See "Key early detection CP and intervention references" folder in HRIF Resources for supporting literature.

HIGH RISK INFANT FOLLOW-UP

Early Detection of high risk for Cerebral Palsy

Background and Evidence

Early detection of high risk for CP

Background

- Cerebral palsy (CP) is one of the common challenges faced by children referred to HRIF.
  - Children born < 28 weeks EGA → reported rates ~10-15%
  - Children born with moderate-severe neonatal HIE → reported rates ~20-60%
- Historically CP was diagnosed at 18–24 months, but evidence now shows that high risk for CP can be detected before 6 months.
  - Early detection of high risk allows for earlier referral for diagnosis and initiation of CP-specific intervention during peak neuroplasticity, which in turn can prevent secondary complications and improve long-term function.
- The **American Academy of Pediatrics (AAP)** in concert with the **American Academy for Cerebral Palsy and Developmental Medicine (AACPDM),** advocate for earlier assessment for CP using using standardized neurologic exams and risk factors to allow for earlier diagnosis of CP, enabling timely intervention.
- Of note, CP is a CCS eligible diagnosis, as defined in CCR 41517.3.

Early detection of high risk for CP

Evidence for early detection, early intervention, and implementation

- High-quality data from international investigations has demonstrated that, using standardized tools such as the General Movements Assessment (GMA) and Hammersmith Infant Neurologic Exam (HINE), and infant risk factors, **high risk for CP can be identified in the first months with high sensitivity, leading to systematic assessment algorithm** (Novak I, et al, *JAMA Pediatr. 2017).*
- An international clinical practice guideline strongly supported 3 best practices including **immediate referral for intervention after detection of high risk for CP**, building parental capacity for attachment, and parental goal setting (Morgan C, et al, *JAMA Pediatr. 2021*).
- **Successful training and implementation** of standardized approaches and tools for early CP detection such as the HINE have been reported in U.S. and international cohorts (Maitre N et al., *Pediatrics 2020*, Butera C, et al, *J Clin Med 2024*, Kwong AKL et al, *J Pediatr 2024*), results of which have included decreasing age at CP diagnosis.
  - **Parents endorse desire for early CP detection and intervention** (Williams et al *J Clin Med* 2021, Morgan, et al *J. Clin. Med*. 2023; McCarty et al *Clin Perinatol 2023*)

Early detection of high risk for CP

CPQCC CCS High Risk Infant Follow Up

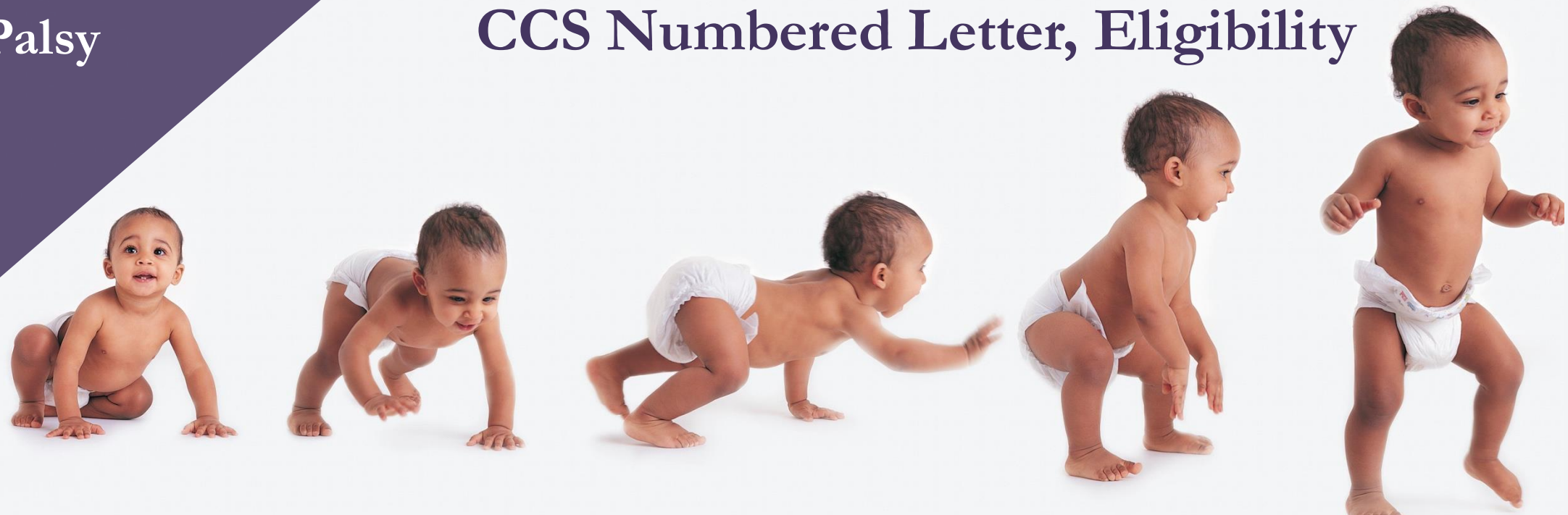
- CPQCC HRIF providers and teams shared in feedback sessions and surveys that they were well-aware of the evidence, their desire for quality improvement and education in early detection of high-risk for CP, and their goal for training in standardized assessments – specifically, the HINE.
  - To meet this quality improvement goal, **CPQCC facilitated ½ day HINE trainings at interested sites**, led by CP Foundation certified trainer Dr. Stacey Dusing; this was initiated in Fall 2024. The CPQCC also convened a **HINE Workgroup** to provide input, experience, guidance.
  - Given increasing use of standardized exams in NICUs and HRIF, CPQCC also included queries in HRIF visits around early detection of high-risk for CP and assessments used.
- **California Children's Services (CCS) is not requiring HINE and/or other standardized assessments for early detection of high risk for CP.**
  - HINE and/or other standardized assessment training and utilization is up to HRIF sites; training and education has been facilitated and supported by CPQCC in its role as a quality improvement program.

See "CCS MTP NL and CCRs" folder in HRIF Resources for documents and tools.

HIGH RISK INFANT FOLLOW-UP

Early Detection of high risk for Cerebral Palsy

CCS Medical Therapy Program: CCS Numbered Letter, Eligibility



Medical Therapy Program

Background and CCS Numbered Letter

- CCS Medical Therapy Program (MTP) provides medically necessary occupational therapy (OT), physical therapy (PT), and medical therapy conference (MTC) services for beneficiaries ages birth to 21 years.
  - https://www.dhcs.ca.gov/services/ccs/Pages/MTP.aspx
- CCS released an **updated numbered letter (CCS NL: 08-1024) in October 2024** to further outline process and eligibility for MTP.
  - The numbered letter indicated that standardized neurological examination such as the HINE (with suboptimal score for age and/or asymmetry score greater than 5), motor assessment such as General Movements Assessment (GMA), and neuroimaging "*may be beneficial in early detection and identification of infants and young children at high risk for CP".*
    - ***However, physical findings as outlined by Title 22 of the California Code of Regulations section 41517.5 must be present for eligibility to MTP.***

Medical Therapy Program

Title 22 CCR 41517.5

- CCR 41517.5 states - in part - that children under three years of age will be eligible for MTP when **two or more of the following neurological findings are present**:

  (1) Exaggerations of or persistence of primitive reflexes beyond the normal age (corrected for prematurity);

  (2) Increased Deep Tendon Reflexes (DTRs) that are 3+ or greater;

  (3) Abnormal posturing as characterized by the arms, legs, head, or trunk turned or twisted into an abnormal position;

  (4) Hypotonicity, with normal or increased DTRs, in infants below one year of age; or

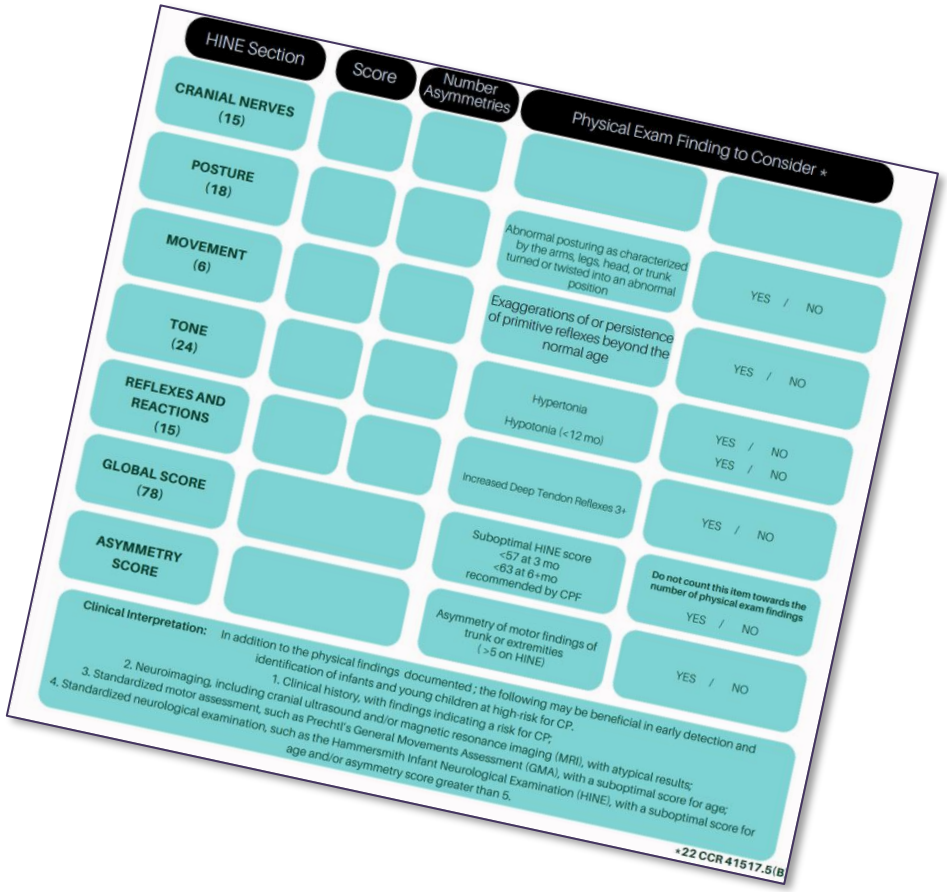
  (5) Asymmetry of motor findings of trunk or extremities.

- Therefore, an **abnormal HINE score and/or asymmetry is NOT adequate for MTP referral; at least two of the above findings must be present and documented in MD or NP outpatient clinic note to meet eligibility.**

Medical Therapy Program

HINE and physical findings

- A HINE suboptimal score or asymmetry score alone is not adequate to achieve eligibility to MTP. However, the HINE is a standardized neurological exam, demonstrating potentially abnormal neurological findings that may fall within those among eligibility for MTP referral.
  - To that end, the HINE Workgroup developed a tool (see "*HINE and neuro exam findings crosswalk",* Resources) that *may* assist HRIF teams using the HINE to consider key neurological findings in context. **This is NOT a CCS document and is NOT a required part of the HRIF visit** – it is simply a resource that teams have requested and some may find useful.



See "CCS MTP NL and CCRs" folder in HRIF Resources.

See "HINE Proforma and Potential tools" folder in HRIF Resources for documents.

HIGH RISK INFANT FOLLOW-UP

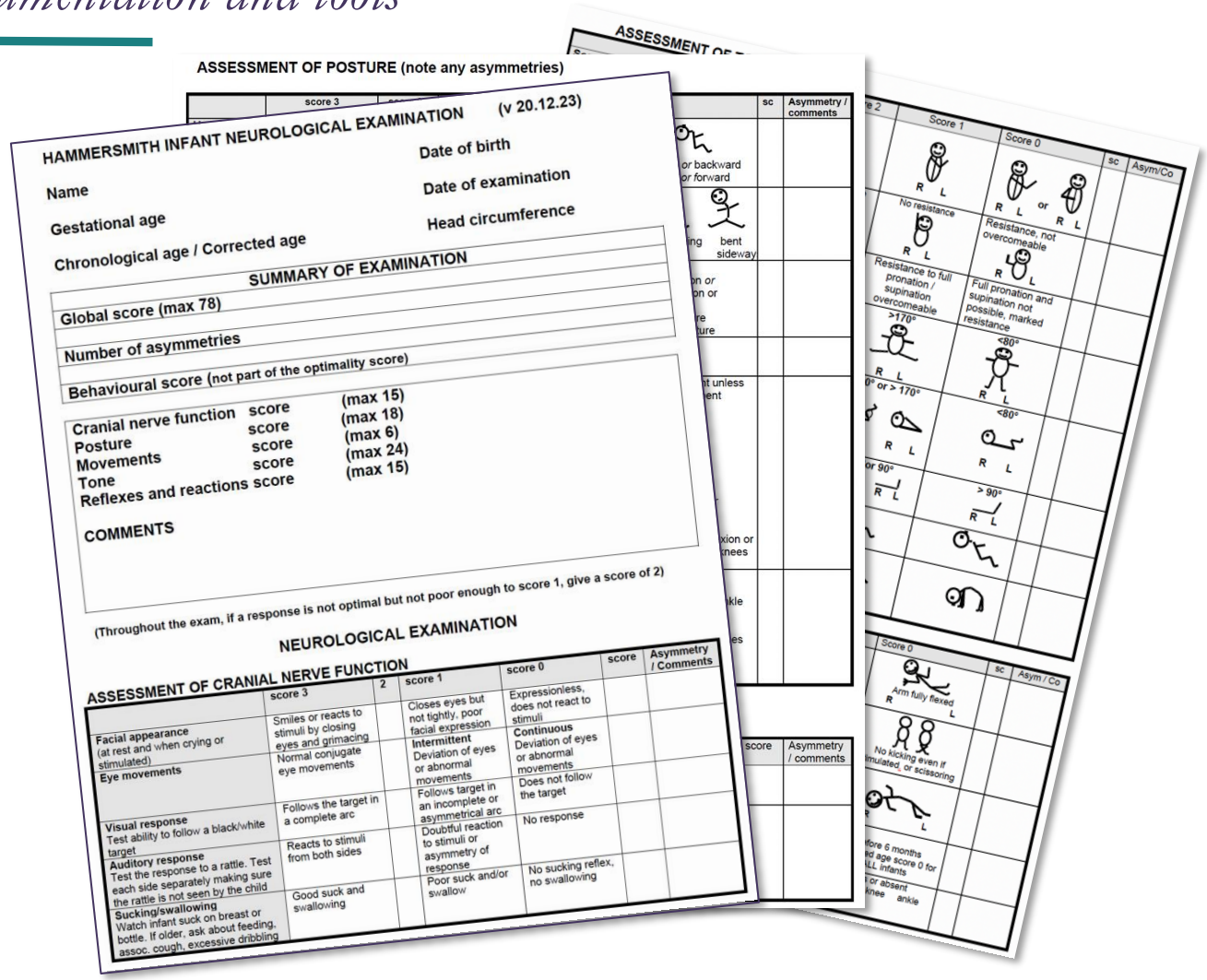
Early Detection of high risk for Cerebral Palsy

HINE in HRIF Clinics

HINE in HRIF clinics

Options for documentation and tools

- The **HINE Proforma** is a structured scoring sheet that guides a consistent format for standardized assessments.
  - Completing this form is NOT required, submission to CPQCC will NOT occur, and HINE scores are NOT collected currently.
    - *Future collection of global score and asymmetry score is under consideration.*



HAMMERSMITH INFANT NEUROLOGICAL EXAMINATION (v 20.12.23)

Name — Date of birth

Gestational age — Date of examination

Chronological age / Corrected age — Head circumference

SUMMARY OF EXAMINATION

Global score (max 78)

Number of asymmetries

Behavioural score (not part of the optimality score)

Cranial nerve function	score	(max 15)
Posture	score	(max 18)
Movements	score	(max 6)
Tone	score	(max 24)
Reflexes and reactions	score	(max 15)

COMMENTS

(Throughout the exam, if a response is not optimal but not poor enough to score 1, give a score of 2)

NEUROLOGICAL EXAMINATION

ASSESSMENT OF CRANIAL NERVE FUNCTION

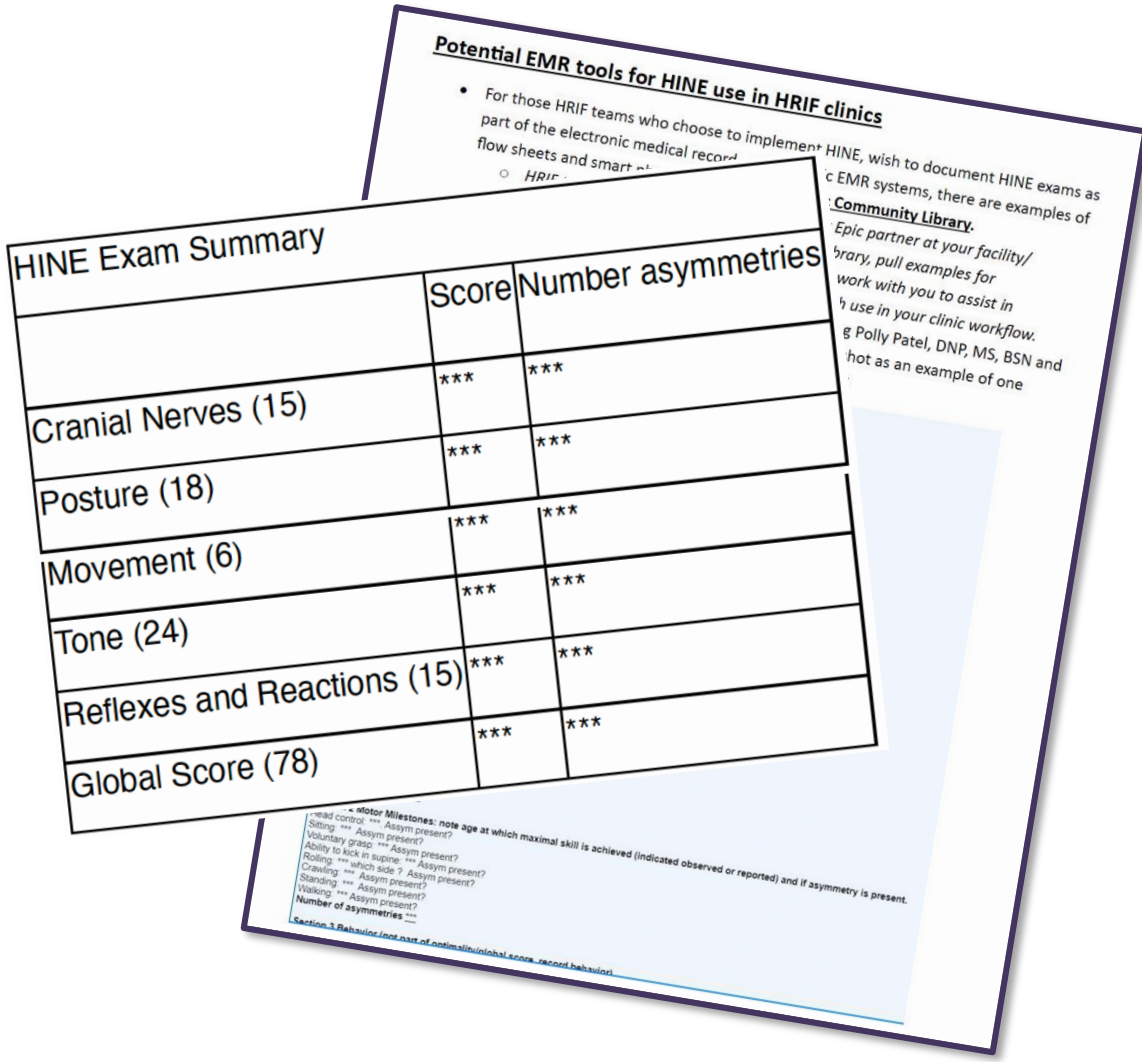
	score 3	2	score 1	score 0	score	Asymmetry / Comments
Facial appearance (at rest and when crying or stimulated)	Smiles or reacts to stimuli by closing eyes and grimacing		Closes eyes but not tightly, poor facial expression	Expressionless, does not react to stimuli		
Eye movements	Normal conjugate eye movements		**Intermittent** Deviation of eyes or abnormal movements	**Continuous** Deviation of eyes or abnormal movements		
Visual response Test ability to follow a black/white target	Follows the target in a complete arc		Follows target in an incomplete or asymmetrical arc	Does not follow the target		
Auditory response Test the response to a rattle. Test each side separately making sure the rattle is not seen by the child	Reacts to stimuli from both sides		Doubtful reaction to stimuli or asymmetry of response	No response		
Sucking/swallowing Watch infant suck on breast or bottle. If older, ask about feeding, assoc. cough, excessive dribbling	Good suck and swallowing		Poor suck and/or swallow	No sucking reflex, no swallowing		

See "HINE Proforma and Potential tools" folder in HRIF Resources.

HINE in HRIF clinics

Options for documentation and tools

- HRIF clinic teams who have chosen to implement HINE have asked about EMR tools that may allow for electronic documentation.
  - There are examples of HINE flow sheets and smart phrases in the **Epic Community Library.** These may be simple high level score tables or more complex. Reach out to your facility Epic team.
  - *Santa Clara Valley Medical Center dot phrase example is shared in the documents folder*.

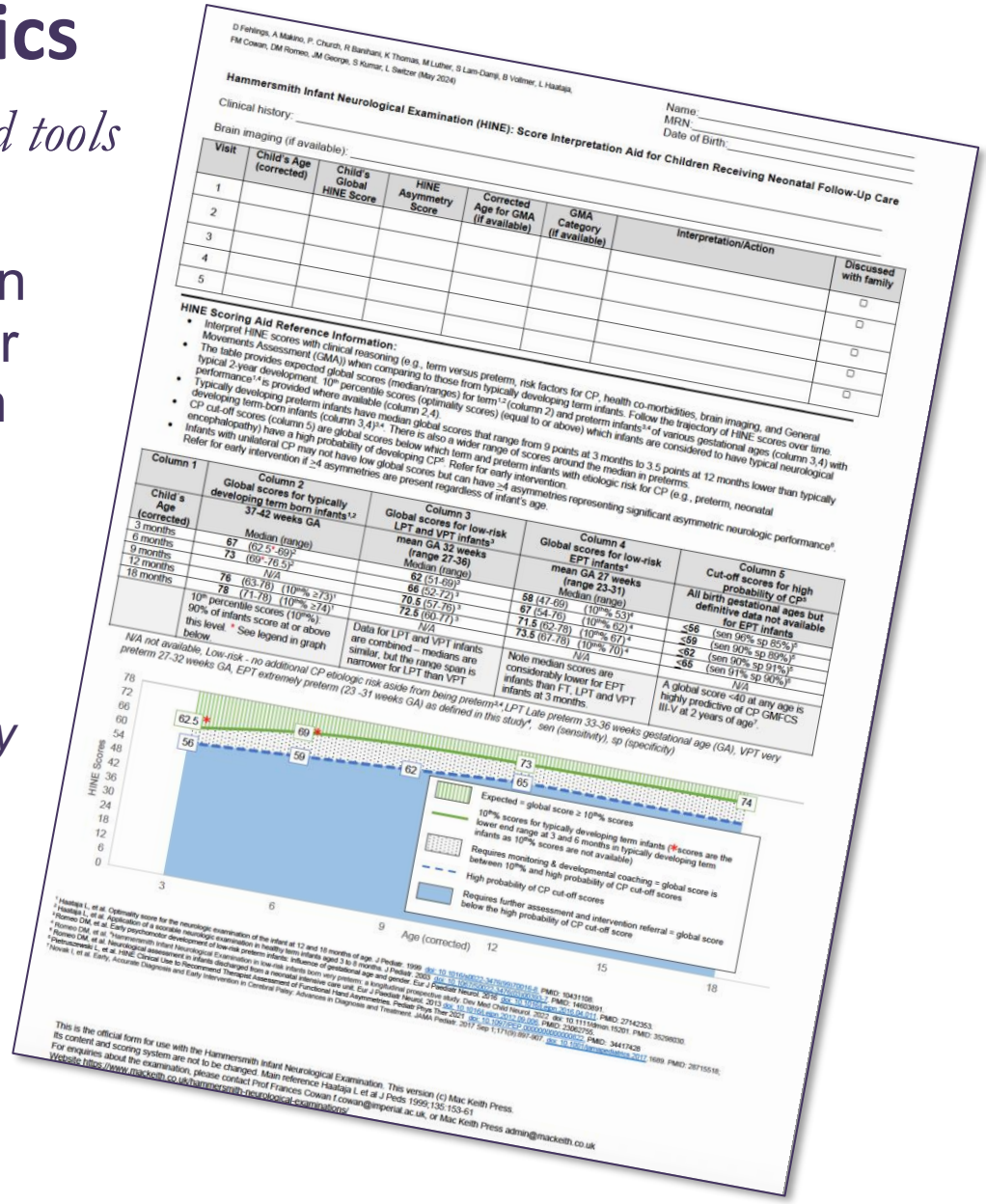


See "HINE Proforma and Potential tools" folder in HRIF Resources.

HINE in HRIF clinics

Options for documentation and tools

- Lessons learned from previous HINE implementation approaches indicate that including a header in paper or EMR documents with general score interpretation guidance is very useful. As an example:
  - *"HINE is a standardized neurological examination used to identify movement disorders. Cut-off scores for corrected ages: 3 and 6 months (≤ 56) and 12 months (≤65). Additionally, an optimality score <63 with more than 5 asymmetries at 3 months has high sensitivity and specificity to distinguish hemiplegia from typical development (Hay, 2018)"*
- A recently published HINE scoring aid (**figure**) includes published cut point information to aid clinicians in efficient interpretation (Fehlings, 2024)



D Fehlings, A Makino, P. Church, R Banihani, K Thomas, M Luther, S Lam-Damji, B Vollmer, L Haataja, FM Cowan, DM Romeo, JM George, S Kumar, L Switzer (May 2024)

Hammersmith Infant Neurological Examination (HINE): Score Interpretation Aid for Children Receiving Neonatal Follow-Up Care

Name:
MRN:
Date of Birth:
Clinical history:
Brain imaging (if available):

Visit	Child's Age (corrected)	Child's Global HINE Score	HINE Asymmetry Score	Corrected Age for GMA (if available)	GMA Category (if available)	Interpretation/Action	Discussed with family
1							☐
2							☐
3							☐
4							☐
5							☐

HINE Scoring Aid Reference Information:

- Interpret HINE scores with clinical reasoning (e.g., term versus preterm, risk factors for CP, health co-morbidities, brain imaging, and General Movements Assessment (GMA)) when comparing to those from typically developing term infants. Follow the trajectory of HINE scores over time.
- The table provides expected global scores (median/ranges) for term[1,2] (column 2) and preterm infants[3,4] of various gestational ages (column 3,4) with typical 2-year development performance[1,4] is provided where available (column 2,4). 10th percentile scores (optimality scores) (equal to or above) which infants are considered to have typical neurological
- Typically developing preterm infants have median global scores that range from 9 points at 3 months to 3.5 points at 12 months lower than typically developing term-born infants (column 3,4)[3,4]. There is also a wider range of scores around the median in preterms.
- CP cut-off scores (column 5) are global scores below which term and preterm infants with etiologic risk for CP (e.g., preterm, neonatal encephalopathy) have a high probability of developing CP[5]. Refer for early intervention.
- Infants with unilateral CP may not have low global scores but can have ≥4 asymmetries representing significant asymmetric neurologic performance[6]. Refer for early intervention if ≥4 asymmetries are present regardless of infant's age.

Column 1	Column 2	Column 3	Column 4	Column 5
Child's Age (corrected)	Global scores for typically developing term born infants[1,2] 37-42 weeks GA Median (range)	Global scores for low-risk LPT and VPT infants[3] mean GA 32 weeks (range 27-36) Median (range)	Global scores for low-risk EPT infants[4] mean GA 27 weeks (range 23-31) Median (range)	Cut-off scores for high probability of CP[5] All birth gestational ages but definitive data not available for EPT infants
3 months	67 (62.5*-69)*	62 (51-69)[3]	58 (47-69) (10th% 53)[4]	≤56 (sen 96% sp 85%)[5]
6 months	73 (69*-76.5)*	66 (52-72)[3]	67 (54-76) (10th% 62)[4]	≤59 (sen 90% sp 80%)[5]
9 months	N/A	70.5 (57-76)[3]	71.5 (62-78) (10th% 67)[4]	≤62 (sen 90% sp 80%)[5]
12 months	76 (63-78) (10th% ≥73)[1]	72.5 (60-77)[3]	73.5 (67-78) (10th% 70)[4]	≤65 (sen 91% sp 90%)[5]
18 months	78 (71-78) (10th% ≥74)[1]	N/A	N/A	N/A

10th percentile scores (10th%) of infants score at or above this level. * See legend in graph below.

Data for LPT and VPT infants are combined – medians are similar, but the range span is narrower for LPT than VPT

Note median scores are considerably lower for EPT infants than FT, LPT and VPT infants at 3 months.

A global score <40 at any age is highly predictive of CP GMFCS III-V at 2 years of age[7].

N/A not available, Low-risk - no additional CP etiologic risk aside from being preterm[3,4] LPT Late preterm 33-36 weeks gestational age (GA), VPT very preterm 27-32 weeks GA, EPT extremely preterm (23 -31 weeks GA) as defined in this study[4], sen (sensitivity), sp (specificity)

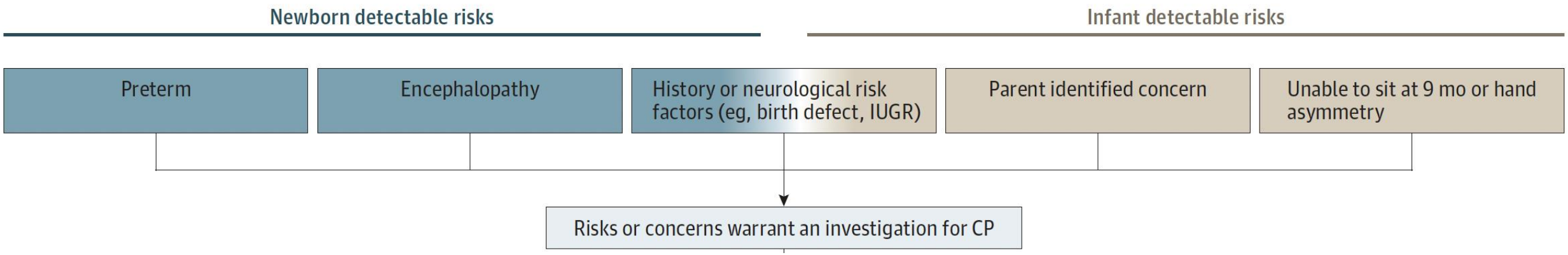
This is the official form for use with the Hammersmith Infant Neurological Examination. This version (c) Mac Keith Press.
For enquiries about the examination, please contact Prof Frances Cowan f.cowan@imperial.ac.uk, or Mac Keith Press admin@mackeith.co.uk
Website https://www.mackeith.co.uk/hammersmith-neurological-examinations/

See "HINE Proforma and Potential tools" folder in HRIF Resources.

HINE in HRIF clinics

Risks or concerns associated with CP

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



Novak I, et al. *JAMA Pediatr. 2017;171(9):897-907.*

HINE in HRIF clinics

HINE and initial HRIF visit

The 1st HRIF Standard Visit age range currently recommended by CCS is 4-8 months (corrected for prematurity). *The best predictive data related to early detection of high risk for CP supports using a combination of a standardized neurological assessment, neuroimaging, standardized motor assessment, and history taking about risk factors.*

- For sites utilizing **HINE alone** (without GMA or TIMP) in initial HRIF visit –
  - Early assessment allows for earlier identification of high risk for CP or concerns warranting serial follow up, and earlier referrals. Therefore, initial assessment is encouraged in the early part of the HRIF 1st Standard Visit window if possible.
  - However, data support predictive validity of the HINE through 12 months. Therefore, the HINE can be utilized later in the window and in follow up assessments.
- For sites utilizing the HINE *and* GMA (+/- TIMP) in initial HRIF visit –
  - Due to the GMA age range limits, the initial HRIF visit would need to be undertaken at <20 weeks of age corrected for prematurity; thus, the initial visit should most likely be an early *Additional Visit* which would need to be justified based on risk factors and/or NICU neurological/ motor assessments.