# Cerebral Palsy Overview:
## Diagnosis and Management Approaches

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## Premises

Life care planners:

1. what you do
2. information you gather
3. organize your thinking

We want to make this useful for you.
We're kind of guessing…

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## Learning Objectives

Participants will:

1. Understand the spectrum of NDDs and how CP fits in
2. Appreciate the many disorders often associated with CP
3. Become familiar with treatments employed for CP and some of the associated problems

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## Presentation Outline

1. NDDs
2. CP: diagnosis, causes
3. Associated Problems
4. Treatment
5. Prognosis/Longevity

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## Neurodevelopmental Disabilities

- Intellectual Disability
- Cerebral Palsy
- Learning Disabilities/Attention Deficit
- Autism
- Blindness
- Deafness

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- Chronic Childhood Neurological Disorders e.g., Seizures, Degenerative CNS Disease, Myopathies, etc.

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## Prevalence of NDDs

| | |
|---|---|
| • Reading deficiency | 20-40% |
| • Learning disability/MBD | 5-7% |
| • Intellectual disability | 3% |
| • Cerebral palsy | .2-.5% |
| • Blindness/deafness | .1-.2% |
| • Autism/ASD | .08%? / 1.3%?? |
| • Seizure disorder | .2-.5% |

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## 4 STATEMENTS

1. Medical Well-Being
2. Intelligence
3. Motor Competence
4. Behavior

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## Developmental Streams (Gesell)

- Language
  - Expressive
  - Receptive
- Motor
  - Fine
  - Gross
- Problem-solving
- Psychosocial

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## Cerebral Palsy

A disorder of movement and posture due to a cerebral insult (an anomaly or injury) which occurs during the developmental years and which is static (non-progressive) in nature.

Cerebral Palsy - Definition

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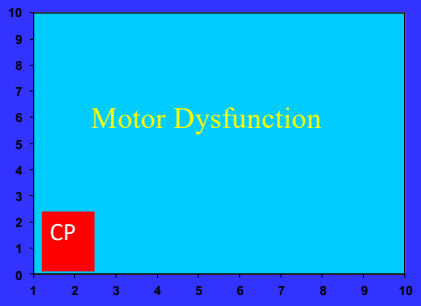
## The Spectrum of Motor Dysfunction

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## Developmental Diagnosis vs. Etiologic Diagnosis

- Problem diagnosis
- Causes of NDDs

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## Time Frames in Neurodevelopmental Disabilities

- Prenatal
- Perinatal
- Postnatal

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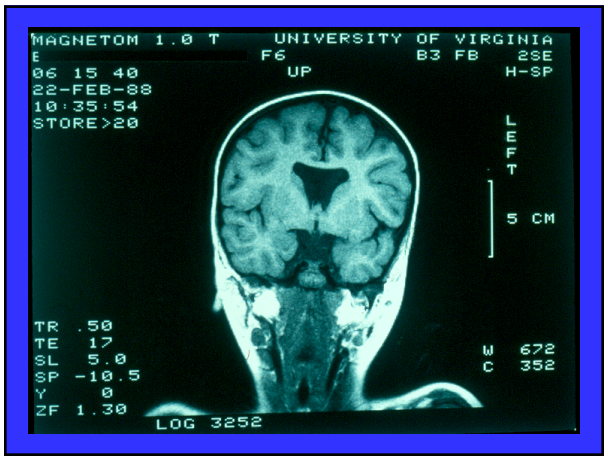
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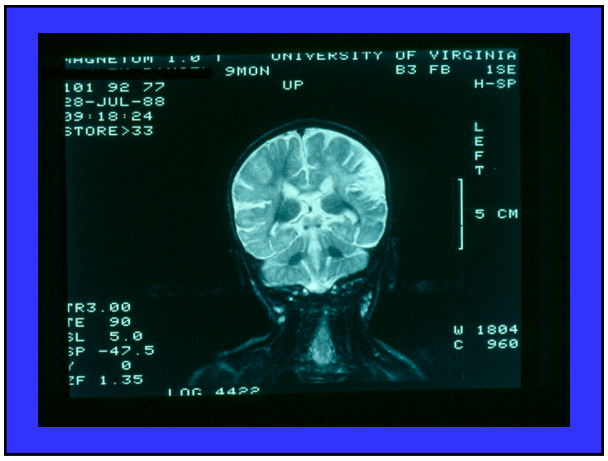
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## Neuromotor Assessment

- Motor Skills
- Classical Neurological Exam
  - Tone
  - Strength
  - Deep tendon reflexes
  - Coordination
- Neurodevelopment Markers:
  - Primitive Reflexes
  - Postural Reactions

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## Gross Motor Milestones

| | | |
|---|---|---|
| Prone: | Head Up | 1 month |
| | Chest Up | 2 months |
| | Up on Elbows | 3 months |
| | Up on Hands | 4 months |
| Roll: | Front to Back | 3-4 months |
| | Back to Front | 4-5 months |
| Sit With Support | | 5 months |
| Sit Without Support | | 6-7 months |
| Come to Sit | | 8 months |
| Crawl (quadruped) | | 8 months |
| Pull to Stand | | 8-9 months |
| Cruise | | 9-10 months |
| Walk With Two Hands Held | | 10 months |
| Walk With One Hand Held | | 11 months |
| Walk alone | | 12 months |

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## Fine Motor Milestones

| | |
|---|---|
| Retains ring (rattle) | 1 month |
| Hands unfisted | 3 months |
| Reaches | 3-4 months |
| Hands to midline | 3-4 months |
| Transfer | 5 months |
| Takes 1-inch cube | 5-6 months |
| Takes pellet (grasp) | 6-7 months |
| Immature pincer | 7-8 months |
| Mature pincer | 10 months |
| Release | 12 months |

***Sources:*** Capute et al.
Knobloch, et al. (Gesell)

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## Neuromotor Assessment

A. Motor Skills
B. Classical Neurological Exam
   - Tone
   - Strength
   - Deep tendon reflexes
   - Coordination
C. Neurodevelopment Markers:
   - Primitive Reflexes
   - Postural Reactions

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Neurodevelopmental Markers of CNS Motor Maturation:

Primitive Reflexes
and
Postural Reactions

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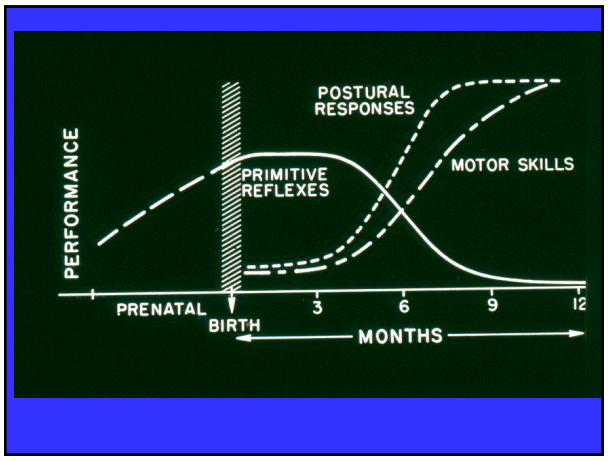
POSTURAL
RESPONSES
PERFORMANCE
PRIMITIVE
REFLEXES
MOTOR SKILLS
PRENATAL
BIRTH
3
6
9
12
MONTHS

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## Postural Reactions

| | | |
|---|---|---|
| **A.** | **Righting** | |
| | Head-righting | 1 ½ - 2 ½ mo. |
| | Landau | 3 – 4 mo. |
| | Derotative | 4 mo. |
| **B.** | **Protection** | |
| | Anterior | 5 mo. |
| | Parachute | 5-6 mo. |
| | Lateral | 6 mo. |
| | Posterior | ? 12 mo. |
| **C.** | **Equilibrium** | |
| | Prone | 2 – 3 mo. |
| | Supine | 2 – 4 mo. |
| | Sitting | 4 – 5 mo. |
| | Standing | 8 – 9 mo. |

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## Diagnostic Criteria for CP

1. Delayed motor milestones
2. Abnormal neurological examination
3. Aberrant quality or timing of primitive reflexes/postural reactions
4. Lack of disease progression by history or repeat exam
5. Supportive evidence for CNS damage/dysfunction:
   - Past history for risk
   - Structural damage on neurodiagnostic studies
   - Associated deficits (seizures, MR, etc.)
6. Age of onset

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## Differential Diagnosis for Motor Disability

Static encephalopathy (cerebral palsy)
Progressive disease
Spinal cord and peripheral nerve injuries
Structural defects

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## Classification of Cerebral Palsy

A. Spastic
- Quadriplegia (tetraplegia)
- Diplegia
- Hemiplegia
- Worster-Drought (bulbar)
- Monoplegia
- Triplegia
- Paraplegia

B. Extrapyramidal
- Rigid
- Choreoathetoid
- Dystonic
- (Dyskinetic)
- Ataxic
- Tremor
- Hypotonic

C. Mixed

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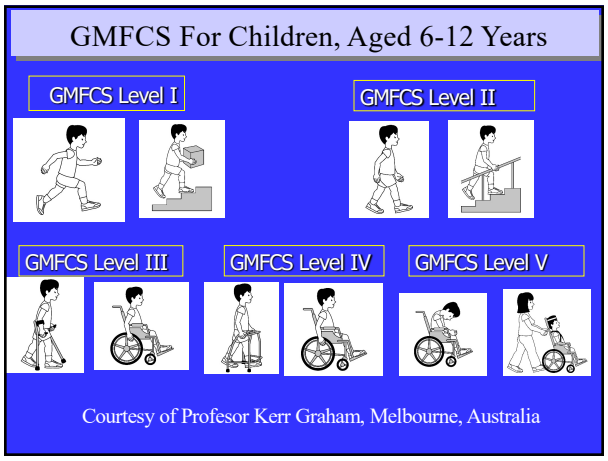
GMFCS For Children, Aged 6-12 Years
GMFCS Level I
GMFCS Level II
GMFCS Level III
GMFCS Level IV
GMFCS Level V
Courtesy of Profesor Kerr Graham, Melbourne, Australia

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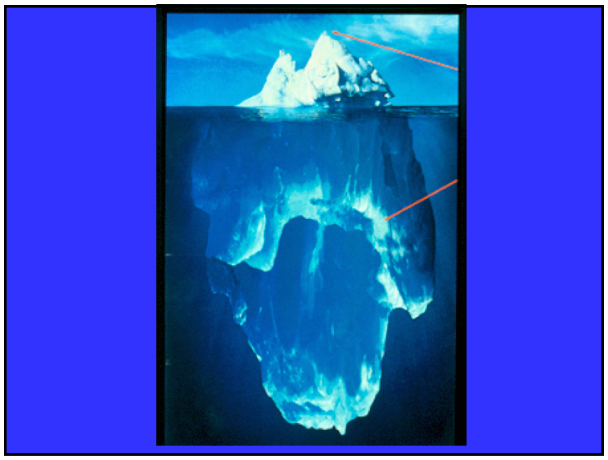

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## Cerebral Palsy: Associated Disorders

- Orthopedic Deformity
- Intellectual Disability
- Learning Disability
- Sensory Deficits
- Visual Impairment
- Oculomotor Disturbance
- Hearing Loss
- Pain

- (Recurrent Otitis)
- Speech Deficits (Dysarthria)
- Feeding Dysfunction (Dysphagia)
- Malnutrition
- Drooling
- Aspiration
- GE Reflux
- Bowel and Bladder Problems
- Seizures
- Cervical Neuropathy
- Autonomic Dysfunction
- Behavioral/Emotional Disturbances

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## Intelligence in Children with CP

(Fisch, et al., LICH)

1000 admission, 1950-1975

85% IQ < 85

48% IQ <70

| | *Mean IQ* |
|---|---|
| Spastic CP | 69 |
| Quadriplegia | 46 |
| Hypotonic CP | 16 |

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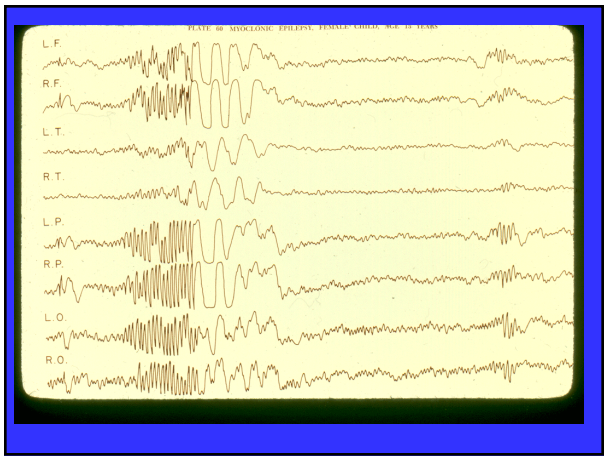


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## Orthopedic Deformity

- Muscle/tendon contracture
- Bone deformity/malalignment
- Joint dislocation and degeneration
- Scoliosis
- Osteoporosis and fracture

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## Spectrum of Oral-Motor Impairment

Speech: poor articulation

Feeding dysfunction: suck
chew
tongue mobility

Swallowing dysfunction: drooling
aspiration

Oral-sensory deficit

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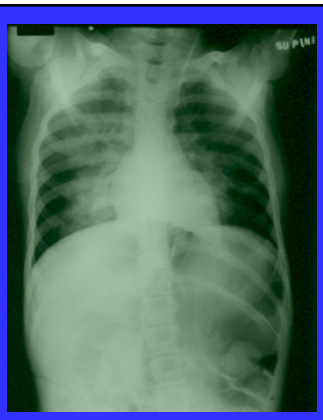


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## Interventions for Children with Cerebral Palsy

- Counseling
- Hands-On Therapy
  - Physical Therapy
  - Occupational Therapy
  - Speech Therapy
- Equipment
  - Braces
  - Adaptive devices
- Drugs
- Surgery

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EXCEPTIONAL PARENT
9TH ANNUAL MOBILITY ISSUE
CHILDREN with CEREBRAL PALSY
A Parents' Guide

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BraunAbility
BRAUNABILITY WHEELCHAIR VANS
DRIVING FREEDOM

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## Adaptive Toys and Equipment



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## Assistive and Augmentative Devices/DME (Durable Medical Equipment)

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## Types of DME

- Non-mobility related DME
  - Formula, tube feeding supplies and pumps, diapers…
  - Communication devices
- Mobility-related DME
  - Wheelchairs, walkers, special needs strollers
- Braces
  - Orthoses, splints

All require evaluation, measurements, specifications, fabrication…

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## Medical/Surgical Treatments for High Tone/Spasticity

- Oral drugs: diazepam (Valium)
  dantrolene (Dantrium)
  baclofen (Lioresal)
  tizanidine (Zanaflex)
- Intrathecal baclofen
- Intramuscular botulinum toxin (Botox, Dysport)
- Electrical muscle stimulation
- Orthopedic surgeries
- Neurosurgeries: CNS electrical stimulation
  dorsal rhizotomy
  deep nuclear ablations
  neuronal transplants

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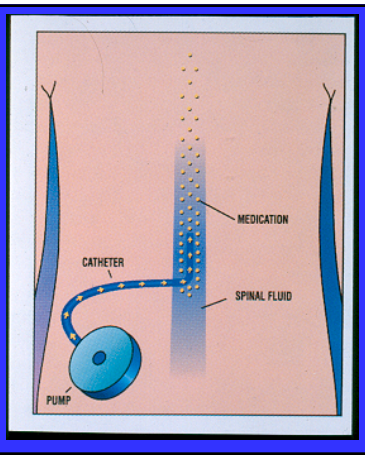


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## Spectrum of Oral-Motor Impairment

Speech: poor articulation
Feeding dysfunction: suck
chew
tongue mobility
Swallowing dysfunction: drooling
aspiration
Oral-sensory deficit

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## Treatments for Drooling

Positioning and Seating
Oral-motor/sensory therapy
Behavior management/modification
Intra-oral prostheses
Pharmacotherapy
- oral medications
- botulinum toxin

Surgery
(Radiation)

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## Orthopedic Surgery in Cerebral Palsy

Goals:

- Facilitate function
- Prevent deformity
- Correct deformity
- Relieve discomfort
- Enhance care
- Cosmesis

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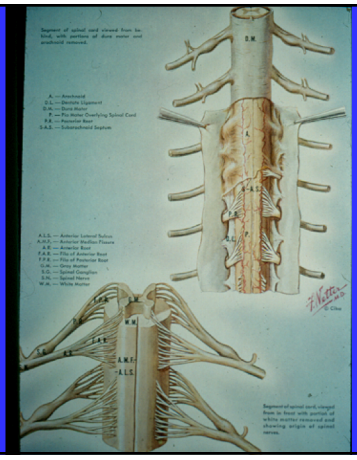

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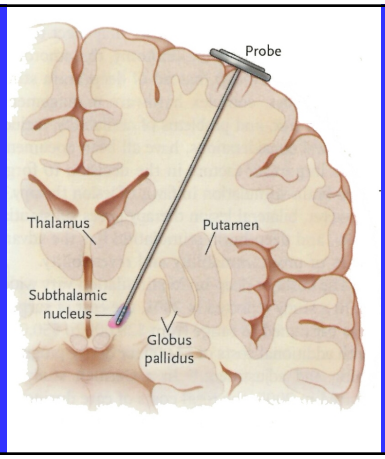
DBS

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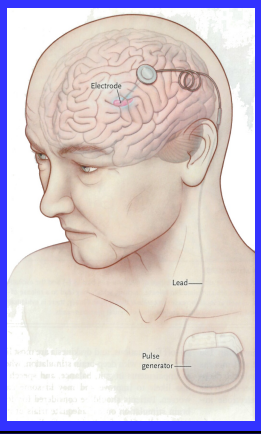


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## "Alternative" Therapies (CAM)

1. Hands-on treatments
   e.g., massage, patterning, craniosacral, chiropractic, etc.
2. Herbal / dietary treatments
   e.g., supplements and eliminations, homeopathy
3. Spiritual
4. Miscellaneous
   e.g., hypnosis, biofeedback, magnets, antifungals

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## Research Treatments

Stem cells

Cannabis

Robotics

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## Robotic Device

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## The Transition Process

**Transfer of Care**

Pediatric Care → Adult Care

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## Transition for NDD Patients: 3 issues

1. It's a lot more complicated
2. Structured organized process
3. Where to transition to?

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## Transition Plans Include All Aspects of a Youth's Life

- Health
- Transportation
- Housing (living space and living skills)
- Social and recreational opportunities
- Employment
- Continuing Education

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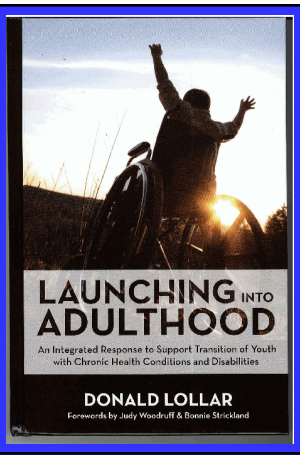


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Parents are the keystone to the therapeutic arch.

MacKeith

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Supports in the Community for People with Disabilities and Their Families: The United Cerebral Palsy Association of Oregon (UCP)

- Family Support
- Community Services
- Community Living
- Brokerage (Case Management)
- Supported Employment

Ann Coffey, Executive Director

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50th anniversary

AACPDM

american academy for cerebral palsy and developmental medicine

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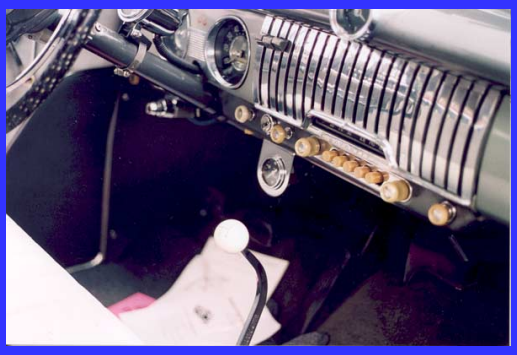

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## CP – Causes of Death

SE Thames study, 1970-1989*
73 deaths (47 male, 26 female)

Age at Death
(range 4 weeks to 15 years, 8 months)

| | |
|---|---|
| 0-2 years | 19 |
| 2-5 years | 23 |
| 6-10 years | 21 |
| 11-15 years | 10 |

*Evans and Alberman, *Arch Dis Child* 1990;65:325

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## Causes of Death in Children with CP

73 cases, ages 4 weeks – 15 years

| | |
|---|---|
| acute bronchopulmonary infection | 48 |
| Subacute/chronic cardiorespiratory | 4 |
| Acute asphyxia/cardiac arrest | 3 |
| Acute seizure | 5 |
| Other infection | 5 |
| Miscellaneous | 8 |
| | 73 |

[from Evans and Alberman, *Arch Dis Child* 1990;65:325]

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## Life Expectancy for People With Disabilities

- Individuals with moderate to severe neurodevelopmental disabilities have a shortened life expectancy compared to the general population.
- There are no perfect data to precisely define the degree of shortened survival.
- Even if there were such data, there would be considerable variability in a life table construction.
- There are 8 important factors to consider.

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## Factors in the Calculation of Life Expectancy

- cerebral palsy – severity
- intellectual disability – severity
- seizures
- developmental brain anomaly
- feeding history/gastrostomy
- general health history
- age
- institutional vs. home care

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## Resources on Life Expectancy


Plover C. Life expectancies for individuals with cerebral palsy. Cumpston Sarjeant publication, updated Feb 2019. www.cumsar.com.au

Day SM, Reynolds RJ, Kush SJ. Extrapolating published survival curves to obtain evidence-based estimates of life expectancy in cerebral palsy. Dev Med Child Neurol. 2015 Dec; 57(12): 1105-18.

Brooks JC, Strauss DJ, Shavelle RM, Tran LM, Rosenbloom L, Wu YW. Recent trends in cerebral palsy survival. Part II: individual survival prognosis. Dev Med Child Neurol. 2014 Nov; 56(11): 1065-71.

Katz RT, Johnson CB. Life Care Planning for the Child with Cerebral Palsy. Phys Med Rehabil Clin N Amer. 2013 Aug; 24(3): 491-505.

Blair E, Langdon K, McIntyre S, Lawrence D, Watson L. Survival and mortality in cerebral palsy: observations to the sixth decade from a data linkage study of a total population register and National Death Index. BMC Neurol 2019; 19: 111-122.

Reynolds RJ , Day SM. Mortality Research and Consulting


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