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## Interventions and Management

### **1. Action Observation Treatment Improves Upper Limb Motor Functions in Children with Cerebral Palsy: A Combined Clinical and Brain Imaging Study.**

Buccino G, Molinaro A, Ambrosi C, Arisi D, Mascaro L, Pinardi C, Rossi A, Gasparotti R, Fazzi E, Galli J.

Neural Plast. 2018 Jul 4;2018:4843985. doi: 10.1155/2018/4843985. eCollection 2018.

The aim of the present study was to assess the role of action observation treatment (AOT) in the rehabilitation of upper limb motor functions in children with cerebral palsy. We carried out a two-group, parallel randomized controlled trial. Eighteen children (aged 5-11 yr) entered the study: 11 were treated children, and 7 served as controls. Outcome measures were scores on two functional scales: Melbourne Assessment of Unilateral Upper Limb Function Scale (MUUL) and the Assisting Hand Assessment (AHA). We collected functional scores before treatment (T1), at the end of treatment (T2), and at two months of follow-up (T3). As compared to controls, treated children improved significantly in both scales at T2 and this improvement persisted at T3. AOT has therefore the potential to become a routine rehabilitation practice in children with CP. Twelve out of 18 enrolled children also underwent a functional magnetic resonance study at T1 and T2. As compared to controls, at T2, treated children showed stronger activation in a parieto-premotor circuit for hand-object interactions. These findings support the notion that AOT contributes to reorganize brain circuits subserving the impaired function rather than activating supplementary or vicariating ones.

PMID: [30123250](#)

### **2. Developing a Suite of Motion-Controlled Games for Upper Extremity Training in Children with Cerebral Palsy: A Proof-of-Concept Study.**

Hung JW, Chang YJ, Chou CX, Wu WC, Howell S, Lu WP.

Games Health J. 2018 Aug 20. doi: 10.1089/g4h.2017.0141. [Epub ahead of print]

**AIM:** The Scratch programming language allows learner developers to write games. The Kinect2Scratch extension makes Scratch games with bodily motion control possible by connecting to Microsoft's Kinect sensor. This study examined the feasibility and possible efficacy of a suite of motion-controlled games designed for upper extremity (UE) training in children with cerebral palsy (CP) using Kinect2Scratch. **MATERIALS AND METHODS:** This is a proof-of-concept study. We developed three games, requiring three UE movement patterns (shoulder holding, reaching, and handclap), for use in children with CP. The primary outcome was feasibility, addressed by adherence, engagement, satisfaction, and safety. The secondary outcome was efficacy, which was evaluated by Quality of Upper Extremities Skills Test (QUEST), Box and Block Test (BBT), Melbourne Assessment 2 (MA2) test, and ABILHAND-kids score. **RESULTS:** Thirteen children with CP (mean age 6.9 years) received 24 sessions of training (30 minutes per session). The adherence rate was 100%. During the first 2 weeks of training, children had a significantly higher level of participation in Kinect2Scratch training than in conventional rehabilitation

[Pittsburgh Participation Scale, median (interquartile range [IQR]), 6 (3-6) vs. 4 (3-6)  $P = 0.04$ ]. However, during the last 2 weeks of training, there was no significant difference in participation between the Kinect2Scratch and conventional training [Pittsburgh Rehabilitation Participation Scale, median (IQR), 4 (3-5) vs. 4 (3-6)  $P = 0.55$ ]. Most children enjoyed playing the games. The mean score of enjoyment was  $4.54 \pm 0.66$ . There were no adverse events during the training periods. The children had significant improvement in total score of QUEST and MA2. There were no significant improvements in BBT and ABILHAND-kids score. **CONCLUSION:** Using Kinect2Scratch games for UE training is a feasible adjunctive program for children with CP.

PMID: [30124337](#)

### **3. Effect of the severity of manual impairment and hand dominance on anticipatory and compensatory postural adjustments during manual reaching in children with cerebral palsy.**

Pavão SL, Pessarelli Visicato L, da Costa CSN, de Campos AC, Rocha NACF.

Res Dev Disabil. 2018 Aug 20;83:47-56. doi: 10.1016/j.ridd.2018.08.007. [Epub ahead of print]

**AIM:** To investigate the role of the severity of manual impairment and of hand dominance on postural sway during anticipatory [APA] and compensatory [CPA] postural adjustments in a seated manual reaching task performed by children with cerebral palsy (CP) and typical children (TC). **METHODS:** We tested 26 TC (mean age  $9.5 \pm 2.1$  years) and 29 children with CP (age  $9.6 \pm 3$  years) classified based on manual impairment levels as mild (Manual Ability Classification System [MACS] I;  $n = 18$ ) or moderate-to-severe (MACS II-III,  $n = 11$ ). Participants were instructed to reach towards a target using their dominant vs. non-dominant arm while sitting on a force-plate. Center of pressure (CoP) sway was analyzed during APA and CPA. **RESULTS:** For all groups, using the non-dominant arm determined greater amplitude and velocity of CoP sway in CPA. Children with moderate-to-severe manual impairment showed greater sway during APA and CPA compared to mild impairment and TC groups. **CONCLUSION:** More severe manual impairment resulted in higher sway during the anticipatory and compensatory phases of the reaching task. Using the non-dominant arm resulted in greater compensatory adjustments during reaching.

PMID: [30138846](#)

### **4. An electromyographic study of abdominal muscle activity in children with spastic cerebral palsy.**

Adjenti SK, Louw G, Jelsma J, Unger M.

S Afr J Physiother. 2017 Oct 20;73(1):341. doi: 10.4102/sajp.v73i1.341. eCollection 2017.

**Background:** Inadequate knowledge in the recruitment patterns of abdominal muscles in individuals with spastic-type cerebral palsy (STCP). **Objectives:** To determine whether there is any difference between the neuromuscular activity (activation pattern) of the abdominal muscles in children with STCP and those of their typically developing (TD) peers. **Method:** The NORAXAN® electromyography (EMG) was used to monitor the neuromuscular activity in abdominal muscles of individuals with STCP ( $n = 63$ ), and the results were compared with the findings from age-matched TD individuals ( $n = 82$ ). **Results:** EMG frequencies were recorded during rest and during active states and compared using repeated measures ANOVA. Spearman's rank order correlation was used to explore relationships between age, body mass index and abdominal muscle activity. With the exception of the rectus abdominis (RA) muscle, the pattern of neuromuscular activity in children with STCP differs significantly from that of their TD peers. Three of the muscles - external oblique abdominis (EO), internal oblique abdominis (IO) and RA - in both groups showed significant changes ( $p < 0.001$ ) in the frequency of EMG activity between the resting and active states. An elevated EMG activity at rest in the EO and IO was recorded in the STCP group, whereas the RA during resting and active stages showed similar results to TD individuals. **Conclusion:** The findings from this study suggest that the RA could be targeted during rehabilitation regimens; however, the force generated by this muscle may not be sufficient for the maintenance of trunk stability without optimal support from the EO and IO muscles.

PMID: [30135898](#)

### **5. Kinematics and postural muscular activity during continuous oscillating platform movement in children and adolescents with cerebral palsy.**

Mills R, Levac D, Sveistrup H.

Gait Posture. 2018 Aug 8;66:13-20. doi: 10.1016/j.gaitpost.2018.08.002. [Epub ahead of print]

**BACKGROUND:** Reactive and anticipatory postural activity has been described in single discrete perturbations in youth with cerebral palsy (CP) but not in continuous perturbation situations. **RESEARCH QUESTION:** We sought to determine how the ability to control postural responses (as reflected in the number of steps taken, postural muscle activity, and marker-pair trajectory cross-correlations) compares between typically developing (TD) youth and age-matched youth with CP when exposed to various frequencies of continuous platform oscillation. We also sought to determine if youth with CP could further modify postural activity based on knowledge of platform movement. **METHODS:** Eleven youth with CP and sixteen TD youth aged 7-17 years stood with eyes open on a movable platform progressively translated antero-posteriorly through four speeds in experimenter-triggered and self-triggered perturbations. Postural muscle activity and 3D kinematics were recorded. The Anchoring Index and marker-pair trajectories were used to quantify body stabilization strategies. Transition states and steady states were analysed. Mann Whitney-U tests analysed between-group differences at each frequency. **RESULTS:** At lower frequencies (0.1 and 0.25 Hz) youth with CP behaved like age-matched TD controls. At higher frequencies (0.5 and 0.61 Hz), youth with CP took a greater number of steps, had a preference for stabilizing their head on the trunk, had low marker-pair correlations with high temporal lag, and showed increased tonic activity compared to their TD peers. **SIGNIFICANCE:** Higher frequency platform movements proved more difficult for youth with CP, however, like TD youth, they shifted from reactive to anticipatory mechanisms when the platform frequency remained constant by taking advantage of knowledge of platform movement. When given control over perturbation onset, further evidence of anticipatory mechanisms was observed following the transition to a new oscillation frequency.

PMID: [30124337](#)

#### **6. The effect of the Majestro-Frost procedure on internal hip rotation during gait in patients with cerebral palsy.**

de Morais Filho MC, Blumetti FC, Kawamura CM, Ferreira CL Júnior, Lopes JAF, Fujino MH, Neves DL.

Gait Posture. 2018 Aug 18;66:32-37. doi: 10.1016/j.gaitpost.2018.08.014. [Epub ahead of print]

**BACKGROUND:** Muscle imbalance is related to persistent internal hip rotation (IHR) after femoral derotation osteotomy (FDO) in cerebral palsy (CP). The aim of this study was to evaluate the effect of the Majestro-Frost soft tissue procedure (MFP), which potentially addresses muscle imbalance, on IHR in CP patients during walking. **METHODS:** A retrospective study of an existing database (medical records and gait laboratory data) was conducted and a search was performed using the following inclusion criteria: (1) diagnosis of spastic CP, (2) GMFCS levels I-III; (3) mean IHR during stance phase higher than 11° at baseline; (4) individuals who received single event multilevel orthopedic surgery in the lower limbs and had three-dimensional gait analyses (3DGA) before and after the intervention. Patients who underwent a FDO were excluded. Eighty-three individuals were considered for the study and they were divided into two groups: No MFP (45 patients who did not receive a MFP) and MFP (36 patients who underwent a MFP). A full clinical examination and 3DGA, with kinematics calculated according to a standard software procedure (Plugin Gait), were performed before and after the intervention, and the results were compared. **RESULTS:** The studied groups matched regarding demographic data and GMFCS distribution. The mean follow-up time was more than 20 months on both groups. The increase of clinical external hip rotation (EHR) on physical examination was observed only in the MFP group (from 26.4° to 33°,  $p = 0.002$ ). During gait analysis, IHR decreased from 21.2° to 4.5° in the MFP group ( $p < 0.001$ ) and from 16.9° to 7.9° in the No MFP group ( $p < 0.001$ ). The reduction of IHR during gait was more significant in the MFP group ( $p = 0.001$ ). **SIGNIFICANCE:** In the present study, patients who underwent a MFP showed more reduction of IHR during gait than those which did not undergo a MFP.

PMID: [30142452](#)

#### **7. Timed up and go test and wearable inertial sensor: Combining tool to assess mobility in a child after orthopedic surgery.**

Fonseca Junior PR, de Moura RCF, Oliveira CS, Politti F.

Gait Posture. 2018 Jul 26. pii: S0966-6362(18)31102-0. doi: 10.1016/j.gaitpost.2018.07.038. [Epub ahead of print]

**PURPOSE:** The objective of this study is to evaluate the gait of a patient with cerebral palsy after orthopedic surgery through a wearable inertial sensor, providing quantitative data on walking parameters, addressing the related changes in the gait pattern of the child after orthopedic surgery. **SUBJECTS AND METHODS:** A case study of a 12 year male child diagnosed with spastic cerebral palsy undergoing a gait analysis by wearable inertial sensor in three different moments: before the surgery, after the surgery and after a physical therapy program. **RESULTS:** The spatio-temporal parameters found in pre-surgical and post-physiotherapeutic was well within normal ranges for their age and sex. The parameters found immediately after the surgical intervention indicate a decrease in gait quality, which is already expected in the postoperative surgical period.

**CONCLUSION:** This study sought to shed a light on the realistic use of the wearable inertial sensor in a clinical setting, and extend the possibility of using portable solutions for gait evaluation in children with CP after orthopedic surgical procedure, providing quantitative data of gait kinematic parameters.

PMID: [30126664](#)

### **8. Functional profiles of children with cerebral palsy in Jordan based on the association between gross motor function and manual ability.**

Almasri NA, Saleh M, Abu-Dahab S, Malkawi SH, Nordmark E.

BMC Pediatr. 2018 Aug 21;18(1):276. doi: 10.1186/s12887-018-1257-x.

**BACKGROUND:** Cerebral palsy (CP) is the most common cause of physical disability in childhood. A major challenge for delivering effective services for children with CP is the heterogeneity of the medical condition. Categorizing children into homogeneous groups based on functional profiles is expected to improve service planning. The aims of this study were to (1) to describe functional profiles of children with CP based on the Gross Motor Function Classification System-Expanded & Revised (GMFCS-E & R) and the Manual Ability Classification System (MACS); and (2) to examine associations and agreements between the GMFCS-E & R and the MACS for all participants then for subgroups based on subtypes of CP and chronological age of children. **METHODS:** A convenience sample of 124 children with CP (mean age 4.5, SD 2.9 years, 56% male) participated in the study. Children were classified into the GMFCS-E & R and the MACS levels by research assistants based on parents input. Research assistants determined the subtypes of CP. **RESULTS:** Thirty six percent of the participants were able to ambulate independently (GMFCS-E & R levels I-II) and 64% were able to handle objects independently (MACS levels I-II). The most common functional profile of children with CP in our study is the "manual abilities better than gross motor function". An overall strong correlation was found between the GMFCS-E & R and the MACS ( $r_s = .73, p < .001$ ), the correlations vary significantly based on subtypes of CP and chronological age of children. A very strong correlation was found in children with spastic quadriplegia ( $r_s = .81, p < .001$ ), moderate with spastic diplegia ( $r_s = .64, p < .001$ ), and weak with spastic hemiplegia ( $r_s = .37, p < .001$ ). **CONCLUSIONS:** The GMFCS- E & R and the MACS provide complementary but distinctive information related to mobility and manual abilities of children with CP. Subtypes of CP and chronological age differentiated functional profiles. Functional abilities of children with CP in Jordan have similar patterns to children with CP in other countries. Functional profiles can inform clinicians, researchers, and policy makers.

PMID: [30131063](#)

### **9. Caregiver knowledge and preferences for gross motor function information in cerebral palsy.**

Bailes AF, Gannotti M, Bellows DM, Shusterman M, Lyman J, Horn SD.

Dev Med Child Neurol. 2018 Aug 21. doi: 10.1111/dmcn.13994. [Epub ahead of print]

**AIM:** To determine caregiver knowledge and preferences for gross motor information and examine differences across Gross Motor Function Classification System (GMFCS) levels. **METHOD:** A questionnaire was developed. Respondents reported GMFCS knowledge, preference for knowledge, and experience with GMFCS and motor curve information. **RESULTS:** In total, 303 caregivers of children with cerebral palsy (CP) (GMFCS level I: 22%; GMFCS level II: 16%; GMFCS level III: 15%; GMFCS level IV: 23%; GMFCS level V: 24%) completed the questionnaire. Forty-five per cent of caregivers knew the GMFCS level at survey, and only 31% knew how their child's motor development compared with others of similar age and level. Caregiver education level was associated with knowledge ( $p < 0.001$ ). Most prefer discussing motor development with a therapist. Of caregivers who knew their child's GMFCS level at survey, 83% reported it would be helpful to revisit the topic over time. Compared with GMFCS level IV and V, caregivers of children in GMFCS levels I to III preferred to learn at the same time as CP diagnosis, ( $p = 0.04$ ) and were more likely to report having received visual aids ( $p = 0.04$ ). Caregivers of children in GMFCS levels IV and V found it more difficult to learn their child's level ( $p < 0.001$ ) versus those caring for children of GMFCS levels I to III, and reported seeing pictures with descriptions more informative ( $p = 0.03$ ). **INTERPRETATION:** Caregivers of children with CP may not know GMFCS and motor curve information, and vary in experience and preferences for this information. **WHAT THIS PAPER ADDS:** Fewer than half of caregivers of children with cerebral palsy (CP) know their child's Gross Motor Function Classification System level. Most want to know how their child's function compares to other children with CP. The majority of caregivers would like to revisit the topic over time. Caregivers want to discuss gross motor information with the therapist and doctor.

PMID: [30132848](#)

### 10. Measuring the Reliability and Construct Validity of the Pediatric Evaluation of Disability Inventory - Computer Adaptive Test (PEDI-CAT) in Children with Cerebral Palsy.

Shore BJ, Allar BG, Miller PE, Matheny TH, Snyder BD, Pinkham MF.

Arch Phys Med Rehabil. 2018 Aug 18. pii: S0003-9993(18)30934-1. doi: 10.1016/j.apmr.2018.07.427. [Epub ahead of print]

**OBJECTIVE:** The purpose of this study was to (1) investigate the construct validity and (2) test-retest reliability of the Pediatric Evaluation of Disability Inventory - Computer Adaptive Test (PEDI-CAT) in children with cerebral palsy (CP). **DESIGN:** A prospective convenience cross-sectional sample **SETTING:** Multidisciplinary CP clinic in a tertiary level pediatric children's hospital **PARTICIPANTS:** One hundred and one, English and Spanish speaking school aged children with a diagnosis of CP, stratified by Gross Motor Function Classification System level, who presented to our multidisciplinary clinic. Participants were excluded if they underwent recent surgery (<6months) or Botulinum Neurotoxin A injection (<3months). A subset of seventeen families participated in retest reliability. **MAIN OUTCOME MEASURES:** Convergent and divergent validity were evaluated using Spearman's correlation analysis; test-retest reliability was assessed using intraclass correlation coefficients (ICC). **RESULTS:** Mean age was 12 years (SD=3.7). Convergent validity was established between Mobility (PEDI-CAT) and Functional Mobility Scale (FMS) (5m,  $r=0.85$ ; 50m,  $r=0.84$ ; 500m,  $r=0.76$ ;  $p<0.001$ ). In ambulant children, convergent validity was established between Daily Activities (PEDI-CAT versus Pediatric Quality of Life CP (PedsQL-CP) ( $r=0.85$ ,  $p<0.001$ ) and between Social/Cognitive (PEDI-CAT) and Speech and Communication (PedsQL-CP) ( $r=0.42$ ;  $p<0.001$ ). In non-ambulant children, convergent validity was established between Daily Activities (PEDI-CAT) and Personal Care [Caregiver's Priority and Child Health Index of Life with Disabilities - (CPCHILDTM)] ( $r=0.44$ ,  $p<0.001$ ) and between Social/Cognitive (PEDI-CAT) and Communication (CPCHILDTM) ( $r=0.64$ ;  $p<0.001$ ). A lack of correlation between Daily Activities, Social/Cognitive, and Responsibility (PEDI-CAT) and FMS and between the Mobility (PEDI-CAT) and Communication (PedsQL) domains confirmed divergent validity. Test-retest reliability was excellent for all domains of the PEDI-CAT (ICC=0.96-0.99). **CONCLUSIONS:** The PEDI-CAT is an outcome measure which demonstrates strong construct validity and reliability in children with CP.

PMID: [30130519](#)

### 11. Psychometric properties of the brief pain inventory modified for proxy report of pain interference in children with cerebral palsy with and without cognitive impairment.

Barney CC, Stibb SM, Merbler AM, Summers RLS, Deshpande S, Krach LE, Symons FJ.

Pain Rep. 2018 Jul 17;3(4):e666. doi: 10.1097/PR9.0000000000000666. eCollection 2018 Jul-Aug.

**Introduction:** Cerebral palsy (CP) is the most common cause of physical disability in children and is often associated with secondary musculoskeletal pain. Cerebral palsy is a heterogeneous condition with wide variability in motor and cognitive capacities. Although pain scales exist, there remains a need for a validated chronic pain assessment tool with high clinical utility for use across such a heterogeneous patient population with and without cognitive impairment. **Objectives:** The purpose of this study was an initial assessment of several psychometric properties of the 12-item modified brief pain inventory (BPI) pain interference subscale as a proxy-report tool in a heterogeneous sample of children with CP with and without cognitive impairment. **Methods:** Participants ( $n = 167$ ; 47% male; mean age = 9.1 years) had pain assessments completed through caregiver report in clinic before spasticity treatment (for a subgroup, the modified BPI was repeated after procedure). To measure concurrent validity, we obtained pain intensity ratings (Numeric Rating Scale of pain) and pain intensity, duration, and frequency scores (Dalhousie Pain Interview). **Results:** Modified BPI scores were internally consistent (Cronbach  $\alpha = 0.96$ ) and correlated significantly with Numeric Rating Scale intensity scores ( $r_s = 0.67$ ,  $P < 0.001$ ), Dalhousie Pain Interview pain intensity ( $r_s = 0.65$ ,  $P < 0.001$ ), pain frequency ( $r_s = 0.56$ ,  $P = 0.02$ ), and pain duration scores ( $r_s = 0.42$ ,  $P = 0.006$ ). Modified BPI scores also significantly decreased after spasticity treatment (pretest [scored 0-10;  $3.27 \pm 2.84$ ], posttest [ $2.27 \pm 2.68$ ];  $t(26) = 2.14$ , 95% confidence interval [0.04-1.95],  $P = 0.04$ ). **Conclusion:** Overall, the modified BPI produced scores with strong internal consistency and that had concurrent validity as a proxy-report tool for children with CP.

PMID: [30123858](#)

### 12. [Effect of acupuncture at proximal and distal acupoints combined with neuromuscular electrical stimulation on children with cerebral palsy salivation].

Gao S, Gao D, Su N, Zeng C, Zhou Q, Lin J.

Zhongguo Zhen Jiu. 2018 Aug 12;38(8):825-30. doi: 10.13703/j.0255-2930.2018.08.008. [Article in Chinese]

**OBJECTIVE:** To explore the effect of acupuncture at the proximal and distal acupoints combined with neuromuscular electrical stimulation (NMES) for the children with cerebral palsy salivation on the basis of oral function training. **METHODS:** A total of 124 children were randomized into an observation group and a control group, 62 cases in each one. Oral function training (30 min a time) and NMES (20 min a time) were used in the two groups. Acupuncture was applied after NMES in the observation group. The main acupoints were Baihui (GV 20), Sishencong (EX-HN 1), Speech Area, Dicang (ST 4), Jiache (ST 6), Hegu (LI 4), Zusanli (ST 36), etc. Scalp acupuncture was for 1 h, and body acupuncture was for 30 min. Pricking blood was used at Jinjin (EX-HN 12) and Yuye (EX-HN 13) for the patients of V in teacher salivation grading (TDS). All the treatment was given for 3 courses, 30 days as a course, 5 times a week, once a day. TDS, safety, dysphagia and Gesell development scale were assessed before and after treatment. **RESULTS:** After treatment, the total effective rate of TDS in the observation group was 83.9% (52/62), which was better than 58.1% (36/62) in the control group ( $P<0.05$ ). The total effective rate of dysphasia in the observation group was 88.7% (55/62), which was better than 69.4% (43/62) in the control group ( $P<0.05$ ). The lip and tongue movement, chewing and swallowing after treatment in the observation group were superior to those in the control group (all  $P<0.05$ ). After treatment, the Gesell development scale of adaptability, language behavior and personal social development quotient were better compared with those before treatment in the observation group (all  $P<0.05$ ); the language behavior improved after treatment in the control group ( $P<0.05$ ). The adaptability, language behavior and personal social development quotient after treatment in the observation group were superior to those in the control group ( $P<0.05$ ,  $P<0.01$ ). The adverse reactions in the observation group were less than those in the control group. **CONCLUSION:** Acupuncture at the proximal and distal acupoints combined with NMES are better than simple NMES for children with cerebral palsy salivation. The methods could not only improve children's behavior cognitive ability, but also improve the sensation and motor coordination of the lip, tongue, pharynx, etc. As a result, the salivation and swallowing function improve.

PMID: [30141292](#)

### 13. [A complex sanatorium-resort rehabilitation of patients with cerebral palsy with spastic diplegia].

Vlasenko SV, Golubova TF, Marusich II, Larina NV, Ponomarenko EN.

Zh Nevrol Psikhiatr Im S S Korsakova. 2018;118(7):40-44. doi: 10.17116/jnevro20181187140. [Article in Russian; Abstract available in Russian from the publisher]

**AIM:** To study an influence of combined methods of rehabilitation for recovery of motor functions in patients with cerebral palsy with spastic diplegia (CPSD). **MATERIAL AND METHODS:** Seventy-six patients with CPSD, aged from 14 to 19 years (mean age  $18.7\pm 4.63$  years), were under observation. A comprehensive clinical and instrumental examination was conducted. Patients of the main group received a course of underwater spinal traction with the introduction of the drug cellex along with Spa treatment. Patients of the comparison group received only Spa treatment. **RESULTS AND CONCLUSION:** Signs of involvement of segmental structures of the nervous system in the pathological process and their role in the formation of motion pathology are established. It is shown that the inclusion of underwater traction according to the original technique and simultaneous introduction of cellex in the complex of rehabilitation measures allows to achieve a pronounced positive dynamics in the form of expansion of motor capabilities of patients with cerebral palsy. There was a significant decrease in spastic muscle tone, restoration of the volume of movements in the joints, improved walking. Positive clinical dynamics was correlated with EMG data.

PMID: [30132455](#)

### 14. [The efficacy of cellex combined with sanatorium-based rehabilitation scheme in patients with cerebral palsy].

Golubova TF, Vlasenko SV, Larina NV, Kafanova KA.

Zh Nevrol Psikhiatr Im S S Korsakova. 2018;118(7):35-39. doi: 10.17116/jnevro20181187135. [Article in Russian; Abstract available in Russian from the publisher]

**AIM:** To study the efficacy of the drug cellex combined with sanatorium treatment in the rehabilitation of patients with cerebral palsy. **MATERIAL AND METHODS:** The study included 59 patients, mean age  $17.06\pm 0.7$  years, with spastic form of cerebral palsy who were administered a course of sanatorium-spa treatment in a specialized spa-resort. All patients underwent complex clinical and neurological examinations and electroencephalography. The main group ( $n=23$ ) received cellex (a course of 10 injections) in addition to traditional treatment. **RESULTS AND CONCLUSION:** The efficacy of treatment assessed by the level of hand functioning and cognitive abilities was higher in the main group compared to the patients of control and comparison groups. Besides, the higher academic performance and positive dynamics of EEG (higher alpha rhythm amplitudes and decreased activity of pathological rhythms) were observed.

PMID: [30132454](#)

### 15. University of the Witwatersrand physiotherapy undergraduate curriculum alignment to medical conditions of patients within Gauteng state health facilities.

Ntsiea MV, Mudzi W, Comley-White N, Van Aswegen H, Olivier B, Roos R, Pilusa S, Potterton J, Myezwa H, Benjamin N, Naidoo V.

S Afr J Physiother. 2017 Jun 29;73(1):362. doi: 10.4102/sajp.v73i1.362. eCollection 2017.

**Background:** The healthcare sector requires graduates with the ability to confidently assess and manage the majority of the medical conditions seen in hospitals. **Objective:** To establish whether the most prevalent medical conditions treated by physiotherapists in Gauteng (South Africa) state health facilities align with the University of the Witwatersrand (Wits) physiotherapy curriculum. **Methods:** This was a retrospective review of condition-related statistics from physiotherapy departments within the Gauteng province state health facilities. Data from all Gauteng government hospitals that had submitted at least 75% of their physiotherapy condition-related statistics to the provincial statistics coordinator from January 2012 to December 2014 were considered and compared to medical conditions covered in the Wits 2015 physiotherapy curriculum to check if all conditions listed in the Gauteng statistics appeared within the Wits curriculum document. The number of teaching hours for the common conditions was noted to check the emphasis given to these conditions in the curriculum. **Results:** Eighty-three per cent of the hospitals submitted 75% of their monthly statistics. Overall, the most common conditions treated were lower limb fractures (13%) followed by stroke (7.6%) (n = 705 597). Within the neuro-musculoskeletal category, the most common conditions after lower limb fractures were soft tissue injuries (15.1%) (n = 330 511). The most common cardiopulmonary conditions were tuberculosis (24.9%), followed by pneumonia (13.8%) (n = 94 895). The most common neurological conditions were stroke (30.9%) followed by cerebral palsy (17%) (n = 174 024). Within the non-specified categories, the number of intensive care unit (ICU) patients was the highest (23%), followed by sputum induction (21%) (n = 138 187). The most common conditions that were emphasised within the Wits curriculum as indicated by the teaching hours: fractures, 14.5 (66%) of 22 third-year orthopaedics hours; stroke, 30 (73%) of 41 third-year neurology hours; soft tissue injuries, 18 (38%) of 48 fourth-year neuro-musculoskeletal hours; back lesions, 24 (50%) of 48 fourth-year neuro-musculoskeletal hours; and ICU patients, 30 (79%) of 38 fourth-year cardiopulmonary hours. **Conclusion:** The Wits physiotherapy curriculum covers all medical conditions treated by physiotherapists within the Gauteng state health facilities, and overall, the curriculum prepares the students to practise in a variety of situations.

PMID: [30135907](#)

### 16. Setting a patient-centered research agenda for cerebral palsy: a participatory action research initiative.

Gross PH, Bailes AF, Horn SD, Hurvitz EA, Kean J, Shusterman M; cerebral palsy research network.

Dev Med Child Neurol. 2018 Aug 21. doi: 10.1111/dmcn.13984. [Epub ahead of print]

**AIM:** To establish a patient-centered research agenda for cerebral palsy (CP). **METHOD:** We engaged a large cross-section of the extended community of people living with CP and those providing healthcare to people with CP ('the community') in an educational series and collaborative survey platform to establish an initial list of prioritized research ideas. After online workshops, a facilitated Delphi process was used to select the 20 highest priorities. Select participants attended an in-person workshop to provide comment and work toward consensus of research priorities. **RESULTS:** A research agenda for CP was developed by the community, which included consumers, clinicians, and researchers interested in advancing the established research agenda. The results included the top 16 research concepts produced by the process to shape and steward the research agenda, and an engaged cross-section of the community. **INTERPRETATION:** It has been shown that proactively engaging consumers with clinical researchers may provide more meaningful research for the community. This study suggests that future research should have more focus on interventions and outcomes across the lifespan with increased emphasis on the following outcome measures: function, quality of life, and participation. **WHAT THIS PAPER ADDS:** A patient-centered research agenda for cerebral palsy was established. Comparative effectiveness of interventions, physical activity, and understanding ageing were leading themes. Longitudinal studies across the lifespan, clinical spectrum, and ages were highly ranked. Participants reported high value for participation outcomes. Participants reported great appreciation for the engagement between consumers and clinician researchers.

PMID: [30132826](#)

### 17. Challenges experienced by mothers caring for children with cerebral palsy in Zambia.

Singogo C, Mweshi M, Rhoda A.

S Afr J Physiother. 2015 Nov 10;71(1):274. doi: 10.4102/sajp.v71i1.274. eCollection 2015.

**Background:** Mothers caring for children with disability experience a number of challenges. **Aim:** The aim of the study was to explore the challenges that mothers who cared for children with cerebral palsy (CP) living in Zambia experienced. **Methods:** During a qualitative study the experiences of 16 conveniently sampled mothers of children with CP, from the Ndola district in Zambia, were explored by means of interviews. The responses were thematically analysed. All the necessary ethical considerations were upheld. **Results:** Mothers experienced social isolation and marital problems, as well as negative attitudes from family, friends, community members and health care professionals. The physical environment created access challenges because of a lack of sidewalks, ramps, functioning lifts and small indoor spaces. **Conclusion:** Mothers of children with CP feel socially isolated owing to a lack of support from family, community members, and health care providers. This social isolation was exacerbated by attitudes of others towards the mothers; it was felt that mothers were responsible for their children's condition. Mothers also experienced marital problems as a result of having a child with CP.

PMID: [30135879](#)

### **18. Factors associated with health-related quality of life 6 years after ICU discharge in a Finnish paediatric population: a cohort study.**

Kyösti E, Ala-Kokko TI, Ohtonen P, Peltoniemi O, Rautiainen P, Kataja J, Ebeling H, Liisanantti JH.

Intensive Care Med. 2018 Aug 22. doi: 10.1007/s00134-018-5296-4. [Epub ahead of print]

**PURPOSE:** Long-term data are urgently needed in children after intensive care. The aim of this study was to measure health-related quality of life 6 years after intensive care in a paediatric intensive care population. **METHODS:** This national, multicentre study enrolled all children and young people admitted to intensive care units (ICUs) in Finland in 2009 and 2010. The data concerning ICU stay were collected retrospectively from the ICU data registries and combined with prospective data from Paediatric Quality of Life Inventory (PedsQL 4.0) questionnaires, the generic 15D, 16D or 17D instrument, and data regarding children's chronic diagnoses and need for healthcare support. **RESULTS:** The questionnaires were answered by 1109 of 3682 living children and adolescents admitted to an ICU, response rate was 30.1%. Among the responders, 90 children (8.4%) had poor (under - 2 SD) PedsQL scores. Children with low scores had a higher rate of chronic diagnoses (94.4% vs. 47.6%), medication on a daily basis (78.7% vs. 29.4%) and a greater need for healthcare services (97.7% vs. 82.2%) than those with normal scores. Diagnoses associated with poor quality of life were asthma, epilepsy, cerebral palsy and other neurological diseases, chromosomal alterations, cancer and long-term pain. These children were mostly admitted electively, and less frequently on an emergency basis, but no other significant differences were found during the intensive care stay. **CONCLUSIONS:** The long-term quality of life after paediatric intensive care is good for the majority of children and young people, and it is dependent on the number of chronic diagnoses and the burden of the chronic disease, especially neurological diseases.

PMID: [30136138](#)

### **19. Incidence of neonatal seizures, perinatal risk factors for epilepsy and mortality after neonatal seizures in the province of Parma, Italy.**

Pisani F, Facini C, Bianchi E, Giussani G, Piccolo B, Beghi E.

Epilepsia. 2018 Aug 22. doi: 10.1111/epi.14537. [Epub ahead of print]

**OBJECTIVE:** Information about the incidence of neonatal seizures (NS) is scarce. Previous studies relied primarily on a clinical diagnosis of seizures. This population-based, retrospective study evaluated the incidence of electroencephalography (EEG)-confirmed seizures in neonates born in the province of Parma and the perinatal risk factors for mortality and epilepsy. **METHODS:** All neonates with suspected seizures or with medical conditions at high risk for seizures from the study area were recorded in the neonatal intensive care unit (NICU) of the Parma University Hospital. NS were EEG confirmed. Perinatal risk factors for mortality and epilepsy after NS were evaluated with Cox's proportional hazards models. **RESULTS:** In a 13-year period, 112 patients presented with NS: 102 newborns had electroclinical seizures (46 full-term and 56 preterm), whereas 10 presented only electrical seizures. The incidence was 2.29/1000 live births (95% confidence interval [CI] 1.87-2.72), with higher rates in preterm neonates (14.28/1000 in preterm vs 1.10/1000 in full-term infants). The incidence increased with decreasing gestational age (31-36 weeks of gestation: 5.01/1000, 28-30: 54.9/1000, and <28: 85.6/1000) and with decreasing birth weight ( $\geq 2500$  g: 1.19/1000, <1000 g: 127.57/1000). Twenty-eight patients (25%) died, 16 (14.3%) had a diagnosis of epilepsy, 33 (29.5%) had cerebral palsy, and 39 (34.8%) had a developmental delay. Among the perinatal risk factors considered, the multivariate analysis showed an association between a 5-minute Apgar score of 0-7 and etiology with increased mortality and between female gender and status epilepticus with epilepsy. **SIGNIFICANCE:** The incidence of NS is inversely associated with gestational age and birth weight. The etiology and a low Apgar score are strongly related to mortality; female gender and status epilepticus are risk factors for the development of epilepsy.

PMID: [30132843](#)

**20. Prospective study of early and late outcomes of extremely low birthweight in Central Saudi Arabia.**

Abolfotouh MA, Al Saif S, Altwaijri WA, Al Rowaily MA.

BMC Pediatr. 2018 Aug 22;18(1):280. doi: 10.1186/s12887-018-1248-y.

**BACKGROUND:** Survival of preterm neonates has steadily improved over the past five decades, due to changes in the neonatal intensive care. However, in Saudi Arabia, there are no written guidelines on the definition of the lower limit of viability, and there has been a call for such a limit. The aims of this study were: (1) to determine lower limits of viability and survival in extremely low birthweight (ELBW) infants, and (2) to determine incidence of neurodevelopmental and cognitive abnormalities within 3-6 years after birth. **METHODS:** Prospective study of all live inborn ELBW infants admitted to the neonatal unit of King Abdulaziz Medical City, Riyadh, Saudi Arabia, within 3 years [between January 1st, 2005 and December 31st, 2007] was conducted (n = 117). Data were collected on demographic and birth data, neonatal complications & interventions and death on discharge. Prospective follow up of all survivors was done, within 6 years after birth, to assess the outcome in terms of neurodevelopmental and cognitive abnormalities. Predictors of survival were determined using logistic regression model. Significance was considered at p-value  $\leq 0.05$ . **RESULTS:** Of all ELBW infants, 41% died before discharge. Survival rate was directly correlated with gestational age (GA) and birthweight (p < 0.05). The 50% limits of viability were those at 25 weeks' gestation or with > 600 g. After adjusting for possible confounders, significant predictors of survival were birthweight (p = 0.001) and Apgar score (p < 0.001). The following impairments were reported during follow up of survivors: developmental delay (39.2%), cerebral palsy (36.2%), speech problems (33.3%), wasting (12.5%), intellectual disability (10%), visual problems (6.6%) and hyperactivity (5.6%). **CONCLUSION:** More than one-third of ELBW died before discharge from NICU, and two-thirds of survivors had one or more neurodevelopmental and/or cognitive abnormalities during their first 6 years of life. The 50% limits of viability of ELBW infants were those at week 25 of gestation or with a birthweight of more than 600 g. Birthweight could be considered as more valid than gestational age in the prediction of viability of ELBW infants. The process of care of ELBW infants in Saudi Arabia may need to be revisited taking these findings into consideration.

PMID: [30134865](#)**21. Magnetic Resonance Imaging of Cerebral Palsy in the Assessment of Time of Brain Insult.**

Ara R, Islam MS, Rahman M, Begum M, Jahan F, Hosneara M, Farzana MN, Islam MS, Ara R, Bhuiyan MA, Hossain GA, Khan N, Chakraborty RK, Rima SZ, Nahar N, Dowel FA, Islam MA, Akther S, Mohammed N.

Mymensingh Med J. 2018 Jul;27(3):453-460.

The aim of this cross-sectional study was to find out the role of Magnetic resonance imaging (MRI) in the assessment of time of brain insult in cerebral palsy (CP). The study was conducted in the Department of Radiology & Imaging, Mymensingh Medical College Hospital, Mymensingh and a total number of 35 patients with were enrolled from January 2015 to December 2016. Maximum patients (57.2%) were under five years followed by 34.3% were of 5 to <8 years and 8.7% were of 8 to <12 years of age and mean age was 4.7 years. Majority of the patients were male 28(80%) and female were 7(20%). Among the patients 23(65.7%) came from poor, whereas 11(31.4%) came from middle class and only one (2.9%) from rich socioeconomic group. According to gestational age of the patients, 26(74.3%) were term ( $\geq 37$ weeks) at delivery and rest (25.7%) were preterm (<37 weeks). Delayed cry after birth were present in 32 (80%) patients. Regarding types of cerebral palsy spastic diplegia, spastic quadriplegia, hemiplegia and extrapyramidal were found 3(8.6%), 25(71.4%), 4(11.4%) and 3(8.6%) respectively. Abnormal MRI was reported in 94.2% patients and gave clues to time of insult in 79.9% (excluding the 14.3% miscellaneous findings). The findings were mal-developments (5.7%), periventricular white matter lesions (25.7%), cortical or deep grey matter lesions (48.6%), miscellaneous (14.3%) and normal (5.7%). Brain mal-developments were more seen in term than in preterm born children (5% vs. 0%). Periventricular white matter lesions were seen significantly more in preterm than in term born children (77.8% vs. 3.9%). Cortical or deep grey matter lesions occurred significantly more in term than in preterm born children (60% vs. 20%). Based on the study it can be concluded that Magnetic Resonance Imaging (MRI) can help in the assessment of time of insult to the developing brain in cerebral palsy (CP).

PMID: [30141431](#)**22. Artificial intelligence and cerebral palsy.**

Dan B.

Dev Med Child Neurol. 2018 Sep;60(9):850. doi: 10.1111/dmcn.13942.

PMID: [30133720](#)

**23. A genomic cause of cerebral palsy should not change the clinical classification.**

MacLennan A, Gecz J, Pérez-Jurado L.

Ann Clin Transl Neurol. 2018 Jun 22;5(8):1011. doi: 10.1002/acn3.591. eCollection 2018 Aug.

PMID: [30128326](#)**24. Reply to: A genomic cause of cerebral palsy should not change the clinical classification.**

Takezawa Y, Kikuchi A, Haginoya K, Kure S.

Ann Clin Transl Neurol. 2018 Jun 22;5(8):1012. doi: 10.1002/acn3.585. eCollection 2018 Aug.

PMID: [30128327](#)**25. Patterns of ischemic injury on brain images in neonatal group B Streptococcal meningitis.**

Choi SY, Kim JW, Ko JW, Lee YS, Chang YP.

Korean J Pediatr. 2018 Aug;61(8):245-252. doi: 10.3345/kjp.2018.61.8.245. Epub 2018 Aug 15.

**PURPOSE:** This study investigated patterns of ischemic injury observed in brain images from patients with neonatal group B Streptococcal (GBS) meningitis. **METHODS:** Clinical findings and brain images from eight term or near-term newborn infants with GBS meningitis were reviewed. **RESULTS:** GBS meningitis was confirmed in all 8 infants via cerebrospinal fluid (CSF) analysis, and patients tested positive for GBS in both blood and CSF cultures. Six infants (75.0%) showed early onset manifestation of the disease (<7 days); the remaining 2 (25.0%) showed late onset manifestation. In 6 infants (75%), cranial ultrasonography showed focal or diffuse echogenicity, suggesting hypoxic-ischemic injury in the basal ganglia, cerebral hemispheres, and periventricular or subcortical white matter; these findings are compatible with meningitis. Findings from magnetic resonance imaging (MRI) were compatible with bacterial meningitis, showing prominent leptomeningeal enhancement, a widening echogenic interhemisphere, and ventricular wall thickening in all infants. Restrictive ischemic lesions observed through diffusion-weighted imaging were evident in all eight infants. Patterns of ischemic injury as detected through MRI were subdivided into 3 groups: 3 infants (37.5%) predominantly showed multiple punctuate lesions in the basal ganglia, 2 infants (25.0%) showed focal or diffuse cerebral infarcts, and 3 infants (37.5%) predominantly showed focal subcortical or periventricular white matter lesions. Four infants (50%) showed significant developmental delay or cerebral palsy. **CONCLUSION:** Certain patterns of ischemic injury are commonly recognized in brain images from patients with neonatal GBS meningitis, and this ischemic complication may modify disease processes and contribute to poor neurologic outcomes.

PMID: [30130950](#)**26. A Model of Perinatal Ischemic Stroke in the Rat: 20 Years Already and What Lessons?**

Charriaut-Marlangue C, Baud O.

Front Neurol. 2018 Aug 7;9:650. doi: 10.3389/fneur.2018.00650. eCollection 2018.

Neonatal hypoxia-ischemia (HI) and ischemia are a common cause of neonatal brain injury resulting in cerebral palsy with subsequent learning disabilities and epilepsy. Recent data suggest a higher incidence of focal ischemia-reperfusion located in the middle cerebral artery (MCA) territory in near-term and newborn babies. Pre-clinical studies in the field of cerebral palsy research used, and still today, the classical HI model in the P7 rat originally described by Rice et al. (1). At the end of the 90s, we designed a new model of focal ischemia in the P7 rat to explore the short and long-term pathophysiology of neonatal arterial ischemic stroke, particularly the phenomenon of reperfusion injury and its sequelae (reported in 1998). Cerebral blood-flow and cell death/damage correlates have been fully characterized. Pharmacologic manipulations have been applied to the model to test therapeutic targets. The model has proven useful for the study of seizure occurrence, a clinical hallmark for neonatal ischemia in babies. Main pre-clinical findings obtained within these 20 last years are discussed associated to clinical pattern of neonatal brain damage.

PMID: [30131764](#)

**27. Perinatal stroke: mechanisms, management, and outcomes of early cerebrovascular brain injury.**

Dunbar M, Kirton A.

Lancet Child Adolesc Health. 2018 Sep;2(9):666-676. doi: 10.1016/S2352-4642(18)30173-1. Epub 2018 Jul 27.

Perinatal stroke encompasses a heterogeneous group of focal neurological injuries early in brain development that probably affects more than 5 million people worldwide. Many such injuries are symptomatic in the first days of life, including neonatal arterial ischaemic stroke, cerebral sinovenous thrombosis, and neonatal haemorrhagic stroke. The remaining focal neurological injuries usually present later in the first year with motor asymmetry, such as arterial presumed perinatal ischaemic stroke, periventricular venous infarction, and presumed perinatal haemorrhagic stroke. The numerous sequelae of these injuries include hemiparesis (cerebral palsy), epilepsy, and cognitive, language, and behavioural challenges. In this Review we summarise each perinatal stroke disease, examining the epidemiology, pathophysiology, acute management, and outcomes, including the effect on parents and families, and emerging therapies to mitigate these lifelong morbidities.

PMID: [30119760](#)**28. Respiratory tract infections in children with tracheostomy.**

Tan CY, Chiu NC, Lee KS, Chi H, Huang FY, Huang DT, Chang L, Kung YH, Huang CY.

J Microbiol Immunol Infect. 2018 Aug 9. pii: S1684-1182(18)30284-6. doi: 10.1016/j.jmii.2018.07.002. [Epub ahead of print]

**BACKGROUND:** Children with tracheostomy are at increased risk for respiratory tract infections, yet the risk involved in tracheostomy related infections is unclear. **METHODS:** We conducted a retrospective review of the medical records of children who underwent tracheostomy between January 2002 and December 2016 at a teaching hospital in Taipei. Demographics, underlying disease, indication for tracheostomy, laboratory data and management, and long-term outcome data were collected. Infection episodes were grouped into definite, possible, non-bacterial pneumonia, and local infection groups. **RESULTS:** Ninety patients were enrolled. Forty-two (46.7%) patients had infections that required hospitalization. Definite bacterial pneumonia accounted for 12 (8.5%) episodes, 113 episodes (80.1%) were possible bacterial pneumonia, 12 (8.5%) were non-bacterial pneumonia, and 4 (2.8%) were local infections. Patients with definite and possible bacterial pneumonia were found to have a longer hospital duration than patients with non-bacterial pneumonia ( $p=0.024$ ), with mean hospitalization stays of  $8.83\pm 5.59$  days and  $5.67\pm 2.55$  days, respectively. The median duration from tracheostomy to bacterial pneumonia was 1.78 years (range, 0.04- 11.38) whereas for the non-bacterial pneumonia group it was 0.57 years (range, 0.04-6.61). Cerebral palsy (CP) (adjusted odds ratio [AOR] 3.65; 95% confidence interval [CI]: 1.11-11.99;  $p=0.033$ ) and gastroesophageal reflux disease (GERD) (AOR 2.84; 95% CI: 1.09-7.38;  $p=0.033$ ) were independently associated with respiratory tract infections in these children. **CONCLUSION:** In this study, CP and GERD were associated with infections in children with tracheostomy. Bacterial and non-bacterial pneumonia are difficult to differentiate clinically which may lead to unnecessary antibiotics use.

PMID: [30131258](#)**29. Asymptomatic dysphagia causing recurrent aspiration pneumonia.**

Løkke A, Dongo LC, Aksglæde KB, Hilberg O.

BMJ Case Rep. 2018 Aug 20;2018. pii: bcr-2018-224370. doi: 10.1136/bcr-2018-224370.

52-year-old male patient with known bipolar disorder and innate cerebral palsy causing widespread spasticity problems. Treated for 2 years with antidepressants and electroconvulsive therapy. He repeatedly presented with-and was treated for-pneumonia resulting in more than 20 episodes of hospital admission. He underwent numerous examinations until a diagnosis of dysphagia was established using video fluoroscopic swallowing examination (modified barium swallow). Eventually, as all other treatment regimens had proven effortless, percutaneous gastrostomy feeding tube was inserted and intensive training with a specialised occupational therapist was started. This treatment regimen caused the recurrent episodes of pneumonia to vanish. It is important to acknowledge that otherwise silent dysphagia may cause recurrent pneumonia.

PMID: [30131410](#)

**30. Respiratory health service utilization of children with neuromuscular disease.**

Rose L, McKim D, Leasa D, Nonoyama M, Tandon A, Bai YQ, Goldstein R, Amin R, Katz S, Gershon A.

Pediatr Pulmonol. 2018 Aug 21. doi: 10.1002/ppul.24145. [Epub ahead of print]

**OBJECTIVES:** To quantify health service utilization including assessment, monitoring, and treatment of respiratory complications of children with neuromuscular disease (NMD), identifying practice variation and adherence to guideline recommendations at a population level. **METHODS:** North American population-based cohort study (2003-2015) of children with NMD using hospital diagnostic and physician billing codes within health administrative databases. **RESULTS:** We identified 18 163 children with NMD. Mean (SD) age was 7.8 (5.6) years with 40%  $\leq 5$ ; 45% were female. Most common diagnoses were cerebral palsy (50%) and spina bifida (16%); 8% had muscular dystrophy. From fiscal years 2003-2014, 15 600 (86%) children went to an emergency department on average 3.5 times every 3 years; 6575 (36%) for respiratory reasons. 8788 (48%) were admitted to hospital with 2190 (12%) for respiratory reasons and 2451 (13%) required intensive care. Respiratory specialist outpatient visits occurred for 2226 (12%) children on average 6.5 visits every 3 years; 723 (4%) had in-hospital respiratory specialist consultation. Pulmonary function testing was conducted in 3194 (18%) children on average 2.4 times every 3 years; sleep studies in 1389 (8%). **CONCLUSION:** In this population-based study of children with NMD, healthcare utilization for respiratory complications was considerable. Frequency of respiratory specialist consultation, monitoring of respiratory function and sleep disordered breathing was variable but on average reflected professional society recommendations. Children with NMD are frequent ED users suggesting a need to improve community and social supports. We did not detect reduced access to respiratory monitoring or specialist consultation in adolescents transitioning to adult services.

PMID: [30129703](#)**31. Fetal vascular malperfusion, an update.**

Redline RW, Ravishankar S.

APMIS. 2018 Jul;126(7):561-569. doi: 10.1111/apm.12849.

Fetal vascular malperfusion is the most recent term applied to a group of placental lesions indicating reduced or absent perfusion of the villous parenchyma by the fetus. The most common etiology of malperfusion is umbilical cord obstruction leading to stasis, ischemia, and in some cases thrombosis. Other contributing factors may include maternal diabetes, fetal cardiac insufficiency or hyperviscosity, and inherited or acquired thrombophilias. Severe or high grade fetal vascular malperfusion is an important risk factor for adverse pregnancy outcomes including fetal growth restriction, fetal CNS injury, and stillbirth. Overall recurrence risk for subsequent pregnancies is low.

PMID: [30129125](#)

## Prevention and Cure

**32. The structure and utility of the placental pathology report.**

Turowski G, Tony Parks W, Arbuckle S, Jacobsen AF, Heazell A.

APMIS. 2018 Jul;126(7):638-646. doi: 10.1111/apm.12842.

The placenta is one of the most exciting organs. It is dynamic; its morphology and function continuously develop and adjust over its brief life span. It mediates the physiology of two distinct yet highly interconnected individuals. The pathology that develops in the placenta, and the adaptations the placenta undergoes to mitigate this pathology, may influence the later life health of the mother and baby (Circ Res, 116, 2015, 715; Hum Reprod Update, 17, 2011, 397; Nutr Rev 71, 2013, S88; Placenta, 36, 2015, S20). Pathological placenta examination may reveal macroscopic and microscopic patterns that provide valuable information to the obstetricians, neonatologists, and pediatricians caring for the family. The placenta often plays a key role in understanding adverse fetal outcomes such as hypoxic brain injury, cerebral palsy, fetal growth restriction, stillbirth, and neonatal death (Placenta, 35, 2014, 552; Placenta, 52, 2017, 58; Placenta, 30, 2009, 700; Obstet Gynecol, 114, 2009, 809; Clin Perinatol, 33, 2006, 503; Pediatr Dev Pathol, 11, 2008, 456; Arch Pathol Lab Med, 124, 2000, 1785). Moreover, it may help to

understand the pathophysiology of pregnancy, improve management of subsequent pregnancies, and assist in medicolegal assessment. Placental pathologic examination may even provide evidence of susceptibility to adult-onset diseases such as diabetes (Pediatr Dev Pathol, 6, 2003, 54; Diabetes Metab, 36, 2010, 682; BJOG, 113, 2006, 1126; Int J Gynaecol Obstet, 104, 2009, S25; Zentralbl Gynakol, 97, 1975, 875). Pathologic examination of the placenta may thus be of tremendous value, particularly for those women experiencing an adverse pregnancy outcome. However, this potential utility may be entirely wasted, if the findings are not communicated in an effective manner to the appropriate clinicians. An optimized, readily understandable report of pathological findings is essential for clinical utility.

PMID: [30129133](#)

### 33. Impact of dosing schedule on uptake of neuroprotective magnesium sulfate.

Cuff RD, Sullivan SA, Chang EY.

J Matern Fetal Neonatal Med. 2018 Aug 19:1-131. doi: 10.1080/14767058.2018.1513482. [Epub ahead of print]

**BACKGROUND:** Preterm delivery < 32-week gestation is associated with significant neurodevelopmental morbidity ranging from mild delay to profound disability. Several randomized trials have shown that magnesium sulfate (MgSO<sub>4</sub>) is an effective neuroprotectant, demonstrating reduced rates of cerebral palsy, death, and gross motor dysfunction for the neonate or infant. Dosing was not consistent amongst the major trials and the onus was placed on institutions by ACOG to develop and implement protocols with respect to magnesium sulfate as a neuroprotectant. A recent study demonstrated that MgSO<sub>4</sub> exposure < 12 hours prior to delivery was associated with a decrease in CP compared to more remote exposure. **OBJECTIVE:** To assess impact of dosing schedule on uptake of neuroprotective magnesium sulfate in patients delivering less than 32 weeks gestational age. **STUDY DESIGN:** A retrospective cohort study of all deliveries occurring < 32 weeks' gestation at a single academic center between March-December 2014 and March-December 2015 was conducted. Institutional policy shifted in 2015 from MgSO<sub>4</sub> bolus with continuous infusion based on the BEAM trial to a single bolus dose based on the PREMAG trial. Patients with preeclampsia, known fetal anomalies, and/or stillbirth were excluded from this analysis. Patients were identified through query of the Medical University of South Carolina Perinatal Information System database (PINS) with respect to whether or not they had received magnesium sulfate within 12 hours of delivery. Chi-squared analysis was performed to compare the overall rate of MgSO<sub>4</sub> exposure and MgSO<sub>4</sub> exposure < 12 hours prior to delivery between groups. Fisher's exact test was used to evaluate maternal, obstetric, and neonatal variables amongst those receiving MgSO<sub>4</sub> within 12 hours of delivery in each cohort. Binary logistic regression analysis was performed to control for co-linear or potential confounding variables. **RESULTS:** A total of 224 patients were identified, 115 delivered between March-December 2014 and 109 delivered between March-December 2015. With respect to MgSO<sub>4</sub> exposure prior to delivery, 27 (23.5%) received MgSO<sub>4</sub> in the 2014 cohort compared to 44 (40.4%) in the 2015 cohort (OR 2.2, p < 0.01). Of those being exposed within 12 hours of delivery, there were 16 (13.9%) maternal exposures in the 2014 cohort versus 28 (26.7%) in the 2015 cohort (OR 2.15, p. 0.02). Of the 18 neonates delivered in 2014 there were 4 cases of grade III or IV intraventricular hemorrhage versus 1 case among the 36 neonates (2.7%) born in 2015 (0.04). This finding holds after controlling for race, preterm labor, gestational age, corticosteroid, birthweight and indomethacin exposure. **CONCLUSIONS:** Dosing of neuroprotective MgSO<sub>4</sub> according to PREMAG trial specifications was associated with a significantly greater percentage of patients having received neuroprotective magnesium at any point prior to delivery or within the 12 hours prior to delivery when compared to dosing according to BEAM trial specifications.

PMID: [30122071](#)

### 34. The neurorestorative effect of human amniotic fluid stem cells on the chronic phase of neonatal hypoxic-ischemic encephalopathy in mice.

Otani T, Ochiai D, Masuda H, Abe Y, Fukutake M, Matsumoto T, Miyakoshi K, Tanaka M.

Pediatr Res. 2018 Aug 10. doi: 10.1038/s41390-018-0131-8. [Epub ahead of print]

**BACKGROUND:** Hypoxic-ischemic encephalopathy (HIE) remains a major cause of cerebral palsy. Increasing evidence has suggested that mesenchymal stem cells have a favorable effect on HIE. However, the efficacy of human amniotic fluid stem cells (hAFS) for HIE, especially in the chronic phase, remains unclear. The aim of this study was to determine the neurorestorative effect of hAFS on the chronic phase of HIE. **METHODS:** hAFS were isolated from AF cells as CD117-positive cells. HI was induced in 9-day-old mice. Animals intranasally received hAFS or phosphate-buffered saline at 10 days post HI and were harvested for histological analysis after functional tests at 21 days post HI. We also implanted PKH26-positive hAFS to assess their migration to the brain. Finally, we determined gene expressions of trophic factors in hAFS co-cultured with HI brain extract. **RESULTS:** hAFS improved sensorimotor deficits in HIE by gray and white matter restoration and neuroinflammation reduction followed by migration to the lesion. Brain-derived neurotrophic factor (BDNF), nerve growth

factor (NGF), hepatocyte growth factor (HGF), and stromal cell-derived factor-1 (SDF-1) gene expressions in hAFS were elevated when exposed to HI-induced brain extract. CONCLUSION: hAFS induced functional recovery by exerting neurorestorative effects in HIE mice, suggesting that intranasal administration of hAFS could be a novel treatment for HIE, especially in the chronic phase.

PMID: [30120407](#)