangle"		Find a cushion with medial abduction and lateral adduction contours to maintain LE alignment	

* Choose a cushion thickness that compensates for incorrect STFH if switching or adjusting the wheelchair is not an option!



Refer to page 61 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 client:

Goal = Positioning

• 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.

Goal = Self-propulsion

• If self-propulsion for a client 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.



Refer to pages 59-60 for more on measuring for a proper back support.

Back Support Height: Too Low

What is going on?	Negative result	What can you do?
Client slides down in the wheelchair, 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)
Client seeks out one arm rest to gain more stability	Pelvic obliquity with scoliosis of the spine	Provide an appropriately sized contoured back support for added stability that allows for
Client rotates spine & pelvis to seek out more stability on one side of the body	Pelvic rotation with rotation of the spine	of client's curvature

If back support is too low, it causes insufficient stability for a client with poor trunk strength and balance.

Back Support Height: Too High/Too Upright			
What is going on?	Negative result	What can you do?	
Client 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)	
Sitting too upright pushes the trunk forward resulting in instability	Anterior pelvic tilt with lumbar lordosis initially Eventually slides into a posterior pelvic tilt	Open seat-to-back angle either through back support hardware or by adjusting the back canes in a MWC with that option Provide an appropriately-sized contoured back support for added stability that allows for immersion and envelopment of client's curvature	

 Another reason to choose an adjustable K0004 MWC at a minimum, is the ability to adjust seat-to-back angle. This can help alleviate fatigue of the trunk muscles and reduce the sensation of being pushed out of the wheelchair.

Legrest

Proper fitting legrests not only provide a place to rest the feet, they:

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

Legrest: Using Only One			
What is going on?	Negative result	What can you do?	
Pelvis is higher on the side with the legrest	Pelvic obliquity	Add second legrest if positioning is your goal	
One-legged heel strike for propulsion	Pelvic rotation		
LEs "sweep" toward the side with the legrest	Windswept positioning of LEs		

 Sometimes only one legrest 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 legrest, decide what is more important: one-legged propulsion OR the prevention of a postural abnormality.

Footplates: Unequal Heights		
What is going on?	Negative result	What can you do?
Unequal footplate heights cause one side of the pelvis to be higher	Pelvic obliquity	Adjust footplate heights to be even

Legrest: Too Short/Footplate: Too High			
What is going on?	Negative result	What can you do?	
Decreased femoral contact reduces surface area for pressure redistribution	Increased risk of pressure injury at ITs, sacrum, and coccyx	Measure lower leg length (L) Lengthen legrest/lower footplate Look for a skin protection cushion that immerses and/or offloads the bony prominences	
Decreased femoral contact allows LEs to "sweep" to one side	Windswept positioning of LEs	Measure lower leg length (L) Lengthen legrest/lower footplate 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 Shortened hamstrings	Measure lower leg length (L) Lengthen legrest/lower footplate	

Legrest: Too Long/Footplate: Too Low			
What is going on?	Negative result	What can you do?	
Client slides forward and stretches legs to reach footplates	Posterior pelvic tilt	Measure lower leg length (L) Shorten legrest/raise footplate	
Client slides forward to reach the footplates promoting a posterior pelvic tilt	Increased risk of pressure injury at the sacrum and coccyx	Measure lower leg length (L) Shorten legrest/raise footplate Look for a skin protection cushion that immerses and/or offloads the bony prominences	
Client stretches foot & ankle downward to reach a footplate that is too low, promoting ankle plantar flexion & inversion	Contracture risk of ankle joint	Measure lower leg length (L) Shorten legrest/raise footplate Consider using a single or double foot support to raise the support surface and maintain alignment	
Client stretches to reach the footplate, only the ball of the foot makes contact with the footplate	Risk of eliciting abnormal reflexes and tone		

Arm Rest

Properly adjusted arm rests serve many functions:

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

Arm Rest Height: Too Low			
What is going on?	Negative result	What can you do?	
Client slides down in the wheelchair to make contact with arm rests	Posterior pelvic tilt with kyphosis of the thoracic spine		
Client 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	
Excessive shoulder depression to make contact with arm rest allows gravity to pull at shoulder joint	Potential shoulder sublaxation and dislocation when weak shoulder musculature is present	accordingly	

Arm Rest Height: Too High		
What is going on?	Negative result	What can you do?
Excessive elevation of the shoulders to place arms on the arm rests	Internal rotation and abduction of the shoulder causing pain, numbness, and contracture risk	Measure seat to
Client leans against arm rest seeking stability versus placing arm on the arm rest	Lateral leaning of trunk	elbow (I) and adjust arm rest height accordingly
Client places UEs in lap to avoid discomfort of shoulder elevation	Posterior pelvic tilt with kyphosis of the thoracic spine	

* Use a MWC with arm rest adjustability which means at a minimum, an <u>adjustable</u> K0004 MWC.

Head Support

Proper head support is important for:

- Socialization and communication
- Safe swallowing
- Respiration
- Attention to task
- Mobility

Suboccipital Area

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

Neck Extension Rotati	on La	ateral
Head Support: Too High		
What is going on?	Negative result	What can you do?
The pad will rest on the occipital area or above, increasing strain on the neck	Client will try to adjust by moving the head away from the pad	Place pad in suboccipital area
Head Support: 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/neck 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.

Addressing equipment issues can sometimes result in upright posture. However, in many other cases, there are also physical limitations that prevent the client from maintaining or even achieving this "ideal" posture. In these cases, you need to identify the "client-related" issue(s) in order to choose the best seating solutions. This requires a seating evaluation.



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.

MOBILITY SKILLS:

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

MEASUREMENTS:

Complete the 8 key client measurements to ensure proper fitting equipment

TRANSPORTATION:

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

CURRENT SEATING/ MOBILITY:

Describe ALL current equipment and the condition of each

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 adjustable wheelchair model that provides an individualized fit
- Consider seat cushions, back supports, head supports, and other accessories to address the client's physical limitations
- Schedule a visit with your trusted ATP/Dealer to trial equipment with your client

 Is there a postural abnormality? Decide if that postural abnormality is reducible or non-reducible. Should your goal be to correct or accommodate it?



Goals of a therapist when fitting a client 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 the client
- 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 client.
- **2.** Measure using a hard measuring tape, not one that can bend and wrap around the client's body. This will lead to measurement errors, adding circumference or length.
- 3. 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.



If you don't already use a measurement form, there is no need to worry about finding one. Copy the easy-to-use measurement forms provided in this guide.

- Standard measurement form: pages 53 54
- Additional measurements to consider with bariatric clients: pages 55 - 56

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

 Remember to look for hip contractures and tight hamstrings during the evaluation! They are often the culprits of poor pelvic positioning.

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WHAT DO I DO IF I DON'T HAVE A MAT TABLE?



In areas of practice such as Home Health, the therapist might not have the benefits of a therapy gym with a mat table. In this case look for a firm flat surface such as:

- A dining room chair
- A solid bath shower bench
- Use a sofa by placing a firm board, such as a transfer board, under the cushion to provide support and rigidity

 The following sections of the guide provide measurement forms that include all the required anatomical measurements to get to the best fitting equipment.



Don't panic!!! Keep reading and we will walk you through the measurements. If you find that you're short on time, we offer a solution on page 57.

Measurement Form

Copy this measurement form to document your findings in the field. Note that there are **8 must have** measurements indicated *



- * B Chest width
- * C Hip width

*

D - Between knees



Bariatric Measurement Form

There are some additional measurement considerations for bariatric clients. Copy this form to document your findings.

1 - Back of knee/calf to rear of buttocks deepest point	
2 - Back of knee/calf to rear of thoracic/ lumbar trunk	
3 - Seat to under forearm/elbow	
4 - Seat to top of gluteal tissue	
5 - Width across feet	
6 - Width across lower legs widest point	
7 - Overall hip width widest point Consider measuring both true width and safe compressible width	
8 - Lateral elbow to elbow	
9 - Width across chest	
10 - Back of head to scapula	
11 - Chest depth lateral trunk support consideration	

Current weight

Weight history

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The Must Have Measurements





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

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

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



Measuring Seat Dimensions

Remember to have your client sitting on a flat, firm surface for accurate measurements.





How to measure SEAT WIDTH (C):

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



How to measure SEAT DEPTH (K):

Measure from the buttocks, including any excess tissue, across the femur to the popliteal fossa/back of the knee

Then subtract 2"

Measuring Back Support Dimensions





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; this measurement helps determine back support width





Seat to inferior angle of scapula = H Client is a **SELF-PROPELLER** with good trunk strength



How to measure HEIGHT (G or H):

Measure the client 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.

Measuring STFH/ Lower Leg Length





How to measure LOWER LEG LENGTH (L):

Measure from the top of the client'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 the back of knee/popliteal fossa

* There must be a 2" clearance between the footplate and floor to clear thresholds.

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

Measuring Arm Rest Dimensions





How to measure ARM HEIGHT (I):

Seat your client 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 sides in case of a pelvic obliquity and/or scoliosis. This will justify the need for a model of wheelchair with adjustable height arm rests.



How to measure ARM LENGTH (J):

If client needs a specialized arm length, measure from end of elbow to where the therapist wants the desired replacement arm support to end

Head Support Positioning



How to measure HEAD SUPPORT HEIGHT:

There is no miracle formula for fitting a client 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 (see below)
- Choose a head support with lateral, anterior/posterior, height, and angle adjustability





 Head support hardware that has offset capabilities accommodates clients 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 properties you need to really understand when choosing a wheelchair seat cushion:

- Methods of pressure redistribution (pages 65 67)
- Cushion geometry (pages 68 73)
- Cushion medium (pages 74 77)

All three concepts are important to understand, but always remember that there is overlap between them and it is crucial to find the best combination to address your individual client's needs.

When choosing a cushion, always keep in mind your goals for the pelvis. For example, if the pelvis is in a non-reducible posture, your goal is to <u>accommodate</u> that posture through cushion geometry and medium.

If the posture is reducible, you will look for contours and a medium that can <u>correct</u> <i>the pelvic position.

Methods of Pressure Redistribution

Pressure cannot be eliminated in seating, so instead, we must focus on the redistribution of pressure. Taking the same amount of pressure and spreading it out over a greater surface area will do this (as illustrated to the right), but even then, there are different methods in doing such.



Pressure on small surface area



Pressure over larger surface area

- Offloading/Partial Offloading
- Immersion
- Immersion and Envelopment





Peak pressure under ITs -(before pressure redistribution)





Pressure spread out under pelvis and femurs with increased surface contact

Offloading/Partial 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.

There are times when complete offloading is possible with cushion geometry and cutouts, but many times partial offloading is used. This means that there is still contact with the support surface under the bony prominences, however, the pressure is greatly reduced because it has been redistributed to areas that can withstand greater pressure.



Immersion

The principle in which a material allows the body to compress or "sink" into it to provide some pressure redistribution with increased surface area contact.



Immersion and Envelopment

The principle in which a material allows the body to compress or "sink" into it **and the material conforms** to the body's shape to provide further pressure redistribution and reduction of peak pressures.



Benefits and considerations of each pressure redistribution method

Offloading/Partial Offloading

Considerations
May not be suitable for someone with hypersensitivity due to the firm end feel; depends on personal preference
Not typically recommended for clients at risk of pressure injury at the greater trochanter since pressure is redistributed to that area
Someone with significant lower extremity contractures may not "fit" the pre-contoured shape
Contours may make independent transfers more difficult for someone with decreased strength

Immersion and Envelopment

Benefits	Considerations
Less firm surface, may create a "softer" end feel for the client; 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
May be good for a variety of pressure injuries depending on the cushion medium	Consider maintenance requirements and if the client and caregiver(s) can properly maintain the cushion
Reduces peak pressures at the bony prominences (ITs, sacrum, and coccyx)	

Cushion Geometry

Linear

- Refers to a flat seat cushion
- Can be a variety of mediums (foam layers, foam with gel, air, etc.)



 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:

- Adductors: Tapered or Straight
- Medial Abductor
- Posterior Pelvic Well
- Anti-Thrust
- Wedge (not pictured)



Refer to page 73 for the benefits and considerations of each style of cushion geometry.

Contoured cushion components

Straight Adductors

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

Benefits of straight adductors:

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





Tapered Adductors

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




Benefits of tapered adductors:

- Partial offloading increases optimal pressure redistribution
- Pelvic stability for clients with trunk and pelvic weakness provides support which may reduce fatigue

Medial Abductor

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



Abductor combined with adductors

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

Posterior Pelvic Well

- 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



Rear



Anti-Thrust

- 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 edge of the anti-thrust

Linear & Anti-Thrust Profiles

Linear





www.permobilus.com

Wedge

- 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

Linear & Wedge Profiles



How contours affect pressure redistribution

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



Benefits and considerations of cushion geometry

Linear

Benefits	Considerations		
Allows freedom of movement	With linear style cushions, if using traditional gel, it often disperses over time, exposing the bony prominences to peak pressures		
Can typically fit any body type	Always consider the medium of a linear cushion; ie. low quality foam compresses and loses its shape over time resulting in increased peak pressures		
Clients with significant lower extremity contractures may fit a linear style cushion better than a contoured one	Lack of stabilizing contours and the medium may affect client fatigue over time		

Contoured

Benefits

Promotes pressure redistribution to greater surface areas, reducing peak pressures

Increased stability can secure the pelvis in an optimal position and reduce excessive fatigue

Use of contours can accommodate or correct abnormal postures

Considerations

Various body shapes & sizes may not always fit in the contours

May not fit clients with significant lower extremity contractures

May restrict freedom of movement during ADLs

Aggressive contours may make independent transfers more difficult

Cushion Medium

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

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





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 client can sit in their wheelchair, ease of transfers, and pelvic posture when weakness is present.



Remember to think of the functional and postural goals of your client!

Foam is not just foam; they are not all created equal! The quality and properties of foam, or any cushion medium, affect the application and effectiveness of a cushion. Be an advocate for your clients 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 layer** of a cushion



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



 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!!!

Benefits and considerations of cushion mediums

Foam

Benefits

Can be designed to be as supportive/ contoured as needed

Can allow for offloading or immersion

Low maintenance

Considerations

Foam can be heavy; consider the weight of the cushion

Need to protect the foam from incontinence

Most foams inherently retain heat and moisture

Air

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

Benefits	Considerations
Promote immersion and envelopment of bony prominences, increasing pressure redistribution	Easily affected by altitude: Higher altitude = firmer
Perceived as "soft" and comfortable	The softness may affect transfers
Can be adjustable	May require some maintenance

Honeycomb

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

Benefits	Considerations	
Inherently breathable	Not adjustable and may not accommodate orthopedic deformities	
Lightweight	Can be perceived as "firm"	
Low maintenance	Not adjustable; client balance, endurance and ROM need to be considered	

Gel/Fluid Inserts

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

Benefits	Considerations
Can allow for immersion of bony prominences for pressure redistribution	Effectiveness is dependent on the cushion geometry and stability
Some gels state that they are "cooling" to manage microclimate	Fluid gel can migrate and result in high peak pressures
New gel technology offers solid gel options, eliminating the problem of gel dispersion	Certain styles require daily maintenance or with every reposition, need to be kneaded and readjusted to provide pressure relief
	With sun exposure, can retain heat

Combination/Hybrid

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

Benefits	Considerations	
Foam provides a stable base for transfers with the skin protection of air/gel	Can be heavy depending on medium and/or manufacturer	
Can allow for immersion and envelopment of bony prominences for increased pressure redistribution	With well cutouts, the migration of gel or loss of air, can result in the ITs resting on edge of the foam, causing peak pressure	
	May require 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 CLIENT NEEDS IT?



There are key questions to ask yourself when deciding if the wheelchair manufacturer's back support should be replaced with an off-the-shelf back support:

- 1. Is your client immobile?
- **2.** Does your client have a postural abnormality that affects pelvic and trunk stability and alignment?
- 3. Does your client require assistance to sit unsupported?
- 4. Does your client complain of pain while sitting in the wheelchair?

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

 If your client 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.



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 (pages 80 81)
- Medium (page 82)
- Adjustability (pages 83 85)



Back support goals:

- Maximize client 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



Posterior Planar



Lateral Contoured Shell

Benefits

Designed to fit the anatomical shape of the end user

Various options depending on client goals; deep, upper thoracic or lower thoracic contours

Considerations

Contour is lateral, not on the posterior surface of the shell

Look for a contoured shell with the ability to conform posteriorly

Look at the shape of the upper shell for scapular cutouts if your client is a self-propeller

Posterior Open Shell

Benefits

Newer concept

Allows for immersion posteriorly with technology that conforms to the shape of the client

Lightweight

Can accommodate and/or correct for multiple reducible postural abnormalities

Considerations

May not be able to adjust for a significant lordosis

Posterior Planar Shell

Benefits

Certain planar styles can be adjustable for conforming to shape

Flat shell allows room to attach harnesses, pelvic belts, a head support, and lateral trunk supports

Considerations

Most have no ability to conform to the shape of the user, resulting in the progression of postural abnormalities

Look for the ability to adjust and contour the back support to the spine if using a planar shell

Back Support 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.

- Foam
- Air
- Combination

Foam

Benefits

Most common

A high quality visco elastic foam allows immersion and envelopment of an individual's shape

Considerations

Can be hot

Consider quality and type of foam used as it affects immersion and envelopment and pressure redistribution

Air

Benefits

Air cells that allow the transfer of air mimic the pressure redistribution properties of water

Individual air cells 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/Hybrid

Benefits

Offer the stability of foam with the pressure redistribution properties of air

Considerations

May require maintenance

Considerations

May require maintenance

Back Support 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 curve excessively, changing 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 tension adjustable straps or cables
- Through mounted wings
- Using foam wedges
- Utilizing air or other cushioning inserts

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

WHY IS ADJUSTING SEAT-TO-BACK ANGLE (STBA) IMPORTANT?



Adjusting seat-to-back angle allows for:

- Increased 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



WHAT SHOULD WE AIM FOR WITH ADJUSTABILITY?



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

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



90° STBA Peak pressure at the apex



Opened STBA More surface contact Match client ROM



Opened STBA + Contour Optimal pressure redistribution

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

Wheelchair 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 client!

Upper Extremity Supports

Upper extremity (UE) 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 clients this way, especially when dealing with abnormal tone or decreased range of motion? Choose an upper extremity support that has angle adjustability!

Types of UE supports

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

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: Helps keep the arm from sliding off the pad
- Minimal Contour: Low profile support
- **Moldable:** Accommodates flexion or extension of the wrist and finger abduction

Lower Extremity Supports

Lower extremity (LE) supports can be added to a wheelchair 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 the legrest

* 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.

Types of LE supports

- Single Foot support
- Double Foot Support
- Double Foot Support with Separator
- Residual Limb Support
- External Fixator Support
- Calf Pads

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

Lateral Trunk Supports

Lateral trunk supports can be added to a wheelchair or back support to:

- Reduce 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 client

Types of lateral supports

- Mounted: Swing-away or fixed; attach to the back support with hardware
- Traditional Foam: Contoured foam pads

 If your client 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 Legrest Misconception

ELEVATING LEGRESTS (ELRs) ARE A GOOD OPTION, RIGHT?



NO! Here are some common misconceptions about ELRs that you **need absolute clarification** on to help you understand why standard legrests are usually the better option.



1 - ELRs keep hips back in wheelchair: Wrong!

ELRs do just the opposite.

- When we elevate the legs, we pull on the already tightened hamstrings of the client (see pages 91 92 for visuals)
- The tightened 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
- The client begins to slide forward out of the wheelchair, the exact opposite of keeping the hips back in the wheelchair

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, seen in manual tilt-in-space or power wheelchairs
- ELRs on a manual wheelchair 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 legrest promotes knee flexion, leading to decreased femoral contact, shifting the pressure back onto the ITs, sacrum, and 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 legrests more easily
- Windswept posture is more prevalent
- ELRs promote flexion of knees, hips, and ankles, increasing risk of contractures at those joints

* AVOID the use of ELRs as much as possible for optimal positioning in a wheelchair. An ELR may be added to the seating system, but <u>only when used in combination with</u> <u>other appropriate positioning components</u>.

The Wedge Misconception



WILL A WEDGE CUSHION KEEP MY CLIENT FROM SLIDING OUT OF THE WHEELCHAIR?



NO! Sometimes a wedge cushion can make the problem worse. Here is what a wedge cushion actually does:

Closes seat-to-back angle



• Pulls on tightened hamstring muscles, resulting in a posterior pelvic tilt and sliding forward









WHAT DO I NEED TO KNOW ABOUT USING A WEDGE CUSHION APPROPRIATELY?



Since a wedge closes STBA, it should not be used for:

- Someone who cannot tolerate a 90° or less STBA
- Someone with tightened hamstrings

A wedge would be 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

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

Problems with Sliding out of the Wheelchair



WHAT SHOULD I DO WHEN MY CLIENT KEEPS SLIDING OUT OF THE WHEELCHAIR?



First, we need to find out why they are sliding. The list below can help get you started.

- **1.** Check for **tightened hamstrings** as they can pull the pelvis forward in the seated posture.
- **2.** Check for **hip ROM** and see if they are trying to increase the seat-to-back angle by sliding forward.
- **3.** Check the **seat depth** and see if it is too deep and putting pressure on the back of their legs.
- **4.** 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 client may slide forward seeking stability.



When we know what might be causing the client to slide, then we can look at possible solutions.

- Accommodate tightened hamstrings by adapting the seat depth and back angle to match the client'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 STBA based on your mat evaluation results
- Measure upper leg length (*page 58*) and get a wheelchair 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

Conclusion

It is important to keep the following goals in mind for your client both short-term **and long-term** and then do the best you can!

- Maximize client comfort
- Minimize pain
- Correct deformities when possible
- Prevent further deformity
- Prevent pressure injury
- Increase functional safety and independence

You are going to **need to advocate for your client now** in order to get them the proper equipment that can address their needs over time.

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

Glossary

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Whee	lchair & Parts	People	e & Process	
MWC:	Manual Wheelchair	ATP:	Assistive Technology Professional	
PWC:	Power Wheelchair	NP:	Nurse Practitioner	
POV:	Power Operated vehicle	PA:	Physician Assistant	
ELR:	Elevating Legrest	LMN:	Letter of Medical Necessity	
STBA:	Seat-to-Back Angle	DME:	Durable Medical Equipment	
STFH:	Seat-to-Floor Height	CRT:	Complex Rehab Technology	
Bodya	& Posture	Client	Function	
ASIS:	Anterior Superior Iliac Spine	ROM:	Range of Motion	
PSIS:	Posterior Superior Iliac Spine	ADLs:	Activities of Daily Living	
IT:	Ischial Tuberosity	MRADLs: Mobility-Related		
LE:	Lower Extremity		Activities of Daily Living	

-1

Upper Extremity UE:

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