



Mobility devices: Manual wheelchairs, power wheelchairs, scooters

July 8, 2020

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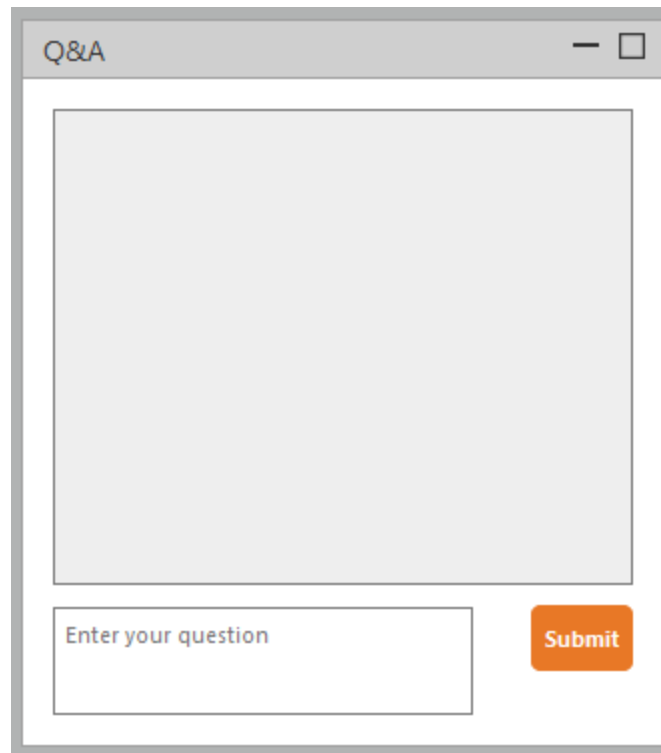
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Presenter



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Medical Director

Objectives

- Discuss the injuries and medical conditions that can cause immobility
- Review the safety considerations necessary for wheelchair mobility
- Describe the differences between manual wheelchairs, power wheelchairs, and scooters
- List the home and vehicle modifications that might be needed to accommodate wheelchairs and scooters
- Discuss other mobility devices that may be used in addition to wheelchairs and scooters

Injuries and medical conditions that can cause immobility

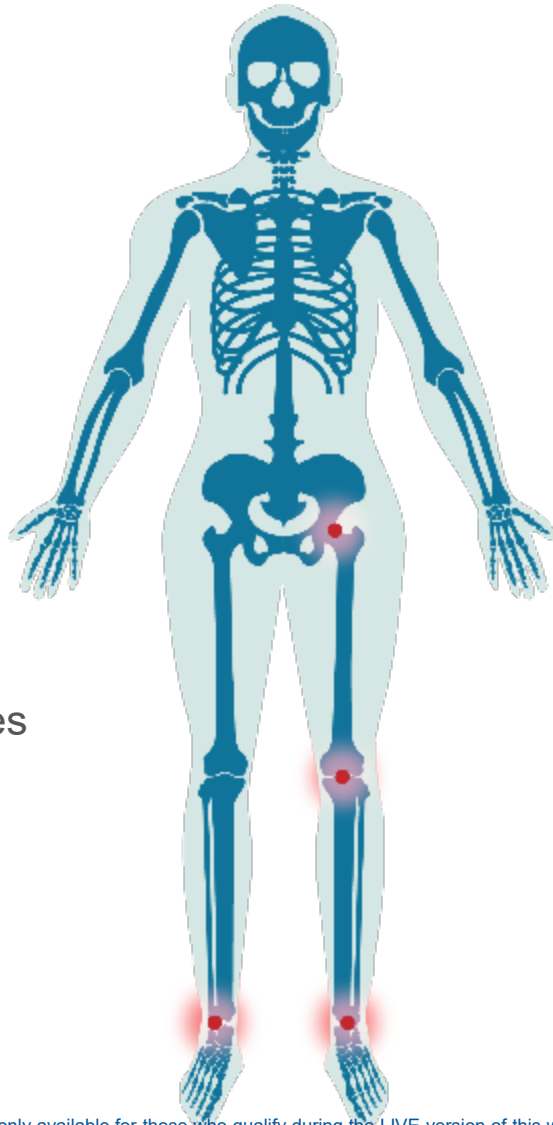
Duration of immobility



Temporary immobility

NON-WEIGHT BEARING OF BOTH LOWER LIMBS

- Multiple trauma
- Bilateral lower limb injuries



JOINT REPLACEMENTS

- Hip
- Knee
- Ankle

FRACTURES, SPRAINS, AND TENDON INJURIES

- Hip
- Leg
- Foot/ankle

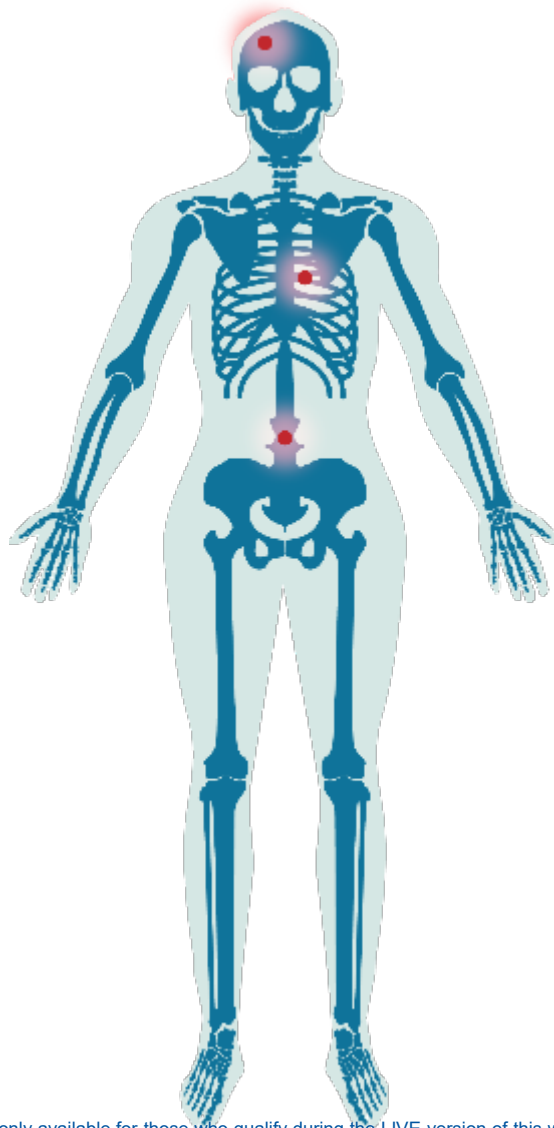
Temporary to permanent immobility

NEUROLOGICAL

- Traumatic brain injury
- Stroke
- Nerve injury and neuropathy

ORTHOPEDIC

- Osteoarthritis
- Osteoporotic fractures (spine)



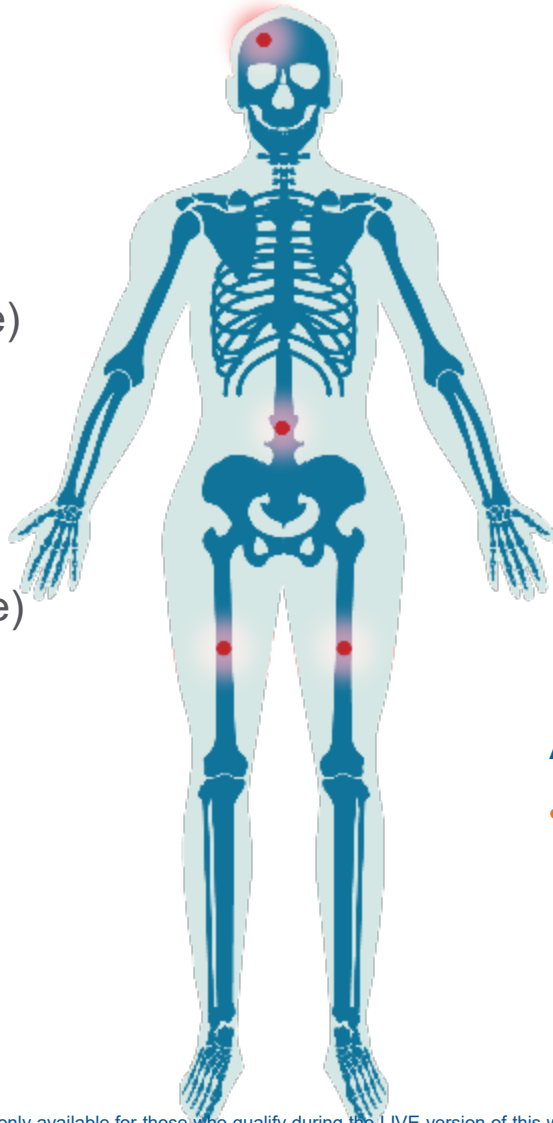
GENERAL MEDICAL

- Pulmonary (chronic bronchitis, emphysema, etc.)
- Cardiovascular (heart failure, cardiomyopathy, etc.)

Permanent immobility

NEUROLOGICAL

- Traumatic brain injury (severe)
- Stroke (severe)
- Anoxic brain injury (severe)
- Spinal cord injury
- Parkinson's disease
- Multiple sclerosis
- ALS (Lou Gehrig's disease)



AMPUTATION

- Unable to use prosthetic device(s)

Effects of comorbid conditions on mobility

- Vision loss
- Cognitive impairment
- Tremor
- Decreased coordination
- Heart disease
- Lung disease
- Obesity
- Depression and anxiety

Considerations for wheelchair mobility

Wheelchair safety



EDUCATION

- Patient
- Caregiver(s)



VISION AND COGNITION

- Assessments
- Precautions



SKIN PROTECTION

- Pressure relief
- Transfers



FALL PREVENTION

- In use
- Transfers

Wheelchair safety

SKIN PROTECTION

Cushion

- Standard
 - Foam
- Pressure-relieving
 - Gel
 - Air

Pressure mapping

- Pressure distribution
- Affected by
 - Weight
 - Posture
 - Hips and spine
- Can change over time

Transfers

- Education
 - Patient
 - Caregiver
- DME
 - Slide board
 - Lift system

HIPS AND HEELS

Manual wheelchairs

Essential manual wheelchair components

- Frame and base
- Seat and back
- Arm support
- Lap tray
- Wheels
- Leg rests
- Casters



Requirements for manual wheelchair use



Cognitive



Visual



Physical

Pros and cons of manual wheelchairs

PROS

- Lightweight
- Portability
- No battery
- Aerobic activity

CONS

- Fatigue with long distance
- Repetitive use injuries

Repetitive use injuries with manual wheelchairs

- Rotator cuff/shoulder injuries
- Lateral epicondylitis (tennis elbow)
- Carpal tunnel syndrome
- Osteoarthritis (upper limbs)

Reducing the risk of repetitive use injuries



Education



Wheelchair selection and configuration



Seating and positioning



Power-assist wheels



Gloves and braces

Types of manual wheelchairs

- Standard
- Lightweight
- Ultra-lightweight
- Heavy duty



Standard manual wheelchair

- **ADVANTAGES**

- Lower cost
- Folds and is easily stored
- Transportability

- **DISADVANTAGES**

- Heavy
- Limited size availability
- Temporary use only



<https://reliablemedsupply.com/products/standard-wheelchair>

Lightweight manual wheelchair

- **ADVANTAGES**

- Slightly lighter in weight
- Some (but not many) adjustable parts

- **DISADVANTAGES**

- Limited sizes
- Some have sling-type upholstery



<https://www.quickie-wheelchairs.com/Ultra-Light-Wheelchairs/Ultralight-Folding-Wheelchairs/Quickie-LXI-Ultralight-Wheelchair/2410p>

Ultra-lightweight manual wheelchair

- **ADVANTAGES**

- Very low weight
- Long-term use
- Adjustable parts
- Easier to propel

- **DISADVANTAGES**

- Higher cost
- Rigid frames (lightest) do not fold



<https://www.quickie-wheelchairs.com/Ultra-Light-Wheelchairs/Ultralight-Folding-Wheelchairs/Quickie-LX-Lightweight-Wheelchair/2405p>

Other types of manual wheelchairs

- Heavy-duty and bariatric



<https://www.quickie-wheelchairs.com/Standard-Manual-Wheelchairs/Invacare-Tracer-IV-Heavy-Duty-Wheelchair/28808p>

Other types of manual wheelchairs

- Heavy-duty and bariatric
- Reclining



Other types of manual wheelchairs

- Heavy-duty and bariatric
- Reclining
- Tilt-in-space



Power-assist wheels



ADVANTAGES

- Decreased energy required to propel
- Less stress on arms

DISADVANTAGES

- Higher cost
- Increased width of wheelchair
- Batteries
 - Heavier
 - Require charging

<https://www.quickie-wheelchairs.com/Wheelchair-Parts-Accessories/Assorted-Wheelchair-Parts/Wheels-Hand-Rims-Axles/Power-Assist-Wheelchair-Wheels/Twion-Wheelchair-Power-Assist-Wheel/40502p>

Power wheelchairs

CMS criteria for wheelchairs

- What is the patient's mobility limitation that prevents them participating in one or more mobility-related ADL (MRADL)?
- Can the patient's mobility limitation be resolved with a cane or a walker?
- Will the use of wheelchair significantly improve the patient's ability to participate in MRADLs in the home?
- Does the patient have the strength and cognition to safely operate the wheelchair?
- For power wheelchair, only if the patient cannot use a manual wheelchair in the home.

<https://www.medicare.gov/Pubs/pdf/11046-Medicare-Wheelchair-Scooter.pdf>

Essential power wheelchair components

- Frame and base
- Seat
- Drive system
- Drive control
- Leg support
- Head and neck support
- Battery



Pros and cons of power wheelchairs

PROS

- Self-propulsion
- Options for drive control
 - Joystick
 - Sip-and-puff
 - Head array
- Long distances

CONS

- Heavy
- Decreased portability
- Risk of battery/power failure

Requirements to use a power wheelchair



Cognitive



Vision



Physical

Drive systems for power wheelchairs

- Rear-wheel
- Front-wheel
- Mid-wheel



Rear-wheel power wheelchair

- **ADVANTAGES**

- Consistent tracking
- Higher-speed use
- Less impact with coordination problems

- **DISADVANTAGES**

- Limited obstacle climbing
- Front wheels sinking in soft surfaces
- Large turning radius



BRADDOM, R. L., BUSCHBACHER, R. M., CHAN, L., & KOWALSKE, K. J. (2007). *Physical medicine & rehabilitation*. Philadelphia: Saunders Elsevier.

Front-wheel power wheelchair

- **ADVANTAGES**

- Better for uneven terrain/hills
- Climbs over obstacles
- Improved turning radius

- **DISADVANTAGES**

- Movement of back half of wheelchair
- Slower top speed



BRADDOM, R. L., BUSCHBACHER, R. M., CHAN, L., & KOWALSKE, K. J. (2007). *Physical medicine & rehabilitation*. Philadelphia: Saunders Elsevier.
<https://newecart.com/products/drive-medical-titan-x16-front-wheel-power-wheelchair-1-ea-22907>

Mid-wheel power wheelchair

- **ADVANTAGES**

- Turn on center with lowest turning radius
- Improved indoor mobility
- Better traction

- **DISADVANTAGE**

- Getting stuck on uneven/steep terrain



BRADDOM, R. L., BUSCHBACHER, R. M., CHAN, L., & KOWALSKE, K. J. (2007). *Physical medicine & rehabilitation*. Philadelphia: Saunders Elsevier.
<https://www.mda.org/quest/article/front-middle-or-rear-finding-power-chair-drive-system-thats-right-you>

Power wheelchair controls

- Joystick
- Sip and puff
- Head array
- Tongue control



Scooters

Requirements for use



Cognitive



Visual



Physical

Scooter turning radius

- Scooters have a large turning radius
- Adequate room indoors is necessary
- Home modifications may be necessary



Types of scooters

- Compact/folding



Types of scooters

- Compact/folding
- 3-Wheeled



Types of scooters

- Compact/folding
- 3-Wheeled
- 4-Wheeled



Other types of wheelchairs

Other types of wheelchairs

- Stand-up



[https://americanqualityhealthproducts.com/all-power-chairs/3944-xo-505-standing-wheelchair-w-multiple-power-functions-by-karman.html#/
<https://msu.edu/~luckie/segway/iBOT/iBOT.html>](https://americanqualityhealthproducts.com/all-power-chairs/3944-xo-505-standing-wheelchair-w-multiple-power-functions-by-karman.html#/)

Other types of wheelchairs

- Stand-up
- Stair-climbing



<https://americanqualityhealthproducts.com/all-power-chairs/3944-xo-505-standing-wheelchair-w-multiple-power-functions-by-karman.html#/>
<https://msu.edu/~luckie/segway/iBOT/iBOT.html>

Home and vehicle modifications

Modifications (home and vehicle)



Essential vs. nonessential



Safety



Function



Quality of life

Home modifications

- Ramp
- Door entry
- Kitchen
- Bathroom
- Counters and sinks
- Turning radius
- Stair lifts



Vehicle modifications

- Rear transport/carrier
- Lift systems
- Driver
 - Seating
 - Hand controls



Other mobility devices

- Canes
- Crutches
- Walkers
 - Standard
 - Rolling
 - Rollator



Other mobility devices

- Canes
- Crutches
- Walkers
 - Standard
 - Rolling
 - Rollator
- Knee scooter



Exoskeleton

- Indications
 - Diagnoses
 - Spinal cord injury
- Benefits
 - Weight-bearing
 - Psychological
- Limitations
 - Distance & speed
 - Does not replace wheelchair for primary mobility
 - Training
 - Comorbid considerations



Summary

- Significant differences exist between manual wheelchairs, power wheelchairs, and scooters
- It's important to determine if the patient has the cognition, vision, and physical abilities to operate any mobility device
- Home and/or vehicle modifications might be necessary to allow for safe and effective use of a wheelchair or scooter
- Additional mobility devices are also available and should be considered when appropriate

Thank you!

Questions?

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