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Introduction to Wheel chair

Increasing the Conformance of Academia towards Rehabilitation Engineering (i-CARE)

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Wheelchairs

- A **wheelchair** is a chair with wheels and it usually involves a chair and wheels, **used** when walking is difficult or impossible **due to** illness, injury, **old age related problems**, or disability
- These can includes **spinal cord injuries** (paraplegia, Hemiplegia, and quadriplegia), **broken leg(s), cerebral palsy**, **brain injury**,. brittle bones, motor neurone diseases **(MND**), multiple sclerosis (**MS**) muscular dystrophy (**MD**), Spina bifida, and more.

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Wheelchairs

- **Wheelchairs come in a wide variety of formats to meet the specific needs of their users**

  The most widely recognized distinction is between

- **powered wheelchairs**, where propulsion is provided by batteries and electric motors, **and**
- **manually propelled wheelchairs**

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Types of wheelchairs

- 1Manual self-propelled wheelchairs
- 2Manual attendant-propelled wheelchairs
- 3Powered wheelchairs
- 4Mobility scooters
- 5Single-arm drive wheelchairs
- 6Reclining and tilting wheelchairs
- 7Standing wheelchairs
- 8Sports wheelchairs
- 9Wheelchair stretchers
- 10All-terrain wheelchairs
- 11Smart wheelchairs

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Accessories

There are a wide range of accessories for wheelchairs.

There are

- **cushions**,
- **cup holders,**
- **seatbelts,**
- **storage bags,**
- **lights, and**
- **more.**

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History of wheelchairs

- The earliest records of wheeled furniture are an inscription found on a stone slate in China and a child's bed depicted in a frieze on a Greek vase, both dating **between the 6th and 5th century BCE**.
- **The first records of wheeled seats being used for transporting disabled persons date to three centuries later in China**; the Chinese used early wheelbarrows to move people as well as heavy objects.
- Although Europeans eventually developed a similar design, this method of transportation did not exist until 1595[6] when an unknown inventor from Spain built one for King Phillip II.
- **In 1933 Harry C. Jennings**, Sr. and his disabled friend **Herbert Everest**, both mechanical engineers, invented the first lightweight, steel, folding, portable wheelchair.[9] Everest had previously broken his back in a mining accident.

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Manual self-propelled wheelchairs

- The larger rear wheels usually have **push-rims** of slightly smaller diameter projecting just beyond the tire; these allow the user to maneuver the chair by pushing on them without requiring them to grasp the tires.
- Manual wheelchairs generally have **brakes** that bear on the tires of the rear wheels, however these are solely a parking brake and in-motion braking is provided by the user's palms bearing directly on the push-rims.
- **Everyday manual wheelchairs come in two major varieties, folding or rigid**
- **Folding** chairs are generally low-end designs, whose predominant advantage is being able to fold, generally by bringing the two sides together. However this is largely an advantage for **part-time users** who may need to store the wheelchair more often than use it.

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Manual self-propelled wheelchairs

- **Rigid wheelchairs,** which are increasingly preferred by **full-time and active users, have permanently welded joints and many fewer moving parts.** This reduces the energy required to push the chair by eliminating many points where the chair would flex and absorb energy as it moves**.**
- **Ultra lightweight rigid wheelchairs are commonly known as 'active user chairs' as they are ideally suited to independent use.**
- **Sport wheelchairs often have large camber angles to improve stability**.
- **All major varieties of wheelchair can be highly customized for the user's needs**.

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Manual attendant-propelled wheelchairs

- An attendant-propelled wheelchair is generally similar to a self-propelled manual wheelchair, but **with small diameter wheels at both front and rear.**
- The chair is maneuvered and controlled by a person standing at the rear and pushing on handles incorporated into the frame.

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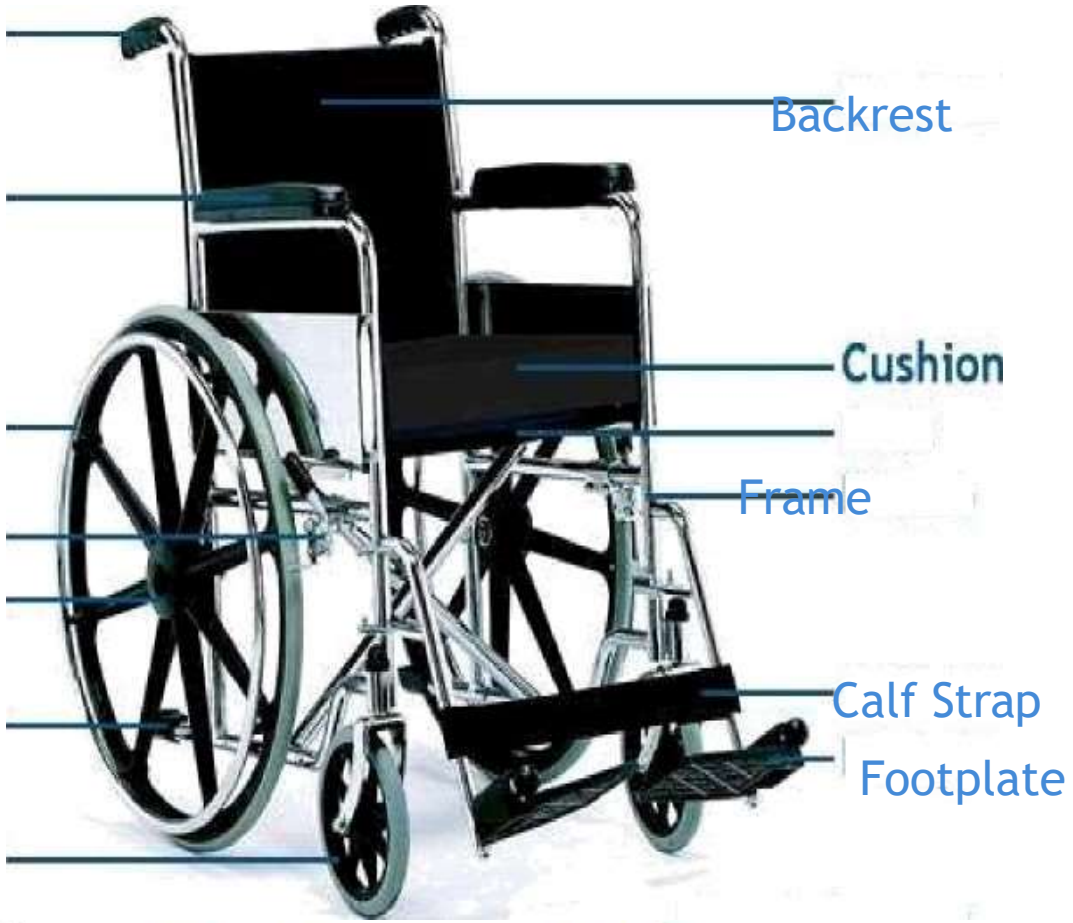
BASIC CONCEPTS



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Manual self-propelled wheelchairs

A self-propelled manual wheelchair incorporates a frame, seat, one or two footplates (footrests) and four wheels:
usually two caster wheels at the front and two large wheels at the back

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Manual attendant-propelled wheelchairs

Automatic electrical foldable

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Basketball wheelchair teem

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Light weight reclining Wheelchair

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Powered wheelchairs

Motorized wheelchair

- An electric-powered wheelchair, commonly called a "power chair" is a wheelchair which **additionally incorporates batteries and electric motors** into the frame and that is controlled by either the user or an attendant, most commonly via a **small joystick** mounted on the armrest, or on the upper rear of the frame. **Alternatives exist for the traditional manual joystick, including headswitches, chin-operated joysticks, sip-and-puff controllers or other specialist controls,** which may allow independent operation of the wheelchair for a wider population of users with varying motor impairments.[10]
- **Ranges of over 10 miles/15 km are commonly available from standard batteries**.

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Powered wheelchairs

- Powerchairs are commonly divided by their access capabilities.
- **An indoor-chair** may only reliably be able to cross completely flat surfaces, limiting them to household use.
- **An indoor-outdoor**
- A power-assisted wheelchair is a recent development that uses the frame and seating of a typical rigid manual chair while replacing the standard rear wheels with wheels of similar size which incorporate batteries and battery-powered motors in the hubs.

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Wheelchair ramp and disabled parking space

Wheelchair ramp in the Sejm, lower chamber of the Polish parliament

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Power wheelchair

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Seating systems

- **Wheelchair seating systems are designed both to support the user in the sitting position and to redistribute pressure from areas of the body that are at risk of pressure ulcers**.[26] For someone in the sitting position, the parts of the body that are the most at risk for tissue breakdown include the ischial tuberosities, coccyx, sacrum and greater trochanters**.**
- **Wheelchair cushions are the prime method of delivering this protection and are nearly universally used**. Wheelchair cushions are also used to **provide stability, comfort, aid posture and absorb shock**.[27]
- Prior to 1970, little was known about the effectiveness of wheelchair cushions and there was not a clinical method of evaluating wheelchair seat cushions. **Most recently, pressure imaging (or pressure mapping) is used to help determine each individual's pressure distribution to properly determine and fit a seating system.**

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Single-arm drive wheelchairs

- **One-arm or single arm drive enables a user to self-propel a manual wheelchair using only a single arm**.

The large wheel on the same side as the arm to be used is fitted with **two concentric handrims**, one of smaller diameter than the other. On most models the outer, smaller rim, is connected to the wheel on the opposite side by an inner concentric axle .

When both handrims are grasped together, the chair may be propelled forward or backward in a straight line.

When either handrim is moved independently, only a single wheel is used and the chair will turn left or right in response to the handrim used.

- Some wheelchairs, designed for use by hemiplegics,

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Smart wheelchairs

- A smart wheelchair is any powerchair using a control system to augment or replace user control.[14]
- **Its purpose is to reduce or eliminate the user's task of driving a power chair**.
- Usually, a smart wheelchair is controlled via a computer, has a suite of sensors and applies techniques in mobile robotics, but this is not necessary. The type of sensors most frequently used by smart wheelchairs are the ultrasonic acoustic range finder (i.e. sonar) and infrared red (IR) range finder.[15]
- The interface may consist of a conventional wheelchair joystick, a "sip-and-puff" device or a touch-sensitive display.

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Smart wheelchairs

- **Smart wheelchairs are designed for a variety of user types. Some are designed for users with cognitive impairments**, such as dementia, these typically apply collision-avoidance techniques to ensure that users do not accidentally select a drive command that results in a collision**.**
- **Others focus on users living with severe motor disabilities**, such as cerebral palsy, or with quadriplegia, and the role of the smart wheelchair is to interpret small muscular activations as high-level commands and execute them. Such wheelchairs typically employ techniques from artificial intelligence, such as path-planning

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Sports wheelchairs

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Reclining and tilting wheelchairs

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A beach wheelchair

- The common adaptation among the different designs is that they have extra-wide balloon wheels or tires, to increase stability and decrease ground pressure on uneven or unsteady terrain.

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BATTI

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Stair climbing electrical wheelchair

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All-terrain wheelchairs

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