Case Study:
Using the HINE in a Child with Hypoxic Ischemic Encephalopathy

Case Summary

- Term infant
- Septic shock in the first week of life
- MRI consistent with bilateral cystic lesions in the cerebral white matter, and extensive cerebellar hemorrhage
- Discharged home with G-tube

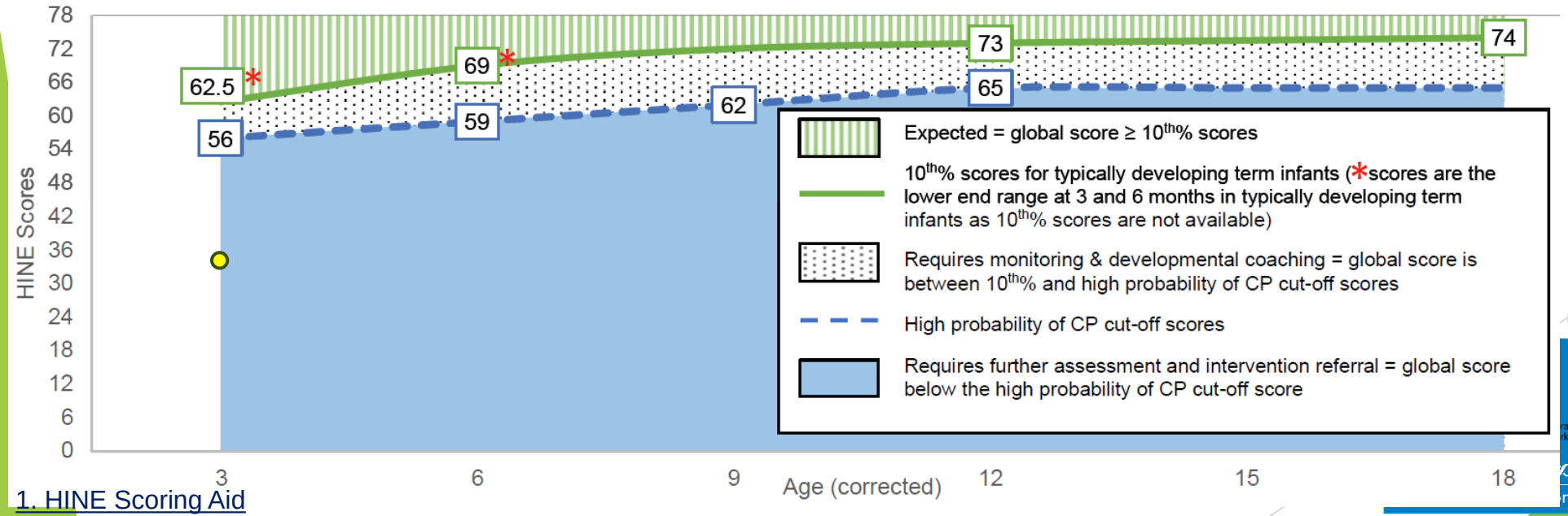
Hammersmith Infant Neurological Examination (HINE): Score Interpretation Aid for Children Receiving Neonatal Follow-Up Care

Clinical history: Term infant, bilateral PVL and cerebellar hemorrhage likely secondary to hypoxic ischemia, G-tube feeds

Brain imaging (if available): MRI: bilateral PVL and cerebellar hemorrhage

- 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.

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				15 wks	Absent Fidgety Movements		☑
2	3 months	35	2 (L)			High Probability of Cerebral Palsy	☑



Refer to early intervention

1. HINE Scoring Aid

Communication With the Family

1. Explore discussions that took place in the NICU
2. Reference imaging findings
3. Use of HINE assessment and scoring aid to open dialogue for early referral to motor based therapies

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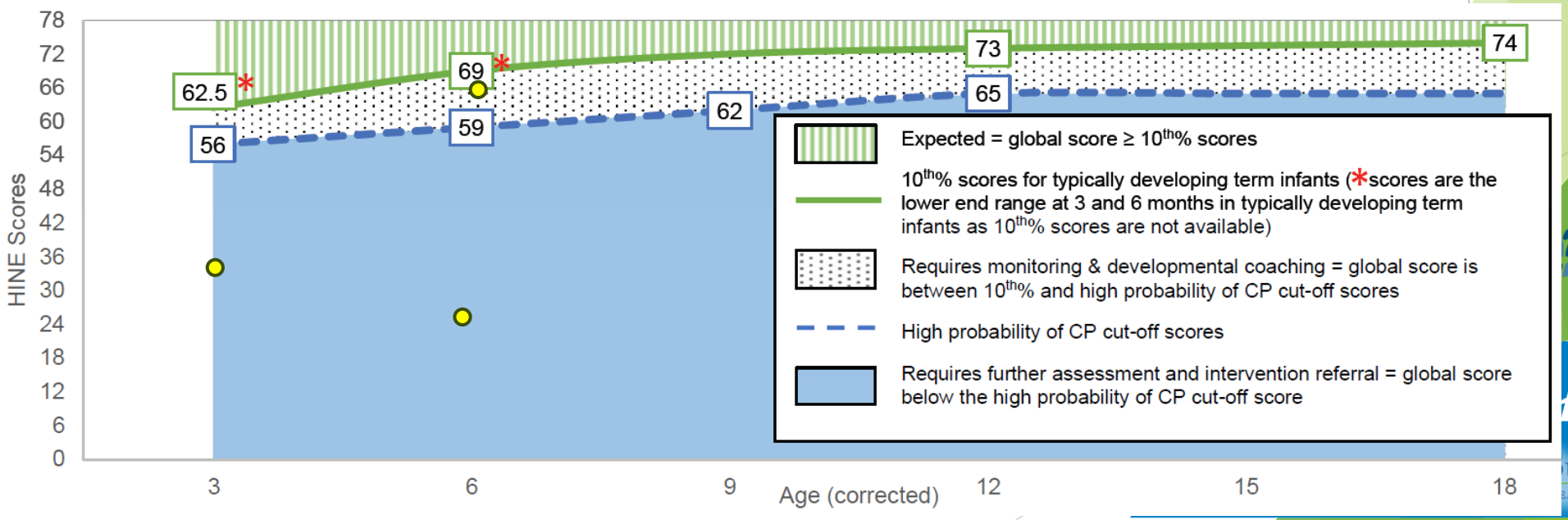
3	6 months	26	0			Quadriplegic cerebral palsy diagnosis	☑



1. HINE Scoring Aid

DEVELOPMENTAL MEDICINE & CHILD NEUROLOGY REVIEW

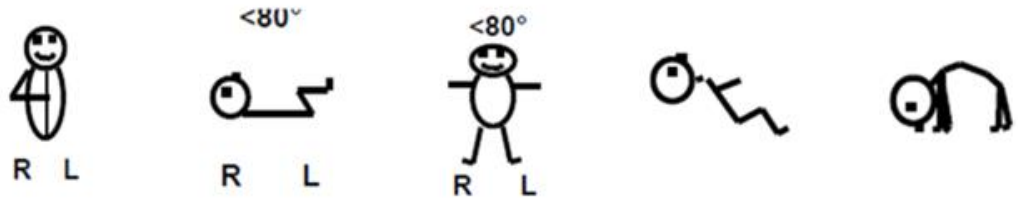
Use of the Hammersmith Infant Neurological Examination in infants with cerebral palsy: a critical review of the literature

DOMENICO M ROMEO | DANIELA RICCI | CLAUDIA BROGNA | EUGENIO MERCURI

	Most Predictive of CP	Least Predictive of CP
Ricci et al. (2006) **Frisone et al. (2002)** **Romeo et al. (2008)** **Romeo et al. (2013)**	1. Movement quality and quantity 2. Tone items in the first semester (axial) 3. Reactions in the second semester 4. Vision 5. Global score < 40 (6-9 mon)	Cranial nerve assessments were found to be the least predictive.

- **POSTURE**
  - Increased neck and trunk extension
  - Limbs – flexed UE, extended LE

- **TONE**
  - Scarf, popliteal angle, hip adductors
  - PTS, ventral suspension



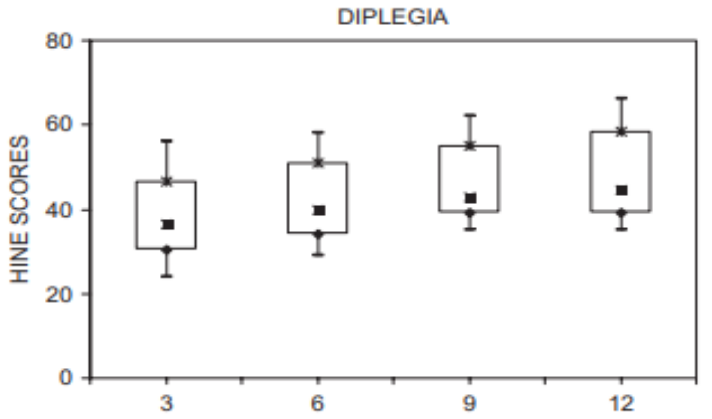
- **REACTIONS**
  - forward parachute and arm protection
  - > 6 mon

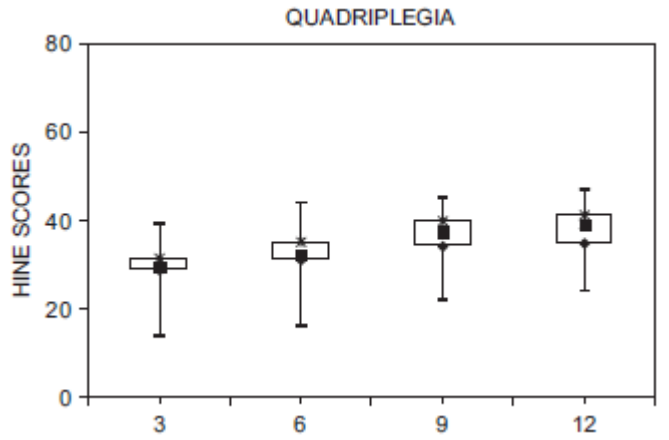
Original article

Neuromotor development in infants with cerebral palsy investigated by the Hammersmith Infant Neurological Examination during the first year of age

Domenico M.M. Romeo[a], Matteo Cioni[a,b,], Mariacristina Scoto[a], Luigi Mazzone[a], Filippo Palermo[c], Mario G. Romeo[d]*

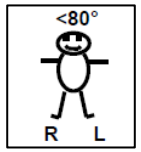
EUROPEAN JOURNAL OF PAEDIATRIC NEUROLOGY 12 (2008) 24–31





- At **3–6 months** infants with quadriplegia **GMFCS IV-V and severe diplegia (GMFCS III)** scored below 40, while GMFCS I,II diplegia scored between 40-60
- By **6-12 months** infants with quadriplegia score mainly <40

Items → main difference between those with Diplegia vs Quadriplegia

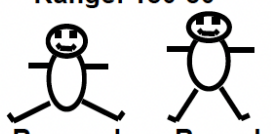
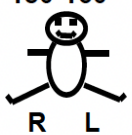
1. Tone (adductors) 

2. Posture (trunk and legs in sitting) items

Trunk in sitting

Legs in sitting

Hip Adductors

	Score 3	Score 2	Score 1	Score 0	sc	Asym / Co
Hip adductors With both the infant's legs extended, abduct them as far as possible. The angle formed by the legs is noted.	**Range: 150-80°** 	**150-160°** 	**>170°** 	**<80°** 	0	

2. HINE Scoring Proforma

kids brain health network

CP-NET Childhood Cerebral Palsy Discovery Network

McMaster Children's Hospital HAMILTON HEALTH SCIENCES

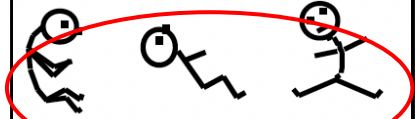
Holland Bloorview Kids Rehabilitation Hospital

Sunnybrook HEALTH SCIENCES CENTRE

Posture:

Trunk Rocketing

- Note → spine is straight but scoring 0 as rocketing back

	score 3	score 2	score 1	score 0	sc	Asymmetry /
Trunk in sitting	 Straight		 Slightly curved or bent to side	 Very rounded; rocketing back; bent sideway	0	

*Be mindful of this rocketing extensor reaction

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Holland Bloorview Kids Rehabilitation Hospital

Sunnybrook Health Sciences Centre

Documentation

Hammersmith Infant Neurological Examination:
The HINE is a standardized exam consisting of 26 items that assess different aspects of neurological function: cranial nerve function, posture, movements, reflexes and protective reactions. The HINE incorporates an asymmetry score to quantify the number of items on the neurological exam that are different on right and left sides. The HINE may be used for infants between 2 and 24 months. The exam can be scored to enable classification into optimal and sub-optimal neuromotor categories. The HINE is administered in the neonatal follow up clinic to infants as it helps us to monitor future motor outcomes. Early identification of movement concerns provides the opportunity for early rehabilitation intervention.

Summary and Recommendations:
X is a lovely baby boy that was born at term with a complicated NICU course that included severe septic shock, and need for G-tube feeds. An MRI completed showed bilateral periventricular leukomalacia, as well as extensive cerebellar hemorrhages. He is now 6 months old. X is continuing to make developmental gains and is progressing with oral feeds. His motor skill development is noted to be delayed. We discussed with his parents today that the combination of his General Movements Assessment, Hammersmith Infant Neurological Examination, neuroimaging and history are in keeping with a diagnosis of bilateral cerebral palsy, quadriplegic subtype.

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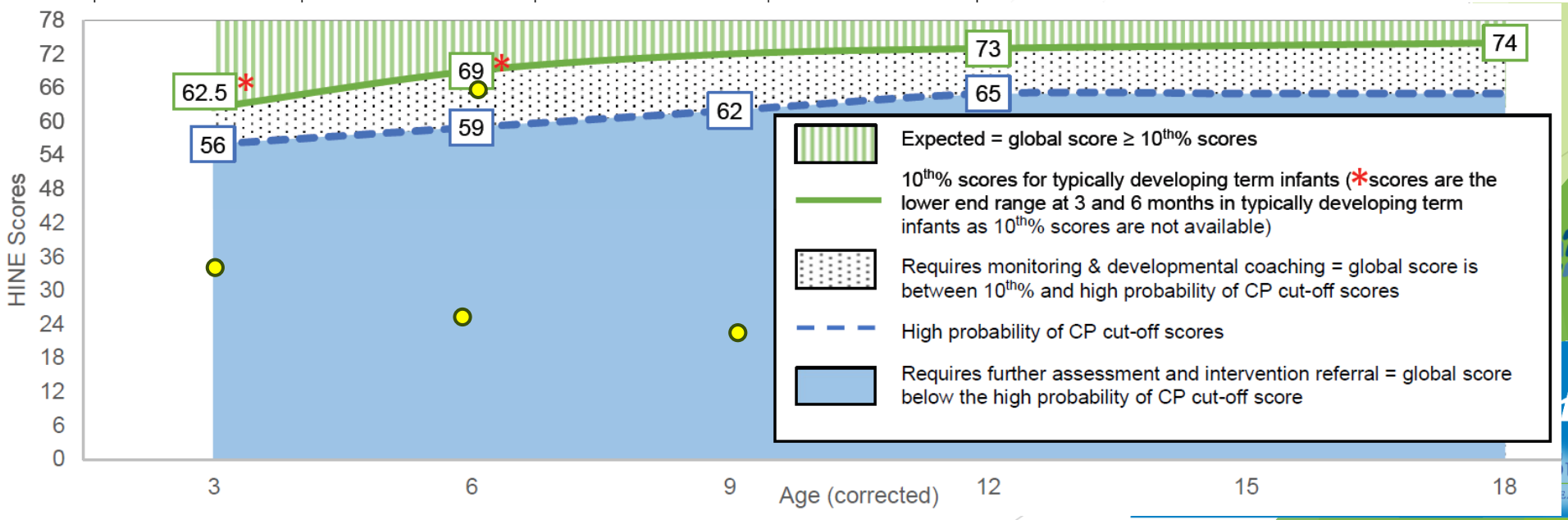
4	9 months	23	0				☑



1. HINE Scoring Aid

Key Messages

When communicating with professionals and families

- Use clinical reasoning to integrate information on HINE, prenatal/perinatal risk factors, GMA, imaging to best understand message to communicate re: developmental presentation, diagnosis, intervention needs
- Follow trajectory of the HINE over time to inform communication and next steps
- Use strength-based approaches and customize communication to each family
- Connect with early intervention/therapy as early as possible (in this case, referral initiated at 3 months)

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Sunnybrook HEALTH SCIENCES CENTRE

References

HINE Scoring Aid

1. https://onlinelibrary.wiley.com/doi/10.1111/dmcn.15977?af=R

HINE Scoring Proforma

2. https://www.mackeith.co.uk/hammersmith-neurological-examinations/hammersmith-neurological-examinations-subscriber-content/recording-and-scoring-proformas/