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## Interventions and Management

### 1. *J Mot Behav.* 2016 Sep 3:1-8. [Epub ahead of print]

Motor Improvement Using Motion Sensing Game Devices for Cerebral Palsy Rehabilitation.

Camara Machado FR, Antunes PP, Souza JM, Santos AC, Levandowski DC, Oliveira AA.

The authors aimed to investigate the effects of an intervention based on interactive game set with the movement sensor Kinect on children with cerebral palsy (CP). Twenty-eight participants were recruited. Their age was between 3 and 12 years old, and rated as level I, II, or III on the Gross Motor Function Classification System. They played two games from the Xbox 360 Kinect system and were evaluated using the Gross Motor Function Measure (GMFM) after a period of 8 weeks. The intervention led to significant motor function improvement as increase of the global scores on the GMFM ( $p < .001$ ). Rehabilitation interventions using the Xbox 360 Kinect interactive games may represent useful tools for children with CP.

[PMID: 27593342](#)

### 2. *Dev Med Child Neurol.* 2016 Sep 3. doi: 10.1111/dmcn.13244. [Epub ahead of print]

Gait patterns for children with cerebral palsy: proceed with caution.

Novacheck TF.

[No abstract available]

[PMID: 27590730](#)

### 3. *J Pediatr Rehabil Med.* 2016 Sep 2;9(3):241-5. doi: 10.3233/PRM-160386.

Energy expenditure during standing in children with cerebral palsy: A brief report.

Saxena S, Kumaran S, Rao BK.

**PURPOSE:** The aim of the study was to estimate the energy expenditure (EE) during a quiet standing task in children with bilateral spastic CP (BSCP) in comparison with typically developing (TD) children, using gas analyzer. **METHODS:** The study was an observational cross-sectional study of children with BSCP (Gross Motor Function Classification System [GMFCS] levels II and III;  $n = 30$ ; 10 males, 20 females; mean weight 27.46 kgs; mean age 10 years) and TD children ( $n = 30$ ; 16 males, 14 females; mean weight 25.35 kgs; mean age 9 years, 9 months). The energy expenditure during quiet standing

task was measured by using Cosmed K4b2 gas analyzer and expressed in terms of peak oxygen consumption (VO<sub>2</sub> max, ml/kg body weight/min). RESULTS: Children with BSCP expended 1.4 times higher energy during standing than TD children (p< 0.0001). CONCLUSION: We identified that standing puts an additional energy demand in ambulant children with BSCP. Findings suggest that both dependant and independent ambulating children with BSCP might need to exert more effort to maintain a static standing position. Therefore, clinicians must evaluate standing position for balance control and energy expenditure to evaluate the efficiency of physical therapy and rehabilitation.

[PMID: 27612085](#)

#### 4. *J Pediatr Orthop.* 2016 Oct-Nov;36(7):743-8. doi: 10.1097/BPO.0000000000000525.

Correction of Tibial Torsion in Children With Cerebral Palsy by Isolated Distal Tibia Rotation Osteotomy: A Short-term, In Vivo Anatomic Study.

Andrisevic E, Westberry DE, Pugh LI, Bagley AM, Tanner S, Davids JR.

**BACKGROUND:** Excessive internal or external tibial torsion is frequently present in children with cerebral palsy. Several surgical techniques have been described to correct excessive tibial torsion, including isolated distal tibial rotation osteotomy (TRO). The anatomic changes surrounding this technique are poorly understood. The goal of the study was to examine the anatomic relationship between the tibia and fibula following isolated distal TRO in children with cerebral palsy. **METHODS:** Twenty patients with 29 limbs were prospectively entered for study. CT scans of the proximal and distal tibiofibular (TF) articulations were obtained preoperatively, at 6 weeks, and 1 year postoperatively. Measurements of tibia and fibula torsion were performed at each interval. Qualitative assessments of proximal and distal TF joint congruency were also performed. **RESULTS:** The subjects with internal tibia torsion (ITT, 19 limbs) showed significant torsional changes for the tibia between preoperative, postoperative, and 1 year time points (mean torsion 13.21, 31.05, 34.84 degrees, respectively). Measurement of fibular torsion in the ITT treatment group also showed significant differences between time points (mean -36.77, -26.77, -18.54 degrees, respectively). Proximal and distal TF joints remained congruent at all time points in the study. Subjects with external tibia torsion (ETT, 10 limbs) showed significant differences between preoperative and postoperative tibial torsion, but not between postoperative and 1 year (mean torsion 54, 19.3, 23.3 degrees, respectively). Measurement of fibular torsion in the ETT treatment group did not change significantly between preoperative and postoperative, but did change significantly between postoperative and 1 year (mean torsion -9.8, -16.9, -30.7 degrees, respectively). Nine of 10 proximal TF joints were found to be subluxated at 6 weeks postoperatively. At 1 year, all 9 of these joints had reduced. **CONCLUSIONS:** Correction of ITT by isolated distal tibial external rotation osteotomy resulted in acute external fibular torsion. The fibular torsion alignment remodeled over time to accommodate the corrected tibial torsional alignment and reduce the strain associated with the plastic deformity of the fibula. Correction of ETT by isolated distal internal TRO resulted in acute subluxation of the proximal TF articulation in almost all cases. Subsequent torsional remodeling of the fibula resulted in correction of the TF subluxation in all cases. Acute correction of TT by isolated distal TRO occurs by distinct mechanisms, based upon the direction of rotational correction.

[PMID: 27603097](#)

#### 5. *World Neurosurg.* 2016 Sep 1. pii: S1878-8750(16)30785-9. doi: 10.1016/j.wneu.2016.08.101. [Epub ahead of print]

Clinical outcomes of correcting cervical deformity in cerebral palsy patients.

Lee CK, Ha Y, Cho SR, Jeon HR, Yoon DH, Kim KN, Yi S, Shin DA, Hosogane N, Cao K.

[No abstract available]

[PMID: 27593721](#)

**6. J Musculoskelet Neuronal Interact. 2016 Sep 7;16(3):183-92.**

Early vibration assisted physiotherapy in toddlers with cerebral palsy - a randomized controlled pilot trial.

Stark C, Herkenrath P, Hollmann H, Waltz S, Becker I, Hoebing L, Semler O, Hoyer-Kuhn H, Duran I, Hero B, Hadders-Algra M, Schoenau E.

**OBJECTIVES:** to investigate feasibility, safety and efficacy of home-based side-alternating whole body vibration (sWBV) to improve motor function in toddlers with cerebral palsy (CP). **METHODS:** Randomized controlled trial including 24 toddlers with CP (mean age 19 months (SD±3.1); 13 boys). **INTERVENTION:** 14 weeks sWBV with ten 9-minute sessions weekly (non-individualized). Group A started with sWBV, followed by 14 weeks without; in group B this order was reversed. Feasibility ( $\geq 70\%$  adherence) and adverse events were recorded; efficacy evaluated with the Gross Motor Function Measure (GMFM-66), Pediatric Evaluation of Disability Inventory (PEDI), at baseline (T0), 14 (T1) and 28 weeks (T2). **RESULTS:** Developmental change between T0 and T1 was similar in both groups; change scores in group A and B: GMFM-66 2.4 (SD±2.1) and 3.3 (SD±2.9) ( $p=0.412$ ); PEDI mobility 8.4 (SD±6.6) and 3.5 (SD±9.2) ( $p=0.148$ ), respectively. In two children muscle tone increased post-sWBV. 24 children received between 67 and 140 sWBV sessions, rate of completed sessions ranged from 48 to 100% and no dropouts were observed. **CONCLUSION:** A 14-week home-based sWBV intervention was feasible and safe in toddlers with CP, but was not associated with improvement in gross motor function.

[PMID: 27609033](#)

**7. Pediatrics. 2016 Sep 7. pii: e20161321. [Epub ahead of print]**

Longitudinal Growth, Diet, and Physical Activity in Young Children With Cerebral Palsy.

Oftedal S, Davies PS, Boyd RN, Stevenson RD, Ware RS, Keawutan P, Benfer KA, Bell KL.

**OBJECTIVES:** To describe the longitudinal relationship between height-for-age z score (HZ), growth velocity z score, energy intake, habitual physical activity (HPA), and sedentary time across Gross Motor Function Classification System (GMFCS) levels I to V in preschoolers with cerebral palsy (CP). **METHODS:** Children with CP ( $n = 175$  [109 (62.2%) boys]; mean recruitment age 2 years, 10 months [SD 11 months]; GMFCS I = 83 [47.2%], II = 21 [11.9%], III = 28 [15.9%], IV = 19 [10.8%], V = 25 [14.2%]) were assessed 440 times between the age of 18 months and 5 years. Height/length ratio was measured or estimated via knee height. Population-based standards were used to calculate HZ and growth velocity z-score by age and sex categories. Feeding method (oral or tube) and gestational age at birth (GA) were collected from parents. Three-day ActiGraph and food diary data were used to measure HPA/sedentary time ratio and energy intake, respectively. Oropharyngeal dysphagia was rated with the Dysphagia Disorder Survey (part 2, Pediatric). Analysis was undertaken with mixed-effects regression models. **RESULTS:** For GMFCS level I, height and growth velocity did not differ from population-level growth standards. Children in levels II to V were significantly shorter, and those in levels III to V grew significantly more slowly than those in level I. There was a significant positive association between HZ and GA at all GMFCS levels. Energy intake, HPA, sedentary time, Dysphagia Disorder Survey score, and feeding method were not significantly associated with either height or growth velocity once GMFCS level was accounted for. **CONCLUSIONS:** Functional status and GA should be considered when assessing the growth of a child with CP. Research into interventions aimed at increasing active movement in GMFCS levels III to V and their efficacy in improving growth and health outcomes is warranted.

[PMID: 27604185](#)

**8. Phys Occup Ther Pediatr. 2016 Sep 3:1-13. [Epub ahead of print]**

Child-Focused and Context-Focused Behaviors of Physical and Occupational Therapists during Treatment of Young Children with Cerebral Palsy.

Kruijsen-Terpstra AJ, Ellens M, Ketelaar M, Verschuren O, Di Rezze B, Gorter JW, Visser-Meily AM, Jongmans MJ.

**AIMS:** To (1) describe the child- and context-focused behaviors of physical and occupational therapists, and (2) compare the behaviors of therapists in a standard therapy session with those of therapists trained to deliver child- and context-focused services. **METHOD:** Videos of 49 therapy sessions provided by 36 therapists were analyzed using the intervention domains of the Paediatric Rehabilitation Observational measure of Fidelity (PROF) to examine the therapeutic behaviors of physical and

occupational therapists with young children with cerebral palsy (CP) (24 to 48 months) in a Dutch rehabilitation setting. The PROF ratings of 18 standard therapy sessions were compared with the ratings of 16 child- and 15 context-focused therapy sessions. RESULTS: Therapists who provided standard therapy demonstrated a mix of child- and context-focused behaviors. PROF ratings indicated fewer child- and context-focused behaviors during standard therapy sessions compared with sessions where therapists were instructed to use either child- or context-focused behaviors. CONCLUSIONS: A sample of Dutch physical and occupational therapists of young children with CP demonstrated a mix of child- and context-focused therapy behaviors during standard therapy. Further research is recommended on clinical reasoning and the effect of setting to better understand therapists' use of child- and context-focused behaviors during therapy sessions.

[PMID: 27593569](#)

**9. Res Dev Disabil. 2016 Sep 1;58:55-64. doi: 10.1016/j.ridd.2016.08.015. [Epub ahead of print]**

Relationship between brain lesion characteristics and communication in preschool children with cerebral palsy.

Coleman A, Fiori S, Weir KA, Ware RS, Boyd RN.

BACKGROUND: MRI shows promise as a prognostic tool for clinical findings such as gross motor function in children with cerebral palsy (CP), however the relationship with communication skills requires exploration. AIMS: To examine the relationship between the type and severity of brain lesion on MRI and communication skills in children with CP. METHODS AND PROCEDURES: 131 children with CP (73 males (56%)), mean corrected age (SD) 28(5) months, Gross Motor Functional Classification System distribution: I=57(44%), II=14(11%), III=19(14%), IV=17(13%), V=24(18%). Children were assessed on the Communication and Symbolic Behavioral Scales Developmental Profile (CSBS-DP) Infant-Toddler Checklist. Structural MRI was analysed with reference to type and semi-quantitative assessment of the severity of brain lesion. Children were classified for motor type, distribution and GMFCS. The relationships between type/severity of brain lesion and communication ability were analysed using multivariable tobit regression. OUTCOMES AND RESULTS: Children with periventricular white matter lesions had better speech than children with cortical/deep grey matter lesions ( $\beta=-2.6$ , 95%CI=-5.0, -0.2,  $p=0.04$ ). Brain lesion severity on the semi-quantitative scale was related to overall communication skills ( $\beta=-0.9$ , 95%CI=-1.4, -0.5,  $p<0.001$ ). Motor impairment better accounted for impairment in overall communication skills than brain lesion severity. IMPLICATIONS: Structural MRI has potential prognostic value for communication impairment in children with CP. WHAT THIS PAPER ADDS?: This is the first paper to explore important aspects of communication in relation to the type and severity of brain lesion on MRI in a representative cohort of preschool-aged children with CP. We found a relationship between the type of brain lesion and communication skills, children who had cortical and deep grey matter lesions had overall communication skills >1 SD below children with periventricular white matter lesions. Children with more severe brain lesions on MRI had poorer overall communication skills. Children with CP born at term had poorer communication than those born prematurely and were more likely to have cortical and deep grey matter lesions. Gross motor function better accounted for overall communication skills than the type of brain lesion or brain lesion severity.

[PMID: 27591975](#)

**10. Eur J Paediatr Neurol. 2016 Aug 29. pii: S1090-3798(16)30141-6. doi: 10.1016/j.ejpn.2016.08.007. [Epub ahead of print]**

A major improvement in social participation of two children with cerebral palsy by a single botulinum toxin injection.

Yalcin E, Kutlay S, Ilgu O, Akyuz M.

A 7 year old girl and 10 year old boy with cerebral palsy had "fig sign" in their both hand due the spastic and dystonic nature of their disease. Fig sign is gesture made with hand and fingers curled and the thumb is pushed and pressed between the middle and index fingers. In some areas of the world the gesture is considered a good luck charm; but in others such as Greece, Indonesia, and in our country (Turkey) it is considered as an obscene gesture. The families were worried about the involuntary position of their children's hand due to its obscene nature.

[PMID: 27594069](#)

**11. J Pediatr Rehabil Med. 2016 Sep 2;9(3):177-83. doi: 10.3233/PRM-160379.**

The prevalence, location, severity, and daily impact of pain reported by youth and young adults with cerebral palsy.

Brunton L, Hall S, Passingham A, Wulff J, Delitala R.

**PURPOSE:** To describe the prevalence, location, severity, and daily impact of pain reported by youth and young adults with cerebral palsy (CP). A secondary aim was to identify any significant associations between the constructs of interest. **METHOD:** An observational study of 112 participants with CP to understand their experience of pain through a questionnaire. Participants were 56 males and 55 females with a mean age of 18y 9mo (SD 4y 5mo). **RESULTS:** Pain was reported by 75% of males and 89% of females. Both severity and impact of pain were significantly greater in females. In addition, severity and impact of pain were significantly different between specific GMFCS levels. There were no significant differences in location of pain by gender or GMFCS level. A strong positive correlation between the severity and impact of pain was observed ( $r_s = 0.80$ ). **CONCLUSION:** The gender differences in the severity and impact of pain and the overall and high prevalence of pain reported here provide healthcare practitioners with an increased awareness of pain distribution/characteristics among young adults with CP. Understanding the impact of pain on daily life can assist practitioners to efficiently manage pain and improve the quality of life for individuals with CP.

[PMID: 27612077](#)

**12. Dev Med Child Neurol. 2016 Sep 3. doi: 10.1111/dmcn.13260. [Epub ahead of print]**

Capturing change: participation trajectories in cerebral palsy during life transitions.

Khetani MA.

[No abstract available]

[PMID: 27591047](#)

## Prevention and Cure

**13. F1000Res. 2016 Aug 9;5. pii: F1000 Faculty Rev-1939. doi: 10.12688/f1000research.8546.1. eCollection 2016.**

Perinatal neuroprotection update.

Jelin AC, Salmeen K, Gano D, Burd I, Thiet MP.

Antepartum, intrapartum, and neonatal events can result in a spectrum of long-term neurological sequelae, including cerebral palsy, cognitive delay, schizophrenia, and autism spectrum disorders [1]. Advances in obstetrical and neonatal care have led to survival at earlier gestational ages and consequently increasing numbers of periviable infants who are at significant risk for long-term neurological deficits. Therefore, efforts to decrease and prevent cerebral insults attempt not only to decrease preterm delivery but also to improve neurological outcomes in infants delivered preterm. We recently published a comprehensive review addressing the impacts of magnesium sulfate, therapeutic hypothermia, delayed cord clamping, infections, and prevention of preterm delivery on the modification of neurological risk [2]. In this review, we will briefly provide updates to the aforementioned topics as well as an expansion on avoidance of toxin and infections, specifically the Zika virus.

[PMID: 27606053](#)

**14. Aust N Z J Obstet Gynaecol. 2016 Sep 7. doi: 10.1111/ajo.12530. [Epub ahead of print]**

The effect of a multidisciplinary obstetric emergency team training program, the In Time course, on diagnosis to delivery interval following umbilical cord prolapse - A retrospective cohort study.

Copson S, Calvert K, Raman P, Nathan E, Epee M.

**BACKGROUND:** Cord prolapse is an uncommon obstetric emergency, with potentially fatal consequences for the baby if prompt action is not taken. Simulation training provides a means by which uncommon emergencies can be practised, with the aim of improving teamwork and clinical outcomes. **AIMS:** This study aimed to determine if the introduction of a simulation-based training course was associated with an improvement in the management of cord prolapse, in particular the diagnosis to delivery interval. We also aimed to investigate if an improvement in perinatal outcomes could be demonstrated. **MATERIALS AND METHODS:** A retrospective cohort study was performed. All cases of cord prolapse in the designated time period were identified and reviewed and a comparison of outcome measures pre- and post-training was undertaken. **RESULTS:** Thirty-one cases were identified in the pre-training period, and compared to 64 cases post-training. Documentation improved significantly post-training. There were non-significant improvements in use of spinal anaesthetic, and in the length of stay in the special care neonatal unit. There was a significant increase in the number of babies with Apgar scores less than seven at 5 min. There were no differences in the diagnosis to delivery interval, or in perinatal mortality rates. **CONCLUSION:** Obstetric emergency training was associated with improved teamwork, as evidenced by the improved documentation post-training in this study, but not with improved diagnosis to delivery interval. Long-term follow-up studies are required to ascertain whether training has an impact on longer-term paediatric outcomes, such as cerebral palsy rates.

[PMID: 27604839](#)

**15. BJOG. 2016 Sep 5. doi: 10.1111/1471-0528.14240. [Epub ahead of print]**

Clinical profile of children with cerebral palsy born term compared with late- and post-term: a retrospective cohort study.

Frank R, Garfinkle J, Oskoui M, Shevell MI.

**OBJECTIVE:** To determine whether cerebral palsy (CP) risks factors, neurological subtype, severity and co-morbidities differ between early/full-term-born children with CP compared with those born late/post-term. **DESIGN:** Retrospective cohort study. **SETTING:** Children with CP born between 1998 and 2014, residing in Canada, and registered in the Canadian Cerebral Palsy Registry (CCPR) (n = 1691), a database with information from 15 participating centres across six Canadian provinces. **POPULATION:** Children with CP from the CCPR born at 37 weeks of gestation and later (n = 802). **METHODS:** The clinical profile of children with CP born at 37-40 weeks of gestation was compared with those born at 41 weeks and later using the Pearson chi-square test (or Fisher's exact test) for univariate analyses of categorical data. A P value <0.05 was considered significant a priori. **MAIN OUTCOME MEASURES:** CP neurological subtype, Gross Motor Function Classification System (GMFCS) severity, risk factors and co-morbidities. **RESULTS:** Neonatal encephalopathy was found in 23.9% of children with CP born early/full-term and in 33.6% of those born late/post-term (P = 0.026). Neonatal hyperbilirubinaemia was found in 10.2% of children born in the earlier period and in 2.6% of those born in the later period (P = 0.008). Apgar score at 5 minutes, but not 10 minutes, was significantly higher in the early/full-term group (9) compared with its late/post-term counterpart (7; P = 0.046). Rates of CP subtype, severity (GMFCS) and co-morbidities did not differ significantly between the two gestational periods. **CONCLUSIONS:** In children with CP, neonatal encephalopathy was significantly less frequent and neonatal hyperbilirubinaemia was significantly more frequent in those born early/full-term compared with their later-born counterparts. However, clinical outcomes of CP were not significantly different between these two gestational epochs.

[PMID: 27592548](#)

**16. BMC Pediatr. 2016 Sep 6;16(1):154. doi: 10.1186/s12887-016-0691-x.**

Case report of a central venous access device-associated thrombosis with aortic embolism in a preterm infant.

Biermayr M, Brunner B, Maurer K, Trawoeger R, Kiechl-Kohlendorfer U, Neubauer V.

**BACKGROUND:** Thrombosis in neonates is commonly a central venous access device (CVAD) associated complication. Furthermore, a patent foramen ovale (PFO) is frequently seen in preterm infants. Even though a coincidence of both is not unusual, detaching of the thrombus and organisation of an aortic embolism has not been described until now. Treatment

recommendations of CVAD-associated thrombosis in neonates do not consider frequently seen complications of preterm infants e.g. intraventricular haemorrhage. This is the first case of a very preterm infant with pre-existing intraventricular haemorrhage, who developed a CVAD-associated thrombosis and thromboembolic complications. **CASE PRESENTATION:** The authors report on a very preterm girl with a pre-existing intraventricular haemorrhage and a CVAD-associated thrombus that, after removal of the CVAD, led to assumed pulmonary embolism and to an extended aortic embolism with consequent cerebral stroke. The girl was treated with unfractionated heparin (UFH) for about 50 days. During the further in-hospital stay the girl developed a mild bronchopulmonary dysplasia. Follow-up revealed clinical signs of cerebral palsy. **CONCLUSION:** Even though preterm infants are often diagnosed with a PFO which constitutes the risk for paradoxical embolism, such complications do not occur frequently due to the physiological heart pressure proportion. Nevertheless, it is important to monitor vital parameters and cerebral perfusion after removing a CVAD with confirmed associated thrombosis, because thromboembolic complications are possible. If practicable, patients with a confirmed CVAD-associated thrombosis should be anticoagulated before removing the CVAD. However, in our patient it was rational to remove the CVAD without prior anticoagulation due to the pre-existing intraventricular haemorrhage. There are various treatment recommendations for thrombosis or embolism in infants. However, there are no clear recommendations in very preterm infants with a high risk of cerebral bleeding respectively a pre-existing intraventricular haemorrhage. We decided to treat our patient with unfractionated heparin until the affected vessels were recanalised. Finally, it remains a case-by-case decision how to treat CVAD-associated thrombosis and consequent embolism depending on the patient's medical history.

[PMID: 27599834](#)

**17. BMJ Open. 2016 Sep 2;6(9):e012777. doi: 10.1136/bmjopen-2016-012777.**

Cohort profile: cerebral palsy in the Norwegian and Danish birth cohorts (MOBAND-CP).

Tollånes MC, Strandberg-Larsen K, Forthun I, Petersen TG, Moster D, Andersen AM, Stoltenberg C, Olsen J, Wilcox AJ. **PURPOSE:** The purpose of MOthers and BABies in Norway and Denmark cerebral palsy (MOBAND-CP) was to study CP aetiology in a prospective design. **PARTICIPANTS:** MOBAND-CP is a cohort of more than 210 000 children, created as a collaboration between the world's two largest pregnancy cohorts—the Norwegian Mother and Child Cohort study (MoBa) and the Danish National Birth Cohort. MOBAND-CP includes maternal interview/questionnaire data collected during pregnancy and follow-up, plus linked information from national health registries. **FINDINGS TO DATE:** Initial harmonisation of data from the 2 cohorts has created 140 variables for children and their mothers. In the MOBAND-CP cohort, 438 children with CP have been identified through record linkage with validated national registries, providing by far the largest such sample with prospectively collected detailed pregnancy data. Several studies investigating various hypotheses regarding CP aetiology are currently on-going. **FUTURE PLANS:** Additional data can be harmonised as necessary to meet requirements of new projects. Biological specimens collected during pregnancy and at delivery are potentially available for assay, as are results from assays conducted on these specimens for other projects. The study size allows consideration of CP subtypes, which is rare in aetiological studies of CP. In addition, MOBAND-CP provides a platform within the context of a merged birth cohort of exceptional size that could, after appropriate permissions have been sought, be used for cohort and case-cohort studies of other relatively rare health conditions of infants and children.

[PMID: 27591025](#)

**18. Dev Med Child Neurol. 2016 Sep 6. doi: 10.1111/dmcn.13215. [Epub ahead of print]**

Seizure burden and neurodevelopmental outcome in neonates with hypoxic-ischemic encephalopathy.

Kharoshankaya L, Stevenson NJ, Livingstone V, Murray DM, Murphy BP, Ahearne CE, Boylan GB.

**AIM:** To examine the relationship between electrographic seizures and long-term outcome in neonates with hypoxic-ischemic encephalopathy (HIE). **METHOD:** Full-term neonates with HIE born in Cork University Maternity Hospital from 2003 to 2006 (pre-hypothermia era) and 2009 to 2012 (hypothermia era) were included in this observational study. All had early continuous electroencephalography monitoring. All electrographic seizures were annotated. The total seizure burden and hourly seizure burden were calculated. Outcome (normal/abnormal) was assessed at 24 to 48 months in surviving neonates using either the Bayley Scales of Infant and Toddler Development, Third Edition or the Griffiths Mental Development Scales; a diagnosis of cerebral palsy or epilepsy was also considered an abnormal outcome. **RESULTS:** Continuous electroencephalography was recorded for a median of 57.1 hours (interquartile range 33.5-80.5h) in 47 neonates (31 males, 16 females); 29 out of 47 (62%) had electrographic seizures and 25 out of 47 (53%) had an abnormal outcome. The presence of seizures per se was not

associated with abnormal outcome ( $p=0.126$ ); however, the odds of an abnormal outcome increased over ninefold (odds ratio [OR] 9.56; 95% confidence interval [95% CI] 2.43-37.67) if a neonate had a total seizure burden of more than 40 minutes ( $p=0.001$ ), and eightfold (OR: 8.00; 95% CI: 2.06-31.07) if a neonate had a maximum hourly seizure burden of more than 13 minutes per hour ( $p=0.003$ ). Controlling for electrographic HIE grade or treatment with hypothermia did not change the direction of the relationship between seizure burden and outcome. INTERPRETATION: In HIE, a high electrographic seizure burden is significantly associated with abnormal outcome, independent of HIE severity or treatment with hypothermia.

[PMID: 27595841](#)

### 19. J Anesth. 2016 Sep 2. [Epub ahead of print]

No association of labor epidural analgesia with cerebral palsy in children.

Zhang L, Graham JH, Feng W, Lewis MW, Zhang X, Kirchner HL.

BACKGROUND: Some pregnant women avoid labor epidural analgesia because of their concerns about risk of cerebral palsy in children. Although it is believed that labor epidural does not contribute to cerebral palsy, to our knowledge no study has been published to specifically address this concern. We carried out a retrospective case-control study to investigate whether labor epidural analgesia is associated with cerebral palsy in children. METHODS: This study used data that were collected and entered into the Geisinger electronic health records between January 2004 and January 2013. During this period, 20,929 children were born at Geisinger hospitals. Among them, 50 children were diagnosed with cerebral palsy, and 20 of those were born vaginally. Each of these 20 cerebral palsy children was matched with up to 5 non-cerebral palsy children born at the same hospitals in the same timeframe using propensity scoring methods. Analgesia was classified as epidural (including epidural or combined spinal and epidural) or non-epidural. Conditional logistic regression was used to compare the percentages of deliveries with each analgesia type between the cerebral palsy and non-cerebral palsy groups. RESULTS: In the non-cerebral palsy group, the percentage of patients receiving labor epidural analgesia was 72 %, and in the cerebral palsy group the percentage was 45 %. There was no significant difference between non-cerebral palsy and cerebral palsy groups (odds ratio, 0.57; 95 % confidence interval, 0.14-2.24;  $p = 0.42$ ). CONCLUSION: We found no association between the use of labor epidural analgesia and the occurrence of cerebral palsy in children.

[PMID: 27590523](#)

### 20. Pediatrics. 2016 Sep 8. [Epub ahead of print]

Maternal Prepregnancy BMI and Risk of Cerebral Palsy in Offspring.

Forthun I, Wilcox AJ, Strandberg-Larsen K, Moster D, Nohr EA, Lie RT, Surén P, Tollånes MC.

OBJECTIVES: To investigate the association between maternal pre-pregnancy BMI and risk of cerebral palsy (CP) in offspring. METHODS: The study population consisted of 188 788 children in the Mothers and Babies in Norway and Denmark CP study, using data from 2 population-based, prospective birth cohorts: the Norwegian Mother and Child Cohort Study and the Danish National Birth Cohort. Prepregnancy BMI was classified as underweight (BMI <18.5), lower normal weight (BMI 18.5-22.9), upper normal weight (BMI 23.0-24.9), overweight (BMI 25.0-29.9), and obese (BMI  $\geq 30$ ). CP diagnoses were obtained from the national CP registries. Associations between maternal prepregnancy BMI and CP in offspring were investigated by using log-binomial regression models. RESULTS: The 2 cohorts had 390 eligible cases of CP (2.1 per 1000 live-born children). Compared with mothers in the lower normal weight group, mothers in the upper normal group had a 40% excess risk of having a child with CP (relative risk [RR], 1.35; 95% confidence interval [CI], 1.03-1.78). Excess risk was 60% (RR, 1.56; 95% CI, 1.21-2.01) for overweight mothers and 60% (RR, 1.55; 95% CI 1.11-2.18) for obese mothers. The risk of CP increased ~4% for each unit increase in BMI (RR, 1.04; 95% CI, 1.02-1.06). Estimates changed little with adjustment for mother's occupational status, age, and smoking habits. CONCLUSIONS: Higher prepregnancy maternal BMI was associated with increased risk of CP in offspring.

[PMID: 27609826](#)