What is cerebral palsy?
Cerebral palsy (CP) is a motor disability caused by a static, non-progressive lesion (encephalopathy) in the brain that occurs in early childhood, usually before 2 years of age. Although cerebral palsy has a variety of etiologies, all individuals with CP will have a range of difficulty with the control of posture and movement. Since the causes can be many, the diagnosis is made based on evidence of non-progressive brain damage and the presence of resulting impairment of the neuromotor system including abnormalities in resting muscle tension (muscle tone) and difficulty with posture, and movement.

Associated Disorders
Cerebral palsy may be associated with sensory impairments, visual impairments, seizure disorders, learning disabilities, communication disorders, intellectual disabilities, and behavior disorders. Although difficult to accurately assess the cognitive status of children with more involved forms of cerebral palsy, approximately 50-67% of individuals with CP have an intellectual or learning disability.

How many children have cerebral palsy?
- Cerebral palsy is the second most common neurological impairment in childhood (Intellectual Disability is the first)
- Prevalence is 3.6/1000 live births (US) or 1 in 278 children. However, the incidence is much higher in babies born of low birth weight. In children born weighing less than 1500 grams the incidence is 8/1000 births.
- Currently it is estimated that 770,000 persons in the US have cerebral palsy. Approximately 10,000 children are diagnosed with CP per year including 1,200 to 1,500 in preschool aged children.

Description of cerebral palsy
The effects of CP vary for each individual and are described in several ways. Traditionally, children with cerebral palsy have been described by the type of muscle tone they demonstrate, how many limbs the tone affects (distribution), and the overall severity of impairments. Recently a functional system, The Gross Motor Function Classification System (GMFCS) http://canchild.mgm.icreate3.esolutionsgroup.ca/en/GMFCS/resources/GMFCS-ER.pdf has been introduced and is used considerably. The GMFC System describes the effect of CP in terms of the individual’s motor function and mobility at different age ranges.
### Tone

<table>
<thead>
<tr>
<th>Type</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spasticity</td>
<td>Hypertonic, increased muscle tone, decreased voluntary muscle control</td>
</tr>
<tr>
<td>Athetosis</td>
<td>Slow, writhing movements of the arms and legs, arms are often more involved and can involve muscles around the mouth</td>
</tr>
<tr>
<td>Ataxia</td>
<td>Decreased balance, lack of proximal muscle control, legs are often more involved than arms, very unstable gait</td>
</tr>
</tbody>
</table>

### Distribution

<table>
<thead>
<tr>
<th>Type</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemiplegia</td>
<td>One side of the body affected, arms often more involved than legs</td>
</tr>
<tr>
<td>Diplegia</td>
<td>All extremities affected but the legs are significantly more affected, spasticity often present in the legs</td>
</tr>
<tr>
<td>Quadriplegia</td>
<td>All extremities affected but the arms are more involved than the legs, intellectual disability common</td>
</tr>
</tbody>
</table>

### Severity of Impairment

<table>
<thead>
<tr>
<th>Type</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>Ambulates independently; may need support to maintain balance on occasion</td>
</tr>
<tr>
<td>Moderate</td>
<td>Ambulates with assistive device, may have learning disabilities or other functional impairments</td>
</tr>
<tr>
<td>Severe</td>
<td>Uses wheeled mobility devices and other adaptive equipment and/or communication systems, may require significant amount of physical assistance with daily tasks</td>
</tr>
</tbody>
</table>

### Gross Motor Function Classification System (GMFC)

The GMFC System for cerebral palsy is based on self-initiated movement with particular emphasis on sitting and walking. This is a 5 level Classification System based on functional limitations, the need for assistive technology including mobility devices (such as walkers, crutches, and canes) and wheeled mobility, and to much lesser extent quality of movement. The purpose is to classify a child’s present gross motor function, not to judge quality of movement or potential for improvement. [http://canchild-mgm.icreate3.esolutionsgroup.ca/en/GMFCS/resources/GMFCS-ER.pdf](http://canchild-mgm.icreate3.esolutionsgroup.ca/en/GMFCS/resources/GMFCS-ER.pdf)

### What are causes of cerebral palsy?

The majority of children with cerebral palsy are born with it because of damage to the brain that occurs sometime in fetal development (prenatal) or during birth (perinatal) from genetic conditions, errors in fetal development, maternal conditions like infection, problems with the placenta or other fetal injury. Also, a small percentage of children acquire cerebral palsy after birth (postnatal) through infection, traumatic injury to the brain, or other injury to the brain tissue.
Prenatal causes: related to heredity, Rh-incompatibility, metabolic disorders, anoxia, and developmental deficits of the brain.

Perinatal causes: brain trauma or injury, asphyxia, and problems related to a prematurity.

Postnatal causes: brain injury due to trauma, toxicity, anoxia, tumors, and brain infections, including bacterial and viral encephalopathy.

What are interventions used for individuals with cerebral palsy?
The goal of intervention is to promote participation in naturally occurring activities and routines.

Medical treatments are directed at diminishing the effects of the impairments on function. A variety of medical interventions are available to help control the spasticity seen in many individuals with CP (See page 5, Treatments For Spasticity).

Therapeutic intervention may include physical therapy, occupational therapy, speech-language therapy, in addition to a host of other types of therapies such as vision, music, art, etc.

The child may also find a variety of special equipment helpful. For example, braces (also called orthotics) may be used to help hold a child’s foot in proper alignment when the child stands or walks. Custom splints can provide support to help a child use his or her hands. A variety of therapy equipment and adapted toys are also available. Activities such as swimming or horseback riding also help strengthen weaker muscles and relax the tighter ones.

A variety of assistive technology is available including communication devices, mobility devices, standing equipment, etc. All devices range from being simple, low tech devices to sophisticated computer driven systems. The overall purpose of all the technology is to promote function as soon as possible.

Educational services including special education and related services are available to children with CP. Under IDEA children with cerebral palsy may be found eligible to receive early intervention, and special education and related services.

References
Cerebral Palsy International Research Foundation  http://www.cpirf.org/


Center for Disease Control and Prevention (CDC), CDC Features, Premature Birth (n.d.). Available at http://www.cdc.gov/Features/PrematureBirth/


Resources

Information Resources

Easter Seals
http://www.easterseals.com

National Institute of Neurological Disorders and Stroke at the National Institutes of Health
www.ninds.nih.gov

March of Dimes Foundation
http://www.marchofdimes.com

United Cerebral Palsy (UCP)
http://www.ucp.org

United Cerebral Palsy (UCP) Research & Educational Foundation
http://www.ucpresearch.org

Intervention Resources

Online Book: Cerebral Palsy: Musculoskeletal Management
http://gait.aidi.udel.edu/gaitlab/cpGuide.html
This CD is a companion to the textbook, Cerebral Palsy: Musculoskeletal Management, by Freeman Miller and published by Springer Verlag

http://www.easystand.com/ginny/index.cfm

## Treatments For Spasticity

<table>
<thead>
<tr>
<th>METHOD</th>
<th>AGE (YEARS)</th>
<th>DIAGNOSIS</th>
<th>CHARACTERISTICS</th>
<th>EXPECTED RESULTS</th>
<th>FOLLOW-UP CARE</th>
<th>OUTCOME</th>
<th>SIDE EFFECTS; RISK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral Medications</td>
<td>Any age; most often 2-5 years</td>
<td>Spastic quadriplegia</td>
<td></td>
<td>Mild decrease in spasticity in arms and legs</td>
<td>PT, OT as needed</td>
<td>Often need SDR or ITB later</td>
<td>Drowsiness</td>
</tr>
<tr>
<td>Botox Injections</td>
<td>Any age: less often over 10</td>
<td>Spastic diplegia; quadriplegia</td>
<td></td>
<td>Decrease in spasticity injected muscle(s) for 2-4 months</td>
<td>PT, OT to increase range of motion and to increase strength</td>
<td>Improved gait; sometimes improved arm function</td>
<td>None with usual doses</td>
</tr>
<tr>
<td>Rhizotomy SDR</td>
<td>4 to 8 (most common)</td>
<td>Spastic diplegia or quadriplegia capable of ADLs</td>
<td>Good leg strength; no severe contractures; motivation for PT</td>
<td>Marked, permanent, non-adjustable decrease in spasticity</td>
<td>Extensive PT, OT</td>
<td>Improved walking; improved ADLs; decreased surgery</td>
<td>Infection: 2% Wound: 1% Spinal fluid leak: 3%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spastic quadriplegia; not capable of ADLs</td>
<td>Severe leg spasticity; interferes with care</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baclofen ITB</td>
<td>Over age 3; big enough to insert pump</td>
<td>Spastic quadriplegia; spasticity in legs ≥ spasticity in arms; capable of ADLs</td>
<td>Severe spasticity; positive response to test dose; spasticity limits function</td>
<td>Adjustable decrease in spasticity</td>
<td>Frequency of PT, OT depends on goals</td>
<td>Improved walking; Improved ADLs; Improved speech, 45% Decrease in orthopedic operations Easier care</td>
<td>Infection: 5-10% Wound: 5-10% Spinal fluid leaks: 5-10%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spastic quadriplegia; not capable of ADLs</td>
<td>Spasticity interferes with care</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Post-traumatic brain injury</td>
<td>Severe spasticity in arms and legs; usually more than one year after injury</td>
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<td></td>
</tr>
</tbody>
</table>

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*p. 5*