Cerebral palsy research news

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Interventions and Management

1.Spatiotemporal kinematic parameters reflect spasticity level during forward reaching in children with hemiplegic cerebral palsy: correlation and regression analysis

Fatma Hegazy, Ali Hassan, Sarah Mohamed Kamel, Alham Al-Sharman, Kalyana Bairapareddy, Ashokan Arumugam, Rabah Al Abdi, Yasser Salem, Emad Aboelnasr

Scientific Reports. 2025 Oct 16;15(1):36137

Abstract
Literature has identified disparities in reaching patterns between children with cerebral palsy and typically developing children. However, determining the spatiotemporal parameters that effectively quantify upper limb motor performance and examining the relationship between these parameters and spasticity level remains a challenge. This study aimed to investigate the relationship between the level of spasticity and the spatiotemporal parameters and detect which parameter is the most influenced by spasticity level. Fifty children with hemiplegic cerebral palsy participated and were asked to reach forward, at a self-selected pace, toward one target at a normalized distance under one level of accuracy. An optoelectronic system captured three-dimensional spatiotemporal parameters quantifying the movement time, velocity, strategy and smoothness of forward reaching. Spearman rank correlation coefficient was used to investigate the strength of the relationship between the level of spasticity and the spatiotemporal parameters ($P<0.05$). Regression analysis was used to model the relationship between the studied variables and to investigate the impact of spasticity on the studied kinematic parameters. The level of spasticity was significantly correlated with normalized jerk score (NJS), number of movement units and peak velocity respectively ($r = 0.7–0.8$). The regression model was statistically significant ($p < .001$), and explained a significant proportion of the variances of the studied parameters especially NJS ($R^2 = 0.972$) and NMU ($R^2 = 0.953$). NJS is the most influenced parameter by the level of spasticity; therefore, it can be used as an index to quantify the impact of spasticity on reaching performance and to evaluate the effectiveness of treatment strategies on motor recovery.
PMID: 41102213

2.Effects of therapeutic instrumental music performance on upper limb motor function of children with cerebral palsy: A systematic review

Zhuolin Wu, Meijiao Wu

Brain & Development. 2025 Oct 13;47(6):104468. Online ahead of print

Abstract
Therapeutic instrumental music performance (TIMP) can be used to improve limb motor function in children with cerebral palsy (CwCP). The purpose of this systematic review is to further analyze the potential therapeutic effects of TIMP on upper limb motor function in CwCP. We used the terms "music," "therapeutic instrumental music performance," "musical instruments," "cerebral palsy," "children," "upper limb," and "upper extremity" as our search keywords, and conducted a search of articles published in English and Chinese databases: PubMed, Cochrane, Web of Science, Wiley Online Library, CINAHL, and CNKI, Wanfang Data as of March 2025. Initially, 409 articles were retrieved. After screening titles and abstracts and assessing eligibility, eight studies were included in this review. All studies assessed hand fine motor function, and five also evaluated upper limb gross motor function. Three studies used only keyboard instruments, two exclusively percussion instruments, and three combined keyboard, percussion, and plucked instruments. The results demonstrated that TIMP effectively improves upper limb motor function in CwCP.
PMID: 41086583

3.Disparities in spinal deformity surgery care for children with cerebral palsy and neuromuscular scoliosis

Luis Torres-Gonzalez, Sara J Morgan, Christopher D Seaver, Rhonda G Cady, Zelphia C Brown, Maykala J Williams, Daniel J Miller

Spine Deform. 2025 Oct 17. Online ahead of print

Purpose: To assess potential disparities in care for non-ambulatory children with cerebral palsy (CP) and associated neuromuscular scoliosis treated at a quaternary pediatric hospital.
Methods: This retrospective cohort study included non-ambulatory children CP who received spinal deformity surgery between 01/2012 and 12/2022. Demographic, clinical, and radiographic data were collected. Relationships between demographic factors and clinical/radiographic data were assessed using Fisher's Exact Test, Wilcoxon Rank-Sum test, Kruskal-Wallis one-way ANOVA, and linear regression models.
Results: Of 502 children identified, 328 met eligibility criteria. The mean age of the sample was 9.8 ± 4.0 years, 59% were male. On presentation, the average major coronal curve magnitude was 46 ± 23˚. Most (70%) were White, 13% were Black, 6% were Hispanic or Latino, and the remaining participants were Asian, Pacific Islander, Native American, Alaska Native, or declined to answer. Most spoke English (89%). Just under half (45%) had both government and commercial insurance and 24% had only government insurance. Black compared to White race ($p = .03$), government compared to commercial insurance ($p = .02$), and farther distance from hospital ($p < .001$) were associated with larger curve magnitudes at presentation, after adjustment for covariates. Non-English language ($p = .002$) was associated with longer time from surgical recommendation to surgery, after adjustment for covariates.
Conclusions: Health disparities were identified related to ethnicity, race, preferred language, and geographical distance from the hospital for children with CP and neuromuscular scoliosis. These findings highlight the need for development of standardized criteria for surveillance, imaging, and referral to reduce health disparities for this specific population.
PMID: 41107656

4.Letter to the Editor concerning "Bipolar spinal correction reduces transfusion rate and hospital stay compared with traditional posterior spinal fusion in children with scoliosis secondary to cerebral palsy" by Lundine K, et al. (Eur Spine J [2025]: doi:10.1007/s00586-025-09282-1)

Shibo Zhou, Guangda Wang

European Spine Journal. 2025 Oct 13. Online ahead of print

Abstract
No abstract available.
PMID: 41081855

5.Talonavicular Fusion in the Treatment of Planovalgus Foot in Ambulatory Children With Cerebral Palsy

Ramin H Zargarbashi, Morteza Aghajani, Behnam Panjavi, Soroush Baghdadi

Journal of Pediatric Orthopaedic Society of North America. 2025 Sep 4;13:100255. eCollection 2025 Nov

Background: Planovalgus is a common foot deformity in cerebral palsy (CP), and surgical correction may be warranted when it becomes symptomatic in daily activities, interferes with brace/shoe wear, or causes substantial lever-arm dysfunction. The purpose of this study was to report the outcomes of talonavicular fusion based on radiographic measures and instrumented gait analysis.
Methods: In an IRB-approved retrospective study, ambulatory children with CP (GMFCS II/III) who underwent talonavicular fusion for the treatment of planovalgus foot from 2018 to 2022 were included. Patients who had pre- and 1-year post-operative instrumented gait studies were selected from this cohort. Several radiographic measures, gait parameters, and the Gait Deviation Index were calculated and compared.
Results: Thirteen patients with 26 feet were included in the final analysis with a mean age of 10.2 years (range, 7–15 years) at the time of surgery. At final follow-up, all radiographic measures showed significant improvement, including the AP talus-first metatarsal angle (pre-op 21.4° ± 4.8, post-op 5.5° ± 2.7, P < .001) and the lateral talus-first metatarsal angle (pre-op 22.9° ± 4.2, post-op 5.7° ± 2.0, P < .001). Spatio-temporal gait parameters did not show significant changes, but the GDI had a significant improvement. Overall, there were 3 adverse outcomes, none of which required a return to the operating room.
Conclusions: We found significant improvements in radiographic outcomes and a high rate of parent satisfaction at final follow-up. Gait parameters did not show significant changes, but there was a significant improvement in GDI. Our findings suggest that talonavicular fusion is a viable option in patients with GMFCS II/III function levels with symptomatic planovalgus foot, has a low complication rate, and is technically less demanding than subtalar or triple fusion.
PMID: 41103531

6.Hyperselective neurectomy for spastic equinovarus in pediatric patients with hypertonia

Lainey G Bukowiec, Kitty Y Wu, Joline E Brandenburg, Peter C Rhee

Journal of Pediatric Rehabilitation Medicine. 2025 Oct 16. Online ahead of print

Purpose: Lower extremity spasticity can cause pain and limit function. This study examined the safety and efficacy of hyperselective neurectomy (HSN) of the gastrocnemius-soleus complex (GSC) in addressing spastic equinus deformities in pediatric patients.
Methods: Pediatric patients that underwent HSN of the GSC by a single surgeon were retrospectively reviewed. Preoperative and postoperative Modified Ashworth Score and passive ankle dorsiflexion (°) were compared using Wilcoxon signed-rank test and Student's paired two-tailed t-test, respectively.
Results: Ten lower extremities in seven patients with a mean age of 10 years were reviewed. Mean follow-up was 15 months. All extremities demonstrated improvement in spasticity. All exhibited improved passive ankle dorsiflexion range of motion with the knee in extension (mean change +17°, SD = 8°, p = 0.000). Five patients demonstrated improved passive dorsiflexion with the knee in flexion while two remained unchanged from preoperative assessment (mean change +13°, SD = 9°, p = 0.002). One complication, wound dehiscence, was noted and managed conservatively. No patients reported loss of strength or sensation. Four patients underwent subsequent staged surgery on the ipsilateral extremity for concomitant contractures.
Conclusion: HSN of the GSC is safe in pediatric patients and effectively reduces spastic equinus deformity and improves ankle passive dorsiflexion in short-term follow-up.
PMID: 41100540

7.Current Variation in the Postoperative Management of Patients With Cerebral Palsy Undergoing Lower Extremity Surgery: A Survey of Surgeon Practices

Arianna Trionfo, Christina Herrero, Jason J Howard, M Wade Shrader

Journal of Pediatric Orthopaedic Society of North America. 2025 Sep 4;13:100261. eCollection 2025 Nov

Background: Children with cerebral palsy (CP) often develop lower limb deformities requiring surgical management. However, optimal postoperative management strategies—including weight-bearing progression, immobilization, and rehabilitation protocols—remain unclear. The purpose of this study was to evaluate current postoperative practices following lower extremity surgery in youth with CP.
Methods: A 42-question electronic survey was sent to 114 practicing orthopaedic surgeons in the American Academy for Cerebral Palsy and Developmental Medicine. Six questions regarding seven surgical procedures (pelvic osteotomy, proximal femoral osteotomy, tibial osteotomy, isolated soft-tissue procedures, foot osteotomies, and foot fusions) were presented. Surgeons were asked about weight bearing, immobilization, initiation of physical therapy, standardized protocols, evaluation for inpatient rehabilitation, and educational sessions. Consensus was defined as >75% agreement for a given response (based on Delphi methodology).
Results: Sixty-five surgeons from North America responded (57% response rate), with predominantly neuromuscular practices. Consensus was reached on only four of 42 questions (9.5%). Regarding weight bearing, 87.7% of surgeons allowed immediate weight bearing after isolated soft-tissue procedures. For immobilization, cast use reached consensus only for distal lower extremity surgeries including tibial osteotomy (95%), foot osteotomy (98%), and foot fusion (100%). Concerning rehabilitation and planning, no consensus was reached for any item.
Conclusions: There was substantial heterogeneity in postoperative practices for children with CP undergoing lower extremity surgery. Other than immediate weight bearing after soft-tissue procedures and casting after distal bony procedures, no clear consensus emerged for weight-bearing progression, immobilization method, or rehabilitation planning. This variability may influence functional outcomes and patient satisfaction. Future studies regarding postoperative practices are warranted.
Key concepts: (1)Postoperative management varies widely for cerebral palsy (CP) patients after lower extremity surgery.(2) Weight-bearing protocols vary: some allow early weight bearing, while others restrict for 8 weeks.(3)No standardized guidelines exist for rehab after lower extremity surgery in CP.
PMID: 41079171

8.Rehabilitation techniques to improve lower limb function for children with bilateral spastic cerebral palsy: a systematic review and meta-analysis

Huijuan Lin, Xiaoying Zhang, Tingting Chen, Kaishou Xu

Neuroscience. 2025 Oct 10;588:11–19. Online ahead of print

Abstract
This systematic review and meta-analysis pooled the efficacy of rehabilitation techniques on lower limb function in children with bilateral spastic cerebral palsy (BSCP) based on the International Classification of Functioning, Disability, and Health–Children & Youth version. Controlled trials written in English were searched in five databases (PubMed, Embase, Web of Science, ProQuest, Scopus) from inception to March 2025. PROSPERO registration: CRD 42024510104. A total of 55 trials involving 1501 children with BSCP, aged 3 years and above, were included in the meta-analysis. The rehabilitation techniques analyzed were treadmill training, functional mobility training, strength training, orthosis, non-invasive electrical stimulation, vibration, and home-based exercise programs. Most of the included trials targeted problems on gait parameters, kinematics parameters, and gross motor function for activities and participation. Meta-analysis showed that functional mobility training, such as action observation training, improved sitting, crawling and kneeling in children with BSCP; treadmill training, like platform swing walkway, mainly improved walking ability and velocity; ankle foot orthosis improved dynamic balance and range of ankle dorsiflexion during walking cycle. Subgroup analysis showed that ankle foot orthosis improved stride length within the first month of initial use and elevated walking cadence and velocity after three months of continuous use. Our findings may provide a reference for rehabilitation strategies on lower limb dysfunction in children with BSCP.
PMID: 41077119

9.Outcomes and standardized tools in telehealth physical therapy for children with cerebral palsy: A scoping review using the ICF framework

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Developmental Medicine & Child Neurology. 2025 Oct 17. Online ahead of print

Aim: To identify the outcomes and standardized tools used to measure changes following telehealth-delivered physical therapy interventions in children and young people with cerebral palsy, within the framework of the International Classification of Functioning, Disability and Health domains, and to describe how these tools were administered.
Method: This scoping review followed the steps of the JBI and identified studies on telehealth-delivered physical therapy interventions in children and young people up to 20 years old using standardized assessment tools. Searches were conducted in MEDLINE/PubMed, Embase, Cochrane, Scopus, Web of Science, PEDro, Lilacs, and grey literature, with no date or language restrictions.
Results: Fourteen studies (625 participants, age range 6 months–20 years, all levels of the Gross Motor Function Classification System) met inclusion criteria. Outcomes were primarily in the activity domain (59.3%), followed by body structure and function (29.6%) and participation (22.2%) domains. Thirty standardized tools were used; the most frequent were the Assisting Hand Assessment (n = 5) and Gross Motor Function Measure (n = 3). Most standardized tools were applied in-person (68.2%), while others used mixed methods (telehealth and in-person: 18.2%) or did not specify the mode of administration (6.8%). Only two studies administered all tools by telehealth.
Interpretation: The outcomes and standardized tools identified in this review target the activity domain, reflecting parental priorities. In-person assessments remain the preferred modality for conducting standardized evaluations. Further research is necessary to investigate the feasibility and measurement properties of using standardized tools by telehealth.
PMID: 41105140

10.Lower Limb Training Threshold Dose and Motor Learning Strategy Reporting in Children With Cerebral Palsy

Matthew Haddon, Isabella Pessóta Sudati, Jizelle Kenworthy-Groen, Dayna Pool, Lauren O'Connor, Robert Ware, Cristina Lee, Kate Dolling, Leanne Sakzewski

Pediatric Physical Therapy. 2025 Oct 16. Online ahead of print

Purpose: This systematic review investigated the threshold dose of active lower limb training required to improve outcomes in children with cerebral palsy (CP) and to evaluate the reporting of motor learning strategies.
Methods: Five databases were searched for randomized controlled trials on active lower limb training in children with CP. Independent assessors conducted study selection, data extraction, and risk of bias assessment. Clinically significant mean group changes established dose thresholds, while motor learning strategies were assessed based on 11 common strategies.
Results: One hundred and one studies (3566 participants, mean age 8.8 years) met inclusion criteria. Threshold doses were 12 hours for walking speed, 7.5 hours for walking endurance, 23.33 hours for gross motor function, and 21 hours for goal performance. Motor learning strategy reporting was low. Most studies had a high risk of bias.
Conclusions: These results provide preliminary guidance for optimizing therapy time to improve walking speed and endurance, gross motor function, and goal performance. More high-quality studies with detailed intervention reporting are needed.
PMID: 41100659

11.The Clinical Impact of Electrical Stimulation on Abnormal Tone During Gait for Individuals With Cerebral Palsy: A Case Report

Christopher Joseph, Kelly Greve

Pediatric Physical Therapy. 2025 Oct 16. Online ahead of print

Purpose: Cerebral palsy (CP) is a condition that often presents with altered muscle tone affecting function. The purpose of this case report is to describe the clinical application of transcutaneous electrical nerve stimulation (TENS) to manage the impact of muscle tone during gait in 2 children with CP.
Summary of key points: Two children with CP, who are gait, received TENS to manage spasticity and dystonia. Gait was analyzed using a two-dimensional gait analysis with and without TENS. Results demonstrated medium and large minimally clinically important differences in velocity, cadence, and stride length with TENS.
Conclusion: Using TENS parameters may be a modality to manage tone and improve gait for children with CP. A larger study is needed to determine the effects of TENS.
Recommendations for clinical practice: Clinicians may use TENS on spastic or dystonic muscles as an intervention to improve gait for children with CP.
PMID: 41100658

12.Deep brain stimulation in the management of movement disorders in childhood: a UK-wide cross-sectional study

Daniel E Lumsden, Ramalakshmi Ramiah, Todd Smallbone, Will Singleton, Sam Amin, Sarah Perides, Gina Lumsdon, Reiko Ashida, Jonathan Ellenbogen, Keymoumars Ashkan, Richard Selway, Margaret Kaminska, Harutomo Hasegawa, Jean-Pierre Lin

Archives of Disease in Childhood. 2025 Oct 14. Online ahead of print

Introduction: We aimed to establish the clinical characteristics of children and young people (CAYP) currently receiving deep brain stimulation (DBS) therapy for the management of movement disorders in the UK to better inform planning of future service provision.
Methods: Cross-sectional service evaluation of centres providing DBS for the management of movement disorders in childhood.
Results: A total of 139 CAYP were identified across three centres. Median age at surgery was 9.8 years (range 2.0–18.9 years), and median duration of DBS was 4.4 years (range from 1 week to 15.75 years). Modal Gross Motor Function Classification System level was V (n=66). The most common causes of movement disorder were dyskinetic cerebral palsy (69/139, 49.6%), dystonia due to mutations in the lysine methyltransferase 2B gene, aka DYT-KMT2B, (13/139, 9.4%) and dystonia due to mutations in the Torsin-1A gene, aka DYT-TOR1A, (9/139, 6.5%). A monogenetic cause of dystonia without evidence of central nervous system pathology on MRI was identified in 30 CAYP (21.6%). Clinically significant dystonia was present in all CAYP, with significant chorea in 47/139 (33.8%) and significant spasticity in only 13/139 (9.4%). No tone-reducing medications were currently used by 43/139 (30.9%) of CAYP. The remaining 96/139 CAYP were currently receiving 1–6 tone-reducing medications, most commonly gabapentin (n=58), clonidine (n=50) and a form of benzodiazepine (n=43). Despite care being provided by paediatric services, 37/139 (26.6%) of CAYP were >18 years of age.
Conclusions: CAYP currently receiving DBS therapy represent a heterogeneous population in terms of dystonia aetiology, functional level and additional pharmacological management. Only 102 CAYP <18 years of age are currently receiving DBS therapy in the UK, representing a small proportion of the population who could benefit from this intervention.
PMID: 41093365

13.Variability and reproducibility of gait parameters in youth with cerebral palsy: Feasibility for multicenter motion analysis studies

Louis-Nicolas Veilleux, Robert Courter, Jing Feng, Spencer Warshauer, Nancy Descôteaux, Ross S Chafetz

Clinical Biomechanics (Bristol). 2025 Oct 6;130:106678. Online ahead of print

Background: Demonstrating instrumented gait analysis inter-evaluator reproducibility is essential to perform proper multicenter studies. Studies have evaluated inter-evaluator reproducibility but often were limited to highly experienced evaluators or assessed in healthy individuals only. The current study aimed at determining if introducing variability through evaluators with various years of gait analysis experience would lead to acceptable levels of reproducibility.
Methods: Three adolescent and one young adult with cerebral palsy were each evaluated by four out of ten evaluators with various years of marker-based gait analysis experience. Gait analysis was performed on a 10-m walkway at patients' preferred speed. The intraclass correlation coefficient (ICC), and the intrinsic (inter-trial) and extrinsic (inter-evaluator) variability of gait parameters were computed.
Findings: Ten evaluators from nine different motion analysis centers (average of 8.4 ± 10.4 years of gait analysis experience; min: 1 year; max: 33 years) participated in the study. For most joints, good to excellent (0.75 to 1 ICCs) reproducibility was reported. Error analysis revealed that the main source of variability was associated with evaluators and not patients' gait. Regression analysis showed that years of experience in a motion analysis center was not a significant predictor of mean inter-evaluator deviation ($\beta = -0.002 \pm 0.006$; $p = 0.659$) or of its standard deviation ($\beta = -0.002 \pm 0.004$; $p = 0.650$).
Interpretation: The result of the current project suggests that one year of marker-based gait analysis experience and reviewing of a procedure video prior to engaging in a study is sufficient to generate quality data.
PMID: 41075334

14.Structural validity of the Pain Interference Questionnaire and Fear of Pain Questionnaire for children and young people with cerebral palsy

Meredith G Smith, Rachel J Gibson, Remo N Russo, Nadine Smith, Adrienne R Harvey

Developmental Medicine & Child Neurology. 2025 Oct 17. Online ahead of print

Aim: To examine the structural validity and internal consistency of the Pain Interference Questionnaire for Cerebral Palsy (PIQ-CP) and Fear of Pain Questionnaire-Adapted for Cerebral Palsy (FOPQ-CP) measures and describe the proportion able to self-report, including individuals with diverse cognitive and communication abilities.
Method: This was a prospective cross-sectional study that included individuals with cerebral palsy (CP) aged 5 to 30 years, who completed the PIQ-CP and FOPQ-CP. Confirmatory factor analysis was used to assess structural validity and Cronbach's alpha (α) was used to assess internal consistency (self-report data only). Self-report and parent-report data were used to determine the proportion able to self-report.
Results: Self-report data showed good fit to the hypothesized model: one-factor PIQ-CP ($n = 115$; confirmatory fit index = 0.964, standardized root mean square residual = 0.078, $\alpha = 0.89$) and two-factor FOPQ-CP ($n = 102$; confirmatory fit index = 0.937, standardized root mean square residual = 0.087, $\alpha = 0.68$ [fear], $\alpha = 0.80$ [avoidance]). Across all participants ($n = 128$), 79% could self-report, 11% required additional parent-report because self-report accuracy was uncertain, and 10% required parent-report only because of severe cognitive impairment.
Interpretation: The PIQ-CP and FOPQ-CP have sufficient structural validity and internal consistency and provide access to self-report in most children and young people with CP. They can now support equitable assessment of the impact of chronic pain in children and young people with CP, including those with diverse abilities.
PMID: 41105033

15.Perioperative Nutritional Optimization in Complex Pediatric Hip and Spine Surgery: A Systematic Review

Cameron Nosrat, Youssef Sibih, Adrian Vallejo, Ishaan Swarup

Journal of Pediatric Orthopaedics. 2025 Oct 14. Online ahead of print

Introduction: Pediatric orthopaedic surgeries for complex hip and spine conditions, particularly in children with cerebral palsy, are associated with high complication rates. Malnutrition, common in this population, contributes to poor wound healing, infections, and prolonged recovery. Despite its impact, definitions and assessments of malnutrition remain inconsistent. Posterior spinal fusion and hip reconstruction carry complication rates over 50%. While interest in nutritional optimization is growing, no standardized approach exists, especially in pediatric orthopaedic populations. The purpose of this study was to evaluate the existing literature on perioperative nutritional assessment and optimization of pediatric patients undergoing complex hip and spine surgery.
Methods: We conducted a PRISMA-compliant systematic review of MEDLINE, Embase, and Cochrane databases in April 2025. Inclusion criteria were studies on patients 21 years or younger undergoing hip or spine surgery that reported perioperative nutritional status or interventions alongside clinical outcomes. Eligible study designs included RCTs, cohort studies, and case series (>10 patients). Data were independently extracted and study quality assessed using the Newcastle-Ottawa Scale (NOS).
Results: Out of 371 studies, 23 met the inclusion criteria. Eighteen were retrospective cohorts, 1 prospective cohort, 2 cross-sectional, and 2 case-control studies. Fifteen were high quality (NOS ≥7). Thirteen studies (57%) examined laboratory-based markers; 10 (43%) assessed nutritional interventions or classifications. Common outcomes included wound complications (48%), respiratory complications (26%), LOS/readmissions (26%), and patient-reported outcomes (17%). Laboratory findings were inconsistent, though transferrin <200 mg/dL was linked to respiratory risk. BMI-based metrics better predicted complications, especially in those who were underweight or experiencing >10% weight loss. Enhanced recovery after surgery (ERAS) protocols improved LOS, pain, and IL-6 levels, while routine nutrition assessments showed no clear benefit.
Conclusion: While isolated laboratory values are inconsistent predictors, underweight status and weight loss are more reliable indicators of risk. ERAS protocols incorporating nutritional strategies may improve outcomes, although more pediatric-focused data are needed. The lack of standardized malnutrition definitions across studies limits comparability. Future research should establish uniform nutritional screening practices and evaluate specific interventions in high-risk pediatric orthopaedic populations. Despite limitations in study heterogeneity and small sample sizes, this review supports integrating structured perioperative nutrition into care pathways.
PMID: 41104946

16.Gastrointestinal tolerance, healthcare resource utilization, and cost analysis of whey peptide-based enteral formula in pediatric post-acute care: a retrospective study

Senthilkumar Sankararaman, Cynthia Lowen, Amarsinh Desai, Pamela Cekola, Pradeep Kumar, Sayan Mondal, Yashashree Vijay Kadam, Chidananda Samal, Abby Klosterbuer

Clinical Nutrition ESPEN. 2025 Oct 14. Online ahead of print

Background and aims: Peptide-based formulas (PBF) are characterized by partially hydrolyzed proteins and are often used in patients with gastrointestinal (GI) intolerance receiving enteral nutrition. More evidence is needed on the clinical and economic benefits of whey as a protein source for PBF in children with GI dysfunction. Using real-world data, this study aimed to compare clinical (i.e. GI intolerance occurrence and symptoms) and health economic outcomes (i.e. healthcare resource utilization [HCRU] and costs) in the 12 months before and after the initiation of 100% whey protein PBF (w-PBF) in children with GI dysfunction receiving EN in a post-acute care setting.
Methods: We retrospectively analyzed US claims data on children with GI dysfunction receiving a PBF composed of 100% whey protein in post-acute care. The overall population and subgroups with cerebral palsy (CP), gastroesophageal reflux disorder (GERD), gastroparesis (GP), and short bowel syndrome (SBS) were assessed. Clinical (GI intolerance and symptoms) and economic (HCRU and costs) outcomes were compared at 12 months pre-index and 1, 3, 6, and 12 months post-index. The index date was defined as the date of the first claim for the w-PBF.
Results: The study included 3,015 children. Compared with pre-index, significant reductions were observed in the proportion of patients experiencing any GI intolerance and abdominal distension up to 12 months post-index in the overall population and in children with CP, GERD, and SBS (all $p<0.05$) and up to 6 months in children with GP (both $p<0.05$). Nausea and vomiting were significantly reduced up to 12 months post-index in all patient groups (all $p<0.05$). Fewer patients visited inpatient services for ≥6 months post-index in the study population and all disease subgroups (all $p<0.05$). Healthcare costs savings were observed for up to 6 months post-index in all patient groups (all $p<0.001$).
Conclusions: This study supports the clinical and economic benefits of w-PBF for enteral nutrition of children with GI dysfunction in post-acute care settings.
PMID: 41101537

17.Long-term neurodevelopmental outcomes in extremely preterm infants born at 22–26 weeks gestation: a follow-up of 2–2.5 years across two Swedish national cohorts from 2004–2007 to 2014–2016

Ulrika Ådén, Aijaz Farooqi, Lena Hellstrom-Westas, Karin Sävman, Thomas Abrahamsson, Lars J Björklund, Magnus Domellöf, Anders Elfvin, Fredrik Ingemansson, Fredrik Serenius, Stellan Hakansson, David Ley, Erik Normann, Petra Um Bergström, Karin Kallen, Mikael Norman

Archives of Disease in Childhood: Fetal and Neonatal Edition. 2025 Oct 15. Online ahead of print

Objective: To compare neurodevelopmental outcomes in extremely preterm (EPT) children born across two epochs in Sweden.
Design and setting: Nationwide population-based cohorts of infants born at 22–26 weeks' gestation in 2004–2007 (Cohort 1) and 2014–2016 (Cohort 2), comprising 1606 live births. Survivors were assessed at 2–2.5 years' corrected age using the same protocol design.
Main outcome: The primary outcome was neurodevelopmental impairment (NDI), defined as a composite of moderate-severe cerebral palsy (CP), visual or hearing deficits, or moderate-severe cognitive, language or motor impairment assessed with the Bayley Scales of Infant and Toddler Development, Third Edition (Bayley III). For children not assessed with Bayley-III, NDI was defined as moderate-severe speech delay, general developmental delay or categories of CP, vision and hearing impairment. Outcomes were compared using logistic regression to evaluate differences between cohorts and perinatal and socioeconomic risk factors.
Results: Of 1188 eligible survivors, 1062 (89.3%) were assessed (mean gestational age 24.8 weeks; 54.9% male). The prevalence of moderate-severe NDI at 22, 23, 24, 25 and 26 weeks' gestation was 60% vs 52%, 51% vs 51%, 34% vs 42%, 27% vs 32% and 17% vs 24% in Cohorts 1 and 2, respectively. Overall prevalence did not differ significantly (27% vs 35%; adjusted OR (AOR) 1.2, 95% CI 0.94 to 1.6). Among 724 (68%) children assessed with Bayley III, Cohort 2 had higher rates of cognitive delay (21.6% vs 11.3%; AOR 1.8, 95% CI 1.1 to 3.4) and language delay (40.9% vs 16.1%; AOR 3.3, 95% CI 1.4 to 4.1). Low GA and maternal country of birth outside the Nordic region were the strongest predictors of NDI and cognitive delay, the latter association confined to Cohort 2.
Conclusion: Although survival of EPT infants in Sweden has improved, long-term neurodevelopmental outcomes have not. The root causes of failed improvements in long-term outcomes for EPT infants are complex and need further clarification.
PMID: 41093440

18.Safety and efficacy of umbilical cord-derived stem cell therapy for the treatment of cerebral palsy patients: a systematic review

Nader Salari, Fatemeh Morddarvanjoghi, Amin Hosseinian-Far, Faranak Aghaz, Kamran Mansouri, Razie Hasheminezhad, Masoud Mohammadi

Orphanet Journal of Rare Diseases. 2025 Oct 17;20(1):518

Background: Allogeneic umbilical cord blood is regarded as a beneficial source of stem cells with varying therapeutic potential. On the other hand, cerebral palsy is one of the neurological conditions that are the primary contributor to early childhood disability. The aim of this systematic review was to harvest data from currently available sources to determine the safety and efficacy of treating cerebral palsy patients with stem cells obtained from allogeneic umbilical cords.
Methods: For this study, systematic searches of the databases PubMed, Scopus, Web of Science, Embase, ScienceDirect, and Google Scholar were conducted with no time Limit until November 2022. Duplicates were found and eliminated after entering the data from the chosen studies into the Endnote reference management program. The remaining studies were assessed in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses phases and the inclusion and exclusion criteria (PRISMA). The search was performed using the keywords of Safety, Effectiveness, Stem Cells, Cerebral Palsy, and Umbilical and the (AND) and (OR) operators and their combinations were used to construct the search strategies.
Results: After several assessments and based on the inclusion and exclusion criteria, 31 of the remaining 58 studies were eliminated. The systematic review method included 7 final studies in the end. Based on the reviewed studies, it was reported that umbilical cord blood is currently one of the best sources of adult stem cells that contain cells with a wide range of therapeutic potential. These studies report that allogeneic umbilical cord blood has the potential to treat cerebral palsy and that concomitant administration of recombinant human erythropoietin (EPO), which has neurotrophic properties, may enhance the efficacy of umbilical cord blood. These studies state that pneumonia and irritability have been reported as complications of umbilical cord blood transfusion. These studies reported that administration of stem cells significantly improves motor function. The safety and efficacy of treating cerebral palsy patients with stem cells taken from an allogeneic umbilical cord were reported in all included investigations.
Conclusion: Cerebral palsy has negative consequences on patients' quality of life, many aspects of the treatment based on allogeneic umbilical cord stem cells remain unknown. Therefore, the optimal dose, the most suitable type of cell, cell identification, and the best administration route should be determined appropriately. The quality of life of patients with cerebral palsy may be negatively impacted, and many details of the allogeneic umbilical cord stem cell therapy are yet unknown. Consequently, it is important to discover the most suitable type of cell, the optimal dose, and the best delivery method.
PMID: 41107995

19.An Exploration of How Functional Neurological Disorder Is Discussed on X (Twitter): Mixed Methods Study Using Social Network and Content Analysis

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Background: Functional neurological disorder (FND) is one of the commonest conditions in neurological practice, describing symptoms like paralysis and seizures that can be severe and disabling. It is a diagnosis that is confirmed clinically rather than by scans or laboratory results. It is a stigmatized and widely misperceived condition, and since the emergence of long COVID, there has been some conflation of FND with other conditions, which has caused further misunderstanding. Social media has become increasingly popular for patients to learn and interact about their conditions, and the information that they seek and receive may be shaped by many factors. Prior to this study, the online discourse about FND had not been described in the literature.
Objective: We aimed to analyze and describe how FND is discussed on the social media platform X (formerly known as Twitter) using a mixed methods approach.
Methods: Using search terms related to FND, the authors collected data from 426 users and 1104 posts, generating a total of 7640 replies and reposts over a 2-month time frame in 2024. Quantitative descriptive and social network analyses were carried out to map key influential users and communities, in addition to measuring the influence of users. Content analysis was undertaken to describe the prevalent topics being discussed.
Results: More users overall associated with conditions outside FND (n=180, 42.3%), mostly long COVID and myalgic encephalomyelitis/chronic fatigue syndrome, compared with FND (n=148, 34.7%). Self-declared patients made up 40.8% (450/1104) of posts and 36.4% (n=155) of users. Social network analysis revealed 2 separate communities with little interaction. There was a prominence of myalgic encephalomyelitis/chronic fatigue syndrome and long COVID-associated users (nodes) over FND users (nodes). The former cluster showed stronger connections outwardly or peripherally than the FND cluster, suggesting that they may have a stronger impact on shaping the public narrative around FND than FND nodes. In total, 7 of the top 10 most influential users often displayed anti-FND views, while FND organizations and professionals had much less influence. There were 58 posts with at least 5000 views. Of these 58, 10 were from self-declared FND professionals, while 19 were from self-declared professionals associated with other conditions. Of these highly viewed posts, 38 of 58 were negatively predisposed toward FND. Content analysis showed themes of (1) conflict, (2) deception, (3) mistreatment and harm, (4) symptom experience, (5) knowledge, and (6) support.
Conclusions: A large proportion of the discourse around FND on X is shaped by users who are dismissive of the concept of FND and those associated with it. These findings have implications for individuals getting support for a condition that is already widely misunderstood. This study could provide a template for assessing how other stigmatized conditions are perceived on the web.
PMID: 41106819

20.Nonmotor Symptom Scales in Children With Movement Disorders: A Scoping Review

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Neurology. 2025 Nov 11;105(9):e214289. Epub 2025 Oct 17

Background and objectives: Nonmotor symptoms (NMSs) in pediatric movement disorders, such as tics, dystonia, and cerebral palsy (CP), are important to consider but can be often overlooked, despite their substantial impact on daily functioning and quality of life. Understanding which NMSs are evaluated in these patient groups, and by which tools, can support the shaping of future research, including the potential development of future dedicated NMS assesment instruments. The aim of this scoping review was to identify the scales and tools used in routine practice and/or in research to assess NMSs in children with movement disorders.
Methods: A comprehensive search of MEDLINE, Embase, and PsycINFO was conducted for studies published between 1990 and 2023. Eligible studies included those that evaluated NMSs using scales in children aged 0-18 years with tic disorders, dystonia, or CP.
Results: A total of 382 studies were included. Most of the articles identified were cross-sectional, cohort, and case-control studies. Cognitive impairment, mental health, behavioral difficulties, and pain were most frequently assessed using standardized scales. However, self-esteem and communication-critical components of social functioning-were rarely evaluated. The assessment of sleep disturbance, fatigue, and gastrointestinal and urinary symptoms was also less frequently addressed. Notably, our methodological approach may have led to an overrepresentation of NMS assessment in CP, given the larger body of literature available for this condition.
Discussion: Significant gaps exist in the evaluation of NMSs in pediatric movement disorders, particularly in areas such as pain, sleep, and gastrointestinal issues. While standardization of NMS assessment is needed, it is unclear whether disorder-specific tools are preferable to broader NMS-focused measures. Given the current lack of data, using general scales may be a pragmatic first step, with refinement into disorder-specific tools as our understanding of symptom patterns evolves. Cross-cultural validation is also essential to improve the applicability of NMS scales across diverse populations. Integrating NMS assessment into routine clinical practice and interdisciplinary care may facilitate early identification and better management of these symptoms.
PMID: 41105901

21.Shifting perspectives: Mental health and transition to adulthood in youth with cerebral palsy

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Disability and Health Journal. 2025 Sep 29:101970. Online ahead of print

Abstract
Cerebral palsy (CP) is a lifelong condition that affects 1.5–3.4 per 1000 children worldwide. As they grow older, these children must transition from pediatric to adult healthcare services. This transition comes with stress and uncertainty for a population that is already at a higher risk of poor mental health. This paper discusses what is known about mental health in youth with CP and its impact on their transition within the medical system. It also uses a biopsycho-ecological framework to understand how transition impacts several domains of their life including family structure and social participation. Actionable guidance for medical providers and caregivers is given to promote a healthier transition process.
PMID: 41102115

22.Antiviral responses in peripheral and brain neurons

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Current Opinion in Immunology. 2025 Oct 14;97:102678. Online ahead of print

Abstract
Neurotropic viruses represent a public health challenge due to their ability to cause severe neurological conditions, including meningitis, encephalitis, and paralysis. Although many studies have investigated the immune responses to viral infections in the brain and other nervous system targets, most have focused on the effects of resident cells, such as microglia and astrocytes, and infiltrating immune cells, including neutrophils, monocytes, and T cells. However, emerging evidence has demonstrated that neurons themselves mount antiviral responses that suppress viral replication directly and enhance the inhibitory functions of adjacent glial and infiltrating immune cells. In this review, we discuss the intrinsic and extrinsic antiviral responses of neurons, highlighting mechanisms by which they detect viruses and initiate inhibitory responses to protect the nervous system from viral invasion and injury.
PMID: 41092855

23.Unpacking Social Disadvantage Metrics in Neuromuscular Conditions: Area Deprivation Index Versus Child Opportunity Index

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Background and objectives: Social determinants of health (SDOH) impact healthcare access and outcomes for children, including those with neuromuscular disorders (NMD). This study examines the extent to which the Area Deprivation Index (ADI) and Child Opportunity Index (COI) provide similar evaluations of SDOH in children with NMD.
Methods: 463 children with NMD <18 years treated at a tertiary children's hospital met inclusion criteria. COI, calculated using ZIP codes, includes education, health and environment, and social and economic domains. ADI, based on census block, measures income, education, employment, and housing quality. Lower COI and higher ADI are thought to represent more adverse SDOH. Analyses included Pearson's correlations, t-tests, ANOVAs, and multivariable regressions.
Results: ADI and COI were negatively correlated ($r = -0.71$, $P < .001$). Furthermore, similar correlations were observed across COI's three subdomains: education ($r = -0.71$), social and economic ($r = -0.67$), and health and environment ($r = -0.68$) (all $P < .001$). However, ADI scores varied "reat'y within each COI quintile. ADI was lower and COI was higher for patients with private versus public insurance ($P < .001$) and for White and Asian versus Black and Hispanic children ($P < .001$). While COI did not differ among diagnoses ($P = .73$), ADI was higher for children with myelomeningocele ($P = .003$) and cerebral palsy ($P = .03$) compared with those with Charcot-Marie-Tooth disease. Lastly, there was no difference in ADI ($P = .44$) or COI ($P = .71$) based on sex.
Conclusions: While ADI and COI are related, they assess SDOH differently. Using multiple SDOH indices may better capture SDOH's impacts on healthcare access and outcomes. Key concepts: (1)The health of children with neuromuscular conditions is affected by social determinants of health.(2)Lower levels of social determinants of health have been shown to delay access to care and negatively impact children's health.(3)The Area Deprivation Index and Child Opportunity Index are two indices often used to quantify social determinants of health and have not yet been directly compared to evaluate their congruence.(4)This study identifies and explores gaps between these two measurements so that clinicians and researchers can more accurately evaluate the impacts of social determinants of health on children's health.
PMID: 41089205

Prevention and Cure

24.Nasotracheal Intubation in Extreme Prematurity and Traumatic Brain Injury: A Cautionary Tale

Cíntia Junges, Jarred Garfinkle, Maryam Oskoui

Case Reports in Pediatrics. 2025 Oct 3;2025:3005450. eCollection 2025

Abstract
We report a case of a male neonate delivered urgently via cesarean at 27 weeks of gestation for placenta abruption who was apneic at birth and needed endotracheal intubation. Traumatic nasal intubation with injury to the cribriform plate and tract through the right cerebral hemisphere occurred. Now at 10 years of age, he has left hemiplegic cerebral palsy, autism spectrum disorder, intellectual disability, and externalizing disruptive behavior. This case highlights a potential complication of nasal intubation in preterm infants and the importance of considering this in choosing the route of intubation in preterm infants.
PMID: 41079043