Cerebral palsy research news

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Interventions and Management

1. Future directions for the assessment of gait dystonia in cerebral palsy
Jorik Nonnekes, Annemieke I Buizer

Dev Med Child Neurol. 2023 Jan 30. doi: 10.1111/dmcn.15523. Online ahead of print.

PMID: 36717760

2. Association of gross motor function and activities of daily living with muscle mass of the trunk and lower extremity muscles, range of motion, and spasticity in children and adults with cerebral palsy
Mitsuhiro Masaki, Honoka Isobe, Yuki Uchikawa, Mami Okamoto, Yoshie Chiyoda, Yuki Katsuhara, Kunio Mino, Kaori Aoyama, Tatsuya Nishi, Yasushi Ando

Dev Neurorehabil. 2023 Jan 30;1-8. doi: 10.1080/17518423.2023.2171149. Online ahead of print.

Purpose: We examined the association of gross motor function and activities of daily living (ADL) with muscle mass of the trunk and lower extremity muscles in children and adults with cerebral palsy (CP). Methods: The subjects were 32 children and adults with CP. Muscle thickness of the trunk and lower extremity muscles was measured using an ultrasound imaging device. Results: Stepwise regression analysis revealed that the thoracic erector spinae muscle thickness was a significant and independent factor of gross motor function. Stepwise regression analysis also showed that the thickness of the rectus abdominis and vastus lateralis muscles were significant and independent factors of ADL. Conclusions: Our findings suggest that declined gross motor function is associated with decreased thoracic erector spinae muscle mass in children and adults with CP. The results also indicate that declined ADL is associated with decreased muscle mass of the rectus abdominis and vastus lateralis muscles.

PMID: 36717387

3. Closed displaced femur fractures in children with nonambulatory cerebral palsy
Luiz Carlos A Silva, Ali Asma, Armagan Can Ulusaloglu, Kenneth J Rogers, James Richard Bowen, Jason J Howard, Michael Wade Shrader, Freeman Miller

J Pediatr Orthop B. 2022 Dec 16. doi: 10.1097/BPB.0000000000001048. Online ahead of print.

Femoral fractures in children with cerebral palsy (CP) represent a frequent medical problem, and treatment represents a challenge. The purpose of this study was to review the closed displaced femoral fractures in our population of nonambulatory

children with CP to compare the results of nonoperative and operative treatment modalities to improve the care of these children. From 2006 to 2020, children with nonambulatory CP were selected with inclusion criteria of displaced femoral fracture and were divided into nonoperative and operative groups. Forty-four children met the inclusion criteria. The nonoperative group included 23 children and the operative group included 21 children. Mechanism of injury was unknown in 48% of the fractures. Fourteen (25%) fractures occurred after a femoral plate fixation during a reconstructive hip surgery, and 38 (86%) children had osteopenia. Our results reveal a high prevalence of osteopenia, low-energy trauma, malunion in nonoperative treatment, and peri-implant fractures. Suspicion of child abuse should be considered when the fracture has an unclear mechanism of the injury. Removal of proximal femoral implants may be considered to prevent peri-implant fractures. Femoral fractures should preferably be treated nonoperatively. Operative treatment should be considered for diaphyseal fractures in children capable of standing transfers, larger children, children with more severe spasticity or movement disorder or those who have suffered a high-energy fracture. Due to the high prevalence of proximal fractures in the presence of hardware, operative treatment is usually required for these fractures. In contrast, distal fractures are adequately managed nonoperatively.

PMID: 36729507

4. Outcomes of double-incision posterior knee release for severe knee flexion contracture
Bartosz Musielak, Salwan R Al-Saad, Marek Jóźwiak, Aleksander Koch, Milud Shadi

J Pediatr Orthop B. 2023 Jan 3. doi: 10.1097/BPB.0000000000001039. Online ahead of print.

Many surgical solutions for knee flexiondeformity in the pediatric population alter the anatomical bony alignment in the distal femur. Posterior knee capsule release has been presented as an alternative surgical procedurethat maintains the anatomical shape of relevant bones while solving the issue of knee flexion contracture. The aim of this study is to assess the results of a double-incision posteriorknee capsulotomy release performed on pediatric patients with neuromuscular or congenital severe knee flexion deformity. Thirty cases (24 patients, mean age 7.4 years) of severe knee flexion contractures were retrospectively analyzed in a cohort of varying underlying conditions (including spina bifida, muscular dystrophy, cerebral palsy, sclerodermia, and congenital patellar dislocations). Posterior knee release was performed through medial and lateral short incisions with subsequent serial casting. Range and pace of correction as well as the complication rate were recorded. Follow-up information (>1 year) included functionality (FMS scale) and pain (Kujala/Knee Injury Osteoarthritis Score [KOOS]) scales. Significant correction in the knee position was achieved in all analyzed knees (from mean 40.2° to 0.7°; $P < 0.01$). Twenty-nine out of 30 cases achieved correction by 7 days postoperatively (average number of casts: 1.93 ± 1.05). Overall complication rate in the analyzed cohort reached 6.7% (2/30 cases; double metaphyseal fracture and arthrofibrosis). At follow-up (22.3 months on average), functional ambulation and pain parameters improved drastically, with no further complications observed. Double-incision posterior knee release is an effective method of knee contracture release, which does not affect the axial alignment of the distal femoral bone. Thus, posterior knee release should be considered as potential alternatives to osteotomies and eight-plate corrections, which are currently the basic methods of knee contracture treatment.

PMID: 36728534

5. [Clinical characteristics analysis of 22 062 patients of foot and ankle deformity from QIN Sihe Orthopaedic Surgery Database between May 25, 1978 and December 31, 2020][Article in Chinese]
Sihe Qin, Baofeng Guo, Xuejian Zheng, Lei Shi, Jun Zhao, Yilan Wang

Zhongguo Xiu Fu Chong Jian Wai Ke Za Zhi. 2023 Jan 15;37(1):74-80. doi: 10.7507/1002-1892.202209065.

Objective: Based on the clinical data of patients with foot and ankle deformities in the QIN Sihe Orthopaedic Surgery Database, to analyze the characteristics and treatment strategies of foot and ankle deformities, and provide a basis for clinical decision-making. Methods: A total of 22 062 patients with foot and ankle deformities who received orthopedic surgery between May 25, 1978 and December 31, 2020 were searched in the QIN Sihe Orthopedic Surgery Database. The gender, age at operation, regional distribution, etiology, type of deformity, operation method, postoperative fixation method, and other information were collected. Results: Among the 22 062 patients, there were 13 046 males (59.13%) and 9 016 females (40.87%); the age at operation ranged from 1 to 77 years, with a median of 17 years, and 20 026 cases (90.77%) were aged 5 to 40 years. The patients came from 32 provinces, municipalities, and autonomous regions across the China and 5 countries including India and the United States, et al. The etiology and diseases type covered 154 kinds (of which sequelae of poliomyelitis, cerebral palsy, spina bifida and tethered spinal cord, congenital equinovarus foot, post-traumatic foot and ankle

deformity, and Charcot-Marie-Tooth disease accounted for the highest proportion). The types of deformities included varus foot, equinus foot, valgus foot, talipes calcaneus, equinocavus, high arched foot, claw toe, and flail foot. Surgical methods included tendon lengthening, soft tissue release, tendon transposition, osteotomy orthopedics, and ankle arthrodesis. The 36 620 operations were performed, including 11 561 cases of hip, knee, and lower leg operations to correct the foot and ankle deformities. Postoperative fixation methods included Ilizarov external fixator in 2 709 cases (12.28%), combined external fixator in 3 966 cases (17.98%), and plaster or brace fixation in 15 387 cases (69.74%). Conclusion: Male patients with foot and ankle deformities account for a large proportion, and the population distribution is mainly adolescents, with a wide distribution of regions, causes and diseases, and talipes equinovarus and varus foot are the main types of deformities. Foot and ankle deformities are often combined with deformities of other parts of the lower limb, which requires a holistic treatment concept. The application of foot soft tissue and bone surgery combined with Ilizarov external fixator and combined external fixators provides a guarantee for the correction of complex foot and ankle deformities.

PMID: 36708119

6. Reliability, Validity and Minimal Detectable Change of a Power Leg Press Test in Individuals with Cerebral Palsy
Mattie Pontiff, Li Li, Noelle G Moreau

Phys Occup Ther Pediatr. 2023 Feb 1;1-14. doi: 10.1080/01942638.2023.2173039. Online ahead of print.

Background: Lower extremity muscle power influences walking ability in individuals with Cerebral Palsy (CP). Aim: Determine the reliability, validity, and minimal detectable change (MDC) of a novel power leg press (PLP) test to measure muscle power in individuals with CP. Methods: Individuals with spastic CP (n = 26 (10 adults, 16 children); mean (SD) age = 19.3 (7.8) years(all); 27.9 (4.89) years (adults); 13.85(2.68) years (children)) performed 2 sessions of the PLP test, 2-10 days apart. A linear position transducer and custom computer code were used to calculate mean and peak power in watts (W). Intraclass correlation coefficients (ICC), standard error of measurement, MDC, and percent change of MDC (MDC%) were calculated for 4 power measures (average and maximum of mean and peak powers) for all participants (AP) and separately for adults (A) and children (C). Validity was evaluated against isokinetic knee extensor power. Results: Test-retest reliability was excellent for all measures of power (ICC = 0.94-0.99). Ranges for MDC/MDC% by the group for power measures were between 33.7-80.7W/15.5-29.4% (AP), 41.1-65.3W/10.7-22.3% (A), and 27.6-79.8W/19-34.3% (C). Correlations were good to excellent between PLP and isokinetic power at all speeds ($r = 0.75$-0.88, $p < .001$). Conclusions: The PLP test demonstrates excellent validity, reliability, and precision for measuring muscle power in those with CP.

PMID: 36722739

7. Practitioner-led, peer-group sports intervention combined with a context-focused intervention for children with cerebral palsy: a protocol of a feasibility randomised clinical trial
Deisiane Oliveira Souto, Luana Cristina da Silva, Ricardo Rodrigues de Sousa Junior, Georgina Clutterbuck, Dana Anaby, Egmar Longo, Rafael Coelho Magalhães, Ana Cristina Resende Camargos, Hércules Ribeiro Leite

BMJ Open. 2023 Jan 31;13(1):e068486. doi: 10.1136/bmjopen-2022-068486.

Background: There is a need to investigate relevant, acceptable and feasible approaches that promote participation in leisure-time physical activity for children with cerebral palsy (CP). The aim of this study is to assess the feasibility of a randomised controlled trial comparing a peer-group intervention focused on improving physical literacy (Sports Stars) with the combination of Sports Stars and a context-focused intervention (Pathways and Resources for Engagement and Participation, PREP) for ambulant children with CP in Brazil. Methods: In this feasibility trial, 18 ambulant children (aged 6-12 years) with CP will be randomised into two groups (nine per group): (1) Sports Stars and (2) Sports Stars plus PREP. The Sports Stars group will receive 8 weekly group sessions, focusing on developing the physical, social, cognitive and psychological skills required to participate in popular Brazilian sports. The combined Sports Stars and PREP group will receive Sports Stars in addition to eight individual PREP sessions focused on overcoming environmental barriers to participation. The primary outcome will include feasibility measures: willingness to participate in an RCT, eligibility and recruitment rates, maintenance of evaluator blinding, acceptability of screening procedures and random allocation, feasibility of evaluating outcomes, contamination between the groups, intervention adherence, treatment satisfaction, understanding of the intervention and implementation resources. Additional instruments will be applied to obtain data related to leisure-time physical activity participation goals, overall participation (home, school and community), physical literacy, level of physical activity and family empowerment. Outcomes will be assessed before, after and 12 weeks after intervention. Ethics and dissemination: This

feasibility trial has been approved by ethical Federal University of Minas Gerais' Ethics Review Committee (CAAE: 33238520.5.0000.5149). All potential subjects will provide written informed consent. The results of this study will be published in peer-reviewed journals and be presented at academic conferences. Trial registration numbers: RBR-4m3b4b6, U1111-1256-4998.

PMID: 36720567

8. Cognitive behavioral therapies for individuals with cerebral palsy: A scoping review
Tamar Silberg, Nisha Kapil, Isabelle Caven, Danielle Levac, Darcy Fehlings

Review Dev Med Child Neurol. 2023 Feb 1. doi: 10.1111/dmcn.15507. Online ahead of print.
Aim: To synthesize the evidence about the main intervention characteristics of cognitive behavioral therapies (CBTs) for individuals with cerebral palsy and identify barriers and facilitators to their success, focusing on aspects of feasibility and markers of success. Method: A scoping review methodology informed a literature search for papers published between 1991 and 2021. Articles were screened, reviewed, and categorized using the DistillerSR systematic review software, and critically appraised for quantitative and/or qualitative criteria. Results: Out of 1265 publications identified, 14 met the inclusion criteria. Elements associated with the specific study participant characteristics (46% female; aged 6-65 years), type of CBT techniques used (third-wave [n = 6], cognitive [n = 3], cognitive and behavioral [n = 2], biofeedback training [n = 2]), and features of the study context and methodological quality (two randomized clinical trials and small sample sizes [n ≤ 12]), were identified. Most studies had psychological targets of intervention (n = 10) and secondary physiological (n = 3) or social (n = 2) objectives. Feasibility indicators were described in nearly one-third of the papers. Interpretation: This study highlights the high flexibility within CBT interventions, enabling their adaptation for individuals with cerebral palsy. However, relatively little, and only low -certainty evidence was identified. More high-quality research in terms of specific CBT techniques, optimal treatment doses, and detailed population characteristics are needed.

PMID: 36725690

9. Is Mobility Sufficient to Understand Community Participation of Adolescents and Young Adults with Cerebral Palsy? The Mediating and Moderating Roles of Contextual Factors
Priscilla R P Figueiredo, Rodrigo A A Nóbrega, Wendy J Coster, Lourdes C C Montenegro, Rosana F Sampaio, Letícia P Silva, Marina B Brandão, Marisa C Mancini

Arch Phys Med Rehabil. 2023 Jan 25;S0003-9993(23)00047-3. doi: 10.1016/j.apmr.2022.12.195.

Objective: To explore whether self-determination and family's socioeconomic status (SES) mediate and/or moderate the relationship between mobility and community participation of adolescents and young adults with cerebral palsy (CP). Design: Survey. Setting: Online platform. Participants: From 55 eligible adolescents/young adults with CP, 50 agreed to participate and two were excluded. The final convenience sample included 48 individuals, aged 15 to 32, levels I-IV of the Gross Motor Function Classification System and I-II of the Communication Function Classification System. Main outcome measure(s): The Temple University Community Participation Measure (TUCPM) documented the amount, breadth and insufficiency/ sufficiency ratios of participation across 26 community settings. The ARC Self-Determination Scale and the Mobility Scale of the Pediatric Evaluation of Disability Inventory-Computer Adaptive Test (PEDI-CAT) measured individuals' self-determination (i.e., autonomy, psychological empowerment and self-realization) and mobility skills, respectively. The Brazilian Economic Classification Criteria-2021 assessed families' SES. Results: Analyses of mediating/moderating effects revealed that the influence of individuals' mobility skills on their breadth of community participation was mediated by autonomy. Families' SES moderated the indirect effect of mobility on community participation breadth through autonomy. When the model was adjusted for participants' age, individuals with higher SES reported greater breadth in community participation, compared to those from moderate and lower SES, for all mobility levels. However, the magnitude of the differences among individuals of different SES levels diminished as mobility increased. Conclusions: The mobility skills of youths with CP influence their community participation through autonomy. To foster greater engagement of these individuals in the community, rehabilitation professionals should focus not only on improvement of mobility skills, but also on the promotion of self-determined behaviors, especially autonomy.

PMID: 36708858

10. Adverse effects following botulinum toxin A injections in children with cerebral palsy
Marco Sapienza, Rahul Kapoor, Flavia Alberghina, Ratna Maheshwari, Kathryn Louise McCracken, Federico Canavese, Ashok N Johari

J Pediatr Orthop B. 2023 Jan 19. doi: 10.1097/BPB.0000000000001055. Online ahead of print.

The study aimed to analyze the adverse events associated with botulinum toxin A (BoNT-A) injections in children with cerebral palsy (CP). The literature search was completed using the Medline, PubMed, Google Scholar, Scopus, and Cochrane Library databases from the earliest date possible up to December 2021. Search terms included 'botulinum toxin', 'cerebral palsy', 'spasticity', 'adverse effects', 'side effects', 'undesirable effects', 'complications', 'lower limb', 'upper limb', and 'children' including combinations of index and free-text terms. Fifty-five studies were included in the study. Data on 6333 pediatric patients and more than 14 080 BoNT-A injections were collected. Respiratory symptoms and respiratory tract infections were the most frequently registered adverse events (AEs). Other common AEs included procedural/focal AEs, flu-like symptoms, and asthenia. Sentinel events including four cases of death were reported. AEs were more frequent and severe in high-dose patients; however, the capacity of BoNT-A to spread systemically remains unclear. Since severe adverse events are not common, further research is needed to collect more definitive clinical and homogeneous data to support the findings of the present research and clarify the safety profile of BoNT-A, especially regarding the incidence of respiratory issues and complications in GMFCS IV or V patients.

PMID: 36723611

11. Investigation of urinary disorders, functional independence, and quality of life in children with cerebral palsy
Arda Türker, Mehmet Özkeskin

Neurourol Urodyn. 2023 Jan 29. doi: 10.1002/nau.25135. Online ahead of print.

Purpose: The study aimed to investigate the relationship between voiding disorders, functional independence, and quality of life, according to the gross motor function classification system, in children with cerebral palsy (CP) aged 8-17. Methods: A total of 102 individuals (aged 8-17) with CP were included in the study. The Gross Motor Function Classification System (GMFCS), Dysfunctional Voiding and Incontinence Scoring System (DVISS), Wee Functional Independence Measure for Children (WeeFIM), and Pediatric Quality of Life Inventory (PedsQL) were used to evaluate the clinical parameters. Results: There is a statistically significant difference in DVISS ($p = 0.010$), WeeFIM ($p = 0.001$), and PedsQL ($p = 0.001$) scores of individuals with CP regarding GMFCS. According to the CP classification, there is a statistically significant difference between WeeFIM ($p = 0.001$) and PedsQL ($p = 0.020$) scores. Besides, there is a significant difference between DVISS ($p = 0.048$), WeeFIM ($p = 0.001$) and PedsQL ($p = 0.001$) according to the ambulation status of individuals with CP. On the other hand, there is a positive moderate, statistically significant correlation between WeeFIM and PedsQL scores ($\rho = 0.306$, $r = 0.002$). A moderately negative statistically significant relationship exists between PedsQL and DVISS ($\rho = -0.266$, $r = 0.007$). A negative, moderate, statistically significant correlation was shown between DVISS and WeeFIM scores ($\rho = -0.323$, $r = 0.001$). Conclusions: As the gross motor functional level of individuals with CP increased, voiding dysfunction increased; on the other hand, functional independence and quality of life decreased.

PMID: 36710569

12. Body Composition in Outpatient Children with Cerebral Palsy: A Case-Control Study
Lawia Szkoda, Andrzej Szopa, Ilona Kwiecień-Czerwieniec, Andrzej Siwiec, Małgorzata Domagalska-Szopa

Int J Gen Med. 2023 Jan 24;16:281-291. doi: 10.2147/IJGM.S393484. eCollection 2023.

Purpose: The purpose of this study was to identify quantitative (BMI z-score and BMI percentile) and qualitative (BC) differences between high functioning outpatient children with CP (GMFCS levels I/II) vs TD children, using BIA. We hypothesized that: 1) BMI z-score and BMI percentile will be lower in children with CP compared with their TD peers; and 2) body components (BC) directly associated with muscle mass (including fat free mass (FFM%) and skeletal muscle mass (SMM) and predicted muscle mass (PMM)) in children with CP will be lower than in their TD peers. Patients and methods: Ninety children with CP (GMFCS levels I/II) aged 8-16 years were enrolled in this study. Due to the fact that there is lack of

normative values of particular body components in the pediatric population, ninety typically developing (TD) peers were used as references. The examination consisted of two parts: 1) the height measurement and 2) body composition assessments, both using the bioelectric impedance analysis (BIA). Results: Average values for height, weight, BMI z-score, and BMI percentile in children with CP were significantly statistically lower than in the reference group. BC's directly associated with muscle mass (including FFM%, SMM, and PMM) in children with CP were lower than those in their TD peers. Conclusion: Altered body compositions were evident in children with CP.

PMID: 36718145

13. Variation in morpho-lexical development within and between diagnoses in children with neurodevelopmental disorders
Susan Foster-Cohen, Toby Macrae, Jayne Newbury

Front Psychol. 2023 Jan 12;13:968408. doi: 10.3389/fpsyg.2022.968408. eCollection 2022.

While primary diagnosis is only one aspect of the presentation of a child with neurodevelopmental delay/disorder, the degree to which early expressive language reflects diagnostic divisions must be understood in order to reduce the risk of obscuring clinically important differences and similarities across diagnoses. We present original data from the New Zealand MacArthur-Bates Communicative Development Inventory (NZCDI) from 88 English-speaking children aged 2;6 to 5;6 years receiving multidisciplinary intervention within a single family-centered program. The children had one of six pediatrician-assigned genetic or behaviorally determined diagnoses: Down syndrome (DS); motor disorders (cerebral palsy and developmental coordination disorder); global development delay; disorders of relating and communicating (R&C); other genetically defined diagnoses; or language delay due to premature (PREM) birth. Morphological and lexical development were compared within and across diagnostic groups, using both data visualization and mixed-effects modeling. Groups varied in the amount of variation within and between them, but only prematurity reached significance, in interaction with age, as a predictor of morpho-lexical scores. Further analysis of longitudinal data available from a subset of the sample (n = 62) suggested that individual trajectories of vocabulary growth could not be reliably predicted by diagnosis. Moreover, the distribution of word types (nouns, predicates, etc.) only distinguished PREM children with language delay from those with DS and those in the R&C group. There were strong similarities in early morpho-lexical development across these clinical populations, with some differences. These findings align with research and clinical approaches which accommodate individual variation within diagnosis, and broad similarities across diagnostic groups.

PMID: 36710780

14. Machine learning approach to gait deviation prediction based on isokinetic data acquired from biometric sensors
Adam Krechowicz, Stanisław Deniziak, Daniel Kaczmarski

Gait Posture. 2023 Jan 23;101:55-59. doi: 10.1016/j.gaitpost.2023.01.015. Online ahead of print.

Background: Analyzing gait deviation is one of the crucial factors during the diagnosis and treatment of children with Cerebral Palsy (CP). The typical diagnostic procedure requires an expensive and complicated three-dimensional gait analysis system based on visual sensors. In this work, we focus on predicting well-known gait pathology scores using only information collected from the BS4P, the affordable isokinetic dynamometer. Using such equipment, it is possible to determine gait pathological indices such as the gait deviation index (GDI) or the Gillette gait index (GGI). Research question: Are there correlations between the results of examining patients with CP on the Biodex Pro 4 device and the gait quality metrics (GDI and GGI)? Methods: The isokinetic data acquired from biometric sensors (74 records) were analyzed using big data methods. We used several Machine Learning methods to find the correlation between gait deviation and isokinetic data: Adaptive Boosting Regression, K-nearest Neighbor, Decision Tree Regression, Random Forest Regression, and Gradient Boost Regression. Results: In this paper, we provided a detailed comparison of different machine learning regression models in predicting gait quality in patients with CP based only on the data gathered from affordable Biodex 4 Pro device. The best result was obtained using the gradient boosting regression model with Mean Absolute Percentage Error of 6%. However, it was not possible to precisely predict the GGI index using this method. Significance: The results obtained showed promising results in the evaluation of gait index scores, which gives the possibility of diagnosing patients with CP without the use of expensive optometric systems. Evaluating gait metrics using the approach proposed in this paper could be very helpful for both physicians and physiotherapists in assessing the condition of patients with CP, as well as other diseases related to gait problems.

PMID: 36731213

15. Public health indicators for cerebral palsy: A European collaborative study of the Surveillance of Cerebral Palsy in Europe network
Catherine Arnaud, Virginie Ehlinger, Annie Perraud, Agnieszka Kinsner-Ovaskainen, Dana Klapouszczak, Kate Himmelmann, Mariana Petra, Gija Rackauskaite, Monica Lanzoni, Mary-Jane Platt, Malika Delobel-Ayoub

Paediatr Perinat Epidemiol. 2023 Feb 1. doi: 10.1111/ppe.12950. Online ahead of print.

Background: Public health indicators (PHIs) play an increasingly important role in health policy decision-making. Although cerebral palsy (CP) is the commonest physical disability in children, its impact at population level has not been systematically measured so far. Objectives: We aimed to propose six PHIs for CP designed to annually document the extent of CP and effectiveness of perinatal organisation, the burden of this condition, access to health services and preventive health strategies in the post-neonatal period and to report on the latest updated estimations using population-based data routinely collected by European CP registries. Methods: The study included children with CP born between 2002 and 2011. Harmonised data (number of cases, functional profile, imaging) were extracted from the Surveillance of Cerebral Palsy in Europe (SCPE) database. Eligibility criteria for analyses were applied separately for each indicator by selecting registries, birth years and CP cases. Current estimates were based on the last 3 birth years, while trends were reported over a 10-year period. All analyses were descriptive. Sensitivity analyses were carried out to examine the stability of the results using various thresholds of percentages of missing values. Results: Analyses were performed on a total of 8621 children with CP from 12 to 17 SCPE registries. A decreasing prevalence of pre/perinatal CP overall, as well as in preterm and full-term-born children, was observed. The burden of the condition was strongly dependent on CP subtype and the presence of associated impairments. Access to brain imaging ranged from 80% to 100% depending on registries. The overall prevalence of post-neonatally acquired CP was approximately 0.8 per 10,000 live births over the study period. Conclusions: Population-based CP registries can provide data that are relevant for generating key outcomes of interest at the population level, thus potentially contributing to improving public health policies for children with disabilities.

PMID: 36722642

16. In utero Exposure to Maternal Diabetes and the Risk of Cerebral Palsy: A Population-based Cohort Study
Asma Ahmed, Laura C Rosella, Maryam Oskoui, Tristan Watson, Seungmi Yang

Epidemiology. 2023 Mar 1;34(2):247-258. doi: 10.1097/EDE.0000000000001574. Epub 2022 Dec 1.

Background: Evidence on the effects of in utero exposure to maternal diabetes on cerebral palsy (CP) in offspring is limited. We aimed to examine the effects of pregestational (PGDM) and gestational diabetes (GDM) separately on CP risk and the mediating role of increased fetal size. Methods: In a population-based study, we included all live births in Ontario, Canada, between 2002 and 2017 followed up through 2018 (n = 2,110,177). Using administrative health data, we estimated crude and adjusted associations between PGDM or GDM and CP using Cox proportional hazards models to account for unequal follow-up in children. For the mediation analysis, we used marginal structural models to estimate the controlled direct effect of PGDM (and GDM) on the risk of CP not mediated by large-for-gestational age (LGA). Results: During the study period, 5,317 children were diagnosed with CP (187 exposed to PGDM and 171 exposed to GDM). Children of mothers with PGDM showed an increased risk (hazard ratio [HR]: 1.84 [95% confidence interval (CI): 1.59, 2.14]) after adjusting for maternal sociodemographic and clinical factors. We found no associations between GDM and CP (adjusted HR: 0.91 [0.77, 1.06]). Our mediation analysis estimated that LGA explained 14% of the PDGM-CP association. Conclusions: In this population-based birth cohort study, maternal pregestational diabetes was associated with increased risk of CP, and the increased risk was not substantially mediated by the increased fetal size.

PMID: 36722807

17. Prevalence and Pattern of Feeding Problems and Relationship to Motor Function Severity in Children with Cerebral Palsy in Umuahia
R I Chidomere, I K Ukpabi, N K Chukwudi, U U Onyeonoro, N C Ojinnaka

West Afr J Med. 2023 Jan 30;40(1):55-59.

Background: Reports show that feeding problems in children with cerebral palsy (CP) significantly reduce nutritional intake and affect their nutritional status. Objective: To determine the prevalence and types of feeding problems and its association with functional severity and nutritional status in children with cerebral palsy. Methods: This cross-sectional study involved 169 children with CP aged 1 - 17 years seen at the Neurology clinic of Federal Medical Centre, Umuahia. Gross motor skills were described using Gross Motor Function Classification System (GMFCS).Nutritional status was determined and classified based on WHO Child Growth Standards. Data was analyzed using SPSS version 20.0. Results: Feeding problem was seen in 39.1% of the subjects, with spitting out food (57.6%), prolonged feeding time (45.5%) and choking (16.7%) being the most common types. Malnutrition occurred in 37.3% of patients. Feeding problems were significantly associated with functional severity ($\chi 2 = 52.06$ and $p < 0.001$) and proportion of feeding problems increased with increasing functional severity. All the subjects with functional severity level V (100%) had feeding problems. There was no statistically significant association between nutritional status and feeding problems ($\chi 2 = 0.77$ and $p = 0.38$), although the proportion of feeding problems was highest (44.3%) in the underweight subjects. Conclusion: The prevalence of feeding problem in children with CP is 39.1%. There was no association between feeding problems and nutritional status. Feeding problem was however significantly associated with functional severity. Therefore there is need for routine evaluation for feeding problems in children with CP to prevent complications.

PMID: 36716306

18. Postnatal Corticosteroids and Developmental Outcomes in Extremely Preterm or Extremely Low Birth Weight Infants: The Victorian Infant Collaborative Study 2016-17 Cohort

Ellen Douglas, Kate A Hodgson, Joy E Olsen, Brett J Manley, Calum T Roberts, Elisha Josev, Peter J Anderson, Lex W Doyle, Peter G Davis, Jeanie L Y Cheong; Victorian Infant Collaborative Study Group

Acta Paediatr. 2023 Jan 31. doi: 10.1111/apa.16696. Online ahead of print.

Aim: Systemic postnatal corticosteroids are used to treat or prevent bronchopulmonary dysplasia (BPD) in extremely preterm (EP) or extremely low birth weight (ELBW) infants but are associated with long-term harm. We aimed to assess the relationship between cumulative postnatal corticosteroid dose and neurodevelopmental outcomes. Methods: Longitudinal cohort study of all EP/ELBW livebirths in Victoria, Australia 2016-2017. Perinatal data were collected prospectively. Neurodevelopmental assessment was performed at 2 years' corrected age. Linear and logistic regression were used to determine relationships between cumulative corticosteroid dose and neurodevelopment, adjusted for gestational age, birth weight, sex, and major intraventricular hemorrhage. Results: 76 EP/ELBW infants received postnatal corticosteroids to treat or prevent BPD, 62/65 survivors were seen at 2 years. Median (IQR) cumulative postnatal corticosteroid dose was 1.36 (0.92-3.45) mg/kg dexamethasone equivalent. Higher cumulative corticosteroid dose was associated with increased odds of cerebral palsy (adjusted OR (95% CI) 1.47 (1.04, 2.07)). Higher cumulative corticosteroid dose was also associated with lower cognitive and motor developmental scores, however this weakened after adjustment for confounding variables: cognitive composite score adjusted coefficient (95% CI) -1.3 (-2.7, 0.1) and motor composite score adjusted coefficient (95% CI) -1.3 (-2.8, 0.2). Conclusion: Higher cumulative postnatal corticosteroid dose in EP/ELBW infants is associated with increased odds of cerebral palsy at 2 years' corrected age. Adequately powered studies are needed to assess the independent effects of cumulative steroid dose on neurodevelopmental outcomes.

PMID: 36719082

19. Association of placental and umbilical cord characteristics with cerebral palsy: national cohort study

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Objectives: Cerebral palsy (CP) is a group of movement disorders usually diagnosed in childhood. A substantial proportion are thought to be caused by antenatal events. Abnormalities of the umbilical cord and placenta are associated with an increased risk of adverse neonatal outcomes, but it is unclear whether these conditions also carry an increased risk of CP. We aimed to determine whether abnormalities of the umbilical cord or placenta are associated with CP and assess if these associations differ by sex of the child or gestational age at birth. Methods: We performed a national cohort study by linking data from The Medical Birth Registry of Norway with other national registries. All liveborn singletons born between 1999 and 2017 (n = 1

087 486) were included and followed up until the end of 2019. Diagnoses of CP were provided by the Norwegian National Insurance Scheme and the Norwegian Patient Register. We used generalized estimating equations and multilevel log binomial regression to calculate relative risks (RR), adjusted for year of birth, and stratified analyses were carried out based on sex and gestational age at birth. Exposures were abnormal umbilical cord (velamentous or marginal insertion, single umbilical artery (SUA), knots and entanglement), and placental abnormalities (retained placenta, placental abruption and previa). Results: A total of 2443 cases with CP (59.8% males) were identified. Velamentous cord insertion (adjusted RR (aRR), 2.11 (95% CI, 1.65-2.60)), cord knots (aRR, 1.53 (95% CI, 1.15-2.04)) and placental abnormalities (placenta previa (aRR, 3.03 (95% CI, 2.00 -4.61)), placental abruption (aRR, 10.63 (95% CI, 8.57-13.18)) and retained placenta (aRR, 1.71 (95% CI, 1.32-2.22))) carried an increased risk of CP. Velamentous cord insertion was associated with CP regardless of gestational age or sex. A retained placenta was associated with a 2-fold increased risk for CP in males, while the associations of SUA and cord knot with CP were significant only among females. Conclusions: The detection of placental and umbilical cord abnormalities may help identify children at increased risk of CP. The associations between placental or umbilical cord abnormalities and the risk of CP do not vary substantially with gestational age at birth or sex of the child. © 2023 The Authors. Ultrasound in Obstetrics & Gynecology published by John Wiley & Sons Ltd on behalf of International Society of Ultrasound in Obstetrics and Gynecology.

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20. The importance of assessing general motor activity in premature infants for predicting neurological outcomes
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Introduction: Conventional methods of neurological assessment of infants can detect nervous system damage, but also have a weakness, i.e., the inability to make predictions for neurological deficits. Prechtl's general movement assessment is a diagnostic tool for the functional assessment of young nervous system. The aim of the study was to assess the quality of spontaneous motor activity in preterm newborns as well as to determine the neurological outcome at the age of 24 months. After that, the predictive value of spontaneous motor activity for neuro-developmental outcome at the age of 24 months was determined. Material and methods: The study included 160 pre-terms children, and designed as a prospective clinical study. Observation of spontaneous motor activity was performed according to the principles of Prechtl's method. Results: Spontaneous motor activity was observed in three periods for each newborn: within 5 days of birth, in the period of 44-46 gestation weeks, and in the period of 50-54 gestation weeks of post-menstrual age. Neurological outcome was assessed at the age of 24 months, and was classified as: normal finding, minimal neurological dysfunction, and cerebral palsy. All preterms, who presented normal patterns of spontaneous movements in neonatal and infant periods had a normal neurological functional outcomes at the age of 24 months. Newborns with pathological patterns of movement (cramped synchronized and absence of fidgety movements) in neonate and infant periods in the final outcomes had minimal neurological dysfunction or cerebral palsy. Conclusions: Assessment of general movement in preterms is a valuable method in prediction of dysfunctions in later neurological development. Early detection of symptoms of minimal neurological deficit and cerebral palsy is of crucial importance since it enables timely inclusion of children into neuro-developmental treatment.

PMID: 36734385

21. Predictive value of Bayley-III Motor Index for later motor difficulties in children born extremely preterm
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Aim: To investigate the predictive ability of the Bayley Scales of Infant and Toddler Development, Third Edition (Bayley-III) Motor Index in children born extremely preterm (<27 gestational weeks) without cerebral palsy. Methods: Children from the EXPRESS study (all extremely preterm births in Sweden, 2004-2007) without neurosensory impairments assessed with Bayley -III at 2.5 years corrected age and Movement Assessment Battery for Children, Second Edition (MABC-2) at 6.5 years comprised the eligible study population (n=282). Motor difficulty was defined as MABC-2 ≤5th percentile. Results: Motor difficulties were found in 57 out of 282 children (20.2%) at 6.5 years. The Bayley-III explained 18.0% of the variance in the MABC-2 ($p<0.001$). The area under the receiver operating curve was 0.71 (95% confidence interval 0.64-0.79, $p<0.00$). At a Bayley-III cut-off value of 85, sensitivity, specificity, positive and negative predictive values for motor difficulties were 26.3%

(15.5-39.7), 92.9% (88.1-95.9), 48.4% (33.0-64.0), 83.3% (80.9-85.4). Likelihood ratios were inconclusive. Conclusion: The Bayley-III at 2.5 years corrected age was a modest predictor of motor outcome in children born extremely preterm at 6.5 years, and underestimated the rate of motor difficulties. Children require follow-up beyond preschool age.

PMID: 36723223

22. Neuroinflammation in Bilirubin Neurotoxicity
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Bilirubin neurotoxicity is a serious consequence of hyperbilirubinemia, which is the most common disease of the neonatal period. Clinically, bilirubin neurotoxicity can result in motor deficit, auditory dysfunction, cerebral palsy, seizure and neurodevelopmental diseases, amongst others. Bilirubin neurotoxicity is one of the major worldwide causes of neonatal brain injury, especially in poorer developing countries. However, the mechanisms of bilirubin neurotoxicity are still unclear. After the failure of attempts targeting neurons in many neurodegenerative disorders, neuroinflammation has become a significant target of research. Here, recent advances concerning neuroinflammation in bilirubin neurotoxicity are reported with a focus on the clinical characteristics of bilirubin neurotoxicity, including age-dependency, region-specificity and its yin-yang properties. Effects of neuroinflammation on blood brain interfaces and treatments targeting neuroinflammation in bilirubin neurotoxicity are also reviewed, which may promote the precision of future treatment of bilirubin neurotoxicity.

PMID: 36722237

23. Prolonged requirements for mechanical ventilation and tube feeding support predicted 18-month outcomes for neonatal encephalopathy
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Aim: We evaluated the predictive ability of prolonged requirements for mechanical ventilation or tube feeding support for 18-month composite outcomes in infants with hypoxic-ischaemic encephalopathy treated with hypothermia. Methods: This retrospective, nationwide, observational study focused on newborn infants registered in Japan's Baby Cooling Registry between 1 January 2012 and 31 December 2016. The adverse outcomes were defined as death or survival with cerebral palsy, visual or auditory impairment or the requirement for mechanical ventilation or tube feeding at 18 months of age. Results: Adverse outcomes occurred in 165 (28%) of the 591 children in the final cohort. These were predicted by prolonged dependence on mechanical ventilation or tube feeding for more than seven and more than 14 days. The respective values were positive predictive value 0.34 (95% CI 0.33-0.34) and 0.60 (95% CI 0.56-0.62), negative predictive value 0.97 (95% CI 0.91-0.99) and 0.93 (95% CI 0.90-0.95) and area under the curve 0.59 (95% CI 0.54-0.64) and 0.81 (95% CI 0.77-0.85). Conclusion: Prolonged dependence on mechanical ventilation or tube feeding for more than 14 days may be useful in predicting 18-month outcomes in newborn infants who have received therapeutic hypothermia.

PMID: 36708079

24. Stercoral Colitis as a Cause of Altered Mental Status in a Patient With Cerebral Palsy
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Stercoral colitis (SC) is a rare inflammatory colitis that occurs due to increased intraluminal pressure from impacted fecal content in the colon. Chronic constipation is the major risk factor for this condition. Delayed diagnosis is associated with high

morbidity and mortality, with complications ranging from colonic perforation to intestinal ulcers. Patients usually present with non-specific symptoms, with advanced cases presenting with acute abdomen pain. This condition can be fatal if not recognized early and promptly treated. Early detection can often be difficult in elderly patients with dementia, stroke, or other neurologic disorders that cause altered mental status (AMS). Therefore, AMS in patients with severe constipation should be a substantial reason to consider stercoral colitis as a differential diagnosis. Here, we describe a case of stercoral colitis in a 59-year-old woman with non-verbal cerebral palsy who had acute metabolic encephalopathy from her stercoral colitis and was successfully treated with colonoscopic fecal disimpaction and an aggressive bowel regimen.

PMID: 36721554

25. Parents' Experiences of Communication in Neonatal Care (PEC): a neonatal survey refined for real-time parent feedback

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Objective: Assessing parent experiences of neonatal services can help improve quality of care; however, there is no formally evaluated UK instrument available to assess this prospectively. Our objective was to refine an existing retrospective survey for 'real-time' feedback. Methods: Co-led by a parent representative, we recruited a convenience sample of parents of infants in a London tertiary neonatal unit. Our steering group selected questions from the existing retrospective 61-question Picker survey (2014), added and revised questions assessing communication and parent involvement. We established face validity, ensuring questions adequately captured the topic, conducted parent cognitive interviews to evaluate parental understanding of questions,and adapted the survey in three revision cycles. We evaluated survey performance. Results: The revised Parents' Experiences of Communication in Neonatal Care (PEC) survey contains 28 questions (10 new) focusing on communication and parent involvement. We cognitively interviewed six parents, and 67 parents completed 197 PEC surveys in the survey performance evaluation. Missing entries exceeded 5% for nine questions; we removed one and format-adjusted the rest as they had performed well during cognitive testing. There was strong inter-item correlation between two question pairs; however, all were retained as they individually assessed important concepts. Conclusion: Revised from the original 61-question Picker survey, the 28-question PEC survey is the first UK instrument formally evaluated to assess parent experience while infants are still receiving neonatal care. Developed with parents, it focuses on communication and parent involvement, enabling continuous assessment and iterative improvement of family-centred interventions in neonatal care.

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