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Interventions and Management

1. *J Hand Surg Am.* 2014 Jul;39(7):1425-1432. doi: 10.1016/j.jhsa.2013.12.017.

Cerebral Palsy of the Elbow and Forearm.

Bunata R1, Icenogle K2.

Management of elbow and forearm involvement in cerebral palsy has evolved over the last 3 decades with a better understanding of its neuropathophysiology, improved outcome measures, and evolving therapy protocols. Current nonoperative and surgical treatment methods are discussed. The use of standard function measuring instruments and encouragement of the participation in research will hopefully result in more accurate outcome information and, thereby, refine our techniques and rehabilitation methods.

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[PMID: 24969499](https://pubmed.ncbi.nlm.nih.gov/24969499/) [PubMed - as supplied by publisher]

2. *Disabil Rehabil Assist Technol.* 2014 Jun 25:1-8. [Epub ahead of print]

Feasibility of school-based computer-assisted robotic gaming technology for upper limb rehabilitation of children with cerebral palsy.

Preston N1, Weightman A, Gallagher J, Holt R, Clarke M, Mon-Williams M, Levesley M, Bhakta B.

Introduction: We investigated the feasibility of using computer-assisted arm rehabilitation (CAAR) computer games in schools. Outcomes were children's preference for single player or dual player mode, and changes in arm activity and kinematics. **Method:** Nine boys and two girls with cerebral palsy (6-12 years, mean 9 years) played assistive technology computer games in single-user mode or with school friends in an AB-BA design. Preference was determined by recording the time spent playing each mode and by qualitative feedback. We used the ABILHAND-kids and Canadian Occupational Performance Measure to evaluate activity limitation, and a portable laptop-based device to capture arm kinematics. **Results:** No difference was recorded between single-user and dual-user modes (median daily use 9.27 versus 11.2 min, $p = 0.214$). Children reported dual-user mode was preferable. There were no changes in activity limitation (ABILHAND-kids, $p = 0.424$; COPM, $p = 0.484$) but we found significant improvements in hand speed ($p = 0.028$), smoothness ($p = 0.005$) and accuracy ($p = 0.007$). **Conclusion:** School timetables prohibit extensive use of rehabilitation technology but there is potential for its short-term use to supplement a rehabilitation program. The restricted access to the rehabilitation games was sufficient to improve

arm kinematics but not arm activity. Implications for Rehabilitation School premises and teaching staff present no obstacles to the installation of rehabilitation gaming technology. Twelve minutes per day is the average amount of time that the school time table permits children to use rehabilitation gaming equipment (without disruption to academic attendance). The use of rehabilitation gaming technology for an average of 12 minutes daily does not appear to benefit children's functional performance, but there are improvements in the kinematics of children's upper limb.

[PMID: 24964205](#) [PubMed - as supplied by publisher]

3. Dev Med Child Neurol. 2014 Jun 23. doi: 10.1111/dmcn.12521. [Epub ahead of print]

A cross-sectional study examining computer task completion by adolescents with cerebral palsy across the Manual Ability Classification System levels.

Davies TC1, AlManji A, Stott NS.

AIM: The aim of this study was to analyze the cursor trajectories of adolescents with cerebral palsy (CP) when using a mouse for point-and-click computer tasks. By identifying some of the factors limiting cursor movement and gaining a better understanding of human movement, it will be possible to design more accessible computer interfaces. **METHOD:** This study evaluated cursor trajectories of 29 individuals with bilateral CP who had different levels of upper limb function as measured by the Manual Ability Classification System, and compared the results with those of 12 adolescents with typical development. **RESULTS:** Among adolescents with typical development, movement time increases linearly as the index of difficulty increases (Fitts' law); however, this linearity was not apparent in adolescents with bilateral CP. **INTERPRETATION:** Interfaces for members of the population are designed around Fitts' law, with low precision requirements at indices of difficulty lower than 4. We found that interactive displays for adolescents with CP should be limited to an index of difficulty of 2.

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4. Curr Osteoporos Rep. 2014 Jun 26. [Epub ahead of print]

Fractures in Children with Cerebral Palsy.

Mughal MZ.

Children with moderate to severe cerebral palsy are at increased risk of sustaining fracture following minimal trauma. Such fractures predominantly occur in lower limb bones and are associated with low bone mineral density. Risk factors for fracture in this group include nonambulatory status, anticonvulsant use, presence of a joint contractures, immobilization after surgery, and poor nutrition. Aims of this review are to describe the prevalence and pathogenesis of fractures in nonambulant children with cerebral palsy. Interventions and treatments that improve low bone mineral density and which may help to reduce the fracture risk in this population are also discussed.

[PMID: 24964775](#) [PubMed - as supplied by publisher]

5. Eur J Paediatr Neurol. 2014 Jun 11. pii: S1090-3798(14)00090-7. doi: 10.1016/j.ejpn.2014.06.003. [Epub ahead of print]

Multidimensional outcome measure of selective dorsal rhizotomy in spastic cerebral palsy.

Carraro E1, Zeme S2, Ticcinelli V3, Massaroni C3, Santin M3, Peretta P4, Martinuzzi A3, Trevisi E3.

BACKGROUND: One of the treatment option to reduce spasticity in cerebral palsy children is selective dorsal rhizotomy. Several studies have demonstrated short and long term improvements in gait and other activities after rhizotomy but this surgery still remains a controversial procedure and patient outcome indicators measures are not

uniform. **AIMS:** To describe our assessment and outcome evaluation protocol and to verify by this protocol short term results of rhizotomy. **METHODS:** We recruited 9 cerebral palsy children (mean age 7.9 years \pm 3.2) affected by mild to moderate spastic diplegia and operated by rhizotomy. Patients were studied preoperatively and at 12 months after surgery by the following clinical and instrumental measures correlated to the International Classification of Functioning: modified Ashworth Scale, passive Range of Motion, Medical Research Council Scale, Selective Motor Control Scale, 3D-motion analysis and energy cost of locomotion measurements (indicators of "body functions"); Gross Motor Functional Measure and Motor Functional Independence Measure (indicators of "activities and participation"). **RESULTS:** Our data showed, after rhizotomy, reduction of spasticity specially in plantarflexors muscles ($p < 0.01$), increase of strength of knee flexors/extensors and foot plantar/dorsiflexion muscles ($p < 0.01$), improvement of selective motor control ($p < 0.05$), more similar spatio-temporal parameters of gait analysis to healthy subjects, reduced equinus foot and knees hyperflexion as energy cost. **CONCLUSION:** The complementary use of multiple indicators may improve the evaluation of the results of dorsal rhizotomy. A beneficial outcome measured by these indicators has been found in our spastic diplegic children one year after rhizotomy.

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6. Rev Neurol (Paris). 2014 Jun 19. pii: S0035-3787(14)00872-8. doi: 10.1016/j.neurol.2014.05.004. [Epub ahead of print]

Botulinum toxin in the management of spasticity in children [Article in French]

Benrhouma H1, Yacoubi J2, Kraoua I2, Klaa H2, Ben Youssef-Turki I2, Gouider-Khouja N3.

INTRODUCTION: Spasticity is a motor disorder, which can be treated by botulinum toxin (BT). We found no studies describing BT management of spasticity in Tunisian children. The aim of our study was to determine the frequency of spastic children treated with BT in the Tunisian hospital population and to evaluate treatment efficacy.

METHODS: We conducted a prospective study over a 5-year period including all children diagnosed with spasticity treated with BT and attending the "Movement Disorders and Botulinum Toxin" outpatient clinic of the National Institute of Neurology of Tunis. **RESULTS:** Hundred and fifteen patients were included (31% of patients attending the "Movement Disorders and Botulinum Toxin" outpatient clinic). Mean age was 7.6years and M:F sex ratio 1.7. Main clinical features were: spastic quadriplegia (48%), equinus deformity (70.4%) and cerebral palsy (88%). All patients were evaluated with the modified Ashworth score and were treated with BT. Other treatments were associated with BT: baclofene, physiotherapy, orthoses, plaster, and sometimes surgical treatment. The average percentage of improvement after BT was >50%. The Ashworth score was significantly lower for the majority of injected muscles. **DISCUSSION AND CONCLUSION:** Our study is the first to describe BT management of spasticity in Tunisian children. Treatments of spasticity are numerous and vary according to location and extent of spasticity. BT is the main treatment for focal spasticity. Associated with physical therapy, BT allows optimal management of spastic children.

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7. Hip Int. 2014 May 23:0. doi: 10.5301/hipint.5000142. [Epub ahead of print]

Changes in hip geometry after selective dorsal rhizotomy in children with cerebral palsy.

Floeter N1, Lebek S, Bakir MS, Sarpong A, Wagner C, Haberl EJ, Funk JF.

PURPOSE: Hip development in children with spastic cerebral palsy (CP) may be different in comparison to that of typical developing children due to impaired motor function and altered lever arms. Selective dorsal rhizotomy (SDR) is known to reduce spasticity. It is postulated that it also improves mobility. Its influence on hip development is unclear. The aim of this study is to evaluate changes in hip geometry before and after selective dorsal rhizotomy.

METHODS: Conventional radiographs (Rippstein I and II) of 33 ambulatory children aged 2.67 to 11.75 years who underwent SDR were analysed pre- and postoperatively at a mean of 18 months (range 12-29 months). Migration percentage, acetabular index, and anteversion were evaluated. The reduction of spasticity was measured with the

modified Ashworth scale. A priori power analysis was performed. As data was normally distributed statistical analysis was performed applying the t-test for paired variables. **RESULTS:** Radiographic parameters concerning hip geometry improved significantly after SDR. The spasticity of adductors and hamstrings was significantly reduced through SDR from on average 1.7 to 0.8 on the modified Ashworth scale ($p < 0.001$). The acetabular index decreased from 19° to 17° ($p = 0.001$), the migration percentage improved from 24% to 21% ($p < 0.001$). Anteversion was also significantly reduced from 41° to 38° ($p < 0.001$). Function improved significantly from 80% to 85% when measured with the GMFM-88 ($p < 0.001$). **CONCLUSIONS:** The results confirm that SDR improves hip geometry as well as function in ambulatory CP children. Long-term studies need to show whether this radiographic improvement has clinical relevance with regard to pain and function.

[PMID: 24970326](#) [PubMed - as supplied by publisher]

8. Yonsei Med J. 2014 Jul 1;55(4):1115-22. doi: 10.3349/ymj.2014.55.4.1115.

Estimation of gastrocnemius muscle volume using ultrasonography in children with spastic cerebral palsy.

Park ES1, Sim E1, Rha DW1, Jung S2.

PURPOSE: This study aimed to investigate useful parameters for estimating gastrocnemius (GCM) muscle volume (MV) using ultrasonography (US) and anthropometry in children with spastic cerebral palsy (CP). **MATERIALS AND METHODS:** Eighteen legs from nine children with spastic CP aged 2 to 6 years were investigated in this study. Tibial length (TL) of each leg was measured and muscle thickness (MT) and anatomical cross-sectional area (aCSA) of GCM muscles were assessed using US. The volume of the GCM was measured by magnetic resonance imaging (MRI) scans. The relationship of TL, MT, and aCSA with MV measured by MRI was investigated. Simple and multiple regression analyses were performed to establish muscle volume prediction equations. **RESULTS:** Resting MT, aCSA, and TL were highly related to MV of both medial and lateral head of GCM determined by MRI. The MV prediction equation based on simple regression analysis resulted in r^2 values ranging from 0.591 to 0.832 ($p < 0.05$). The r^2 values were higher using aCSA as independent variable than using MT. The MV prediction equation based on multiple regression analysis resulted in r^2 values ranging from 0.779 to 0.903 ($p < 0.05$). However, the relatively high standard error of the estimate values ranged from 18.0-33.6% on simple regression and 15.5-25.6% on multiple regression. The contribution of aCSA was higher than that of MT for predicting MV of GCM. **CONCLUSION:** Our study demonstrated the suitability of US assessment of aCSA and MT combined with TL for estimating MV of GCM in children with spastic CP and showed that aCSA is more useful parameter than MT.

[PMID: 24954345](#) [PubMed - in process] Free full text

9. Int Orthop. 2014 Jun 27. [Epub ahead of print]

Hip reconstruction surgery is successful in restoring joint congruity in patients with cerebral palsy: long-term outcome.

Braatz F1, Eidemüller A, Klotz MC, Beckmann NA, Wolf SI, Dreher T.

PURPOSE: Neurogenic hip dislocation is frequently observed in patients with cerebral palsy (CP). If the hip is not centred but not dislocated, the hip joint can be recentered with minor operative effort. Reconstructive procedures are indicated if the femoral head is subluxated or dislocated. There are no data as to when destruction of the femoral head requires a salvage procedure or whether hip reconstruction surgery is successful in restoring joint congruity in patients with CP. Our aim was to investigate femoral head plasticity after hip reconstruction surgery in a long-term outcome study. **METHODS:** We studied a large cohort of patients with CP and high hip dislocation (Tönnis grade IV) before surgery. Sixty-eight patients were assessed, of whom 23 presented with bilateral high hip dislocation, and 91 complex hip reconstructions were conducted. Standardised radiographic examination was performed before and directly after surgery and at the long-term follow-up examination. **RESULTS:** Pain was the most frequent reason for complex hip-joint reconstruction (49 patients, 72 %). An impressive improvement in pain was demonstrated postoperatively. Forty-five hip joints presented aspheric incongruity postoperatively, which improved on average 7.7 years after surgery and 59 hip joints showed congruency. Only 15 % of patients experienced pain at the time of final follow-up, and that was of low intensity. **CONCLUSIONS:** Early conservative treatment for hip dislocation is helpful, and operative reconstruction should also be scheduled early. Continued surveillance is necessary, and Reimers index is useful for monitoring the development of hip centering. In case of

hip pain and femoral head deformity, our long-term study indicates that hip reconstruction surgery as a part of multilevel surgery improves pain and function in patients with CP and Tönnis IV hip dislocation, even if the hip joint is incongruent after operation. This incongruity improves over the long-term. If possible, a reconstruction procedure should be performed before the femoral head becomes deformed. High plasticity of the hip joint suggest that even if the femoral head is deformed, hip reconstruction can be recommended.

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10. Early Hum Dev. 2014 Jun 24;90(9):435-441. doi: 10.1016/j.earlhumdev.2014.05.011. [Epub ahead of print]

Postural adjustments in infants at very high risk for cerebral palsy before and after developing the ability to sit independently.

Boxum AG1, van Balen LC1, Dijkstra LJ1, Hamer EG1, Hielkema T1, Reinders-Messelink HA2, Hadders-Algra M3.

BACKGROUND: Children with cerebral palsy (CP) have impaired postural control. Posture is controlled in two levels: direction-specificity, and fine-tuning of direction-specific adjustments, including recruitment order. Literature suggests that direction-specificity might be a prerequisite for independent sitting. **AIM:** To study development of postural adjustments in infants at very high risk for CP (VHR-infants) during developing the ability to sit independently. **METHOD:** In a longitudinal study surface electromyograms of the neck-, trunk- and arm muscles of 11 VHR-infants and 11 typically developing (TD) infants were recorded during reaching in sitting before and after developing the ability to sit unsupported (median ages: VHR 8.0 and 14.9months; TD 5.7 and 10.4months). Sessions were video-recorded. **RESULTS:** In VHR- and TD-infants the prevalence of direction-specific adjustments and recruitment order did not change when the infant learned to sit independently. In VHR-infants able to sit independently more successful reaching was associated with a higher frequency of bottom-up recruitment (Spearman's $\rho=0.828$, $p=0.006$) and a lower frequency of simultaneous recruitment (Spearman's $\rho=-0.701$, $p=0.035$), but not with more direction-specificity. In TD-infants not able to sit independently, more successful reaching was associated with higher rates of direction-specific adjustments at the neck level (Spearman's $\rho=0.778$, $p=0.014$), but not with recruitment order. **CONCLUSIONS:** In VHR- and TD-infants postural adjustments during reaching in terms of direction-specificity and recruitment order are not related to development of independent sitting. Postural adjustments are associated with success of reaching, be it in a different way for VHR- and TD-infants. Clinical trial registration number: NTR1428.

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11. Biomedica. 2014 Mar;34(1):102-9. doi: 10.1590/S0120-41572014000100013.

Differences in standing balance in patients with cerebral palsy and typically developing children [Article in Spanish]

Gatica VF1, Irene Velásquez S2, Méndez GA1, Guzmán EE2, Manterola CG3.

Introduction: Physical disability is the most common disability (10.3 %) in the central area of Chile. The cerebral palsy is one of the diseases that generates motor deficits and loss of balance. Balance is crucial for maintaining postural stability. **Objective:** To establish the differences in area and average velocity of the center of pressure between typically developing children and cerebral palsy patients, and to determine the degree of use of different sensory systems. **Materials and methods:** This was a cross-sectional study. A convenience sample was divided into two groups: typically developing children ($n=7$) and cerebral palsy patients ($n=7$). The parameters measured by a force plate were the area and average velocity of excursion of the center of pressure, as well as the frequency bands (0.0625, 0.125, 0.25, 0.5, 1, 2 and 4 Hz) . **Results:** During the eyes open condition, the cerebral palsy subject had an average velocity of the center of pressure significantly higher than the typically developing children group ($p=0.043$). The frequency bands 0.25 Hz and 0.5 Hz related to the vestibular system showed significant differences between groups ($p=0.021$ y $p=0.036$). In the eyes closed phase a significant increase in the area of the center of pressure and a higher use of the otolithic vestibular system were observed in the cerebral palsy group. **Conclusions:** Cerebral palsy patients showed a lower standing balance in addition to using the vestibular system significantly more both in eyes open and eyes closed phases.

[PMID: 24967863](#) [PubMed - in process] Free full text

12. Indian J Pediatr. 2014 Jun 29. [Epub ahead of print]

Brown Tumor due to Vitamin D Deficiency in a Child with Cerebral Palsy.

Yadav J1, Madaan P, Jain V.

[PMID: 24972550](#) [PubMed - as supplied by publisher]

13. Int Urol Nephrol. 2014 Jun 28. [Epub ahead of print]

Does selective dorsal rhizotomy improve bladder function in children with cerebral palsy?

Chiu PK1, Yam KY, Lam TY, Cheng CH, Yu C, Li ML, Chu PS, Man CW.

PURPOSE: To investigate the efficacy of selective dorsal rhizotomy (SDR) on urinary symptoms and bladder function in cerebral palsy children. **METHODS:** Selective dorsal rhizotomy was performed in 56 children with spastic cerebral palsy. Intraspinous nerve root divisions over the cauda equina from L1/2 to S1/2 levels were performed. Urinary symptoms and urodynamic study (UDS) parameters before and after SDR were analyzed. **RESULTS:** Fifty-four out of 56 children (mean age 7.7) with SDR performed had complete urinary symptoms for analysis, of which 90 % had diplegic cerebral palsy. Fifty-one children had preoperative UDS performed, and 20 children had both preoperative and postoperative UDS. All UDS were performed within 4 weeks before SDR, and the mean time from SDR to post-op UDS was 8.4 months. Before operation, 22 out of 54 (40.7 %) children had urgency or frequency, and 16 out of 54 (29.6 %) children had incontinence. Twelve out of 22 (54.5 %) children with urgency or frequency became completely asymptomatic after SDR ($p = 0.013$), while 9 out of the 10 children with residual urgency or frequency had significant improvement. Twelve out of 16 (75.0 %) incontinent children became continent after SDR ($p = 0.013$). Bladder capacity at first incontinence significantly increased from 70 to 130 ml ($p = 0.016$). Other parameters had no significant difference after SDR. There was a trend that S2 rootlet division had major contribution in achieving continence. **CONCLUSIONS:** Selective dorsal rhizotomy significantly improved urgency, frequency, incontinence, and urodynamic bladder capacity at first incontinence in a significant proportion of spastic cerebral palsy children.

[PMID: 24973204](#) [PubMed - as supplied by publisher]

14. Behav Brain Funct. 2014 Jun 25;10(1):22. [Epub ahead of print]

Correlations between color perception and motor function impairment in children with spastic cerebral palsy.

Costa MF, Pereira JC.

INTRODUCTION: The aim of the present study was to evaluate color perception thresholds and relate them to the degree of motor impairment in children with spastic cerebral palsy (SCP). **METHODS:** Binocular and monocular chromaticity discrimination thresholds were estimated for the protan, deutan, and tritan color confusion axes in 43 SCP children aged 6-15 years who were classified as tetraplegic ($n = 12$), diplegic ($n = 16$), and hemiplegic ($n = 15$) without ophthalmological complaints. Motor impairment was rated according to the Gross Motor Function Classification System (GMFCS) in five levels of severity. **RESULTS:** Analysis of variance showed significantly reduced discrimination in tetraplegic children ($p < 0.001$) compared with the diplegic, hemiplegic, and control groups. We also found a positive correlation between chromaticity discrimination thresholds and GMFCS ratings in all of the groups. **DISCUSSION:** Chromaticity discrimination thresholds measured psychophysically were reduced for all three color confusion axis in tetraplegic children compared with normal children. Diplegic and hemiplegic children had similar results as normal children. The finding of a correlation between quantified motor impairment and color discrimination losses in SCP patients is a new observation that might help elucidate the causes of color perception loss in these patients. Visual information is essential for the rehabilitation of CP children. Knowledge of the degree of correlation between vision and motor impairment is valuable when planning a rehabilitation program.

[PMID: 24961924](#) [PubMed - as supplied by publisher] Free full text

15. Indian Pediatr. 2014 May 8;51(5):385-7.

Health-related Quality of Life in Children with Cerebral Palsy and Their Families.

Dobhal M1, Juneja M, Jain R, Sairam S, Thiagarajan D.

OBJECTIVE: To determine the health-related quality of life in children with cerebral palsy and their families. **METHODS:** One hundred children (3-10 years of age) receiving regular rehabilitation therapy for cerebral palsy for last 1 year at a Child Development Centre were enrolled and the Lifestyle assessment questionnaire - cerebral palsy was administered to the parents. **RESULTS:** 9% had good, 24% had mildly-affected, 37% had moderately-affected and 30% had severely-affected health-related quality of life. The physical independence, mobility and social integration dimensions were much more severely affected than the clinical burden, economic burden and schooling dimensions. **CONCLUSION:** Health-related quality of child is affected in most children with cerebral palsy.

[PMID: 24953580](#) [PubMed - in process]

16. J Clin Exp Neuropsychol. 2014 Jun 23:1-11. [Epub ahead of print]

Feasibility of event-related potential methodology to evaluate changes in cortical processing after rehabilitation in children with cerebral palsy: A pilot study.

Maitre NL1, Henderson G, Gogliotti S, Pearson J, Simmons A, Wang L, Slaughter JC, Key AP.

This study examined the feasibility of using event-related potentials (ERPs) to measure changes in cortical processing following an established rehabilitative intervention (constraint-induced movement therapy, CIMT) for children with cerebral palsy (CP). Sixteen participants with a diagnosis of hemiparetic CP, with a median age of 6 years, were assessed pre and immediately post CIMT and at 6-month follow-up, using a picture-word match/mismatch discrimination task and standard neurobehavioral measures. Intervention effects were evident in improved performance on behavioral tests of sensory and motor function and the increased mean ERP amplitude of the N400 match/mismatch response on the side ipsilateral to the lesion. These effects were maintained 6 months after the intervention. No such changes were observed on the side contralateral to the lesion. This research suggests that ERPs can measure rehabilitation-induced changes in neural function in children with CP.

[PMID: 24953907](#) [PubMed - as supplied by publisher]

17. ISRN Family Med. 2014 Feb 20;2014:769619. doi: 10.1155/2014/769619. eCollection 2014.

A Qualitative Study of Psychosocial Problems among Parents of Children with Cerebral Palsy Attending Two Tertiary Care Hospitals in Western India.

Nimbalkar S1, Raithatha S2, Shah R3, Panchal DA4.

Objective. To explore the psychosocial problems faced by the parents of children with cerebral palsy (CP) in rural and urban settings. **Design.** Qualitative research design using focus group discussions (FGDs) was used for the study. **Setting.** Two FGDs comprising one at a rural tertiary level care hospital and the other at an urban tertiary level care hospital were conducted. **Participants.** A total of thirteen parents participated in the two FGDs. **Main Outcome Measured.** Psychosocial problems experienced by the parents of children suffering from CP were measured. **Results.** The problems experienced by the mothers were associated with common themes such as disturbed social relationships, health problems, financial problems, moments of happiness, worries about future of the child, need for more support services, and lack of adequate number of trained physiotherapists. All the parents had children with problems since birth and most had approached various health care providers for a cure for their child. **Conclusions.** A wide range of psychosocial problems are experienced by the parents of children with CP. Studies like this can provide valuable information for designing a family centered care programme for children with

CP.

[PMID: 24967331](#) [PubMed] Free PMC Article

18. Disabil Rehabil. 2014 Jun 25:1-5. [Epub ahead of print]

Transcultural adaptation and validation of the Korean version of Caregiver Priorities & Child Health Index of Life with Disabilities (CPCHILD).

Sung KH1, Kwon SS, Narayanan UG, Chung CY, Lee KM, Lee SY, Lee DJ, Park MS.

Purpose: The aim of this study was to translate and transculturally adapt the Caregiver Priorities & Child Health Index of Life with Disabilities (CPCHILD) questionnaire into Korean language, and to test the reliability and validity, including the internal consistency, known-group validity and factor analysis of the Korean version of the CPCHILD. **Methods:** A Korean version of CPCHILD was produced according to internationally accepted guidelines. For validity testing, 194 consecutive parents or caregivers of children with cerebral palsy (CP) were recruited and completed the questionnaire. Internal consistency, test-retest reliability, and known-groups validity were evaluated and factor analysis was performed to validate the Korean version of the CPCHILD. **Results:** In terms of internal consistency, a Cronbach's alpha was above 0.90 in all domains of the CPCHILD (range 0.921 to 0.966), except the 5th domain (0.628). In terms of known-groups validity, the total score of the CPCHILD was significantly different according to the Gross Motor Function Classification System (GMFCS) level ($p < 0.001$). Intra-class correlation coefficient spanned from 0.517 to 0.801. Factor analysis showed that the five-factor solution of the CPCHILD explained 76.7% of the variance with 59.0, 6.5, 5.1, 4.2 and 3.2% of variance by each components number. **Conclusions:** The Korean version of CPCHILD was found to be a reliable and valid questionnaire of caregivers' perspectives on the health-related quality of life in severely affected children with CP. However, the Korean version of CPCHILD contains some redundant items, and factor analysis suggested a five-domain questionnaire. **Implication for Rehabilitation** The Korean version of CPCHILD is a reliable, internally consistent, valid instrument for assessing the health-related quality of life in severely affected children with CP from the perspective of caregivers. After the transcultural adaptation and validation of the Korean CPCHILD, it can be reliably used in clinical and research settings to evaluate the health-related quality of life in Korean patients with CP.

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19. J Child Neurol. 2014 Jun 22. pii: 0883073814535503. [Epub ahead of print]

Evidence-Based Diagnosis, Health Care, and Rehabilitation for Children With Cerebral Palsy.

Novak I.

Safer and more effective interventions have been invented for children with cerebral palsy, but the rapid expansion of the evidence base has made keeping up-to-date difficult. Unfortunately, outdated care is being provided. The aims were to survey the questions parents asked neurologists and provide evidence-based answers, using knowledge translation techniques. Parents asked the following questions: (1) what's wrong with my baby? An algorithm for early diagnosis was proposed. (2) What is cerebral palsy and what online resources are current? Reputable information websites were sourced and hyperlinks provided. (3) The prognosis? Prognostic data from meta-analyses were summarized in an infographic. (4) What interventions offer the most evidence-supported results? Systematic review data about the most effective interventions was mapped into a bubble chart infographic. Finally, (5) What can we expect? Predictors and facilitators of good outcomes were summarized. This article provides an overview of the most up-to-date diagnostic practices and evidence-based intervention options.

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Prevention and Cure

20. *Dev Med Child Neurol.* 2014 Jun 26. doi: 10.1111/dmcn.12520. [Epub ahead of print]

Recent trends in cerebral palsy survival. Part I: period and cohort effects.

Brooks JC1, Strauss DJ, Shavelle RM, Tran LM, Rosenbloom L, Wu YW.

AIM: To determine whether the trend of improved survival among individuals with cerebral palsy (CP) in California during the 1980s and 1990s has continued during the most recent decade.

METHOD: In an observational cohort study we evaluated individuals with CP, aged 4 years and older, who were clients of the California Department of Developmental Services. Medical diagnoses, functional disabilities, and special health care requirements were assessed with Client Development Evaluation Reports made between 1983 and 2010. Trends in birth cohort survival were analyzed with Kaplan-Meier curves and Cox regression. Calendar year period effects were analyzed with Poisson regression. **RESULTS:** A total of 51 923 persons with CP (28 789 males [55%], 23 134 females [45%]; mean age 14y 11mo, SD 14y 1mo, range 4y 0mo to 96y 10mo) collectively contributed 662 268 years of follow-up. There were 7690 deaths for an overall mortality rate of 11.6 per 1000 persons per year. No significant birth cohort effects on survival were observed in 4-year-olds who had no severe disabilities. By contrast, children who did not lift their heads in prone position who were born in more recent years had significantly lower mortality rates (Cox hazard ratio 0.971, $p < 0.001$) than those with comparable disabilities born earlier. With regard to calendar year period effects, we found that age-, sex-, and disability-specific mortality rates declined by 1.5% (95% CI 0.9-2.1) year-over-year from 1983 to 2010. The estimate increased to 2.5% (95% CI 1.9-3.1) per year when we additionally controlled for tube-feeding status. Mortality rates in tube fed adolescents and adults, ages 15 to 59 years, declined by 0.9% (95% CI, 0.4-1.4) per year. No improvement was observed for adolescents or adults who fed orally or for those over age 60. In fact, the ratio of age-specific mortality rates for these latter groups to those in the general population, increased by 1.7% (95% CI 1.3-2.0) per year during the study period. **INTERPRETATION:** The trend toward improved survival has continued throughout the most recent decade. Declines in CP childhood mortality are comparable to the improvements observed in the United States general population (i.e. the mortality ratio in childhood has remained roughly constant over the last three decades). In contrast, the mortality ratio for most adolescents and adults with CP, relative to the general population, has increased.

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Effect of neonatal hemoglobin concentration on long-term outcome of infants affected by fetomaternal hemorrhage.

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BACKGROUND: Fetomaternal hemorrhage (FMH) can cause severe morbidity. However, perinatal risk factors for long-term poor outcome due to FMH have not been extensively studied. **AIMS:** To determine which FMH infants are likely to have neurological sequelae. **STUDY DESIGN:** A single-center retrospective observational study. Perinatal factors, including demographic characteristics, Kleihauer-Betke test, blood gas analysis, and neonatal blood hemoglobin concentration ([Hb]), were analyzed in association with long-term outcomes. **SUBJECTS:** All 18 neonates referred to a Neonatal Intensive Care Unit of Kagoshima City Hospital and diagnosed with FMH during a 15-year study period. All had a neonatal [Hb] < 7.5 g/dL and 15 of 17 neonates tested had Kleihauer-Betke test result $> 4.0\%$. **OUTCOME MEASURES:** Poor long-term outcome was defined as any of the following determined at 12month old or more: cerebral palsy, mental retardation, attention deficit/hyperactivity disorder, and epilepsy. **RESULTS:** Nine of the 18 neonates exhibited poor outcomes. Among demographic characteristics and blood variables compared between two groups with poor and favorable outcomes, significant differences were observed in [Hb] (3.6 ± 1.4 vs. 5.4 ± 1.1 g/dL, $P = 0.01$), pH (7.09 ± 0.11 vs. 7.25 ± 0.13 , $P = 0.02$) and base deficits (17.5 ± 5.4 vs. 10.4 ± 6.0 mmol/L, $P = 0.02$) in neonatal blood, and a number of infants with $[Hb] \leq 4.5$ g/dL (78% [7/9] vs. 22% [2/9], $P = 0.03$), respectively. The base deficit in neonatal arterial blood increased significantly with decreasing neonatal

[Hb]. CONCLUSIONS: Severe anemia causing severe base deficit is associated with neurological sequelae in FMH infants.

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22. PLoS One. 2014 Jun 25;9(6):e100451. doi: 10.1371/journal.pone.0100451. eCollection 2014.

Spatial patterns of whole brain grey and white matter injury in patients with occult spastic diplegic cerebral palsy.

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Spastic diplegic cerebral palsy (SDCP) is a common type of cerebral palsy (CP), which presents as a group of motor-impairment syndromes. Previous conventional MRI studies have reported abnormal structural changes in SDCP, such as periventricular leukomalacia. However, there are roughly 27.8% SDCP patients presenting normal appearance in conventional MRI, which were considered as occult SDCP. In this study, sixteen patients with occult SDCP and 16 age- and sex-matched healthy control subjects were collected and the data were acquired on a 3T MR system. We applied voxel-based morphometry (VBM) and tract-based spatial statistics (TBSS) analysis to investigate whole brain grey and white matter injury in occult SDCP. By using VBM method, the grey matter volume reduction was revealed in the bilateral basal ganglia regions, thalamus, insula, and left cerebral peduncle, whereas the white matter atrophy was found to be located in the posterior part of corpus callosum and right posterior corona radiata in the occult SDCP patients. By using TBSS, reduced fractional anisotropy (FA) values were detected in multiple white matter regions, including bilateral white matter tracts in prefrontal lobe, temporal lobe, internal and external capsule, corpus callosum, cingulum, thalamus, brainstem and cerebellum. Additionally, several regions of white matter tracts injury were found to be significantly correlated with motor dysfunction. These results collectively revealed the spatial patterns of whole brain grey and white matter injury in occult SDCP.

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White matter loss in a mouse model of periventricular leukomalacia is rescued by trophic factors.

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Periventricular leukomalacia (PVL) is the most frequent cause of cerebral palsy and other intellectual disabilities, and currently there is no treatment. In PVL, glutamate excitotoxicity (GME) leads to abnormal oligodendrocytes (OLs), myelin deficiency, and ventriculomegaly. We have previously identified that the combination of transferrin and insulin growth factors (TSC1) promotes endogenous OL regeneration and remyelination in the postnatal and adult rodent brain. Here, we produced a periventricular white matter lesion with a single intracerebral injection of N-methyl-D-aspartate (NMDA). Comparing lesions produced by NMDA alone and those produced by NMDA + TSC1 we found that: NMDA affected survival and reduced migration of OL progenitors (OLPs). In contrast, mice injected with NMDA + TSC1 proliferated twice as much indicating that TSC1 supported regeneration of the OLP population after the insult. Olig2-mRNA expression showed 52% OLP survival in mice receiving a NMDA injection and increased to 78% when TSC1 + NMDA were injected simultaneously and ventricular size was reduced by TSC1. Furthermore, in striatal slices TSC1 reduced the inward currents induced by NMDA in medium-sized spiny neurons, demonstrating neuroprotection. Thus, white matter loss after excitotoxicity can be partially rescued as TSC1 conferred neuroprotection to preexisting OLP and regeneration via OLP proliferation. Furthermore, we showed that early TSC1 administration maximizes neuroprotection.

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