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Cerebral palsy research news

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Professor Nadia Badawi AM
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Interventions and Management

1. Computer Vision for Gait Assessment in Cerebral Palsy: Metric Learning and Confidence Estimation

Peijun Zhao, Moises Alencastre-Miranda, Zhan Shen, Ciaran O'Neill, David Whiteman, Javier Gervas-Arruga, Hermano Igo Krebs

IEEE Trans Neural Syst Rehabil Eng. 2024 Jun 18:PP. doi: 10.1109/TNSRE.2024.3416159. Online ahead of print.

Assessing the motor impairments of individuals with neurological disorders holds significant importance in clinical practice. Currently, these clinical assessments are time-intensive and depend on qualitative scales administered by trained healthcare professionals at the clinic. These evaluations provide only coarse snapshots of a person's abilities, failing to track quantitatively the detail and minutiae of recovery over time. To overcome these limitations, we introduce a novel machine learning approach that can be administered anywhere including home. It leverages a spatial-temporal graph convolutional network (STGCN) to extract motion characteristics from pose data obtained from monocular video captured by portable devices like smartphones and tablets. We propose an end-to-end model, achieving an accuracy rate of approximately 76.6% in assessing children with Cerebral Palsy (CP) using the Gross Motor Function Classification System (GMFCS). This represents a 5% improvement in accuracy compared to the current state-of-the-art techniques and demonstrates strong agreement with professional assessments, as indicated by the weighted Cohen's Kappa (κlw = 0.733). In addition, we introduce the use of metric learning through triplet loss and self-supervised training to better handle situations with a limited number of training samples and enable confidence estimation. Setting a confidence threshold at 0.95, we attain an impressive estimation accuracy of 88%. Notably, our method can be efficiently implemented on a wide range of mobile devices, providing real-time or near real-time results.

PMID: 38889045

2. Selective voluntary motor control influences knee joint torque, work and power in children with spastic cerebral palsy

Eileen G Fowler, Andy Vuong, Loretta A Staudt, Marcia B Greenberg, Sophia A Mesler, Keren Chen, Kristen M Stearns-Reider

Gait Posture. 2024 Jun 19:113:151-157. doi: 10.1016/j.gaitpost.2024.06.005. Online ahead of print.

Background: Children with spastic cerebral palsy (CP) have damage to the corticospinal tracts that are responsible for selective motor control (SMC). Force, velocity and timing of joint movement are related biomechanical features controlled by the corticospinal tracts (CSTs) that are important for skilled movement. Research question: Does SMC influence knee joint biomechanics in spastic CP? Methods: In this prospective study, relationships between SMC and knee biomechanics (peak torque, total work, average power) across a range of velocities (0-300 deg/s) were assessed using an isokinetic dynamometer in 23 children with spastic CP. SMC was assessed using Selective Control Assessment of the Lower Extremity (SCALE). Logistic and linear regression models were used to evaluate relationships between SCALE and biomechanical measures. Results: The ability to produce knee torque diminished with increasing velocity for both Low (0-4 points) and High (5-10

points) SCALE limb score groups ($p < 0.01$). More knees in the High group produced extension torque at 300 deg/s ($p < 0.05$) and flexion torque at 30, 90,180, 240 and 300 deg/s ($p < 0.05$). The ability to produce torque markedly decreased above 180 deg/s for Low group flexion. For knees that produced torque, significant positive correlations between SCALE limb scores and joint torque (0 and 120 deg/s), work (120 deg/s) and power (120 deg/s) were found ($p < 0.05$). Greater knee torque, work and power for the High group was found for the extensors at most velocities and the flexors for up to 120 deg/s ($p < 0.05$). Few Low group participants generated knee flexor torque above 120 deg/s limiting comparisons. Significance: Biomechanical impairments found for children with low SMC are concerning as skilled movements during gait, play and sport activities occur at high velocities. Differences in SMC should be considered when designing individualized assessments and interventions.

PMID: 38901387

3. Impact of video vector analysis of ankle foot orthoses in children with physical disability: A 10-year clinical review

R O'Sullivan, M Carriquiry, A Quinn, D C Fisher, D Kiernan

Gait Posture. 2024 Jun 19:113:173-177. doi: 10.1016/j.gaitpost.2024.06.016. Online ahead of print.

Background: Ankle Foot Orthoses (AFOs) are frequently prescribed to manage gait impairments in children with physical disability, and it is important that AFOs are prescribed and fitted appropriately to maximize potential benefits. AFO tuning, manipulation of the AFO footwear combination (AFO-FC) by means of video vector analysis, is routinely used to optimize AFO use. However, the incidence or types of changes that are implemented after this type of orthotic review are unknown. Research question: To investigate the impact of a multi-disciplinary video vector clinic on AFO provision in children with physical disability. Methods: All children who attended a video vector clinic over a period of 10-years from the establishment of the clinic were included in the study. Outcomes of the clinic were grouped into 5 categories: (1) No change to AFO-FC; (2) Altered/tuned AFO-FC; (3) Discontinued AFO-FC; (4) Recast AFO; (5) Change in prescription. Data were summarised narratively. Results: 141 independently ambulant children were included. The diagnoses were bilateral cerebral palsy (39 %, n=55), unilateral cerebral palsy (38 %, n=54), spina bifida (9 %, n=13), hereditary spastic paraparesis (2 %, n=3) and other (11 %, n=16). No changes were made in 52 % of cases (n=74), tuning in 22 % of cases (n=31), the AFO was recast in 13 % of cases (n=19) and discontinued in 10 % of cases (n=14). A prescription change was recommended in 3 % of cases (n=4). Significance: Our findings suggest that the video vector clinic is a time efficient and effective means of assessing gait function in children with AFOs. Without assessment at the clinic, most of the children assessed would likely have been referred for a full and more time consuming 3-dimensional gait analysis. Video vector analysis at the initial AFO fitting may improve alignment and possibly reduce non-compliance at an earlier stage.

PMID: 38905852

4. Increased knee flexion in participants with cerebral palsy results in altered stresses at the distal femoral growth plate compared to a typically developing cohort

Willi Koller, Elias Wallnöfer, Jana Holder, Andreas Kranzl, Gabriel Mindler, Arnold Baca, Hans Kainz

Gait Posture. 2024 Jun 18:113:158-166. doi: 10.1016/j.gaitpost.2024.06.012. Online ahead of print.

Introduction: Femoral deformities are highly prevalent in children with cerebral palsy (CP) and can have a severe impact on patients' gait abilities. While the mechanical stress regime within the distal femoral growth plate remains underexplored, understanding it is crucial given bone's adaptive response to mechanical stimuli. We quantified stresses at the distal femoral growth plate to deepen our understanding of the relationship between healthy and pathological gait patterns, internal loading, and femoral growth patterns. Methods: This study included three-dimensional motion capture data and magnetic resonance images of 13 typically developing children and twelve participants with cerebral palsy. Employing a multi-scale mechanobiological approach, integrating musculoskeletal simulations and subject-specific finite element analysis, we investigated the orientation of the distal femoral growth plate and the stresses within it. Limbs of participants with CP were grouped depending on their knee flexion kinematics during stance phase as this potentially changes the stresses induced by knee and patellofemoral joint contact forces. Results: Despite similar growth plate orientation across groups, significant differences were observed in the shape and distribution of growth values. Higher growth rates were noted in the anterior compartment in CP limbs with high knee flexion while CP limbs with normal knee flexion showed high similarity to the group of healthy participants. Discussion: Results indicate that the knee flexion angle during the stance phase is of high relevance for typical bone growth at the distal femur. The evaluated growth rates reveal plausible results, as long-term promoted growth in the anterior compartment leads to anterior bending of the femur which was confirmed for the group with high knee flexion through analyses of the femoral geometry. The framework for these multi-scale simulations has been made accessible on GitHub, empowering peers to conduct similar mechanobiological studies. Advancing our understanding of femoral bone development could ultimately support clinical decision-making.

PMID: 38905850

5. Letter to the editor re "Comparison of the efficiency of transcutaneous electrical nerve stimulation and manual therapy in children with cerebral palsy with lower urinary system dysfunction - A randomized prospective trial"

Isabel Casal-Beloy, Rosa María Romero Ruíz

J Pediatr Urol. 2024 Jun 4:S1477-5131(24)00294-8. doi: 10.1016/j.jpurol.2024.05.029. Online ahead of print.

No abstract available

PMID: 38880669

6. Sitting Postural Management to Prevent Migration Percentage Progression in Non-Ambulatory Children with Cerebral Palsy: Randomized Controlled Trial Preliminary Data

Silvia Faccioli, Irene Maggi, Emanuela Pagliano, Claudia Migliorini, Arianna Michelutti, Liliana Guerra, Anna Ronchetti, Giovanna Cristella, Nicoletta Battisti, Lara Mancini, Odoardo Picciolini, Silvia Alboresi, Antonio Trabacca, Shaniko Kaleci

J Clin Med. 2024 May 27;13(11):3129. doi: 10.3390/jcm13113129.

Background/Objectives: To determine whether a sitting position with the femoral heads centered into the acetabulum is more effective than the usual sitting position in preventing migration percentage progression in non-ambulatory children with bilateral cerebral palsy. Methods: This was a multicenter, randomized controlled trial. Inclusion criteria: spastic or dyskinetic cerebral palsy, Gross Motor Function Classification System level IV-V, age 1-6 years, migration percentage <41%, and informed consent. Exclusion criteria: contractures affecting the hip, anterior luxation, previous hip surgery, and lumbar scoliosis. The treatment group sat with their hips significantly abducted to reduce the head into the acetabulum in a customized system for at least five hours/day for two years. Controls sat with the pelvis and lower limbs aligned but the hips less abducted in an adaptive seating system. The primary outcome was migration percentage (MP) progression. Health-related quality of life and family satisfaction were among the secondary outcomes. The study was approved by the local ethics board and conducted in accordance with CONSORT reporting guidelines. Clinicaltrials: gov ID: NCT04603625. Results: Overall median MP progression was 1.6 after the first year and 2.5 after the second year. No significant differences were observed between the groups. MP exceeded 40% and 50% in 1.8% and 0% of the experimental group and 5.4% and 3.6% of controls in years 1 and 2, respectively. Both groups expressed satisfaction with the postural system and stable health-related quality of life. Conclusions: MP remained stable over the two-year period in both groups. Considering outliers which progressed over 50%, a more protective trend of the hip-centering sitting approach emerged, but this needs to be confirmed in a final, larger dataset.

PMID: 38892841

7. Designing strategies to support Implementation of iNtensive Therapy for Early Reach through PLAY (INTERPLAY) for young children with cerebral palsy: a study protocol

Alicia Hilderley, Christine Cassidy, Sandra Reist-Asencio, Chelsea Tao, Stephen Tao, Susan McCoy, Divya Vurrabindi, Kathleen O'Grady, Mia Herrero, Liz Cambridge, Eleanor Leverington, Victoria Micek, John Andersen, Darcy Fehlings, Adam Kirton

Implement Sci Commun. 2024 Jun 18;5(1):66. doi: 10.1186/s43058-024-00602-y.

Background: Intensive manual therapy is important for improving lifelong upper limb motor outcomes for infants and toddlers with cerebral palsy. This play-based therapy is delivered by caregivers who are coached by occupational therapists. However, access to this therapy is very limited for Canadian children with cerebral palsy younger than two years old. This project aims to first identify barriers and facilitators and then design implementation strategies to support early intensive manual therapy delivery for infants and toddlers with cerebral palsy across Canada. Methods: A mixed-methods sequential explanatory design will be used with four consecutive phases. The updated Consolidated Framework for Implementation Research will guide the study. Quantitative data will be collected from a survey in Phase One. Participants will be recruited from three groups: (1) Caregivers of children with cerebral palsy six years old and younger who are eligible for manual therapy; (2) occupational therapists who treat children with cerebral palsy; and (3) healthcare administrators or people responsible for managing pediatric occupational therapy programs. In Phase Two, quantitative data from the survey will be used to map to implementation strategies known to be effective at addressing the identified modifiable barriers and facilitators. Phase Three will collect qualitative data from semi-structured interviews for the purpose of explaining Phase One quantitative findings in greater depth, and for understanding the appropriateness of strategies identified in Phase Two. The participant recruitment strategy and interview guide content for Phase Three will be informed by results of Phase One. Phase Four will use a modified nominal group technique to refine and prioritize an implementation strategy toolbox. Results will be widely disseminated to knowledge users to provide them with tailorable strategies to increase delivery of early intensive manual interventions. Discussion: This study will provide a comprehensive understanding of the barriers and facilitators to implementation of early intensive manual therapy for young children with cerebral palsy in Canada. A toolbox of evidence-based and tailorable implementation strategies will be disseminated nationally to support uptake of early intensive manual therapy into clinical practice for young children

with cerebral palsy.

PMID: 38890681

8. Care burden, perceived social support, coping attitudes and life satisfaction of mothers with children with cerebral palsy

Semiha Dertli, Aydan Selen Aydin Yilmaz, Ulviye Gunay

Child Care Health Dev. 2024 Jul;50(4):e13297. doi: 10.1111/cch.13297.

Aim: This study's aim is to determine the relationship between care burden, perceived social support, coping attitudes and life satisfaction of mothers with children with cerebral palsy (CP). Methods: This descriptive study was conducted in Turkey between March and June 2022 to determine the relationship between caregiving burden, perceived social support, coping attitudes and life satisfaction of 122 mothers with CP children. Path analysis was used to evaluate the data. Results: Correlation analysis showed a positive relationship between mothers' social support perceptions and life satisfaction and coping attitudes, a positive relationship between their life satisfaction and coping attitudes ($p < .001$). The path analysis showed that the social support perceived by the mothers significantly affected their coping attitudes ($\beta = .257$; $p < .001$) and life satisfaction ($\beta = .081$; $p < .001$). Mothers' care burden ($\beta = .169$; $p < .001$) and coping attitudes ($\beta = .071$; $p < .05$) also had a significant effect on their life satisfaction. Conclusions: It is an important finding of this study that mothers' perceptions of social support and coping attitudes have a positive effect on their life satisfaction. Long-term care can cause physical and psychological problems for mothers. Mothers' strong coping strategies and high levels of social support may reduce the occurrence of these problems. Drawing attention to this issue in mothers and revealing the effects of these variables is important in terms of indirectly supporting child outcomes.

PMID: 38895968

9. Access to dental care and caries experience among children with cerebral palsy: a Singapore experience

Joanne Mui Ching Tan, Yebeen Ysabelle Boo, Logan Manikam, Tong Hong Yeo, Jeremy Bingyuan Lin, Ruixiang Yee, Zhi Min Ng

Singapore Med J. 2024 Jun 19. doi: 10.4103/singaporemedj.SMJ-2022-022. Online ahead of print.

Introduction: Cerebral palsy (CP) is one of the most severe childhood neurodevelopmental disabilities resulting from non-progressive insult to the developing brain. We aimed to report our experience regarding dental visit attendance, caries prevalence and factors affecting dental access in children with CP in Singapore. Methods: Patients diagnosed with CP who were born in or after 1994 were included in this study. We reviewed the data of all 151 patients recruited under the CP Registry in Singapore (SingCPR) from September 2017 to May 2020. The SingCPR was launched in September 2017 to assist in future planning of services and resources for CP in Singapore. Results: The mean age of the patients was 7.8 years, with the interquartile range being 3 years and 8 months-10 years and 10 months. Only 41.7% reported a visit to the dentist ever, with 25.4% reporting presence of dental caries. Age was the only statistically significant factor influencing access to dental care. None of the children less than 2 years old ever received any dental care, and 20% of the children with CP aged 2-6 years had received dental care before. Age range with the highest percentage of dental visits was 7-12 years, with up to 44.0% having ever received dental care. We believe the prevalence of dental caries was underreported as many children did not receive any dental care and therefore may have undetected dental caries. Conclusion: Dental care in children with CP should be advocated early for prevention and detection of caries.

PMID: 38900000

10. Comparison of the effects of abdominal massage and osteopathic manipulative treatment home program on constipation in children with cerebral palsy

Aisel T Chatip, Gönül Acar, Ayfer A Akçay

JGH Open. 2024 Jun 19;8(6):e13102. doi: 10.1002/jgh3.13102. eCollection 2024 Jun.

Background and aim: The aim of this study is to compare the effects of osteopathic manipulative therapy home program (OMT-H) versus abdominal massage home program (AMHP) in treating constipation in children with cerebral palsy (CP). Methods: Twenty-nine children with CP with a mean age of 12.2 ± 3.76 years, who were constipated and were not on medication, were divided into three randomized groups: (i) control group (n = 10), (ii) AMHP (n = 10), and (iii) OMT-H (n = 9). In AMHP and OMT-H groups, treatment was applied as 20-min sessions every other day for 10 sessions for 3 weeks. Modified Constipation Assessment Scale (MCAS), Rome III criteria, and the Bristol Stool Form Scale (BSFS) were used for evaluation before treatment and once a week during treatment. Results: While there was no change in constipation symptoms in the control

group, there was an improvement in constipation symptoms after treatment in the AMHP and OMT-H groups (AMHP, P = 0.003; OMT-H, P = 0.000014). While the treatment showed to be effective from the first week in the OMT-H group, the change in BSFS (P = 0.026) and MCAS sub-parameters was found to be superior. Conclusion: AMHP and OMT-H are effective and beneficial in treating constipation. In children with CP, OMT-H was found to be quicker and more successful compared with AMHP. The OMT-H can be effectively used in clinical practice in relieving constipation in CP.

PMID: 38903486

11. Visuospatial Perception in Prematurely Born Children Without Cerebral Palsy or Retinopathy but With Scholar Complaints

Hind Drissi, Jessica Mosquera, Frank Plaisant, Carole Vuillerot, Sibylle Gonzalez-Monge, Laure Pisella

Dev Neuropsychol. 2024 Jun 21:1-18. doi: 10.1080/87565641.2024.2366217. Online ahead of print.

In the absence of any complaints in early childhood, preterm children remain more at risk of encountering academic difficulties, but their clinical picture remains not well characterized. We screened visuospatial perception in 70 children born preterm consulting for scholar complaints. Developmental Coordination Disorder (with or without comorbidities) was associated with high prevalence (27%) of impaired perception of spatial relationship. Prematurely born children who obtained no diagnosis of Neuro-Developmental Disorder exhibited a high prevalence (31%) of impaired perception of object magnitude. Regression revealed that low gestational age and fetal growth restriction significantly predicted the magnitude but not the spatial relationship perception.

PMID: 38904205

12. Clinical characteristics, associated comorbidities and hospital outcomes of neonates with sleep disordered breathing: a retrospective cohort study

Bhavesh Mehta, Karen Waters, Dominic Fitzgerald, Nadia Badawi

BMJ Paediatr Open. 2024 Jun 18;8(1):e002639. doi: 10.1136/bmjpo-2024-002639.

Objective: Awareness of the need for early identification and treatment of sleep disordered breathing (SDB) in neonates is increasing but is challenging. Unrecognised SDB can have negative neurodevelopmental consequences. Our study aims to describe the clinical profile, risk factors, diagnostic modalities and interventions that can be used to manage neonates with SDB to facilitate early recognition and improved management. Methods: A single-centre retrospective study of neonates referred for assessment of suspected SDB to a tertiary newborn intensive care unit in New South Wales Australia over a 2-year period. Electronic records were reviewed. Outcome measures included demographic data, clinical characteristics, comorbidities, reason for referral, polysomnography (PSG) data, interventions targeted to treat SDB and hospital outcome. Descriptive analysis was performed and reported. Results: Eighty neonates were included. Increased work of breathing, or apnoea with oxygen desaturation being the most common reasons (46% and 31%, respectively) for referral. Most neonates had significant comorbidities requiring involvement of multiple specialists (mean 3.3) in management. The majority had moderate to severe SDB based on PSG parameters of very high mean apnoea-hypopnoea index (62.5/hour) with a mean obstructive apnoea index (38.7/hour). Ten per cent of patients required airway surgery. The majority of neonates (70%) were discharged home on non-invasive ventilation. Conclusion: SDB is a serious problem in high-risk neonates and it is associated with significant multisystem comorbidities necessitating a multidisciplinary team approach to optimise management. This study shows that PSG is useful in neonates to diagnose and guide management of SDB.

PMID: 38897623

13. Racial and geographic disparities in neonatal brain care

Zachary A Vesoulis, Stephanie Diggs, Cherise Brackett, Brynne Sullivan

Semin Perinatol. 2024 Jun 13:151925. doi: 10.1016/j.semperi.2024.151925. Online ahead of print.

In this review, we explore race-based disparities in neonatology and their impact on brain injury and neurodevelopmental outcomes. We discuss the historical context of healthcare discrimination, focusing on the post-Civil War era and the segregation of healthcare facilities. We highlight the increasing disparity in infant mortality rates between Black and White infants, with premature birth being a major contributing factor, and emphasize the role of prenatal factors such as metabolic syndrome and toxic stress in affecting neonatal health. Furthermore, we examine the geographic and historical aspects of racial disparities, including the consequences of redlining and limited access to healthcare facilities or nutritious food options in Black communities. Finally, we delve into the higher incidence of brain injuries in Black neonates, as well as disparities in adverse neurodevelopmental outcome. This evidence underscores the need for comprehensive efforts to address systemic

racism and provide equitable access to healthcare resources.

PMID: 38897830

14. Translation and Adaptation of Cerebral Palsy Quality of Life Primary Caregiver - Teen Questionnaire in North Indian Population: CP-QOL-Teen (Hindi)

Reena Jain, Priti Arun, Ramanjot

Indian J Pediatr. 2024 Jun 20. doi: 10.1007/s12098-024-05189-9. Online ahead of print.

No abstract available

PMID: 38898195

15. Magnitude and clinical characteristics of cerebral palsy among children in Africa: A systematic review and meta-analysis

Biruk Beletew Abate, Kindie Mekuria Tegegne, Alemu Birara Zemariam, Addis Wondmagegn Alamaw, Mulat Awoke Kassa, Tegene Atamenta Kitaw, Gebremeskel Kibret Abebe, Molla Azmeraw Bizuayehu

PLOS Glob Public Health. 2024 Jun 21;4(6):e0003003. doi: 10.1371/journal.pgph.0003003. eCollection 2024.

Cerebral palsy (CP) is the most common motor disability in childhood which causes a child's behavioral, feeding, and sleep difficulties. It remains a poorly studied health problem in Africa. The main aim of this study was assessing the pooled prevalence of Cerebral Palsy (CP) and its clinical characteristics in Africa context. Systematic review and meta-analysis were conducted using Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines to search articles from electronic databases (Cochrane library, Ovid platform) (Medline, Embase, and Emcare), Google Scholar, CINAHL, PubMed, Maternity and Infant Care Database (MIDIRS). The last search date was on 12/05/ 2023 G. C. A weighted inverse variance random-effects model was used to estimate the pooled estimates of cerebral palsy and its types. The subgroup analysis, publication bias and sensitivity analysis were done. Studies on prevalence and clinical characteristics of cerebral palsy were included. The primary and secondary outcomes were prevalence and clinical characteristics of cerebral palsy respectively. A total of 15 articles with (n = 498406 patients) were included for the final analysis. The pooled prevalence of cerebral palsy in Africa was found to be 3·34 (2·70, 3·98). The most common type is spastic cerebral palsy accounting 69·30% (66·76, 71·83) of all cases. The second one is quadriplegic cerebral palsy which was found to be 41·49% (33·16, 49·81). Ataxic cerebral palsy accounted 5·36% (3·22, 7·50). On the other hand, dyskinetic cerebral palsy was found to be 10.88% (6·26, 15·49). About 32·10% (19·25, 44.95) of cases were bilateral while 25·17% (16·84, 33·50) were unilateral. The incidence of cerebral palsy in Africa surpasses the reported rates in developed nations. Spastic and quadriplegic subtypes emerge as the most frequently observed. It is recommended to channel initiatives toward the strategic focus on preventive measures, early detection strategies, and comprehensive management protocols.

PMID: 38905321

16. Consensus definition and diagnostic criteria for neonatal encephalopathy-study protocol for a real-time modified delphi study

Aoife Branagan, Tim Hurley, Fiona Quirke, Declan Devane, Petek E Taneri, Nadia Badawi, Bharati Sinha, Cynthia Bearer, Frank H Bloomfield, Sonia L Bonifacio, Geraldine Boylan, Suzann K Campbell, Lina Chalak, Mary D'Alton, Linda S deVries, Mohamed El Dib, Donna M Ferriero, Chris Gale, Pierre Gressens, Alistair J Gunn, Sarah Kay, Beccy Maeso, Sarah B Mulkey, Deirdre M Murray, Karin B Nelson, Tetyana H Nesterenko, Betsy Pilon, Nicola J Robertson, Karen Walker, Courtney J Wusthoff, Eleanor J Molloy; Steering Group for DEFiNE (Definition of Neonatal Encephalopathy)

Pediatr Res. 2024 Jun 20. doi: 10.1038/s41390-024-03303-3. Online ahead of print.

Background: 'Neonatal encephalopathy' (NE) describes a group of conditions in term infants presenting in the earliest days after birth with disturbed neurological function of cerebral origin. NE is aetiologically heterogenous; one cause is peripartum hypoxic ischaemia. Lack of uniformity in the terminology used to describe NE and its diagnostic criteria creates difficulty in the design and interpretation of research and complicates communication with families. The DEFINE study aims to use a modified Delphi approach to form a consensus definition for NE, and diagnostic criteria. Methods: Directed by an international steering group, we will conduct a systematic review of the literature to assess the terminology used in trials of NE, and with their guidance perform an online Real-time Delphi survey to develop a consensus diagnosis and criteria for NE. A consensus meeting will be held to agree on the final terminology and criteria, and the outcome disseminated widely. Discussion: A clear and consistent consensus-based definition of NE and criteria for its diagnosis, achieved by use of a modified Delphi technique, will enable more comparability of research results and improved communication among professionals and with families.

Impact: The terms Neonatal Encephalopathy and Hypoxic Ischaemic Encephalopathy tend to be used interchangeably in the literature to describe a term newborn with signs of encephalopathy at birth. This creates difficulty in communication with families and carers, and between medical professionals and researchers, as well as creating difficulty with performance of research. The DEFINE project will use a Real-time Delphi approach to create a consensus definition for the term 'Neonatal Encephalopathy'. A definition formed by this consensus approach will be accepted and utilised by the neonatal community to improve research, outcomes, and parental experience.

PMID: 38902453

17. Cerebral Palsy Phenotypes in Genetic Epilepsies

Siddharth Srivastava, Hyun Yong Koh, Lacey Smith, Annapurna Poduri; Boston Children's Hospital Neurology Phenotyping and Referral Group

Pediatr Neurol. 2024 May 31:157:79-86. doi: 10.1016/j.pediatrneurol.2024.05.016. Online ahead of print.

Background: Although there are established connections between genetic epilepsies and neurodevelopmental disorders like intellectual disability, the presence of cerebral palsy (CP) in genetic epilepsies is undercharacterized. We performed a retrospective chart review evaluating the motor phenotype of patients with genetic epilepsies. Methods: Patients were ascertained through a research exome sequencing study to identify genetic causes of epilepsy. We analyzed data from the first 100 individuals with molecular diagnoses. We determined motor phenotype by reviewing medical records for muscle tone and motor function data. We characterized patients according to CP subtypes: spastic diplegic, spastic quadriplegic, spastic hemiplegic, dyskinetic, hypotonic-ataxic. Results: Of 100 individuals with genetic epilepsies, 14% had evidence of possible CP, including 5% characterized as hypotonic-ataxic CP, 5% spastic quadriplegic CP, 3% spastic diplegic CP, and 1% hemiplegic CP. Presence of CP did not correlate with seizure onset age (P = 0.63) or seizure control (P = 0.07). CP occurred in 11% (n = 3 of 27) with focal epilepsy, 9% (n = 5 of 54) with generalized epilepsy, and 32% (n = 6 of 19) with combined focal/generalized epilepsy (P = 0.06). Conclusions: In this retrospective analysis of patients with genetic epilepsies, we identified a substantial portion with CP phenotypes, representing an under-recognized comorbidity. These findings underscore the many neurodevelopmental features associated with neurogenetic conditions, regardless of the feature for which they were ascertained for sequencing. Detailed motor phenotyping is needed to determine the prevalence of CP and its subtypes among genetic epilepsies. These motor phenotypes require clinical management and represent important targeted outcomes in trials for patients with genetic epilepsies.

PMID: 38901369

18. Health care resource use in preschool children with cerebral palsy

No authors listed

Dev Med Child Neurol. 2024 Jun 19. doi: 10.1111/dmcn.16011. Online ahead of print.

No abstract available

PMID: 38898787

19. Prenatal diagnosis and postnatal outcome of fetal intracranial hemorrhage: a single-center experience

Suhra Kim, Yun Ji Jung, Jiwon Baik, Hayan Kwon, JoonHo Lee, Ja-Young Kwon, Young-Han Kim

Obstet Gynecol Sci. 2024 Jun 20. doi: 10.5468/ogs.24097. Online ahead of print.

Objective: To assess prenatal ultrasonographic findings and postnatal outcomes in fetuses with intracranial hemorrhage (ICH). Methods: This retrospective study included fetuses prenatally diagnosed with ICH between December 2012 and August 2023. Maternal characteristics, prenatal ultrasonographic findings, and postnatal outcomes were reviewed. Results: Twenty-seven fetuses with ICH were reviewed. Intracranial hemorrhage was classified as grade 3-4 in 24 fetuses. Twenty-two fetuses had ICH, four had ICH with subdural hemorrhage, and one had ICH with subarachnoid hemorrhage. Ventriculomegaly was the most common ultrasonographic finding, and was observed in 22 of the 27 (81.5%) fetuses. Seven fetuses were lost to follow-up, and four intrauterine fetal deaths occurred. The remaining 16 fetuses were delivered at a median gestational age of 35±2 weeks. The infants were followed-up for 40.1 months (range, 4-88). Nine of the 16 infants underwent ventriculoperitoneal placement. One infant underwent brain surgery for severe epilepsy. Motor impairment, including cerebral palsy, was observed in 13 (81.2%) infants. Neurologic impairment occurred in six (37.5%) infants, developmental delay in nine (56.2%), and epilepsy in 11 (68.7%). Conclusion: Fetal ICH is a rare complication diagnosed during pregnancy, which results in subsequent fetal neurological sequelae or death. This study demonstrated that the common ultrasonographic findings in fetal ICH were progressive ventriculomegaly and increased periventricular echogenicity. Fetuses diagnosed with prenatal ICH, especially

those affected by higher-grade ICH, may be at an increased risk of long-term neurodevelopmental problems.

PMID: 38898776

20. Association between Cognitive Abilities before the Age of 3 and Those at Least 1 Year Later in Children with Developmental Delay

Kwangohk Jun, Donghwi Park, Hyoshin Eo, Seongho Woo, Won Mo Koo, Jong Min Kim, Byung Joo Lee, Min Cheol Cheol Chang

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Aim: This study investigated whether early cognitive assessment in children with developmental delay (DD) predicts cognitive development. We investigated the correlation between cognitive and language development in children with DD, cerebral palsy (CP), and autism spectrum disorder (ASD). Methods: Data were collected from children diagnosed with DD who visited the hospital between 2015 and 2023. The assessments included the Korean Bayley Scales of Infant and Toddler Development Second Edition (K-BSID-II) and the Korean Wechsler Preschool Primary Scale of Intelligence Fourth Edition (K-WPPSI-IV). Language development was evaluated using the Sequenced Language Scale for Infants (SELSI) and Preschool Receptive-Expressive Language Scale (PRES). Correlation and multivariate regression analyses were performed. Results: Among 95 children in the study, a significant correlation was discovered between early cognitive assessments (the Mental Developmental Index from the K-BSID-II) and later cognitive development (the Full-Scale Intelligence Quotient from the K-WPPSI-IV) in the DD and CP groups, but not in the ASD group. The DD and CP groups exhibited significant correlations in language development between the SELSI and PRES, whereas the ASD group did not. Interpretation: Early cognitive assessments can predict later cognitive development in children with DD and CP, but not in those with ASD, according to this study. There was a strong correlation between language and cognitive development in the DD and CP groups, highlighting the importance of early intervention and assessment for these children. Further investigation is necessary to address these limitations and refine demographic data.

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21. Association of Gestational Age at Birth and Changes on MRI With Prevalence and Spectrum of Comorbidities in Children With Cerebral Palsy

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Background and objectives: For individuals with cerebral palsy (CP) and caregivers, comorbidities may be a greater challenge than neuromotor impairment. Clinicians may make assumptions regarding risk of comorbidities based simply on term vs preterm birth, but this has not been well examined. To better understand factors affecting comorbidity pattern, we investigated the relationship between gestational age (GA) and imaging pattern on the presence of specific comorbidities. Methods: This is a cross-sectional study of data extracted from the Canadian Cerebral Palsy Registry of children with CP. Multivariable analysis was used to evaluate the relationship between brain injury, GA, and comorbidities. Comorbidities included in the analysis were communication, cognitive, visual, and auditory impairment, seizures in the past year, and gavage feeding. Each comorbidity was assessed as a separate nonexclusive outcome, with GA, MRI pattern, birth weight, postneonatal insult, 5-minute Apgar score, and male sex considered as potential modifiers. Results: The only comorbidity affected by GA on multivariable analysis was seizures within the past year that were more prevalent in term children (odds ratio [OR] 1.1 95% CI 1.0-1.2) and was also affected by Apgar score (OR 0.9 95% CI 0.85-0.94), but not MRI pattern. MRI pattern appeared important for communication impairment (deep gray OR 4.2 95% CI 1.8-10.0; total brain injury OR 8.5, 95% CI 3.2-22.6; malformation OR 2.7, 95% CI 1.3 -5.7) and cognitive impairment (deep gray OR 5.6, 95% CI 2.4-13.2; total brain injury OR 10.1, 95% CI 4.0-25.3; malformation OR 3.3, 95% CI 1.6-6.8; watershed OR 3.6, 95% CI 1.4-8.9). Focal injury compared with normal MRI was associated with reduced odds of visual impairment (OR 0.24, 95% CI 0.12-0.48), auditory impairment (OR 0.2195% CI 0.10-0.46) and communication impairment (OR 0.46, 95% CI 0.26-0.82), and overall number of comorbidities (coefficient -0.73, 95% CI -1.2 to -0.31). The number of comorbidities was increased by total brain injury pattern (coefficient 0.65, 95% CI 0.15-1.13) and reduced by focal brain injury (coefficient -0.73, 95% CI -1.2 to -0.31) and increasing 5-minute Apgar score (coefficient -0.11, 95% CI -0.16 to -0.07). Discussion: In those with brain injuries sufficient to cause CP, development of additional comorbidities is less affected by GA at birth and more related to the underlying cause of CP as reflected by MRI patterns.

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22. Cerebral palsy and neurodevelopmental disorders with motor disabilities: Similar but not synonymous

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