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Cerebral palsy research news

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Interventions and Management

1. Reliability and validity of the East Asian children's version of mini-MACS in children with cerebral palsy
Xiaohui Hou, Huiying Qiu, Liru Liu, Yinhua Li, Lu He, Jinling Li, Hongmei Tang, Kaishou Xu

Front Rehabil Sci. 2022 Nov 21;3:997221. doi: 10.3389/fresc.2022.997221. eCollection 2022.

Background: Mini-Manual Ability Classification System (Mini-MACS) was developed for children with cerebral palsy aged 1 -4 years, but its validity and reliability in different cultures are unavailable yet. This study was to determine the reliability and validity of Mini-MACS in East Asian children with cerebral palsy and investigate the correlation between Mini-MACS and Gross Motor Function Classification System. Methods: One hundred and four East Asian children with cerebral palsy aged 12 -48 months were classified by one of their parents, an occupational therapist, and a physical therapist with Mini-MACS. The results were analyzed for inter-rater reliability by using intraclass correlation coefficient (ICC). The Nine-hole Peg Test was used for the criterion-related validity analysis, and parents retested their children after 2 weeks to evaluate test-retest reliability. Gross Motor Function Classification System levels were also collected to investigate the correlation with Mini-MACS. Results: Good inter-rater reliability among the occupational therapist, physical therapist, and parents was found [ICC = 0.984 (95% confidence interval, CI, 0.976-0.989), 0.973 (95% CI 0.960-0.982), and 0.966 (95% CI 0.950-0.977), respectively; $p < 0.01$]. The test-retest reliability in parents was almost perfect [ICC = 0.985 (95% CI 0.977-0.990), $p < 0.01$]. Mini-MACS had consistency with the Nine-hole Peg Test ($r = 0.582$, 0.581, and 0.566, respectively; $p < 0.01$). A correlation was found between Gross Motor Function Classification System and Mini-MACS ($r = 0.626$, 0.596, and 0.598, respectively; $p < 0.01$). Conclusion: The Mini-MACS demonstrates evidence that it is a valid and reliable tool to classify manual ability in East Asian children with cerebral palsy and is also positively related to the Gross Motor Function Classification System.

PMID: 36478790

2. Minimally Invasive Adductor Release With Obturator Block for Hip Subluxation in Cerebral Palsy: A Report of Two Cases
David A Yngve, Chad L Evans

Case Reports Cureus. 2022 Oct 31;14(10):e30906. doi: 10.7759/cureus.30906. eCollection 2022 Oct.

Cerebral palsy (CP) is the most common motor disability in childhood and presents with spasticity, increased tone, decreased range of motion, and difficulty with ambulation. Abnormal communication between the cerebrum and the motor fibers leads to functional deficits and long-term adverse sequelae. This case report focuses on hip dysplasia. Two children with CP who were 4.4 and 3.8 years at initial surgery had substantial hip dysplasia with migration percentages (MPs) by X-ray of 60 and 55 and Gross Motor Functional Classification System (GMFCS) levels of 4 and 5. Each patient underwent minimally invasive selective percutaneous myofascial lengthening (SPML) of the hip adductors and ethanol block of the obturator nerves, along

with other indicated procedures. Follow-ups were four and six years for the two cases. Indications for surgery included adductor spasticity with contracture, brisk adductor reflexes, scissoring, and hip dysplasia. The goals were to relieve symptoms and to serve as temporizing measures prior to possible later hip reconstruction. Results showed that, in each case, the MP improved substantially. Case 1 was a child who initially took steps with assistance and became independent by age six, with GMFCS scores improving from 4 to 2. The MP improved from 60 to 35 over four years. Case 2 was a child of GMFCS 5 who could not stand or take steps. The MP improved from 55 to 25 over six years. In addition to the initial SPML surgery, he had a second SPML surgery 31 months later at age six. This case is noteworthy in that the child consistently used a hip abduction orthosis and an abducted wheelchair through the entire six-year follow-up period. In conclusion, some young children with a significant hip subluxation can achieve improvement following minimally invasive surgery at medium-term follow-up. Our two children each had special circumstances. One was more highly functioning and became an independent walker. The other had consistent use of a hip abduction orthosis and an abducted wheelchair.

PMID: 36465771

3. The incidence of avascular necrosis in children with cerebral palsy after hip containment surgery
Jeremy P Bauer, Susan Sienko, Dennis Roy, Deric Nye, Seth Tarrant, Ryan Price, Ellen Raney

J Child Orthop. 2022 Dec;16(6):454-460. doi: 10.1177/18632521221137383. Epub 2022 Nov 16.

Purpose: To establish the rate of avascular necrosis after hip reconstruction surgery in children with cerebral palsy and to identify risk factors that influence the development of avascular necrosis in this population. Methods: An institutional review board-approved retrospective review was conducted on children with cerebral palsy who underwent hip containment surgery at a single institution. Radiographs were evaluated at three time points. The Reimer's migration percentage, neck shaft angle, epiphyseal shaft angle, acetabular index, center edge angle, and acetabular angle were measured. The presence of avascular necrosis was evaluated and graded by the Bucholz/Ogden and the Kalamchi/MacEwen classification systems. Multivariate logistic regression was performed to identify risk factors associated with the development of avascular necrosis. Results: A total of 154 children with cerebral palsy underwent hip containment surgery on 223 hips. Twenty-nine children (18.8%) underwent both pelvic and femoral procedures; 36 children (23.4%) had only femoral procedures; 47 children (30.5%) had femoral and soft tissue; and 42 children (27.3%) had pelvic, femoral, and soft tissue procedures. Using the Bucholz and Ogden or the Kalamchi classifications, the rate of avascular necrosis was 24.7% (38/154). Of the variables evaluated, preoperative Reimers was found to be significant predictors of avascular necrosis. The rate of avascular necrosis was 26.7% for Gross Motor Functional Classification System level III, 24.1% for Gross Motor Functional Classification System level IV, and 27.3% for Gross Motor Functional Classification System level V. Conclusion: The overall rate of avascular necrosis in children undergoing hip containment surgery was 26.7%. Together, age at surgery, open reduction, previous surgery, preoperative Reimers, and estimated blood loss contributed to the development of postoperative avascular necrosis; however, only preoperative Reimers significantly contributed to the development of avascular necrosis in children with cerebral palsy undergoing hip containment procedures.

PMID: 36483645

4. Distal femoral extension osteotomy and patellar tendon advancement or shortening in ambulatory children with cerebral palsy: A modified Delphi consensus study and literature review
Erich Rutz, Tom F Novacheck, Thomas Dreher, Jon R Davids, James McCarthy, Robert M Kay, Benjamin J Shore, M Wade Shrader, Matthew Veerkamp, Hank Chambers, Unni Narayanan, Kristan Pierz, Jason Rhodes, Jeffrey Shilt, Tim Theologis, Anja Van Campenhout, Kerr Graham

J Child Orthop. 2022 Dec;16(6):442-453. doi: 10.1177/18632521221137391. Epub 2022 Nov 23.

Purpose: In children with cerebral palsy, flexion deformities of the knee can be treated with a distal femoral extension osteotomy combined with either patellar tendon advancement or patellar tendon shortening. The purpose of this study was to establish a consensus through expert orthopedic opinion, using a modified Delphi process to describe the surgical indications for distal femoral extension osteotomy and patellar tendon advancement/patellar tendon shortening. A literature review was also conducted to summarize the recent literature on distal femoral extension osteotomy and patellar tendon shortening/patellar tendon advancement. Method: A group of 16 pediatric orthopedic surgeons, with more than 10 years of experience in the surgical management of children with cerebral palsy, was established. The group used a 5-level Likert-type scale to record agreement or disagreement with statements regarding distal femoral extension osteotomy and patellar tendon advancement/

patellar tendon shortening. Consensus for the surgical indications for distal femoral extension osteotomy and patellar tendon advancement/patellar tendon shortening was achieved through a modified Delphi process. The literature review, summarized studies of clinical outcomes of distal femoral extension osteotomy/patellar tendon shortening/patellar tendon advancement, published between 2008 and 2022. Results: There was a high level of agreement with consensus for 31 out of 44 (70%) statements on distal femoral extension osteotomy. Agreement was lower for patellar tendon advancement/patellar tendon shortening with consensus reached for 8 of 21 (38%) of statements. The literature review included 25 studies which revealed variation in operative technique for distal femoral extension osteotomy, patellar tendon advancement, and patellar tendon shortening. Distal femoral extension osteotomy and patellar tendon advancement/patellar tendon shortening were generally effective in correcting knee flexion deformities and extensor lag, but there was marked variation in outcomes and complication rates. Conclusion: The results from this study will provide guidelines for surgeons who care for children with cerebral palsy and point to unresolved questions for further research. Level of evidence: level V.

PMID: 36483640

5. Long-term outcome of hamstring lengthening versus transfer and the role of biceps femoris lengthening in patients with spastic diplegia and dynamic knee flexion in gait
Patrick Do, Jing Feng, Michael D Sussman

J Child Orthop. 2022 Dec;16(6):429-441. doi: 10.1177/18632521221128593. Epub 2022 Oct 19.

Background: Orthopedic treatment of flexed-knee gait consists of hamstring lengthening along with surgery at other levels. Transfer of the semitendinosus (hamstring transfer) was introduced to avoid increase of anterior pelvic tilt as well as reduce risk of recurrence. Methods: We retrospectively assessed children with spastic cerebral palsy and flexed-knee gait pre-operatively, 1 year post-operatively, and at a minimum of 7 years post-operatively. Results: The 39 patients were a mean 9.4 ± 3.4 years at the time of surgery, 20 subjects underwent hamstring transfer, and 19 subjects had hamstring lengthening with mean follow-up 9.1 years. Passive range of motion improved initially, but regressed at long term. Dynamic minimum knee flexion in stance decreased in both groups at the first post-operative study, and was maintained at final follow-up in 64-67% of patients. There was a small increase in anterior pelvic tilt at the 1-year follow-up which subsequently decreased to less than pre-operative in the hamstring lengthening group but remained mildly increased (5°) in the hamstring transfer group at final follow-up. Success in correcting stance knee flexion of the entire group was 69% of the Gross Motor Function Classification System grades I and II and 60% of the Gross Motor Function Classification System grade III subjects. Gait profile Score and sagittal knee Gait Variable Score both showed clinically important improvement after surgery and was mostly maintained long term for both groups. Lateral hamstring lengthening was beneficial in more severe patients, with minimal risk of adverse effects. Conclusion: Hamstring surgery as part of single event multi-level surgery (SEMLS) is effective in correcting flexed-knee gait in 60%-70% of patients with minimal effect on anterior pelvic tilt. There was no added advantage to hamstring transfer. Biceps Femoris lengthening may be beneficial and without significant additional risk. Level of evidence: level III.

PMID: 36483639

6. Impact of Orthopaedic Surgeons on National Institutes of Health Funding for Hip and Knee Arthroplasty Research
Jason Silvestre, Roxana Martinez, Terry L Thompson, Robert H Wilson, Charles L Nelson

J Bone Joint Surg Am. 2022 Dec 7;104(23):e100. doi: 10.2106/JBJS.22.00025. Epub 2022 Jun 22.

Background: The National Institutes of Health (NIH) remains one of the predominant sources of biomedical research funding in the United States, yet its impact on total hip and knee arthroplasty research is poorly understood. This study defines the portfolio of NIH funding for total joint arthroplasty (TJA) and the impact of orthopaedic surgeons on this portfolio. Methods: The Research Portfolio Online Reporting Tools Expenditures and Results (RePORTER) database was queried for NIH grants that had been awarded for total hip and knee arthroplasty and total NIH funding from 2010 to 2020. Compound annual growth rates (CAGRs) were calculated. Funding totals were compared with those from 20 other clinical areas. The principal investigators (PIs) and grants were characterized, and comparisons were made with use of the Student t test. Results: A total of 489 grants were awarded, totaling $181 million (CAGR of 10.3%). This was >3 times the growth rate for the total NIH budget (CAGR of 2.9%), which increased from $31.2 to $41.7 billion over the 11-year period. When compared with 20 other clinical areas, TJA received the least amount of NIH funding over that period. Alzheimer disease received the most funding ($12.1 billion, CAGR of 19.5%), and cerebral palsy received the penultimate amount of funding ($284 million, CAGR of 6.3%). The R01 grant mechanism was the predominant source (63.1%), and the Mayo Clinic (Rochester, Minnesota) received the most

funding (9.7%). Departments of orthopaedic surgery were awarded the most funding (23.5%), yet only 20 orthopaedic surgeons were identified as PIs (16.0%). There were no significant differences in NIH funding totals by PI demographic and academic characteristics ($p > 0.05$), yet orthopaedic surgeons had among the highest Hirsch indices (h-indices) ($p < 0.001$). Funding supported clinical (63.5%), translational (19.3%), basic science (7.1%), and other types (10.1%) of research. The top areas with funding were postoperative complications (44.4%), postoperative pain management (17.6%), rehabilitation (15.1%), and implant design (12.4%). Conclusions: There is a paucity of orthopaedic surgeon representation among NIH grants awarded for TJA. Opportunities may exist for orthopaedic surgeons to collaborate in identified areas of clinical interest. Additional research is needed to understand the obstacles to obtaining NIH grant funding for orthopaedic surgeon PIs. Clinical relevance: Increasing the levels of funding from the NIH is a strategic priority for departments of orthopaedic surgery. Understanding levels of funding for clinical areas in total joint arthroplasty is critical to foster research and discovery support from the NIH.

PMID: 36476739

7. Under pressure: design and validation of a pressure-sensitive insole for ankle plantar flexion biofeedback during neuromuscular gait training
Benjamin C Conner, Ying Fang, Zachary F Lerner

J Neuroeng Rehabil. 2022 Dec 8;19(1):135. doi: 10.1186/s12984-022-01119-y.

Background: Electromyography (EMG)-based audiovisual biofeedback systems, developed and tested in research settings to train neuromuscular control in patient populations such as cerebral palsy (CP), have inherent implementation obstacles that may limit their translation to clinical practice. The purpose of this study was to design and validate an alternative, plantar pressure-based biofeedback system for improving ankle plantar flexor recruitment during walking in individuals with CP. Methods: Eight individuals with CP (11-18 years old) were recruited to test both an EMG-based and a plantar pressure-based biofeedback system while walking. Ankle plantar flexor muscle recruitment, co-contraction at the ankle, and lower limb kinematics were compared between the two systems and relative to baseline walking. Results: Relative to baseline walking, both biofeedback systems yielded significant increases in mean soleus (43-58%, $p < 0.05$), and mean (68-70%, $p < 0.05$) and peak (71-82%, $p < 0.05$) medial gastrocnemius activation, with no differences between the two systems and strong relationships for all primary outcome variables ($R = 0.89$-0.94). Ankle co-contraction significantly increased relative to baseline only with the EMG-based system (52%, $p = 0.03$). Conclusion: These findings support future research on functional training with this simple, low-cost biofeedback modality.

PMID: 36482447

8. Effectiveness of a Blend of Pelvic Proprioceptive Neuromuscular Facilitation, Task-Oriented Approach, and Rood's Approach in a Three-Year-Old Child With Spastic Diplegia: A Case Report
Pranali M Pachkhede, Vikrant G Salphale, Pooja Dhage, Nikita S Deshmukh

Case Reports Cureus. 2022 Nov 3;14(11):e31063. doi: 10.7759/cureus.31063. eCollection 2022 Nov.

As a result of non-progressive brain damage, cerebral palsy (CP) has traditionally been seen as a disorder of movement and posture; however, more recent classifications enable clinicians to understand more than just the movement issue. Research has evolved with the accurate categorization of cerebral palsy into distribution, motor type, and functional level. Children with spastic diplegia usually have pelvic asymmetry, which affects the child's functional abilities, including their ability to balance and walk independently. Physical therapists currently treat this illness using a variety of treatments, each of which is significant in its own way. A model for enhancing organizational capabilities is clinical management in physical therapy, which incorporates effective practices supported by research and improves outcomes. This case study demonstrates the efficiency of a deliberate physical therapy strategy to enhance functional independence in a three-year-old male child with spastic diplegia. The young patient complained of difficulties with balance and toe-walking and a delay in reaching age-appropriate milestones when seen in the neuro physiotherapy outpatient department. History demonstrated that a delayed cry occurred with an abrupt onset of fever, foaming at the mouth, and other symptoms described.

PMID: 36475170

9. Lower limb muscle fatigue after uphill walking in children with unilateral spastic cerebral palsy
I Moll, J M N Essers, R G J Marcellis, R H J Senden, Y J M Janssen-Potten, R J Vermeulen, K Meijer

PLoS On. 2022 Dec 6;17(12):e0278657. doi: 10.1371/journal.pone.0278657. eCollection 2022.

Fatigue during walking is a common complaint in cerebral palsy (CP). The primary purpose of this study is to investigate muscle fatigue from surface electromyography (sEMG) measurements after a treadmill-based fatigue protocol with increasing incline and speed in children with CP with drop foot. The secondary purpose is to investigate whether changes in sagittal kinematics of hip, knee and ankle occur after fatigue. Eighteen subjects with unilateral spastic CP performed the protocol while wearing their ankle-foot orthosis and scored their fatigue on the OMNI scale of perceived exertion. The median frequency (MF) and root mean square (RMS) were used as sEMG measures for fatigue and linear mixed effects model were applied. The MF was significantly decreased in fatigued condition, especially in the affected leg and in the tibialis anterior and peroneus longus muscle. The RMS did not change significantly in fatigued condition, while the OMNI fatigue score indicated patients felt really fatigued. No changes in sagittal kinematics of hip, knee and ankle were found using statistical non-parametric mapping. In conclusion, the current fatigue protocol seems promising in inducing fatigue in a population with CP with drop foot and it could be used to expand knowledge on muscle fatigue during walking in CP.

PMID: 36473000

10. Supported-standing interventions for children and young adults with non-ambulant cerebral palsy: A scoping review
Lynore J McLean, Ginny S Paleg, Roslyn W Livingstone

Dev Med Child Neurol. 2022 Dec 3. doi: 10.1111/dmcn.15435. Online ahead of print.

Aim: To describe the evidence, outcomes, and lived experience of supported standing for children and young adults with cerebral palsy aged 25 years or younger, classified in Gross Motor Function Classification System levels IV and V. Method: This scoping review included searches in eight electronic databases and manual searching from database inception to May 2020 and updated on 21st February 2022. Two of three reviewers independently screened titles and abstracts and extracted and appraised data. Methodological quality and risk of bias were appraised using tools appropriate to study type. Content analysis and frequency effect sizes were calculated for qualitative and descriptive evidence. Results: From 126 full-text references, 59 citations (one study was reported over two citations) were included: 16 systematic reviews, 17 intervention studies reporting over 18 citations, eight analytical cross-sectional studies, five descriptive cross-sectional/survey studies, five qualitative studies, and one mixed-methods study were identified, along with six clinical guidelines. Maintenance of bone mineral density and contracture prevention outcomes were supported by the most experimental studies and evidence syntheses, while evidence supporting other outcomes was primarily quasi-experimental or descriptive. Qualitative evidence suggests that programmes are influenced by attitudes, device, child, and environmental factors. Interpretation: Individualized assessment and prescription are essential to match personal and environmental needs. Although experimental evidence is limited due to many factors, lived-experience and cohort data suggest that successful integration of standing programmes into age-appropriate and meaningful activities may enhance function, participation, and overall health.

PMID: 36463377

11. Day-to-Day Variability of Clinical Feeding and Swallowing Performance in School-Age Self-Feeding Children With Cerebral Palsy
Georgia A Malandraki, Çagla Kantarcigil, Bruce A Craig, Yumin Zhang, Andrew M Gordon

Am J Speech Lang Pathol. 2022 Dec 9;1-11. doi: 10.1044/2022_AJSLP-22-00137. Online ahead of print.

Purpose: We aimed to examine the day-to-day variability of feeding and swallowing performance and mealtime duration in school-age self-feeding children with spastic cerebral palsy (SCP) across 15 days. Method: Thirteen children with SCP (ages 5;10 [years;months]-17;6) participated. Children were divided into unilateral (UCP, n = 6) and bilateral (BCP, n = 7) SCP groups. Feeding/swallowing assessments using the Dysphagia Disorder Survey (DDS) were conducted and total mealtime durations (TMDs) were calculated for all days. DDS Part 1 (factors related to feeding) and DDS Part 2 (signs of oropharyngeal difficulties) components were rated. Mixed-effects models were used to compare group means and estimate between- and

within-subject variances in each group. Likelihood ratio tests were used to determine best covariance structure and compare variance types across groups. Results: Within-subject variance for all three variables, DDS Part 1, 2, and TMD, across days was larger in the BCP group than the UCP group (Part 1: p = .0036, Part 2: p = .0002, and TMD: p = .0005) and the between-subject variance was larger in the BCP group for DDS Part 2 (p = .0362). The UCP group presented with lower (milder) DDS scores (Part 1: p = .0160; Part 2: p = .0141) and shorter TMD (p = .0077) than the BCP group across days. Furthermore, both groups exhibited greater variability in DDS Part 2 than 1 (p < .0001). Conclusion: These preliminary results emphasize the need to account for day-to-day variability when evaluating swallowing especially in children with BCP and provide preliminary ranges of performance that could be useful for clinical prognosis and future treatment research. Supplemental material: https://doi-org.ezproxy.library.sydney.edu.au/10.23641/asha.21669611.

PMID: 36492292

12. Corrigendum: Dietary fiber and probiotics based on gut microbiota targeting for functional constipation in children with cerebral palsy
Congfu Huang, Jinli Lyu, Chunuo Chu, Lan Ge, Yuanping Peng, Zhenyu Yang, Shenghua Xiong, Bin Wu, Xiao Chen, Xiaowei Zhang

Published Erratum Front Pediatr. 2022 Nov 21;10:1074856. doi: 10.3389/fped.2022.1074856. eCollection 2022.

[This corrects the article DOI: 10.3389/fped.2022.1001789.].

PMID: 36479280

13. Large Bowel Obstruction Secondary to a Fecaloma in a Child With Cerebral Palsy
Sabeen Ul Haq

Case Reports Cureus. 2022 Nov 4;14(11):e31078. doi: 10.7759/cureus.31078. eCollection 2022 Nov.

A nine-year-old wheelchair-bound female with cerebral palsy and intellectual disability secondary to trafficking protein particle complex subunit 9 (TRAPPC9) mutation presented to the family medicine clinic after not having passed stool for six days. There was a history of chronic constipation. Examination revealed high-pitched "tinkling" bowel sounds; therefore, a plain abdominal X-ray was ordered to rule out the possibility of intestinal obstruction, which showed a large fecaloma in the rectum with dilated bowel loops proximal to it, signifying obstruction. This was successfully treated with the administration of a rectal enema and confirmed by a post-enema radiograph. Although rare in children, a fecaloma should be considered a cause of bowel obstruction, especially where there is a history of chronic constipation. A plain abdominal X-ray can be useful in diagnosing a fecaloma in pediatric cases.

PMID: 36475161

14. Development of the corpus callosum and cognition after neonatal encephalopathy
Hollie Byrne, Arthur P C Spencer, Georgia Geary, Sally Jary, Marianne Thoresen, Frances M Cowan, Jonathan C W Brooks, Elavazhagan Chakkarapani

Ann Clin Transl Neurol. 2022 Dec 8. doi: 10.1002/acn3.51696. Online ahead of print.

Objective: Neonatal imaging studies report corpus callosum abnormalities after neonatal hypoxic-ischaemic encephalopathy (HIE), but corpus callosum development and relation to cognition in childhood are unknown. Using magnetic resonance imaging (MRI), we examined the relationship between corpus callosum size, microstructure and cognitive and motor outcomes at early school-age children cooled for HIE (cases) without cerebral palsy compared to healthy, matched controls. A secondary aim was to examine the impact of HIE-related neonatal brain injury on corpus callosum size, microstructure and growth.

Methods: Participants aged 6-8 years underwent MRI, the Movement Assessment Battery for Children Second Edition and Wechsler Intelligence Scale for Children Fourth Edition. Cross-sectional area, volume, fractional anisotropy and radial diffusivity of the corpus callosum and five subdivisions were measured. Multivariable regression was used to assess associations between total motor score, full-scale IQ (FSIQ) and imaging metrics. Results: Adjusting for age, sex and intracranial volume, cases (N = 40) compared to controls (N = 39) demonstrated reduced whole corpus callosum area (β = -26.9, 95% confidence interval [CI] = -53.17, -0.58), volume (β = -138.5, 95% CI = -267.54, -9.56), fractional anisotropy and increased radial diffusivity ($P < 0.05$) within segments II-V. In cases, segment V area (β = 0.18, 95% CI = 0.004, 0.35), volume (β = 0.04, 95% CI = 0.001, 0.079), whole corpus callosum fractional anisotropy (β = 13.8 95% CI = 0.6, 27.1) and radial diffusivity (β = -11.3, 95% CI = -22.22, -0.42) were associated with FSIQ. Growth of the corpus callosum was restricted in cases with a FSIQ ≤85, and volume was reduced in cases with mild neonatal multifocal injury compared to white matter injury alone. Interpretation: Following neonatal HIE, morphological and microstructural changes in the corpus callosum are associated with reduced cognitive function at early school age.

PMID: 36480557

15. Changes in in-hospital survival and long-term neurodevelopmental outcomes of extremely preterm infants: A retrospective study of a Japanese tertiary center
Mitsuhiro Haga, Masayo Kanai, Akio Ishiguro, Eri Nishimura, Yohei Minamitani, Ayaka Iwatani, Ryo Nishiguchi, Naoyuki Miyahara, Shuntaro Oka, Ayumi Sasaki, Yukiko Motojima, Kana Saito, Kanako Itoh, Sumiko Era, Shinichiro Yabe, Akihiko Kikuchi, Miharu Fuji, Mizue Matsumoto, Fumihiko Namba, Hisanori Sobajima, Masanori Tamura, Kazuhiko Kabe

J Pediatr. 2022 Nov 30;S0022-3476(22)01075-7. doi: 10.1016/j.jpeds.2022.11.024. Online ahead of print.

Objectives: To elucidate whether the survival and long-term neurodevelopmental outcomes of extremely preterm infants have improved in a Japanese tertiary center with an active treatment policy for infants born at 22-23 weeks of gestation. Study design: This single-centered retrospective cohort study enrolled EPI treated at Saitama Medical Center, Saitama Medical University, from 2003 to 2014. Patients with major congenital abnormalities were excluded. Primary outcomes were in-hospital survival and severe neurodevelopmental impairment (NDI) at six years of age, which was defined as having severe cerebral palsy, severe cognitive impairment, severe visual impairment, or deafness. We assessed the changes in primary outcomes between the first (Period 1; 2003-2008) and the second half (Period 2; 2009-2014) of the study period and evaluated the association between birth-year and primary outcomes using multivariate logistic regression models. Results: Of the 403 eligible patients, 340 (84%) survived to discharge. Among 248 patients available at six years of age, 43 (14%) were classified as having severe NDI. Between the two periods, in-hospital survival improved from 155/198 (78%) to 185/205 (90%), but severe NDI increased from 11/108 (10%) to 32/140 (23%). In multivariate logistic regression models adjusted for gestational age, birthweight, sex, singleton birth, and antenatal corticosteroids, the adjusted odds ratio (95% confidence interval) of birth-year for in-hospital survival and severe NDI was 1.2 (1.1-1.3) and 1.1 (1.0-1.3), respectively. Conclusion: Mortality among EPI has improved over the past 12 years; nevertheless, no significant improvement was observed in the long-term neurodevelopmental outcomes.

PMID: 36462685

16. Implementing public involvement standards in cerebral palsy register research
Claire Kerr, Karen McConnell, Helen Savage, Monica Acheson

Front Rehabil Sci. 2022 Nov 17;3:903167. doi: 10.3389/fresc.2022.903167. eCollection 2022.

Background: In 2018, the National Institute for Health Research launched Draft Standards for Public Involvement in Research. The Northern Ireland Cerebral Palsy Register (NICPR) was competitively selected as a "test-bed" project to pilot the Draft Standards over a one-year period. Aim: This perspective paper aims to describe the NICPR's experience of piloting the Draft Standards for Public Involvement in Research, highlighting successes and challenges. Method: Three of the six Draft Standards were piloted from April 2018 to April 2019: Standard 2 "working together", Standard 4 "communications" and Standard 5, "impact". Results: Implementation of Standard 2 resulted in formation of a dedicated Public Involvement Group. Standard 4 was implemented by revision of the NICPR's Privacy Notice and development of the NICPR website. Standard 5 was not implemented during the test-bed pilot period. Discussion: Benefits of use of the Draft Standards in cerebral palsy register research included development of relationships, improving quality, accessibility and relevance of NICPR materials, increasing skills and confidence, networking opportunities, advocating for others and feeling empowered to shape cerebral palsy research.

Challenges included administrative issues, absence of dedicated and sustained funding, limitations in the availability and applicability of public involvement training and the time required for meaningful public involvement. Conclusions: Standards for Public Involvement provide a useful framework for structuring and embedding meaningful public involvement. Sustained, authentic public involvement in cerebral palsy register research ensures that people affected by the condition are empowered to engage, inform, develop and lead research that meets their needs.

PMID: 36466936

17. Development of children, adolescents, and young adults with cerebral palsy according to the ICF: A scoping review
Paula S C Chagas, Elton D D Magalhães, Ricardo R Sousa Junior, Angélica C S F Romeros, Robert J Palisano, Hércules R Leite, Peter Rosenbaum

Review Dev Med Child Neurol. 2022 Dec 5. doi: 10.1111/dmcn.15484. Online ahead of print.

Aim: To identify and provide a descriptive overview of the development of children, adolescents, and young adults with cerebral palsy (CP) in longitudinal studies; and map areas of focus according to the components of the World Health Organization's International Classification of Functioning, Disability, and Health (ICF). Method: Longitudinal studies of the development of children, adolescents, and/or young adults with CP were included in this scoping review. A search for eligible studies was conducted in the databases MEDLINE, PubMed, LILACS, EMBASE, Cochrane, CINAHL, and Scopus, and was restricted to the years 2002 to 2022. All outcome measures of the studies were classified into ICF components. Results: In the 56 studies included, there were 19 438 participants, involving mainly children, followed by adolescents, and lastly young adults. All components of the ICF were investigated and many studies reported outcomes in more than one component. Activity was the most investigated (67.9%; n = 38 studies), followed by body functions and structures (42.9%; n = 24 studies). Participation (14.2%; n = 8 studies) and environmental factors (3.6%; n = 2 studies) were the least studied. None of the studies investigated personal factors as an outcome. Interpretation: This scoping review provides an overview of studies on the development of children, adolescents, and young adults with CP, using the ICF framework, identifying current areas of focus and gaps in the research. Future studies should target participation, contextual factors, and the transition into adulthood.

PMID: 36469744

18. Health Care for Adults With Cerebral Palsy and Spina Bifida-Must It Be so Difficult?
Joline E Brandenburg

Editorial Mayo Clin Proc. 2022 Dec;97(12):2186-2188. doi: 10.1016/j.mayocp.2022.10.021.

No abstract available

PMID: 36464460

19. Fostering integration among students with different backgrounds using an orthotic community service program
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Background: In this globalization era, institutions are developing strategies including international service-learning pedagogies to integrate global perspectives and dimensions into the learning and teaching processes to develop students' capacity in intercultural competence. Objective: This study aimed to assess the students' intercultural learning outcome through provision of orthotic community service to the less-privileged children. Methods: A Hong Kong-based university collaborated with 2 American universities to conduct an orthotic community service program for the children with cerebral palsy in mainland China. In the process of service delivery, the students with different backgrounds worked closely and students' professional

knowledge, intercultural understanding, and communication skills were evaluated. A mixed-method approach was adopted to investigate on how this international program could facilitate meaningful interactions in clinical practices. Preprogram and postprogram surveys and focus group interviews were conducted. Statistical analyses were performed on the quantitative data, while interview data were analyzed thematically. Results: A comparison of preprogram and postprogram surveys showed that the students perceived this community service program important for enhancement of their capabilities to communicate with people from other cultures ($n = 39$, $p < 0.05$). It also showed an increase in local students' willingness to work with people from other cultures. Some themes related to intercultural competences were identified from the interview: "intercultural awareness, understanding, and communication" as well as openness to work/socialize with people from other cultures." Conclusions: This study demonstrated that an international community service program could initiate positive changes in students' intercultural communication capability and interest to work with culturally different people.

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20. Positive end expiratory pressure and respiratory system resistance between self-inflating bag and T-piece resuscitator in a cadaveric piglet lung model
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Introduction: In neonatal resuscitation, T-piece resuscitator (TPR) are used widely, but the evidence is limited for their use in infants born at term gestation. The aim of this study was to compare the delivered positive end expiratory pressure (PEEP) and respiratory system resistance (Rrs) using TPR and self-inflating bag (SIB) in a cadaveric piglet model. Methods: Cadaveric newborn piglets were tracheotomised, intubated (cuffed tube) and leak tested. Static lung compliance was measured. Positive pressure ventilation was applied by TPR and SIB in a randomized sequence with varying, inflations per minute (40, 60 and 80 min) and peak inspiratory pressures (18 and 30 cmH_2O). PEEP was constant at 5 cmH_2O. The lungs were washed with saline and static lung compliance was re-measured; ventilation sequences were repeated. Lung inflation data for the respiratory mechanics were measured using a respiratory function monitor and digitally recorded for both pre and post-lung wash inflation sequences. A paired sample t-test was used to compare the mean and standard deviation. Results: The mean difference in PEEP (TPR vs. SIB) was statistically significant at higher inflation rates of 60 and 80 bpm. At normal lung compliance, mean difference was 1.231 ($p = 0.000$) and 2.099 ($p = 0.000$) with PIP of 18 and 30 cmH_2O respectively. Significantly higher Rrs were observed when using a TPR with higher inflation rates of 60 and 80 bpm at varying lung compliance. Conclusion: TPR is associated with significantly higher PEEP in a compliant lung model, which is probably related to the resistance of the TPR circuit. The effect of inadvertent PEEP on lung mechanics and hemodynamics need to be examined in humans. Further studies are needed to assess devices used to provide PEEP (TPR, SIB with PEEP valve, Anaesthetic bag with flow valve) during resuscitation of the newborn.

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Prevention and Cure

21. Stem cell treatment and cerebral palsy: A Systematic review and meta-analysis
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Objective: We designed this systematic review and meta-analysis to estimate the pooled efficacy and safety profile of different types of stem cells in treating patients with cerebral palsy (CP). Methods: We systematically searched PubMed, Scopus, EMBASE, Web of Science, Google Scholar, and also gray literature, including references of the included studies which were published before November 2021. We extracted data regarding the total number of participants, first author, publication year, country of origin, mean age, cell type, cell dose, cell source, method of transplantation, duration of follow-up, Gross motor function, Ashworth scale, and adverse events. Results: We found 2073 articles by literature search; after deleting duplicates,

1194 remained. Nine articles remained for meta-analysis. The SMD of GMF-66 score (after-before) treatment was 1.5 (95% CI:0.7-2.3) (I2=89.9%, P<0.001). The pooled incidence of Gastrointestinal (GI) complications after transplantation was 21% (95% CI:9-33%) (I2=56%, P=0.08). The pooled incidence of fever after transplantation was 18 % (95% CI:6-30%) (I2=87.9%, P=0.08<0.001) Conclusion: The result of this systematic review and meta-analysis show that stem cell therapy in cerebral palsy has neuroprotective properties from anti-inflammatory and anti-apoptotic activities. Stem cell therapy seems to be a promising adjunct to traditional therapies for cerebral palsy patients.

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