

Feb 5: TeleECHO Neurodevelopmental Follow-up of Preterm Infants

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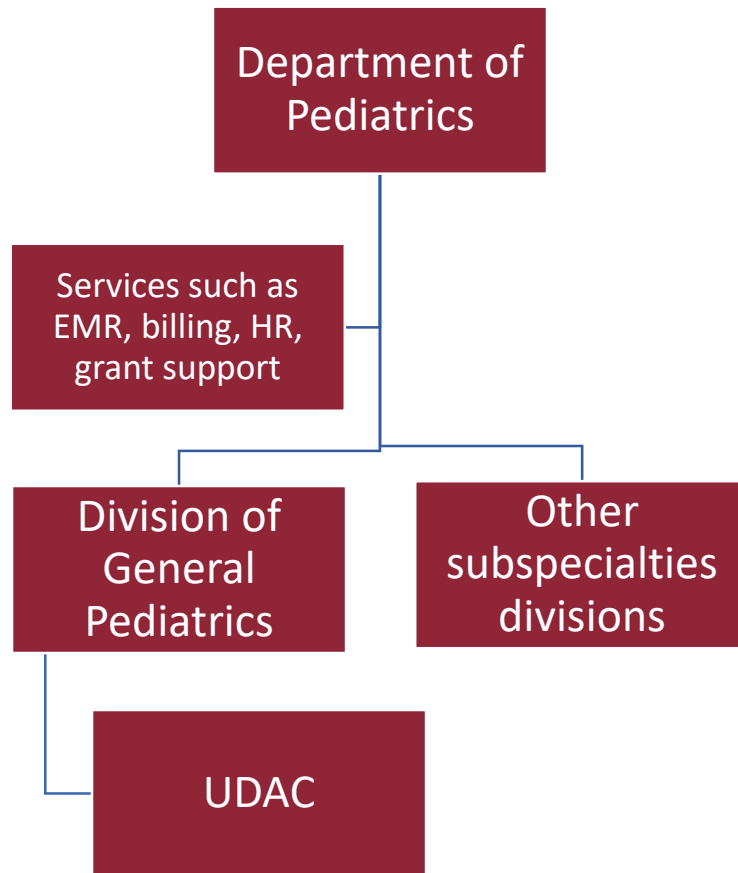
Objectives:

 Recognize common developmental problems in extremely preterm infants

 Become familiar with the GMA and HINE exams, including the results that identify a problem in the infant

 Identify resources to help you care for your preterm infant patient

UDAC is part of the Department of Pediatrics



- Only academic center in the Intermountain West
- Closely affiliated with Primary Children's Hospital, the only children's hospital in the Intermountain West
- Has outreach activities throughout the region
- Has extensive administrative resources to manage a clinical enterprise

University Developmental Assessment Clinics



Child Developmental Program

The Child Developmental Program (CDP) provides clinical assessments, diagnostic services, consulting, and case management for children and adolescents with any type of developmental concern, including the following:

- Autism spectrum disorder
- Speech and hearing concerns
- Behavioral and emotional challenges
- Developmental or physical delays
- Cognitive concerns

Assessment Programs:

- Child Developmental Program (CDP)

Longitudinal Follow-up Programs:

- Neonatal Follow-up Program (NFP)
- Heart Center Neurodevelopmental Program (HCNP)

Strengths of the NFP

- All eligible children come to one clinic
- We see all eligible children in the state
- Follow children for 4 years
- Multiple subspecialists-in one place
- No balance billing to the families (this means zero out of pocket expense)
- Data reported back to all NICUs for parent/staff/provider education, value initiatives and research
- Very high parent satisfaction

Multidisciplinary Team

- Developmental Pediatrics and Nurse Practitioners
- Neurology
- Registered Nurse
- Speech and Language Pathology
- Occupational Therapy
- Physical Therapy
- Family Support Services
- Care coordination

Referral Criteria

- Birthweight \leq 1250 gms (2 lbs, 12 oz)
- Gestational age \leq 26 weeks
- ECMO support
- Diagnosis of hypoxic ischemic encephalopathy (HIE)
- Referral by a medical provider/NICU



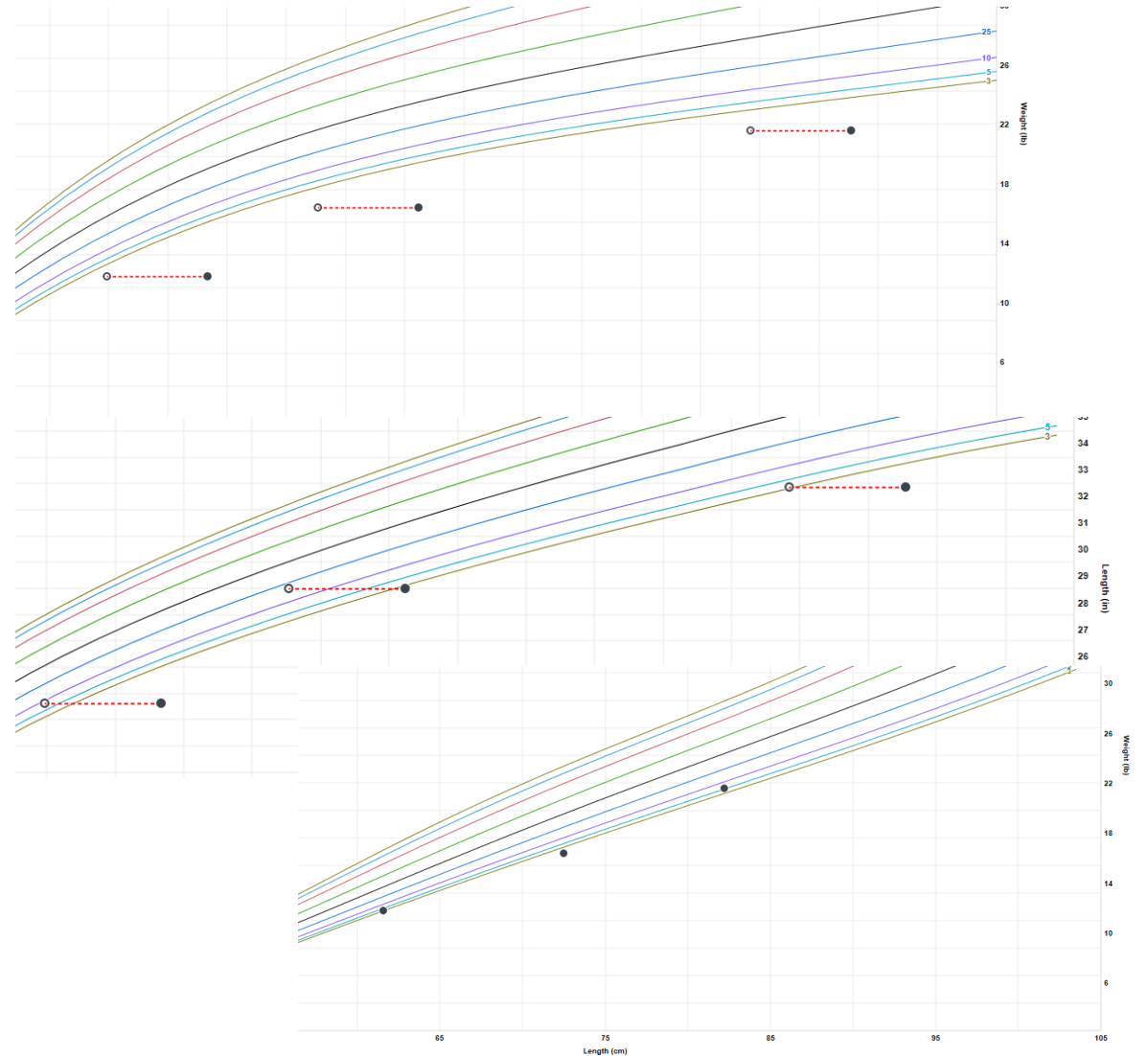


Recognizing Common Developmental Problems in Extremely Preterm Infants: What are we evaluating?

- Developmental Peds (both MD and NP): Development in the context of overall health (sleep, diet, growth, respiratory status)
- Psychology: Cognition and behavior
- Speech and language: Expressive and receptive skills
- Neurology: Consult for children with HIE, IVH
- OT: Feeding, sensory, fine motor skills
- PT: Mobility, gross motor skills
- Vision and hearing screening

Medical issues are developmental issues

- Growth
 - Take care to correct for gestational age
 - Note weight for height rather than just weight



Vision and Hearing

- Vision

- Children who have had exams for ROP and are cleared still need to see pediatric ophthalmology at about 6 months of age, adjusted due to increased risk of strabismus and visual acuity problems.

- Hearing

- Hypoxic-ischemic encephalopathy
- ECMO use
- Meningitis
- CMV
- Hyperbilirubinemia (specifically for infants with history of total serum bilirubin ≥ 20 ,
- Craniofacial abnormalities
- Family history of childhood hearing loss
- Parental concerns
- Chronic otitis media

Pearls



Medical issues that affect development

- Diet: adjust expectations for corrected age
- Sleep: adjust expectations for corrected age
- Respiratory: Dr. Lai to come speak...stay tuned

Visit Schedule (adjusted ages)

3 months

(6 month for infants who score low on the HINE)

9 months

18 months

2 years

3 years

4 years



University Developmental Assessment Clinics

Neonatal Follow-Up Program Schedule

	Peds Neuro Exam	PT/OT	Developmental Testing	Speech	Audio
3 Months	X Hine	TIMP, GMA			X
6 Months (if needed)	X Hine	PDMS			
9 Months	X Hine	PDMS			X
18 Months	X (Hine)	prn	Bayley Screener	CSBS	prn
2 Years	X (Hine)	prn	Bayley	Bayley Lang.	prn
3 Years	X	prn	Conners Behavioral Rating Scale	PLS-5 Screening Test	prn
4 Years	X	prn	Bracken School Readiness or WPPSI	PLS-5 Screening Test	prn

CSBS: Communication and Symbolic Behavior Scales
HINE: Hammersmith Infant Neurologic Exam
GMA: General Movements Assessment
WPPSI: Wechsler Preschool and Primary Scale of Intelligence
TIMP: Test of Infant Motor Performance
PLS-5: Preschool Language Scale, fifth edition



Early Detection and Intervention for CP: Guidelines

- Developed by multidisciplinary team of scientific/clinical experts and parent stakeholders
- Early recognition of CP can and should occur as early as possible so that
 1. Infants can receive diagnostic-specific early intervention and surveillance to optimize neuroplasticity and prevent complications.
 2. Parents can receive psychological and financials support, if available.

Early, Accurate Diagnosis and Early Intervention in Cerebral Palsy

Advances in Diagnosis and Treatment

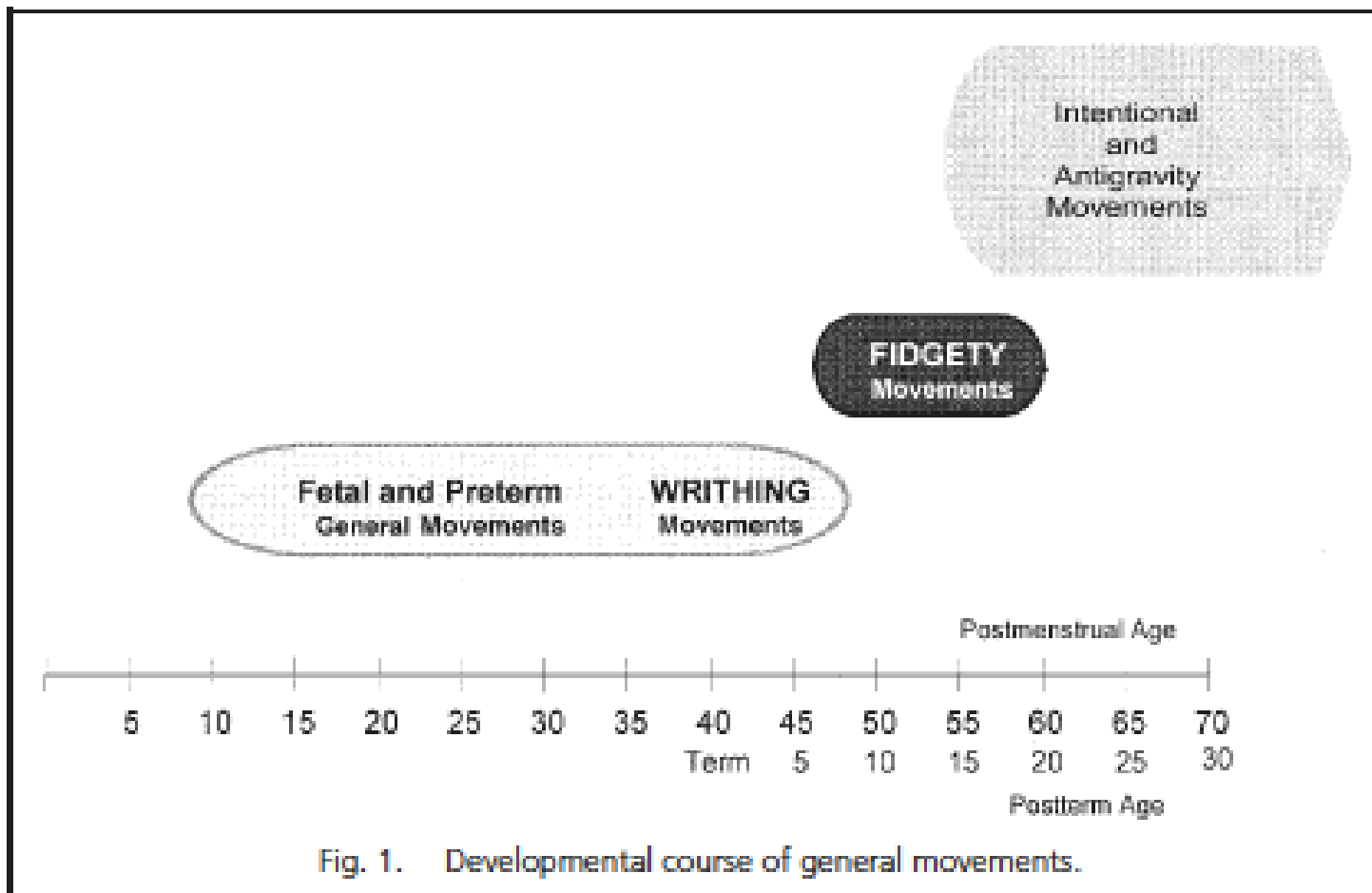
Iona Novak, PhD; Cathy Morgan, PhD; Lars Adde, PhD; James Blackman, PhD; Roslyn N. Boyd, PhD; Janice Brunstrom-Hernandez, MD; Giovanni Cioni, MD; Diana Damiano, PhD; Johanna Parrish, PhD; Ann-Christin Eliasson, PhD; Linda S. de Vries, PhD; Christa Einsiedler, PhD.

neonatal encephalopathy, infants with brain defects, and infants admitted to the NICU)	
Early Detection of CP Before 5 mo CA	
3.0 Option A: The most accurate method for early detection of CP in infants with newborn-detectable risks and younger than 5 mo (CA) is to use a combination of a standardized motor assessment and neuroimaging and history taking about risk factors	Strong recommendation based on high-quality evidence of test psychometrics in newborn-detectable risk populations
Standardized motor assessment	Strong recommendation based on high-quality evidence of test psychometrics in newborn-detectable risk populations
3.1 Test: GMs to identify motor dysfunction (95%-98% predictive of CP), combined with neuroimaging	
Neuroimaging	Strong recommendation based on high-quality evidence of test psychometrics in newborn-detectable risk populations
3.2 Test: MRI (before sedation is required for neuroimaging) to detect abnormal neuroanatomy in the motor areas of the brain (80%-90% predictive of CP). Note that normal neuroimaging does not automatically preclude the diagnosis of risk of CP	
4.0 Option B: In contexts where the GMs assessment is not available or MRI is not safe or affordable (eg, in countries of low to middle income), early detection of CP in infants with newborn-detectable risks and younger than 5 mo (CA) is still possible and should be carried out to enable access to early intervention	Strong recommendation based on moderate-quality evidence of test psychometrics in newborn-detectable risk populations
Standardized neurological assessment	Strong recommendation based on moderate-quality evidence of test psychometrics in newborn-detectable risk populations
4.1 Test: HINE (scores <57 at 3 mo are 96% predictive of CP)	
Standardized motor assessment	Conditional recommendation based on low-quality evidence of test psychometrics in at-risk populations
4.2 Test: TIMP	

Novak et al. JAMA Peds 2017

Prechtl General Movement Assessment (GMA)

- Standardized assessment to identify infants at risk for neuromotor deficits by observing quality of general movements (GMs).
 - Body movements in variable sequence of neck, arm, trunk and leg movements.
 - Similar from early fetal life until ~48 weeks
 - **Writhing movements -> fidgety movements**



In the NICU: writhing age

Normal Writhing



Cramped Synchronized



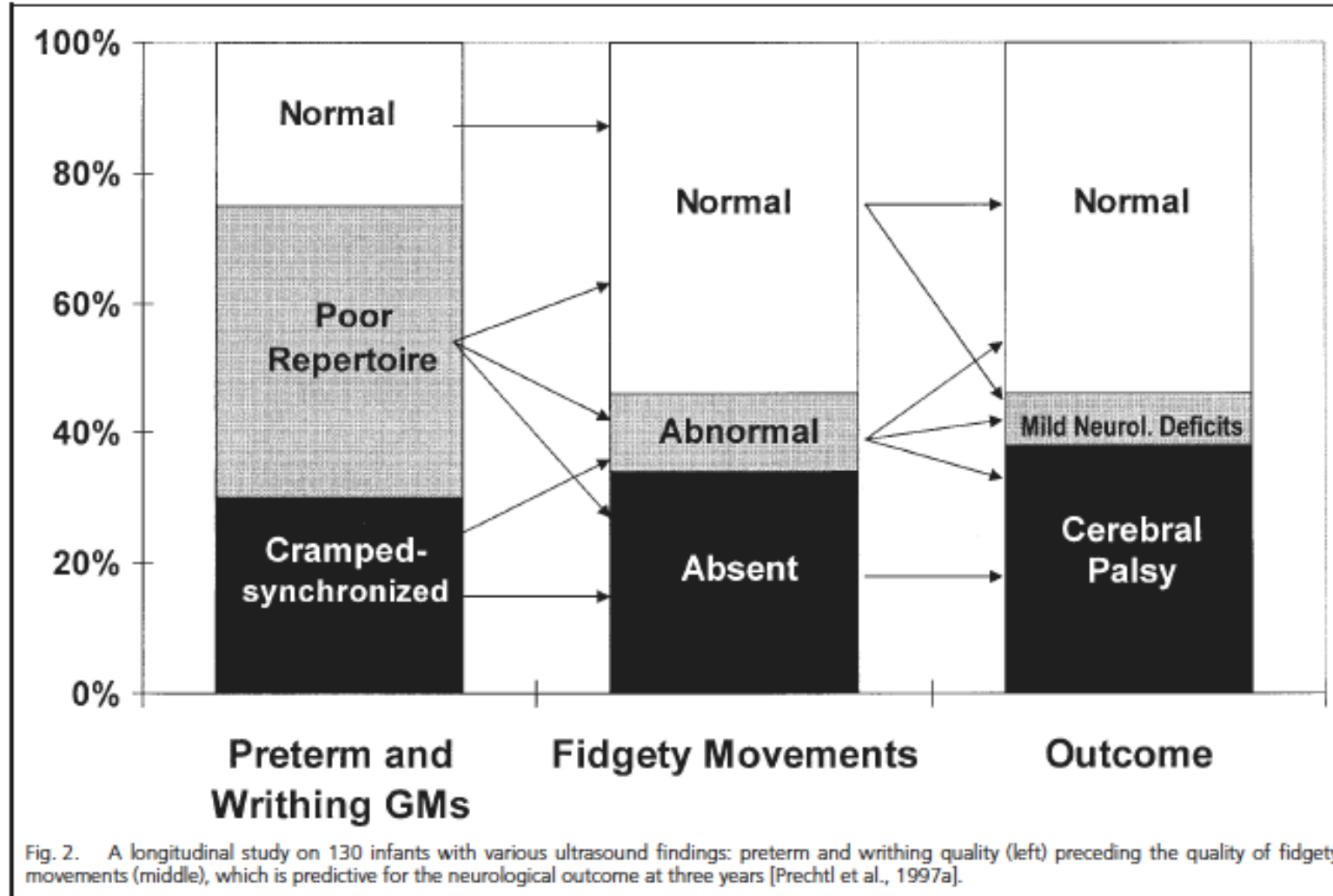
In the Clinic: Fidgety Age

Fidgety Present



Absent Fidgety





SYSTEMATIC REVIEW OF PREDICTIVE VALUE OF GMA

- CS movements in near-term and term period and AF movements at 3-4 months corrected age predicts cerebral palsy
- Fidgety period: sensitivity 97%(93-99) specificity 89% (83-93).
- Writhing period: sensitivity 93% (86-96) specificity 59% (CI 45-71)

Hammersmith Infant Neurological Examination (HINE)

- Standardized and scoreable clinical neurological examination for infants 2-24 months
- 26 items assessing cranial nerve function, posture, quality/quantity of movements, tone, reflexes and reactions
- Each item scored individually (0, 1, 2 or 3), with a global score adding the scores of all individual items (range: 0-78)
- Infants 3 months of age with a global score ≤ 56 are considered to fall into the at risk category. Infants 6 months of age with a global score < 59 are considered to fall into the at risk category. Infants 9 months of age with a global score < 62 are considered to fall into the at risk category. Infants 12 months of age with a global score < 65 are considered to fall into the at risk category.

HINE ABNORMAL FINDINGS



Late acquisition of parachute reaction



Asymmetry of lateral tilt



Abnormal arm protection

HINE ABNORMAL FINDINGS

Popliteal angle $<90^\circ$

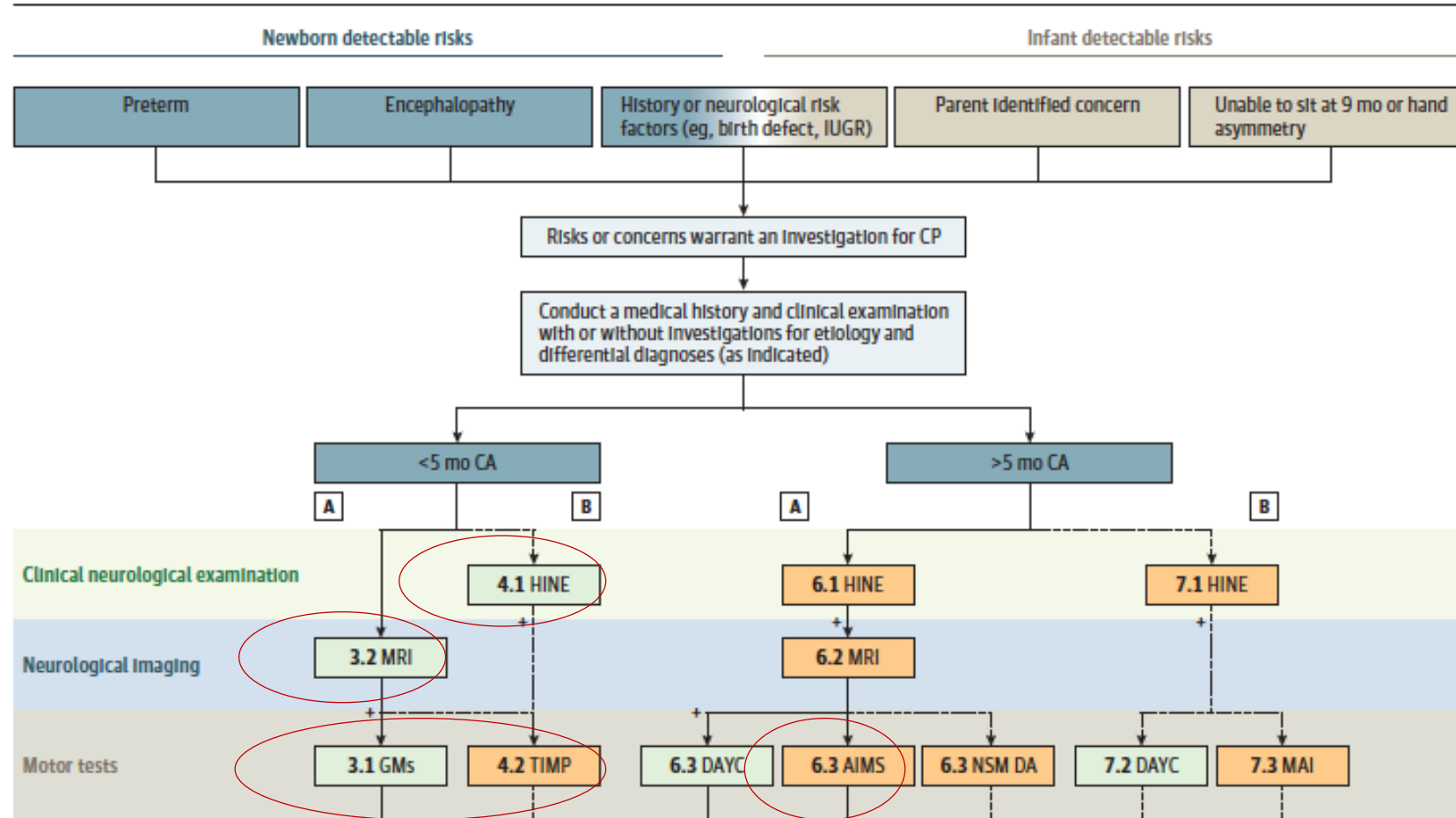


Adductor angle $<80^\circ$



Head lag

Figure. Algorithm for Early Diagnosis of Cerebral Palsy or High Risk of Cerebral Palsy





Resources

- Neonatal Follow-up Program through the University of Utah Developmental Assessment Clinics (UDAC)
- Utah Family Voices: Family Support
- Integrated Services (UDOH): Additional support services
- Medical Home Portal www.medicalhomeportal.org

Helping Children Develop to Their Full Potential



- The Neonatal Follow-up Program (NFP) is designed for infants who have spent time in a newborn intensive care nursery. These children may be at a higher risk for developmental concerns, especially if born small, early or seriously ill. Infants in this program will be assessed on an ongoing basis. Any child meeting the eligibility requirements or having developmental concerns is strongly encouraged to attend.

Medical Home Portal: www.medicalhomeportal.org



About the Portal

The **Medical Home Portal** is a unique source of reliable information about children and youth with special health care needs (CYSHCN), offering a "one-stop shop" for

Partnering with the Portal

The **Medical Home Portal** partners with six states to offer their residents information

What is Medical Home?

The Medical Home approach to caring for children focuses on the patient, his/her family, and their community and aims to improve outcomes related to health.

Medical Home Portal: www.medicalhomeportal.org

Premature Infant Follow-Up

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 - Ears/Hearing
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 - Respiratory
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 - Dental
 - Skin & Appearance

▼ Related Issues

Premature Infant Follow-Up

Overview



AJ Photo/Science Photo Library

Babies are surviving increasingly premature births due to the dramatic improvements in neonatal intensive care and the use of prenatal steroids, surfactant, continuous positive airway pressure (CPAP), and improved neurodevelopmental care techniques. This module focuses on the care of infants born at extremely low gestational ages and weights - typically at or less than 26 weeks and/or 1500 grams (about 3 pounds) - although much of this information will also pertain to preterm infants born later in gestation. Premature infants, particularly those born extremely early often have, or are at risk for developing, bronchopulmonary dysplasia, retinopathy of prematurity, intraventricular hemorrhage, hypoxic-ischemic encephalopathy (HIE), necrotizing enterocolitis, and other complications that require follow-up in the neonatal period and beyond. The medical home will often need to manage supplemental oxygen, feedings through gastrostomy or jejunostomy tubes, specialized immunizations, and specialized formulas, as well as coordinate the care provided by multiple subspecialists and/or developmental therapists. Specialized preterm infant follow-up clinics are becoming more available and can help detect and address complications.

Other Names & Coding

Extreme prematurity
Very low birth weight

[Common Terms Used to Describe Prematurity](#) provides frequently used definitions for some of the many terms used to describe prematurity.

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