

# Case Study: Extreme Preterm Baby – No CP Diagnosis



# Case Summary

Former 24+3 weeks 529gm at birth with neonatal history significant for RDS, severe bilateral ROP requiring treatment, significant BPD discharged on home O2, and neonatal meningitis.

- A small cerebellar hemorrhage, otherwise unremarkable in serial cranial ultrasounds.
- General Movement Assessment (GMA): Fidgety movements (FMs) present at 14+5 weeks post-term with a Motor Optimality Score-Revised (MOS-R) of 24, which is within the mildly reduced but still normal range.



# PRETERM – LOW INITIAL HINE SCORES THAT IMPROVE

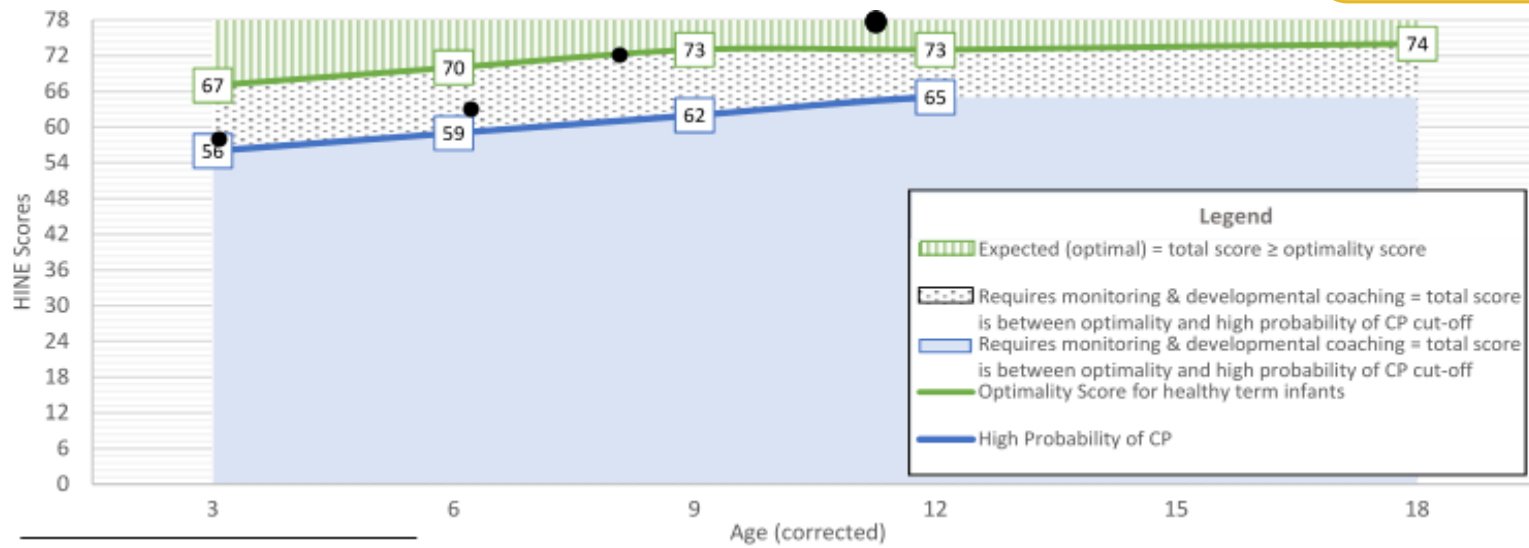
## Hammersmith Infant Neurological Examination (HINE): Score Interpretation Aid

Clinical history: 24 + 3 weeks RDS, giant melanocytic nevus, CLD, UTI, ROP S3Z2 (laser bilaterally), meningitis

Brain imaging (if available): small cerebellar hemorrhage

Visit	Child's Age (corrected)	Child's Total HINE Score	HINE Asymmetry Score	Corrected Age for GMA (if available)	GMA Category (if available)	Interpretation/Action	Discussed with family
1	1m3d				PR	PR = Poor repertoire	<input type="checkbox"/>
2	3m12d	57.5	3 (R)	14.5 weeks	normal FMs	MOSR=24 FM= Figdety Movements	<input type="checkbox"/>
3	6m14d	62.5	2 (R)				
4	8m4d	72	1				
5	11m20d	77	0				

See Next Slide for Interpretation and Actions 😊



Banihani, Luther



# CASE 1 – ASSESSMENT TRAJECTORY INTERPRETATION/ACTION

Visit	Child's Age (corrected)	Child's Global HINE Score	HINE Asymmetry Score	Corrected Age (CA) for GMA (if available)	GMA Category (if available)	Interpretation/Action	Discussed with family
1	1m 3d	-	-	5 weeks Post term	Poor repertoire (PR)	<p>Typical Pattern in Extreme Preterm Infants. The trajectory of the GMA and video series is particularly predictive, especially at the fidgety movements stage (FMs).</p> <p><b>Action:</b></p> <ol style="list-style-type: none"> <li>1. Close Monitoring</li> <li>2. Refer to local infant development program (EI)</li> <li>3. Follow-up in 2 months</li> <li>4. Coaching Strategies: Discussed and implemented</li> </ol>	Yes
2	3m 12 d	57.5	3 (R)	14+5	FMs – Normal MOS-R=24	<p>Typical Pattern in Extreme Preterm Infants GMA: Overall reassuring. HINE score indicates areas to monitor due to extreme prematurity and ongoing health issues. Main focus: Proximal Hypotonia and weakness, particularly in core muscles of the shoulder and pelvic girdles. Asymmetries and fixing behaviors due to extreme preterm motor profile.</p> <p><b>Action Plan:</b></p> <ol style="list-style-type: none"> <li>1. Tummy Time: Frequent, brief sessions; increase as tolerated.</li> <li>2. Supported Sitting strategies.</li> <li>3. Discussion on initiation of solid feeding @ 4 months CA.</li> <li>4. Follow-Up: In 2 months.</li> </ol>	Yes
3	6m 14d	62.5	2(R)	-	-	<p>Typical Pattern in Extreme Preterm Infants Overall reassuring</p> <p><b>Action Plan:</b></p> <ol style="list-style-type: none"> <li>1. Sitting and transition movement strategies</li> <li>2. Follow-Up: In 2 months</li> </ol>	Yes
4	8m 4d	72	1	-	-	Corrected Age - appropriate motor skills	Yes
5	11m 20d	77	0	-	-	Corrected Age – appropriate motor skills	Yes



# Case Summary

Former 24+3 weeks, 652 gm at birth. Neonatal history significant for: Bilateral vocal cord paralysis, significant BPD, discharged on home oxygen.

- Mildly dilated ventricles, mild left ventriculomegaly, echogenic structures in corpus callosum, moderate ventriculomegaly, and bilateral congenital cysts observed in serial cranial ultrasounds.
- General Movement Assessment (GMA): Fidgety movements present at 15 +3 weeks post-term with a Motor Optimality Score-Revised (MOS-R) of 17 (moderately reduced – requires intervention).



# PRETERM BABY, VERY LOW INITIAL HINE SCORES THAT IMPROVE

## Hammersmith Infant Neurological Examination (HINE): Score Interpretation Aid

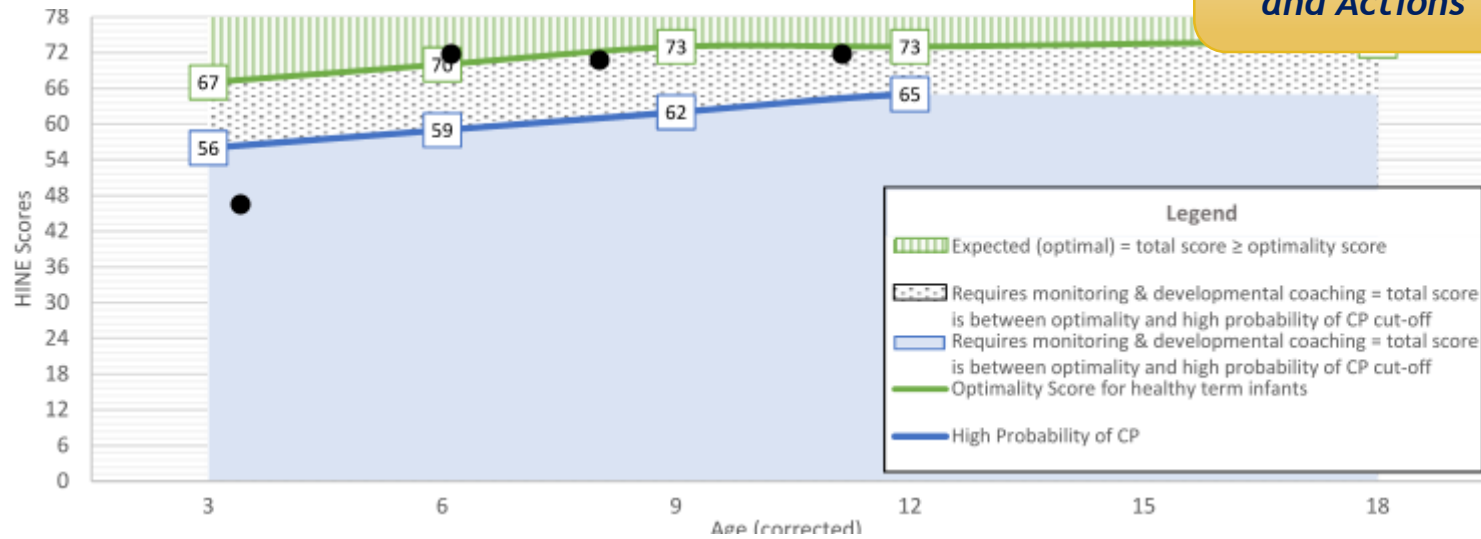
Clinical history: GA: 24 + 3 BW: 652g CLD, dysmorphism, bilateral vocal cord paralysis, ROP bilaterally, hemangiomas, GERD

### Imaging

Brain imaging (if available): MRI [*mild prominence of extra axial CSF spaces, mild to moderate enlargement of lateral ventricles, and microhe*]  
 Head Ultrasound [*ventriculomegaly*]

Visit	Child's Age (corrected)	Child's Total HINE Score	HINE Asymmetry Score	Corrected Age for GMA (if available)	GMA Category (if available)	Interpretation/Action	Discussed with family
1				1m16d	N		<input type="checkbox"/>
2				13w3d	NF, MOSR:20	NF=normal fidgety movements	<input type="checkbox"/>
3	3m20d	44	3 (L)	15w3d	NF, MOSR:17		<input type="checkbox"/>
4	6m18d	72	4 (L)				<input type="checkbox"/>
5	8m14d	67	1 (L)				<input type="checkbox"/>

See Next Slide for Interpretation and Actions 😊



CP-NET  
Childhood Cerebral Palsy  
Discovery Network

Holland Bloorview  
Kids Rehabilitation Hospital

Sunnybrook  
HEALTH SCIENCES CENTRE

## CASE 2 – ASSESSMENT TRAJECTORY INTERPRETATION/ACTION

Visit	Child's Age (corrected)	Child's Global HINE Score	HINE Asymmetry Score	Corrected Age (CA) for GMA (if available)	GMA Category (if available)	Interpretation/Action	Discussed with family
1	1m 16d	-	-		Normal (N)	Assuring - Typical Pattern in Extreme Preterm Infants. The trajectory of the GMA and video series is particularly predictive, especially at the fidgety movements stage (FMs) @ 3-4 months CA <b>Action:</b> 1. Close Monitoring 2. Refer to local infant development program (EI) 3. Follow-up in 2 months as per clinic schedule 4. Coaching Strategies: Discussed and implemented - Tummy Time: Frequent, brief sessions; increase as tolerated	Yes
2	-	-	-	13w 3d	FMs – Normal MOS-R=20	Typical Pattern in Extreme Preterm Infants GMA: Overall reassuring. MOS-R within (moderately reduced – requires intervention). <b>Action Plan:</b> 1. Tummy Time: Frequent, brief sessions; increase as tolerated. 2. Supported Sitting strategies. 3. Discussion on initiation of solid feeding @ 4 months CA. 4. Follow-Up: In 2 months.	Yes
3	3m 20d	44	3 (L)	15w 3d	FMs – Normal MOS-R=17	Typical Pattern in Extreme Preterm Infants GMA: Overall reassuring, consistent with previous assessments. MOS-R: Shows moderately reduced scores, indicating the need for some intervention. HINE Score: Suggests potential areas of concern for CP based on full-term data. However, given your baby's preterm birth and medical history, we will wait for the next visit to make any conclusions. Many items not scored align with the preterm profile, including noticeable Hypotonia and weakness in the core muscles of the shoulder and pelvic girdles. Asymmetries and behaviors are typical for this stage of development. <b>Action Plan:</b> 1. Close Monitoring: Follow-up in 2 months. 2. Coaching Strategies: Tummy Time: Short, frequent sessions throughout the day; gradually increase as tolerated. Supported Sitting: Work on strategies and practice rolling. 3. Referral: Consider motor-based intervention, such as physiotherapy.	
4	6m 14d	72	4(L)	-	-	Your baby has shown significant progress in motor skills and is now off oxygen. You are effectively following the coaching strategies provided by our clinic and community therapist. Your baby is approaching age-appropriate motor skills, though some typical patterns of extreme preterm development are still present. This includes four asymmetries mainly related to intermittent fixing behaviors and posture. <b>Action Plan:</b> 1. Coaching Strategies: Focus on sitting and transition movement strategies in both directions. 2. Encourage more floor play and discourage extended standing play. 3. Continue with community therapist. 4. Schedule a follow-up in 2 month	Yes
5	8m 14d	67	1 (L)	-	-	Same as # 4 visit – We are still pleased with the progress	Yes

# Points to Consider When Assessing Asymmetries in Extreme Preterm Infants

- Extreme preterm infants can exhibit asymmetries secondary to neurological immaturity rather than a reflection of true asymmetric neurological performance
- Review Neuroimaging: Always review neonatal neuroimaging U/S and/or MRI to check for injuries associated with a higher possibility of unilateral CP, such as unilateral PVHI or unilateral PVL or others.
- GMA Results: After neuroimaging, review GMA results and monitor for segmental hand movements and emerging asymmetries at the 3-4 months GMA, especially at the FM's stage, if applicable in your clinic.
- Location of Asymmetries: Observe where the asymmetries are noticeable.
- Are they consistently on the same side or do they vary?
- Age-Related Considerations: Take into account age-appropriate development milestones.
- Cranial Nerves: Assess the function of cranial nerves.
- Further Examination: If more than 4 items are noted, consider a closer look at hand function.

## CASE 2 ASYMMETRIES

Legs in sitting	able to sit with a straight back and legs straight or slightly bent (long sitting)  <input type="checkbox"/> R <input checked="" type="checkbox"/> L	<input type="checkbox"/> R <input type="checkbox"/> L	sit with straight back but knees bent at 15-20°  <input checked="" type="checkbox"/> R <input type="checkbox"/> L	unable to sit straight unless knees markedly bent (no long sitting)  <input type="checkbox"/> R <input type="checkbox"/> L	2	A - right leg more flexed
in supine and in standing	legs in neutral position straight or slightly bent <input type="checkbox"/> R <input type="checkbox"/> L	Slight internal rotation or external rotation <input type="checkbox"/> R <input type="checkbox"/> L	Internal rotation or external rotation at the hips <input type="checkbox"/> R <input type="checkbox"/> L	marked internal rotation or external rotation or fixed extension or flexion or contractures at hips and knees <input type="checkbox"/> R <input type="checkbox"/> L		
Popliteal angle	Range: 150°-100°  <input type="checkbox"/> R <input type="checkbox"/> L	150-160°  <input type="checkbox"/> R <input type="checkbox"/> L	~90° or > 170°  <input type="checkbox"/> R <input type="checkbox"/> L	<80°  <input type="checkbox"/> R <input type="checkbox"/> L	3	A - L tighter
Ankle dorsiflexion	Range: 30°-85°  <input type="checkbox"/> R <input type="checkbox"/> L	20-30°  <input type="checkbox"/> R <input type="checkbox"/> L	<20° or 90°  <input type="checkbox"/> R <input type="checkbox"/> L	> 90°  <input type="checkbox"/> R <input type="checkbox"/> L	3	A - L catch
Arm protection	Pull the infant by one arm from the supine position (steady the contralateral hip) and note the reaction of arm on opposite side.  <input checked="" type="checkbox"/> R <input type="checkbox"/> L		arm semi flexed <input type="checkbox"/> R <input checked="" type="checkbox"/> L	arm fully flexed <input type="checkbox"/> R <input type="checkbox"/> L	2	A - left side

## CASE 2: Asymmetries:

- 1 on R: 3 on L (Mainly seen in LE's i.e. R Leg in posture; L in tone-popliteal angle)
- The L Arm protection may be related to immaturity at this age
- Although this child is close to meeting criteria for a referral for >4 asymmetries, it should be noted that there is a mixture in sides (R and L) and the asymmetries are not involving the UE
- Close monitoring and coaching strategies were provided and asymmetries were largely resolved by 5 months

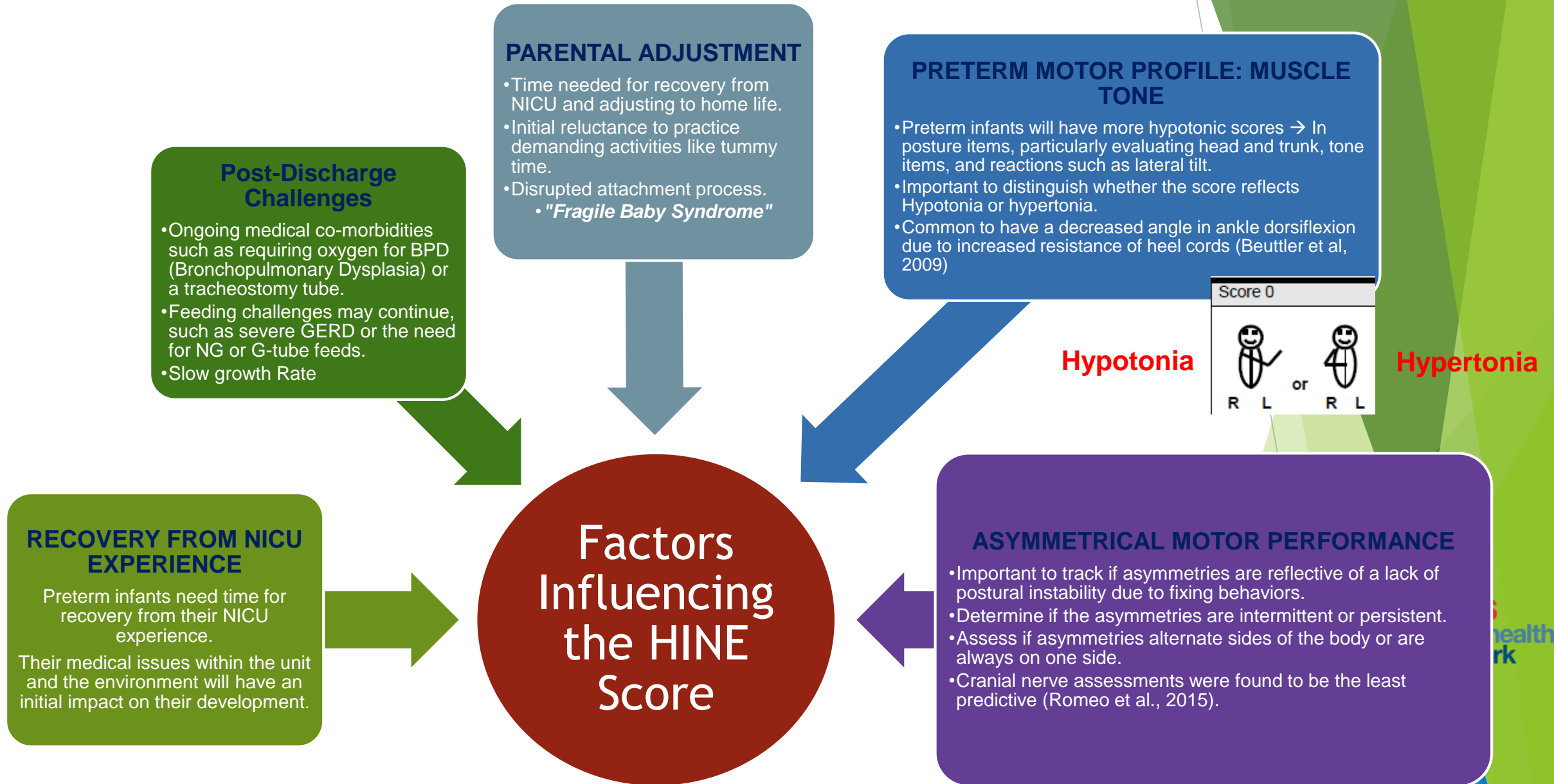


# Keep in Mind: Interpretation of HINE Scores Important Factors

- ✓ **Contextual Evaluation:** Avoid using low HINE scores in isolation, particularly at 3 and 6 months corrected age for preterm infants.
- ✓ **Clinical Reasoning:** Incorporate neuroimaging and GMA results into the interpretation of scores.
- ✓ **Gestational Age and Health Comorbidities:** Factor in any health comorbidities.
- ✓ **Asymmetries:** Determine if asymmetries are consistently on the same side or alternate.
  - Assess involvement of cranial nerves.
  - Consider if asymmetries are related to immaturity, especially with reflexes and reactions.
  - For referral to CIMT, ensure upper extremities are involved.



# HINE AND THE PRETERM INFANT



# 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/>

