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Professor Nadia Badawi AM

Macquarie Group Foundation Chair of Cerebral Palsy

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Interventions and Management

1. Biomechanical and functional effects of shoulder kinesio taping® on cerebral palsy children interacting with virtual objects.

García-Hernández N, Corona-Cortés J, García-Fuentes L, González-Santibañez RD, Parra-Vega V.

Comput Methods Biomech Biomed Engin. 2019 Mar 4:1-9. doi: 10.1080/10255842.2019.1580361. [Epub ahead of print]

The reaching of objects is usually practiced by CP children in conventional or Virtual Reality-based therapies to enhance motor skill performance. Recently, Kinesio Taping® method has been studied to increase mechanical stability and improve functional movement of the upper limb; however, its influence on CP children's upper limb motion has been rarely quantified due to lack of sensory measurement. Therefore, in this paper, we evaluate the biomechanical and functional effects of applying shoulder Kinesio Taping® on CP children in the reaching-transporting of virtual objects, by using a low-cost tracking device, exact robust differentiation of data and a simple nonlinear biomechanical dynamic model of the trunk and arm.

PMID: [30829542](#)

2. Effectiveness of Multilevel Botulinum Toxin A Injection with Integrated Treatment Program on Spasticity Reduction in Non-ambulatory Young Children with Cerebral Palsy.

Aydil S, Akpinar FM, Akpinar E, Beng K, Yagmurlu MF.

Med Princ Pract. 2019 Mar 6. doi: 10.1159/000499369. [Epub ahead of print]

OBJECTIVE: The aim of the present study was to evaluate the effectiveness of multilevel Botulinum Toxin A (BTX-A) injection, as part of an integrated approach, for the treatment of spasticity in non-ambulatory young children with diplegic Cerebral Palsy (CP). **SUBJECTS AND METHODS:** Seventeen non-ambulatory patients aged 4-8 years with diplegic CP (Gross Motor Function Classification System (GMFCS) level IV) were evaluated before and at 1st, 3rd and 6th months after BTX-A injection. The effect of BTX-A on spasticity of gastrocnemius and hamstring muscles were assessed using the Modified Ashworth Scale (MAS) and Modified Tardieu Scale (MTS). The velocity-dependent properties of spastic muscle as both slow (R2) and fast (R1) stretches were evaluated in MTS. **RESULTS:** A statistically significant improvement was observed in R1 angles of gastrocnemius and hamstring muscles at 1st and 3rd months after BTX-A injection in non-ambulatory young children with CP. Statistically significant improvement was found in MAS of gastrocnemius and hamstring muscles and R2 angles of knee and ankle joint after 1st month of BTX-A injection. **CONCLUSION:** Multilevel BTX-A injection as part of an integrated approach can be used for focal treatment of spasticity, especially of hamstring and gastrocnemius muscles, in non-ambulatory young children with CP GMFCS level IV.

PMID: [30840957](#)

3. Unlocking a locked knee by ultrasound guided anesthetic injection.

Tyagi N, Al-Haidary R, Sahu A.

Radiol Case Rep. 2019 Feb 25;14(5):548-550. doi: 10.1016/j.radcr.2019.01.013. eCollection 2019 May.

Twenty-three-year old male patient with a background of mild cerebral palsy (with limited effect on mobility) presented with 36 hours history of pain on the lateral aspect of his left knee. On examination his knee was locked and there was no associated history of trauma. A detailed MRI scan required in extension and unlocked leg to elucidate the cause. This was achieved by administration of local anesthetic under ultrasound guidance to the lateral aspect of the knee with successful results. This case is important as it looks at minimally invasive management of the acutely locked knee prior to more detailed imaging. Pseudolocking of the knee is a well-known cause of knee locking. Performing a magnetic resonance imaging (MRI) scan to diagnose cases of pseudolocking can prevent unnecessary intervention such as arthroscopy. In our case, the orthopedic team was reluctant to take the patient to theatre without more detailed imaging, given his medical history. There are very few case reports in the literature which address this issue and there is no case in the literature using this technique in cerebral palsy with muscle spasm.

PMID: [30847011](#)

4. Prevalence and classification of equinus foot in bilateral spastic cerebral palsy.

Horsch A, Götze M, Geisbüsch A, Beckmann N, Tsitlakidis S, Berrsche G, Klotz M.

World J Pediatr. 2019 Mar 4. doi: 10.1007/s12519-019-00238-2. [Epub ahead of print]

BACKGROUND: Equinus is a common deformity in children with bilateral spastic cerebral palsy (BSCP). While dynamic equinus usually is treated by conservative therapy, fixed contractures need surgical correction. To choose the appropriate surgical method, it is important to discriminate between isolated gastrocnemius shortening and combined gastrosoleus complex contracture. **METHODS:** In a retrospective study 938 patients with BSCP were studied. Patients underwent gait analysis and clinical examination. 248 patients (496 limbs) met the inclusion criteria. Data from motion analysis and clinical examination were used to calculate the prevalence and to further classify fixed equinus foot. **RESULTS:** The prevalence of equinus was 83.3%. During clinical exam 246 (59.6%) limbs showed combined gastrosoleus complex contracture and 167 (40.4%) isolated gastrocnemius contracture. Max. DF at stance and mean DF at initial contact were significantly reduced in combined contracture, while max. ROM was increased ($P < 0.05$). **CONCLUSIONS:** Corroborating the results of previous studies, in this study there was a high prevalence of fixed equinus in patients with BSCP. The prevalence of equinus correlated with increasing age. As half of the patients with fixed equinus show a different involvement of gastrocnemius and soleus muscle, we recommend to apply Silfverskiöld's test to discriminate between those two types to choose the appropriate surgical therapy.

PMID: [30830663](#)

5. Double hindfoot arthrodesis technique for the treatment of severe equino-plano-valgus foot deformity in cerebral palsy: long-term results and radiological evaluation.

Costici PF1, Donati F, Russo R, Verardi C, Pagnotta G.

J Pediatr Orthop B. 2019 Mar 4. doi: 10.1097/BPB.0000000000000616. [Epub ahead of print]

To evaluate the clinical and radiological results of a double arthrodesis technique for the treatment of equino-plano-valgus foot deformity in pediatric patients affected by cerebral palsy. A retrospective evaluation was performed on 175 feet surgically treated with a talonavicular and calcaneocuboid joint fusion technique. The average age at surgery was 14.7 years (range: 12-20 years). Visual analogue scale for pain score, Gross Motor Function Classification System scale, talonavicular angle, Costa-Bertani angle, and Kite's angle on standard weight bearing radiographs were evaluated preoperatively and postoperatively. The mean clinical follow-up was 62.4 months (range: 12-112 months). The mid Gross Motor Function Classification System scale value did not show a significant improvement in any of the subgroups considered. A significant improvement in the visual analogue scale for pain score value was evident 6 months after surgery. Radiological examination showed a statistically significant improvement in the talonavicular angle (average 7.4°) and the Costa-Bertani angle (average 128.5°). Complications occurred in 8.6% of cases. The described surgical technique is safe and efficacious, and could represent a useful option of treatment of equino-plano-valgus severe deformity in cerebral palsy patients older than 12 years of age.

PMID: [30839360](#)

6. Asymmetry index in muscle activations.

Castagneri C, Agostini V, Rosati S, Balestra G, Knaflitz M.

IEEE Trans Neural Syst Rehabil Eng. 2019 Mar 7. doi: 10.1109/TNSRE.2019.2903687. [Epub ahead of print]

Gait asymmetry is typically evaluated using spatio-temporal or joint kinematics parameters. Only a few studies addressed the problem of defining an asymmetry index directly based on muscle activity, extracting parameters from surface electromyography (sEMG) signals. Moreover, no studies used the extraction of the muscle principal activations (activations that are necessary for accomplishing a specific motor task) as the base to construct an asymmetry index, less affected by the variability of sEMG patterns. The aim of this study is to define a robust index to quantitatively assess the asymmetry of muscle activations during locomotion, based on the extraction of the principal activations. SEMG signals were analyzed combining Statistical Gait Analysis (SGA) and a clustering algorithm that allows for obtaining the muscle principal activations. We evaluated the asymmetry levels of four lower limb muscles in: (1) healthy subjects of different ages (children, adults, and elderly); (2) different populations of orthopedic patients (adults with megaprosthesis of the knee after bone tumor resection, elderly subjects after total knee arthroplasty and elderly subjects after total hip arthroplasty); and (3) neurological patients (children with hemiplegic cerebral palsy and elderly subjects affected by idiopathic Normal Pressure Hydrocephalus). The asymmetry index obtained for each pathological population was then compared to that of age-matched controls. We found asymmetry levels consistent with the expected impact of the different pathologies on muscle activation during gait. This suggests that the proposed index can be successfully used in clinics for an objective assessment of the muscle activation asymmetry during locomotion.

PMID: [30843847](#)**7. Role of femoral derotation on gait after selective dorsal rhizotomy in children with spastic cerebral palsy.**

Van Campenhout A, Huenaearts C, Poulussen L, Prinsen SD, Desloovere K.

Dev Med Child Neurol. 2019 Mar 4. doi: 10.1111/dmcn.14192. [Epub ahead of print]

AIM: To evaluate the long-term outcome of selective dorsal rhizotomy (SDR) on gait and the influence of previous femoral derotation osteotomy (FDO). **METHOD:** In a retrospective cohort study of 29 children (16 females, 13 males) with spastic diplegic cerebral palsy, 14 children received FDO before SDR, whereas 15 children with moderate or near-normal internal femoral rotation during gait received only SDR. Three-dimensional gait data were obtained pre-FDO, pre-SDR, 1 year post-SDR, and 3 to 5 years post-SDR, to study the Gait Profile Score (GPS), pelvic tilt, and knee and hip kinematics. A mixed analysis of variance with the repeated measure 'time' was performed between different time points for each group. **RESULTS:** Children who first underwent FDO and then SDR started with a more complex gait pathology but showed fewer gait deviations 3 to 5 years post-SDR, compared to children who only underwent SDR. This was reflected by a lower GPS and pelvic tilt, as well as less knee flexion in stance. **INTERPRETATION:** The effect of SDR on gait is only significant in the mid- to long-term if the bony lever arms are also corrected. Thus, the clinical outcome after SDR is dependent on good proximal alignment. **WHAT THIS PAPER ADDS:** Pelvic tilt remains stable after femoral derotation osteotomy (FDO)+selective dorsal rhizotomy (SDR). But pelvic tilt deteriorates after SDR only. Hip and knee extension is better after FDO+SDR than after SDR only. Spasticity reduction (by SDR) combined with bony lever arm correction (by FDO) improves gait.

PMID: [30834521](#)**8. Influence of impaired selective motor control on gait in children with cerebral palsy.**

Zhou JY, Lowe E, Cahill-Rowley K, Mahtani GB, Young JL, Rose J.

J Child Orthop. 2019 Feb 1;13(1):73-81. doi: 10.1302/1863-2548.13.180013.

PURPOSE: Spastic cerebral palsy (CP) is characterized by four neuromuscular deficits: weakness, short muscle-tendon unit, muscle spasticity and impaired selective motor control (SMC). We examined the influence of impaired SMC on gait in children with bilateral spastic CP. Delineating the influence of neuromuscular deficits on gait abnormalities can guide surgical and therapeutic interventions to reduce long-term debilitating effects of CP. **METHODS:** The relationship between impaired SMC and gait was assessed using multivariate linear regression analysis of Selective Control Assessment of the Lower Extremity (SCALE) in relation to stance phase knee flexion and temporal-spatial gait parameters calculated using 3D kinematics for 57 children with bilateral spastic CP, ages seven to 11 years. **RESULTS:** Mean SCALE values were 5.8 (0 to 10, sd 3.0) and 5.7 (0 to 10, sd 2.9) for right and left legs, respectively. Multivariate linear regression models, including right and left SCALE and

height, significantly predicted right and left knee flexion at initial contact ($R = 0.479$, $p = 0.003$; $R = 0.452$, $p = 0.007$, respectively) and right and left knee flexion in midstance ($R = 0.428$, $p = 0.013$; $R = 0.407$, $p = 0.022$, respectively). The model significantly predicted right and left step length ($R = 0.645$, $p = 0.000$; $R = 0.523$, $p = 0.001$, respectively) and predicted gait velocity ($R = 0.444$, $p = 0.008$). The model including SCALE did not predict step width. **CONCLUSION:** Results indicate impaired SMC predicts increased knee flexion at initial contact, and reduces step length and velocity. Understanding the influence of impaired SMC on gait can inform decisions regarding therapy and surgery, such as hamstring lengthening. **LEVEL OF EVIDENCE:** Level II Retrospective Study.

PMID: [30838079](#)

9. The Immediate Effects of a Dynamic Orthosis on Gait Patterns in Children With Unilateral Spastic Cerebral Palsy: A Kinematic Analysis.

Martins E, Cordovil R, Oliveira R, Pinho J, Diniz A, Vaz JR.

Front Pediatr. 2019 Feb 21;7:42. doi: 10.3389/fped.2019.00042. eCollection 2019.

This study analyzes the immediate effects of wearing a Therasuit on sagittal plane lower limb angular displacements during gait in children with unilateral spastic cerebral palsy (US-CP). Seven participants (median age = 7.00 years; ranging from 5.83 to 9.00 years) with US-CP, levels I and II of the Gross Motor Function Classification System, were assessed with kinematic gait analysis in three different conditions: (A) Baseline; (B) Therasuit without elastics and (C) Therasuit with elastics. Significant improvements were observed at the hip joint of both lower limbs during most of the gait cycle in participants wearing a Therasuit, including a decrease in the flexion pattern at the initial contact and swing phase in both lower limbs, and an increase in the extension pattern in the paretic lower limb during the stance phase. At the knee joint in the paretic lower limb, significant differences were found between the baseline and Therasuit with elastics conditions on the knee angle at initial contact, and between baseline and both Therasuit conditions on the flexion angle at swing phase. However, the inter-individual variability in kinematic patterns at the knee joint was high. At the ankle joint, decreased plantar flexion at initial contact and increased dorsiflexion during stance and swing phases were observed at the Therasuit with elastics condition, helping to correct the equinus-foot in the paretic lower limb during the whole gait cycle. The Z-values showed large effect sizes particularly for most of the angular hip variables in both lower limbs and for the angular ankle variables in the paretic lower limb. The Therasuit seems to have some positive immediate effects on gait kinematics in children with spastic unilateral cerebral palsy by providing a more functional and safer gait pattern. Future investigations with larger samples are recommended to further support these findings.

PMID: [30847335](#)

10. A Battery-Powered Ankle Exoskeleton Improves Gait Mechanics in a Feasibility Study of Individuals with Cerebral Palsy.

Lerner ZF, Harvey TA, Lawson JL.

Ann Biomed Eng. 2019 Mar 1. doi: 10.1007/s10439-019-02237-w. [Epub ahead of print]

Neuromuscular impairment associated with cerebral palsy (CP) often leads to life-long walking deficits. Our goal was to evaluate the ability of a novel untethered wearable ankle exoskeleton to reduce the severity of gait pathology from CP. In this clinical feasibility study of five individuals with CP, we used instrumented gait analysis to quantify how powered plantar-flexor assistance affected gait mechanics following multi-visit acclimation. Compared to how each participant walked normally, walking with untethered exoskeleton assistance resulted in improved ankle plantar-flexion and knee extension; residual flexion deformity across the lower-extremity improved by a clinically significant 14.4° ($p = 0.022$). Powered plantar-flexor assistance increased average total positive ankle power by 44% ($p = 0.037$), and resulted in a 30% reduction in average negative biological ankle power ($p = 0.004$) and a 29% reduction in average positive hip power ($p = 0.009$). These findings suggest that powered ankle assistance augmented, rather than simply replaced, biological function to produce a more efficient gait pattern, which was corroborated by a 19% improvement in metabolic cost of transport ($p = 0.011$). This study provides evidence in support of the continued investigation of ankle assistance in mobility and rehabilitation interventions for this patient population.

PMID: [30825030](#)

11. The effect of joint translation constraint on within-participant variability of kinematics and kinetics during running in cerebral palsy.

Chappell A, Liew B, Murphy AT, Gibson N, Allison GT, Williams G, Morris SL.

Clin Biomech (Bristol, Avon). 2019 Feb 15;63:54-62. doi: 10.1016/j.clinbiomech.2019.02.003. [Epub ahead of print]

BACKGROUND: Biomechanical data in cerebral palsy are inherently variable but no optimal model of translational joint constraint has been identified. The primary aim of this study was to determine which model of translational joint constraint resulted in the lowest within-participant variability of lower limb joint angles and moments. The secondary aim was to determine which model best distinguished known functional groups in Cerebral Palsy. **METHODS:** Three models (three degrees of freedom, six degrees of freedom and six degrees of freedom with specified joint translation constraint) were applied to data from running trials of 40 children with cerebral palsy. **FINDINGS:** Joint angle standard deviations were largest using the six degrees of freedom model and smallest using the constrained six degrees of freedom model ($p < 0.050$). For all joints in all planes of motion, joint moment standard deviations were largest using the six degrees of freedom model and smallest using the constrained six degrees of freedom model; standard deviations using the constrained model were smaller than the three degrees of freedom model by 10-30% of moment magnitude (0.01-0.03 Nm/kg; $p < 0.001$). The six degrees of freedom models distinguished functional subgroups with larger effect size than the three degrees of freedom model only for hip power generation in swing. **INTERPRETATION:** A model with specified joint constraint minimized within-participant variability during running and was useful for detecting differences in functional capacity in cerebral palsy.

PMID: [30844578](#)

12. Gross Motor Function Classification System Specific Growth Charts-Utility as a Risk Stratification Tool for Surgical Site Infection Following Spine Surgery.

Baranek ES1, Maier SP 2nd, Matsumoto H, Hyman JE, Vitale MG, Roye DP Jr, Roye BD.

J Pediatr Orthop. 2019 Apr;39(4):e298-e302. doi: 10.1097/BPO.0000000000001285.

BACKGROUND: There is currently minimal evidence that preoperative malnutrition increases surgical site infection (SSI) risk in children with cerebral palsy (CP) undergoing spinal deformity surgery. Growth charts specifically for patients with CP have been created to aid in the clinical interpretation of body mass index (BMI) as a marker of nutritional status, but to our knowledge these charts have never been used to risk stratify patients before orthopaedic surgery. We hypothesize that patients with CP who have BMI-for-age below the 10th percentile ($BMI \leq 10$) on CP-specific growth charts are at increased risk of surgical site infection following spinal deformity surgery compared with patients with BMI-for-age above the 10th percentile ($BMI > 10$). **METHODS:** Single-center, retrospective review comparing the rate of SSI in patients with CP stratified by BMI-for-age percentiles on CP-specific growth charts who underwent spinal deformity surgery. Odds ratios with 95% confidence intervals and Pearson χ tests were used to analyze the association of the measured nutritional indicators with SSI. **RESULTS:** In total, 65 patients, who underwent 74 procedures, had complete follow-up data and were included in this analysis. Ten patients (15.4%) were GMFCS I-III and 55 (84.6%) were GMFCS IV-V; 39 (60%) were orally fed and 26 (40%) were tube-fed. The rate of SSI in this patient population was 13.5% with 10 SSIs reported within 90 days of surgery. There was a significant association between patients with a BMI below the 10th percentile on GMFCS-stratified growth charts and the development of SSI (OR, 13.6; 95% CI, 2.4-75.4; $P=0.005$). All SSIs occurred in patients that were GMFCS IV-V. There was no association between height, weight, feeding method, or pelvic instrumentation and development of SSI. **CONCLUSIONS:** CP-specific growth charts are useful tools for identifying patients at increased risk for SSI following spinal instrumentation procedures, whereas standard CDC growth charts are much less sensitive. There is a strong association between preoperative BMI percentile on GMFCS-stratified growth charts and SSI following spinal deformity surgery. **LEVEL OF EVIDENCE:** Level III-Retrospective Study.

PMID: [30839482](#)

13. Caregivers', teachers', and assistants' use and learning of partner strategies in communication using high-tech speech-generating devices with children with severe cerebral palsy.

Tegler H, Pless M, Blom Johansson M, Sonnander K.

Assist Technol. 2019 Mar 7:1-9. doi: 10.1080/10400435.2019.1581303. [Epub ahead of print]

Communication with speech generating devices (SGDs) with children with severe physical, communicative and cognitive

impairments, such as children with cerebral palsy (CP), can be difficult. Use of partner strategies facilitates the communication and instructional approaches such as feedback and role play facilitate communication partners' learning in how to use partner strategies. To describe communication partners' use and learning about partner strategies in SGD-mediated communication with children with severe CP. Questionnaires (n = 65) were sent to caregivers (n = 30), teachers (n = 17), and teaching or personal assistants (n = 18) of children with severe CP. Response rate was 80%. To ask open-ended questions was the most frequently used partner strategy and aided augmented input the least frequently used partner strategy. Most commonly, participants learned partner strategies from speech and language pathologists (SLPs) who used verbal instructions when teaching partner strategies but seldom or never feedback, role play or video examples. Communication partners' learning about partner strategies in SGD-mediated communication is inadequate and needs to be improved. SLPs, who are the main prescribers of SGDs and responsible for training and support in using them, should consider using instructional approaches when teaching communication partners about partner strategies in communication with an SGD.

PMID: [30843763](#)

14. Body Representation in Children With Unilateral Cerebral Palsy.

Nuara A, Papangelo P, Avanzini P, Fabbri-Destro M.

Front Psychol. 2019 Feb 19;10:354. doi: 10.3389/fpsyg.2019.00354. eCollection 2019.

Drawings produced by children provide insights about their physical and psychological status. In children suffering from unilateral cerebral palsy (UCP), self-portraits constitute a unique opportunity to study whether and how their disease affects self-body representation. The aim of the present study is to evaluate self-body representation in UCP children, comparing it to the way they portray both healthy and hemiparetic peers. Ten UCP children were asked to perform 3 drawings: a self-portrait, a portrait of their best classmate, and finally a portrait of a hemiparetic peer who had joint them in a child-to-child rehabilitation protocol. As controls, 16 typically developing children were asked to perform a self-portrait, and their best-classmate portrait. The asymmetry index (AI), consisting of the difference between the upper limbs length expressed as percentage of their average, resulted greater in UCP than in controls' self-portrait. More interestingly, UCP children portrayed themselves more asymmetrically relative to their classmates and hemiparetic peers. No difference in terms of AI was found between self- vs. classmate-portrait in the control group. This study provides evidence that UCP affects body self-representation, but not body-representation in general. In fact, the asymmetry in upper limb representation observed in children with UCP does not constitute a mere picturing of the hemiparesis, but rather reflects the experienced status of functioning, that is valid only for one's own. The inclusion of portraits in pediatric neurorehabilitation programs might enable clinicians to collect additional evidence about the children self-perceived functioning, i.e., an information not easily obtainable in pediatric patients.

PMID: [30837926](#)

15. Children and Teens in Charge of their Health (CATCH): A protocol for a feasibility randomised controlled trial of solution-focused coaching to foster healthy lifestyles in childhood disability.

McPherson AC, Biddiss E, Chen L, Church PT, de Groot JF, Keenan S, King G, Lui T, Maltais DB, Mérette C, Moffet H, Moola F, Schweltnus H.

BMJ Open. 2019 Mar 4;9(3):e025119. doi: 10.1136/bmjopen-2018-025119.

INTRODUCTION: Children with physical disabilities are rarely included in interventions to promote healthy lifestyles, despite being at higher risk for suboptimal dietary and physical activity behaviours. The Children and Teens in Charge of their Health study explores the feasibility and acceptability of conducting a randomised controlled trial (RCT) of a strengths-based, solution-focused coaching intervention for improving and sustaining physical activity and healthy dietary habits in children and young people with physical disabilities. **METHODS AND ANALYSIS:** Thirty children aged 10-18 years with a diagnosis of spina bifida or cerebral palsy who are able to set healthy lifestyle goals will be recruited from two children's rehabilitation hospitals in Ontario, Canada. Participants will be enrolled in the study for twelve months. All participants will receive standard care and printed information about healthy lifestyles. Of the 30 participants, 15 will be randomised to receive a coaching intervention for the first 6 months. Health indicators and psychosocial outcomes will be assessed by blinded assessors four times: at the start of the trial, immediately postintervention (6 months after randomisation), and at 3 and 6 months postintervention (9 and 12 months after randomisation, respectively). Predefined success criteria will be used to assess the feasibility of trial processes such as recruitment, attrition, stratification and intervention fidelity. Acceptability and perceived impact of the intervention will be explored qualitatively. **ETHICS AND DISSEMINATION:** The study has been approved by Holland Bloorview Kids Rehabilitation Hospital's Research Ethics Board (Ref: 17-752). A knowledge translation planning template will be used to ensure our findings have maximum reach. **TRIAL REGISTRATION NUMBER:** NCT03523806.

PMID: [30837255](#)

16. Health-related quality of life in adults with cerebral palsy living in Sweden and relation to demographic and disability-specific factors.

Jarl J, Alriksson-Schmidt A, Rodby-Bousquet E.

Disabil Health J. 2019 Feb 22. pii: S1936-6574(19)30035-4. doi: 10.1016/j.dhjo.2019.02.002. [Epub ahead of print]

BACKGROUND: The knowledge base on health-related quality of life (HRQoL) in adults with cerebral palsy (CP) is small and inconsistent. **OBJECTIVE:** The aim was to study HRQoL in adults with CP stratified on demographic and disability-specific factors using both experience- and hypothetical-based value-sets. **METHODS:** Cross-sectional study based on registry data from the Swedish follow-up program CPUP. The EQ-5D-3L (5 domains; self-care, usual activities, mobility, pain/discomfort, anxiety/depression) was used to measure HRQoL. The Swedish experience-based and the United Kingdom hypothetical-based value-sets were used to calculate the quality-adjusted life-years (QALY), and associations to demographic and disability-specific factors were studied in univariate and multivariate analyses. **RESULTS:** The sample consisted of 408 adults with CP (189 women, 219 men), 18-73 years (mean age = 27, SD = 10). Approximately half reported no problems on self-care, usual activities, anxiety/depression, and some problems on mobility and pain/discomfort. Using the value-set based on experienced health states resulted in substantially higher HRQoL scores (0.77) compared to the hypothetical-based values (0.54) (when the health state is described to someone not personally experiencing it). Level of functioning and pain were strongly related to HRQoL, with gross motor functioning being a dominating factor. Sex and CP-subtype were not associated with HRQoL in the multivariate analysis. **CONCLUSIONS:** HRQoL was found to be high in this Swedish population of adults with CP although severe pain and reduced functioning was associated with lower HRQoL. The choice of value-set have strong influence on the HRQoL estimations, especially for lower levels of functioning.

PMID: [30837198](#)

17. Intrathecal Baclofen Pump versus Globus Pallidus Interna Deep Brain Stimulation in Adult Patients with Severe Cerebral Palsy.

Kim JH, Jung NY, Chang WS, Jung HH, Cho SR, Chang JW.

World Neurosurg. 2019 Mar 1. pii: S1878-8750(19)30503-0. doi: 10.1016/j.wneu.2019.02.092. [Epub ahead of print]

OBJECTIVE: There is no consensus on a standardized approach to spasticity or dystonia management of cerebral palsy (CP). This study aimed to investigate clinical outcomes and compare therapeutic responses for pallidal stimulation versus intrathecal baclofen (ITB) therapy in adult patients with severe CP. **METHODS:** We retrospectively reviewed CP patients treated with deep brain stimulation (DBS) of the globus pallidus internus (GPi) or implantation of ITB pump between June 2003 and April 2017. Patients were included if they were clinically diagnosed with medically intractable cerebral palsy and had >12 months of post-procedural follow-up data. Patients were assessed before and 12 months post-treatment using the Visual Analogue Scale, Burke-Fahn-Marsden Dystonia Rating Scale, self-rating improvement scale, and 36-item short form general health survey questionnaire. **RESULTS:** Patients (n=22) were divided into GPi DBS (n=12), and ITB therapy (n=10) groups. For the Burke-Fahn-Marsden Dystonia Rating Scale, DBS group movement scores and ITB group disability scores were significantly improved post-treatment. Although Visual Analogue Scales did not differ between groups, self-rating improvement scores differed significantly between groups. For quality of life, physical functioning, body pain, vitality, social functioning, and mental health significantly improved in ITB group 12 months post-treatment compared to those of preoperative period. Only mental health differed significantly between groups. **CONCLUSIONS:** Despite retrospective design and relatively low number of cases, this study indicated that ITB therapy was less invasive and more effective in improving the quality of life compared to GPi DBS. ITB therapy should be considered an alternative treatment for patients with severe CP.

PMID: [30831291](#)

18. (Re)organisation of the somatosensory system after early brain lesion: A lateralization index fMRI study.

Lemée JM, Chinier E, Ali P, Labriffe M, Ter Minassian A, Dinomais M.

Ann Phys Rehabil Med. 2019 Feb 27. pii: S1877-0657(19)30031-4. doi: 10.1016/j.rehab.2019.02.001. [Epub ahead of print]

OBJECTIVE: To evaluate the relationship between neural (re)organization of the somatosensory cortex and impairment of sensory function (2-point discrimination [2PD]) in individuals with unilateral cerebral palsy. **METHODS:** We included 21 individuals with unilateral cerebral palsy. 2PD thresholds were evaluated on thumb pads, and activation of the somatosensory cortex was recorded by functional MRI (fMRI) during passive movements of the affected hand. A lateralization index (LI) was

calculated for the primary sensory (S1) and secondary sensory (S2) cortices and the correlation between the LI and 2PD thresholds was analysed. RESULTS: We found a significant negative correlation between the 2PD thresholds and the S2 LI ($r=-0.5$, one-tailed P -value=0.01) and a trend towards a negative correlation with the S1 LI ($r=-0.4$, one-tailed P -value=0.05). CONCLUSION: High levels of activation in the contralesional hemisphere were associated with high levels of sensory impairment in individuals with unilateral cerebral palsy. The interhemispheric (re)organization of the somatosensory system may not effectively compensate for somatosensory impairment.

PMID: [30825646](#)

19. Orthopaedic Surgery in Dystonic Cerebral Palsy.

Blumetti FC, Wu JCN, Barzi F, Axt MW, Waugh MC, Selber P.

J Pediatr Orthop. 2019 Apr;39(4):209-216. doi: 10.1097/BPO.0000000000000919.

BACKGROUND: Outcomes after orthopaedic interventions in patients with dystonic cerebral palsy (DCP) are historically regarded as unpredictable. This study aims to evaluate the overall outcome of orthopaedic surgery in children with DCP. METHOD: Children with DCP who underwent lower limb orthopaedic surgery with a minimum follow-up of 12 months were included. Data collected included age at time of surgery, surgical procedures performed, Gross Motor Function Classification System (GMFCS) level, and Barry Albright Dystonia Scale (BADs) score. The cohort was divided into 2 groups. Group 1 (GMFCS levels I to III), mean age 12 years 7 months and group 2 (GMFCS levels IV to V), mean age 10 years 7 months. Group 1 had surgery aimed at deformity correction to improve gait and mobility, and group 2 for the management or prevention of hip displacement. Outcome measures analyzed were: the incidence of unpredictable results related to surgery and early recurrence of deformity in both groups. Functional mobility scale scores were evaluated for group 1 and hip migration percentage for group 2. Linear mixed models were used to take into account repeated measures over time and correlations between measurements from the same patient. RESULTS: Group 1 ($n=18$); had low BADs scores and were considered to have mild dystonia. Three children experienced unpredictable results, 2 had early recurrence of deformity, 3 had a decline, and 1 child improved in the functional mobility scale. Group 2 ($n=19$); had high BADs scores and were considered to have moderate to severe dystonia. Nine surgical events involved bony procedures and 15 were soft tissue surgery only. One surgical event led to unpredictable results and 2 children had early recurrence of deformity. Postoperatively, a linear trend of increasing migration percentage [0.49% (95% confidence interval, 0.23-0.74; $P=0.0002$)] was seen up to 21 months. There was no significant change after 21 months [-0.08% (95% confidence interval, -0.24 to +0.041; $P=0.18$)]. CONCLUSIONS: This study suggests that unpredictable results and early recurrence of deformity following orthopaedic surgery in children with DCP are not as common as previously regarded. Furthermore, functional mobility and hip morphology can be improved. LEVEL OF EVIDENCE: Level IV-this is a case-series.

PMID: [30839486](#)

20. Muscle spasm-induced exothermia in dystonic cerebral palsy: uncommon and frequently misdiagnosed condition.

So PNH, Castañeda MRRQ, Morante ARV, Oliva RV.

BMJ Case Rep. 2019 Mar 4;12(3). pii: e227488. doi: 10.1136/bcr-2018-227488.

A known cerebral palsy young man presented with prolonged bouts of generalised body movements associated with high-grade fever without any localising signs of infection, requiring multiple hospital admissions over several months. All septic work-ups, including a lumbar puncture, were negative. Serum chemistry was consistent with rhabdomyolysis. Repeated electroencephalograms showed no epileptiform discharges. Cranial MRI with gadolinium contrast revealed left cerebral atrophy with hyperintensities at the left basal ganglia. Uncontrolled dystonia with concomitant rhabdomyolysis was considered. Subsequent aggressive hydration and administration of muscle relaxant afforded abrupt resolution of symptoms.

PMID: [30837235](#)

21. Implementing accurate identification and measurement of dyskinesia in cerebral palsy into clinical practice: A knowledge translation study.

Stewart K, de Vries T, Harvey A.

J Paediatr Child Health. 2019 Mar 6. doi: 10.1111/jpc.14420. [Epub ahead of print]

AIM: The application of current, best evidence into clinical practice is problematic. This article describes a knowledge translation (KT) project aimed at improving clinician identification, classification and measurement of dyskinesia in children with cerebral palsy (CP). METHOD: A 2-year KT fellowship investigated clinicians' understanding of dyskinetic CP, identified knowledge gaps, determined educational needs and implemented a multifaceted KT strategy and dissemination framework to address those needs. RESULTS: Australian and New Zealand medical and allied health clinicians identified significant gaps in their clinical knowledge regarding dyskinetic CP, particularly confidence in identifying and measuring dyskinesia and poor knowledge of available identification and measurement tools. Following a targeted implementation strategy, there was a definite shift towards increased awareness of dyskinetic CP, a significant improvement in identification and measurement confidence (mean change from 47 to 66% confidence, $P < 0.0001$), and the embedding of the knowledge and skills into everyday clinical practice. CONCLUSIONS: This targeted and well-resourced KT project in dyskinetic CP improved clinician knowledge and led to meaningful change in clinical practice. The strategy utilised would be appropriate across a range of health-care settings.

PMID: [30843308](#)

22. Cerebral Palsy.

Hallman-Cooper JL, Scott A.

SourceStatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2019-. 2019 Feb 18.

Cerebral palsy is a group of permanent disorders affecting the development of movement and causing a limitation of activity. Non-progressive disturbances that manifest in the developing fetal or infant brain lead to cerebral palsy.[1] It is the most common cause of childhood disability. The degree and type of motor impairment and functional capabilities vary depending on the etiology. Cerebral palsy may have several associated comorbidities, including epilepsy, musculoskeletal problems, intellectual disability, feeding difficulties, visual abnormalities, hearing abnormalities, and communication difficulties. Treatment of cerebral palsy should take a multidisciplinary approach.

PMID: [30844174](#)

23. Medico-legal considerations and operative vaginal delivery.

Murphy DJ.

Best Pract Res Clin Obstet Gynaecol. 2019 Feb 10. pii: S1521-6934(19)30007-0. doi: 10.1016/j.bpobgyn.2019.01.012. [Epub ahead of print]

Women undergo operative vaginal delivery (OVD) as an alternative to caesarean section when complications arise in the second stage of labour. The perinatal mortality associated with OVD is very low, and most of the perinatal morbidity is minor. However, when serious adverse events occur, such as traumatic birth injury, shoulder dystocia, cerebral palsy and perinatal death, there are medico-legal implications. There is also the potential for litigation in relation to maternal pelvic floor injury, which is increased with OVD. Obstetricians performing and supervising OVDs need to be aware of the potential pitfalls and minimise the risk of adverse outcomes. Given that most obstetricians will be involved in adverse birth-related events, it is important that they are aware of the legal processes that may ensue. It is also important when reviewing adverse OVD-related outcomes that association is differentiated from causation. These issues are addressed in the current chapter with attention drawn to the Montgomery ruling, which redefines the legal standards expected in relation to informed consent.

PMID: [30827818](#)

24. [Genetic analysis of 10 children with cerebral palsy].

Zhu Q, Ni Y, Wang J, Yin H, Zhang Q, Bian W, Zhang L, Lin M, Liu J, Zhou J, Sha C, Zhou X.

Zhonghua Yi Xue Yi Chuan Xue Za Zhi. 2019 Mar 10;36(3):229-233. doi: 10.3760/cma.j.issn.1003-9406.2019.03.009. [Article in Chinese]

OBJECTIVE: To explore the genetic basis of cerebral palsy (CP). METHODS: A pair of twins with cerebral palsy and different phenotypes were subjected to whole genome sequencing, and other 8 children with CP were subjected to whole exome sequencing. Genetic variations were screened by a self-designed filtration process in order to explore the CP-related

biological pathways and genes. RESULTS: Three biological pathways related to CP were identified, which included axon guiding, transmission across chemical synapses and protein-protein interactions at synapses, and 25 susceptibility genes for CP were identified. CONCLUSION: The molecular mechanism of CP has been explored, which may provide clues for development of new treatment for CP.

PMID: [30835352](#)

25. Important report on cerebral palsy in Bangladesh: but different findings compared with other countries need further exploration.

Andrews C, Kakooza-Mwesige A, Eliasson AC, Forsberg H.

Dev Med Child Neurol. 2019 Mar 4. doi: 10.1111/dmcn.14202. [Epub ahead of print]

PMID: [30828785](#)

Prevention and Cure

26. Factors associated with intraventricular hemorrhage among preterm neonates in Aminu Kano teaching hospital.

Egwu CC, Ogala WN, Farouk ZL, Tabari AM, Dambatta AH.

Niger J Clin Pract. 2019 Mar;22(3):298-304. doi: 10.4103/njcp.njcp_154_18.

BACKGROUND: Intraventricular hemorrhage (IVH) is a severe complication among preterm neonates which can result in hydrocephalus, cerebral palsy, behavioural disorders, learning disabilities, or death. It is important to identify the factors associated with IVH in order to prevent these neurological consequences and reduce the resultant burden of neurological disease. Aim: To determine the factors associated with IVH among preterm neonates. DESIGN: The study was prospective cross-sectional in design. SUBJECTS AND METHODS: Ninety-nine preterm neonates who were < 37 completed weeks of gestation were recruited consecutively from the Special Care Baby Unit of a Tertiary Hospital. Transfontanelle ultrasonography was used to detect IVH and the factors associated with IVH were classified into: neonatal, maternal (prenatal), and clinical factors. Data were analyzed using SPSS version 16.0 for windows. Chi-squared test and Fisher's exact probability test were used as appropriate. The level of significance was set at $P < 0.05$. The association between these factors and IVH was evaluated by univariate and multivariate logistic regression analyses. RESULTS: Among the 99 preterm neonates studied, 36 (36.4%) of them were between 28 and 31 weeks of gestation, whereas 63 (63.6%) were between 32 and 36 weeks of gestation. In univariate analysis, the factors found to be associated with IVH were lower gestational age <32 weeks gestation, low Apgar score of <3 in 1 and 5 min, respectively, outborn status of neonates, lower social class, need for respiratory support, and blood transfusion. However, the lower gestational age (odds ratio [OR]: 10.9, 95% confidence interval [CI]:1.95-61.04) and respiratory support (continuous positive airway pressure (CPAP)) [OR: 52.24; CI: 3.40-721.84] were retained as significant predictors of IVH in the multivariate logistic regression model. CONCLUSION: The lower gestational age and respiratory support (CPAP) are independent predictors for IVH. Prevention of preterm delivery and improvement in interventions of neonatal care (CPAP) are necessary to prevent the risk for IVH especially in the early preterm neonates.

PMID: [30837415](#)