Neurodevelopment

Risk Factors for Poor Neurodevelopmental Outcome

- Developmental progress may be variable for motor and language skills.
- BPD, even in the absence of overt brain injury, is a risk factor for neurodevelopmental delay.
- Peri- or intraventricular hemorrhage, periventricular leukomalacia, necrotizing enterocolitis, retinopathy of prematurity, sepsis, complex congenital heart disease, and hearing loss have a negative effect on neurodevelopment.
- Post-discharge social and environmental conditions significantly influence cognitive outcome.
- Infants with low birth weight who live in an underprivileged (i.e., low socioeconomic) environment have the greatest risk of poor neurodevelopmental outcome.

Testing

- Adjust an infant's age for prematurity until he/she is 2 years adjusted age.
- Include developmental screening as a regular component of well-child care.
- Use standardized screening tests to assure consistency and accuracy in the identification of infants who may need a more comprehensive developmental evaluation.
- Repeat screening tests at each well-child visit in order to follow their developmental trajectory.
- If an evaluation is abnormal or parents express concerns, a specific intervention needs to be started within 2 months.
- Parental report of current skills is predictive of developmental delay.
- Parental concerns about language, fine-motor, cognitive, and emotional-behavioral development are highly predictive of true problems.
- Parent test instruments have excellent psychometric properties and are comparable to screening tests administered by medical staff. These include:
  - Parent's Evaluation of Developmental Status.
  - Ages and Stages Questionnaires.
  - Child Development Inventories.

- Screening tests requiring direct examination of the infant:
  - Denver-II Screening Test.
  - Bayley Infant Neurodevelopmental Screener.
  - Battelle Developmental Inventory.
  - Early Language Milestone Scale.
- Screening tests for behavioral and psychosocial problems:
- Temperament and Atypical Behavior Scale.
- Child Behavioral Checklist.
- The Carey Temperament Scales.
- Eyberg Child Behavior Inventory.
- Family Psychosocial Screening.

Behavioral Issues

- Infants <1500g have an increased risk of behavioral, social, and emotional problems in early childhood, and these may persist.
  - Behavioral: peer conflict; aggressiveness; hyperactivity; less adaptability, activity, attention, and persistence.
  - Social: lower levels of social competence and poorly developed social skills.
  - Emotional: increased risk of developing ADHD.

Referrals/Early Intervention Programs

- Recommend management along with developmental pediatricians, early childhood intervention programs, and possible neurology.
- Questionable or borderline evaluations necessitate early and frequent repeat assessments to detect trends in the child's development.
- Err on the side of caution, and refer the infant for formal testing early rather than waiting.
- Identifying a child as needing a more complete evaluation may provoke anxiety in a parent but should not be avoided even in cases of mildly delayed children.

- Intervention referrals should be made early for infants or children younger than 3 years who are at risk for, or experiencing, developmental delay.
- Early intervention programs provide, at no cost to families:
  - Family education and counseling, home visits, parent support groups, speech pathology, audiology, occupational therapy, physical therapy, psychological services, nursing services, nutritional services, social work, vision services, access to assistive technology devices.

Outcomes

Poor head growth by 8 months corrected age is a strong predictor of poor cognitive function, poor academic achievement, and behavioral issues at 8-9 years of age.

Cerebral palsy, a nonprogressive, chronic disorder of posture and movement is:

- 28 times more frequent than in term infants.
- Most often manifests as spasticity in the lower extremities (spastic diplegia).
- Characterized as hypotonia in infancy followed by spasticity later, increased deep tendon reflexes, clonus, abnormal postural reflexes, "commando" creeping.

Among adolescents who were former VLBW infants:

30-50% have poor academic achievement.

20-30% have ADHD.

25-30% have psychiatric disorders.

Premature infants:

- 40-80% may have transient tone abnormalities that usually resolve by 12 months corrected age. These include increased or decreased muscle tone, poor head control, jerky movements, tremors, asymmetry, and delayed development of autonomic reactions.
- 30% of infants born <1000g with "normal" head ultrasound at discharge have cerebral palsy or other severe developmental delay at followup.
- Frequently exhibit a delay in expressive language over the first 2 years of age.
- Have a high rate of impaired visual-motor integration and neuromotor and cognitive functions; problems with behavior and temperament may occur in early childhood and can persist.
- 45-50% with a birth weight <1000g require special educational services.