Mobility devices: Manual wheelchairs, power wheelchairs, scooters

July 8, 2020
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Presenter

Robert Hall, M.D
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 | Temporary to Permanent | Permanent
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

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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.)

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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

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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

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# Pros and cons of manual wheelchairs

<table>
<thead>
<tr>
<th>PROS</th>
<th>CONS</th>
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<tbody>
<tr>
<td>Lightweight</td>
<td>Fatigue with long distance</td>
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<tr>
<td>Portability</td>
<td>Repetitive use injuries</td>
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<tr>
<td>No battery</td>
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<td>Aerobic activity</td>
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</table>
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


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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

Other types of manual wheelchairs

- Heavy-duty and bariatric

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

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.

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

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


Mid-wheel power wheelchair

• ADVANTAGES
  ▪ Turn on center with lowest turning radius
  ▪ Improved indoor mobility
  ▪ Better traction

• DISADVANTAGE
  ▪ Getting stuck on uneven/steep terrain


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

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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

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Other types of wheelchairs

• Stand-up
• Stair-climbing

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

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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

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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!

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