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Interventions and Management

1. Spasticity in Children and Young People with Non-Progressive Brain Disorders: Management of Spasticity and Co-Existing Motor Disorders and Their Early Musculoskeletal Complications.

National Collaborating Centre for Women's and Children's Health (UK).

London: RCOG Press; 2012 Jul.

National Institute for Health and Clinical Excellence: Guidance.

This guideline covers the management of spasticity and co-existing motor disorders and their early musculoskeletal complications in children and young people (from birth up to their 19th birthday) with non-progressive brain disorders. Cerebral palsy is the most common condition associated with spasticity in children and young people. The incidence of cerebral palsy is not known, but its prevalence in the UK is 186 per 100,000 population, with a total of 110,000 people affected. The guideline covers the management of spasticity associated with cerebral palsy, but not all aspects of the management of cerebral palsy. The impact of spasticity and co-existing motor disorders and their early musculoskeletal complications on the child or young person varies. Common problems include impaired motor function affecting the person's ability to participate in society, pain from muscle spasms, motor developmental delay and difficulties with daily care due to the onset of secondary complications of spasticity. Management should be tailored to meet the problems faced by the individual child or young person and their individual goals. There is considerable variation in practice in managing spasticity, including variation in the availability of treatments and the intensity of their use. This guideline will help healthcare professionals to select and use appropriate treatments for individual children and young people.

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Sections: 1) Guideline summary; 2) Introduction; 3) Guideline development methodology; 4) Physical therapy ; physiotherapy and/or occupational therapy); 5) Orthoses; 6) Oral drugs; 7) Botulinum toxin; 8) Intrathecal baclofen; 9) Orthopaedic surgery; 10) Selective dorsal rhizotomy; 11) Health economics; 12) References; 13) Abbreviations and glossary; 14) Appendices: A Scope, Declarations of interest, C Stakeholders, D Review protocols, E Outcome measures, F Search strategies, G Summary of identified studies, H Excluded studies, I Evidence tables, J Forest plots, K GRADE tables, L Benefits and harms of intrathecal baclofen.

23346608 [PubMed] [Free full text](#)

2. Ann Plast Surg. 2013 Jan 20. [Epub ahead of print]**Correction of Postburn Equinus Deformity.**

Hur GY, Rhee BJ, Ko JH, Seo DK, Choi JK, Jang YC, Lee JW.

From the Department of Plastic and Reconstructive Surgery, Hangang Sacred Heart Hospital, Hallym University Medical Center, Seoul, Korea.

BACKGROUND: Equinus deformity is characterized by an abnormal tiptoe gait and does not allow normal walking, hence needing correction. Congenital causes of equinus deformity include neurological diseases such as cerebral palsy and poliomyelitis. Acquired causes include injuries such as extensive trauma. We have corrected equinus deformity from extensive lower leg burns by a single operation through excisional release of the scar, Achilles lengthening, and radial forearm free flap. **METHODS:** Fifteen patients with postburn equinus deformity who were treated between January 2000 and March 2012 were retrospectively studied. We investigated their age, sex, cause and severity of burn injury, equinus degree, ankle range of motion and the changes in the activity, extent of Achilles lengthening, flap size, complication, and the recurrence in these patients. **RESULTS:** The average degree of equinus deformity before the operation was 45 degrees. With an average Achilles lengthening of 4.6 cm, all patients achieved neutral position. The patients who had poor activity due to tiptoe gait before the operation showed good to fair levels of walking ability postoperatively. During an average follow-up period of 3 years and 9 months, no patients had a recurrence. **CONCLUSIONS:** Equinus deformity causes significant restrictions to walking and the reconstruction is a challenging problem. Although prevention is more important during the initial stages of treatment, we have successfully corrected patients with existing equinus deformity by scar release, Z-tenoplasty of Achilles, and radial forearm free flap.

[PMID: 23340460](#) [PubMed - as supplied by publisher]

3. J Foot Ankle Surg. 2013 Jan 17. pii: S1067-2516(12)00555-8. doi: 10.1053/j.jfas.2012.12.007. [Epub ahead of print]**Comparison of Lateral Opening Wedge Calcaneal Osteotomy and Medial Calcaneal Sliding-opening Wedge Cuboid-closing Wedge Cuneiform Osteotomy for Correction of Planovalgus Foot Deformity in Children.**

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The purpose of the present study was to compare the clinical and radiographic results between 2 procedures, lateral opening wedge calcaneal osteotomy (LCL) and medial calcaneal sliding-opening wedge cuboid-closing wedge cuneiform osteotomy (3C) in patients with planovalgus foot deformity. A total of 38 patients who underwent either LCL (18 patients, 28 feet) or 3C (20 patients, 32 feet) were included in the present study. The etiology of the planovalgus foot deformity was idiopathic in 16 feet and cerebral palsy in 44 feet. The 2 procedures used in the present study were indicated in symptomatic (pain or callus) children in whom conservative treatment, such as shoe modifications or orthotics, had been applied for more than 1 year but had failed. The patients were evaluated preoperatively, postoperatively, and at the last follow-up visit, both clinically and radiologically, and the interval to union and postoperative courses were compared between the 2 groups. In the LCL group, 19 of the 28 feet (68%) showed a satisfactory outcome and 9 (32%) an unsatisfactory outcome. In the 3C group, 28 of the 32 feet (88%) showed a satisfactory outcome and 4 (12%) an unsatisfactory outcome. The clinical results were not significantly different between the 2 groups, with mild to moderate pes planovalgus deformity. However, the clinical results were better in the 3C group with severe pes planovalgus deformity than in the LCL group with severe pes planovalgus deformity. All 4 radiographic parameters were improved at the last follow-up visit in both groups. In particular, the talar-first metatarsal angle and the calcaneal pitch angle on the weightbearing lateral radiographs were significantly improved in the 3C group with mild to moderate planovalgus foot deformity. All 4 parameters were significantly improved in the 3C group with severe planovalgus foot deformity. No significant differences were observed between the 2 groups in terms of the interval to union and postoperative care. No case of postoperative deep infection or nonunion was encountered in either group. 3C is a more effective procedure than LCL for the correction of pes planovalgus deformity in children, especially severe pes planovalgus deformities.

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[PMID: 23333282](#) [PubMed - as supplied by publisher]

4. J Ultrasound Med. 2013 Feb;32(2):313-7.

Differences in lateral ankle ligaments between affected and unaffected legs in children with spastic hemiplegic cerebral palsy.

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Objectives To investigate the architectural alterations of the lateral ankle ligaments in spastic hemiplegic cerebral palsy. **Methods** Eight children (5 male and 3 female; mean age \pm SD, 5.2 ± 2.7 years) with spastic hemiplegic cerebral palsy were recruited. A modified Ashworth scale and passive ankle dorsiflexion angle were evaluated. Sonograms of the anterior talofibular ligament and calcaneofibular ligament were obtained to measure ligament thickness, and the anterior talofibular/calcaneofibular ligament thickness ratio was calculated. Two sonographic measurements were taken to check for intra-rater reliability. **Results** The interclass correlation coefficients of the repeated anterior talofibular ligament and calcaneofibular ligament thickness measurements in the unaffected/affected legs were 0.960/0.945 and 0.922/0.933, respectively. The anterior talofibular ligament thickness in the affected legs was significantly greater than that in the unaffected legs (2.50 ± 0.35 versus 1.40 ± 0.28 mm; $P = .011$), but the calcaneofibular ligament thickness in the affected legs was significantly less than that in the unaffected legs (0.80 ± 0.18 versus 1.28 ± 0.31 mm; $P = .021$). The anterior talofibular/calcaneofibular ligament thickness ratio in the affected legs was significantly greater than that in unaffected legs (2.10 ± 0.81 versus 1.03 ± 0.13 ; $P = .012$). The ratio was positively correlated with the modified Ashworth scale and age but negatively correlated with the passive ankle dorsiflexion angle in the affected legs. **Conclusions** This study revealed an increased anterior talofibular ligament thickness and a decreased calcaneofibular ligament thickness in the affected legs compared with the unaffected legs. These architectural features of the lateral ankle ligaments may contribute to the equinovarus deformity of the ankle together with spastic leg muscles in children with spastic hemiplegic cerebral palsy.

[PMID: 23341388](#) [PubMed - in process]

5. Eur Spine J. 2013 Jan 24. [Epub ahead of print]

Intraoperative spinal cord monitoring during the surgical correction of scoliosis due to cerebral palsy and other neuromuscular disorders.

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PURPOSE: Patients with neuromuscular scoliosis are at increased risk of neurological deficit post-operatively, but are a difficult population on whom to perform neurophysiological monitoring. We look here at a 7-year sample of our practice in the monitoring of neuromuscular patients. **METHODS:** A retrospective chart review was performed for 109 patients who underwent correction of neuromuscular scoliosis within our institution between 2005 and 2011. **RESULTS:** Of 109 patients who were identified, intraoperative monitoring was attempted in 66 cases. In eight cases (13 %), no reliable monitoring could be achieved and was therefore abandoned. On nine occasions, there was a significant drop in at least one modality intraoperatively. None of these nine suffered any clinically observable neurological deficit post-operatively. Of the 109 patients, 2 had clinically detectable deficits post-operatively, both of whom had undergone normal intraoperative monitoring. **CONCLUSIONS:** The two patients with observable deficit had their instrumentation left in situ after discussion with them and/or parents. Spinal cord monitoring in this population is possible but potentially unreliable. Surgeons will need to carefully consider the use of monitoring in their management of this challenging population.

[PMID: 23344681](#) [PubMed - as supplied by publisher]

6. Toxins (Basel). 2013 Jan 11;5(1):93-105. doi: 10.3390/toxins5010093.**Influence of botulinum toxin therapy on postural control and lower limb intersegmental coordination in children with spastic cerebral palsy.**

Degelaen M, de Borre L, Kerckhofs E, de Meirleir L, Buyl R, Cheron G, Dan B.

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Botulinum toxin injections may significantly improve lower limb kinematics in gait of children with spastic forms of cerebral palsy. Here we aimed to analyze the effect of lower limb botulinum toxin injections on trunk postural control and lower limb intralimb (intersegmental) coordination in children with spastic diplegia or spastic hemiplegia (GMFCS I or II). We recorded tridimensional trunk kinematics and thigh, shank and foot elevation angles in fourteen 3-12 year-old children with spastic diplegia and 14 with spastic hemiplegia while walking either barefoot or with ankle-foot orthoses (AFO) before and after botulinum toxin infiltration according to a management protocol. We found significantly greater trunk excursions in the transverse plane (barefoot condition) and in the frontal plane (AFO condition). Intralimb coordination showed significant differences only in the barefoot condition, suggesting that reducing the degrees of freedom may limit the emergence of selective coordination. Minimal relative phase analysis showed differences between the groups (diplegia and hemiplegia) but there were no significant alterations unless the children wore AFO. We conclude that botulinum toxin injection in lower limb spastic muscles leads to changes in motor planning, including through interference with trunk stability, but a combination of therapies (orthoses and physical therapy) is needed in order to learn new motor strategies.

[PMID: 23344454](#) [PubMed - in process]

7. Ann Rehabil Med. 2012 Dec;36(6):770-5. doi: 10.5535/arm.2012.36.6.770. Epub 2012 Dec 28.**Factors affecting bone mineral density in adults with cerebral palsy.**

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OBJECTIVE: To clarify factors affecting bone mineral density (BMD) in adults with cerebral palsy (CP). **METHOD:** Thirty-five patients with CP participated in this study. Demographic data including gender, age, body mass index (BMI), subtype according to neuromotor type and topographical distribution, ambulatory function, and functional independence measure (FIM) were investigated. The BMD of the lumbar spine and femur were measured using Dual-energy X-ray absorptiometry, and the factors affecting BMD were analyzed. **RESULTS:** The BMD had no significant association with factors such as gender, age, and subtype in adults with CP. However, BMI was significantly correlated with the BMD of lumbar spine and femur ($p < 0.05$). The FIM score was also positively correlated with the BMD of femur ($p < 0.05$). Moreover, CP patients with higher ambulatory function had significantly higher BMD of femur ($p < 0.05$). **CONCLUSION:** These findings suggest that BMI and functional levels such as FIM and ambulatory function can affect BMD in adults with CP. The results might be used as basic data, suggesting the importance of treatment including weight bearing exercise and gait training in adults with CP.

[PMID: 23342308](#) [PubMed]

8. Dev Med Child Neurol. 2013 Jan 22. doi: 10.1111/dmcn.12057. [Epub ahead of print]**Caution regarding the Pediatric Motor Activity Log to measure upper limb intervention outcomes for children with unilateral cerebral palsy.**

Wallen M, Ziviani J.

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[PMID: 23336281](#) [PubMed - as supplied by publisher]

9. J Child Neurol. 2013 Jan 24. [Epub ahead of print]

Levodopa Does Not Improve Function in Individuals with Dystonic Cerebral Palsy.

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Although levodopa is the main treatment for dystonia, its role in cerebral palsy has not been assessed. We hypothesized that levodopa will improve upper limb function in individuals with cerebral palsy. Nine participants (age 16.8 ± 5.6 years) with quadriplegic cerebral palsy and upper limb dystonia were enrolled in this randomized, double-blind, placebo-controlled, crossover study. Function was assessed before and after 2 weeks of treatment of levodopa and placebo using box-and-blocks, 9-hole pegs, dynamometer recordings, and Quality of Upper Extremity Skills Test. No benefits for upper limb functional performance were found following levodopa (6.65 ± 1.66 mg/kg/d) treatment compared to placebo. No side effects were reported.

[PMID: 23349519](#) [PubMed - as supplied by publisher]

10. Disabil Rehabil. 2013 Jan 22. [Epub ahead of print]

Stages of change in physical activity behavior in children and adolescents with cerebral palsy.

Verschuren O, Wiaart L, Ketelaar M.

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Purpose: To identify facilitators and barriers frequently experienced by families of children with cerebral palsy (CP) and associated with being at the pre-intention, intention and action stages for physical activity. Method: Qualitative study involving in-depth focus group interviews with 33 ambulatory children and adolescents with CP and their parents ($n = 33$). These interviews were followed by questionnaires to determine stage of behavior change (i.e. pre-intention, intention and action) related to the child's participation in physical activity. Results: Families who were classified in the intention stage of behavioral change were more likely to identify environmental barriers related to the social environment and the facility or program than parents at the pre-intention stage. Families who were classified into intention and action stages were more likely to identify facilitators related to parental factors than families at the pre-intention stage. Moreover, at the action stage facilitators were related to the facility/program. Conclusions: The identified facilitators and barriers, organized according to three stages of change (pre-intention, intention and action), provide important theoretical insights into how and why children and adolescents with CP and their parents might change their physical activity behavior. Implications for rehabilitation Understanding the barriers and facilitators of physical activity for children and adolescents with CP is essential for designing effective interventions to promote participation in this group. Using the three stages of change and the identified barriers and facilitators for participation can result in tailored advice to increase physical activity behavior.

[PMID: 23336120](#) [PubMed - as supplied by publisher]

11. Rev Bras Fisioter. 2012 Dec;16(6):515-522.

Translation of the Children Helping Out - Responsibilities, Expectations and Supports (CHORES) questionnaire into Brazilian-Portuguese: semantic, idiomatic, conceptual and experiential equivalences and application in normal children and adolescents and in children with cerebral palsy. [Article in English, Portuguese]

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BACKGROUND: The participation of children with disabilities in daily chores in different environments has been a therapeutic goal shared by both parents and rehabilitation professionals, leading to increased demand for instrument development. The Children Helping Out: Responsibilities, Expectations and Supports (CHORES) questionnaire was created with the objective of measuring child and teenager participation in daily household tasks. **OBJECTIVES:** To translate the CHORES questionnaire into Brazilian Portuguese, evaluate semantic, idiomatic, experiential, and conceptual equivalences, apply the questionnaire to children and teenagers with and without disabilities, and test its test-retest reliability. **METHOD:** Methodological study developed through the following stages: (1) translation of the questionnaire by two different translators; (2) synthesis of translations; (3) back-translation into English; (4) analysis by an expert committee to develop the pre-final version; (5) test-retest reliability; (6) administration to a sample of 50 parents of children with and without disabilities. **RESULTS:** The CHORES translation was validated in all stages. The implemented adaptations aimed to improve the understanding of the instrument's content by families of different socioeconomic and educational levels. The questionnaire showed strong consistency within a 7 to 14-day interval (ICCs=0.93 a 0.97; $p=0.0001$). After application, there was no need to change any items in the questionnaire. **CONCLUSIONS:** The translation of the CHORES questionnaire into Brazilian Portuguese offers a unique instrument for health professionals in Brazil, enabling the documentation of child and teenager participation in daily household tasks and making it possible to develop scientific investigation on the topic.

[PMID: 23348598](#) [PubMed - as supplied by publisher]

12. Ann Rehabil Med. 2012 Dec;36(6):756-61. doi: 10.5535/arm.2012.36.6.756. Epub 2012 Dec 28.

Hippotherapy in adult patients with chronic brain disorders: a pilot study.

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OBJECTIVE: To investigate the effects of hippotherapy for adult patients with brain disorders. **METHOD:** Eight chronic brain disorder patients (7 males, mean age 42.4 ± 16.6 years) were recruited. The mean duration from injury was 7.9 ± 7.7 years. The diagnoses were stroke ($n=5$), traumatic brain disorder ($n=2$), and cerebral palsy ($n=1$). Hippotherapy sessions were conducted twice a week for eight consecutive weeks in an indoor riding arena. Each hippotherapy session lasted 30 minutes. All participants were evaluated by the Berg balance scale, Tinetti Performance-Oriented Mobility Assessment, 10 Meter Walking Test, Functional Ambulatory Category, Korean Beck Depression Inventory, and Hamilton Depression Rating Scale. We performed baseline assessments twice just before starting hippotherapy. We also assessed the participants immediately after hippotherapy and at eight weeks after hippotherapy. **RESULTS:** All participants showed no difference in balance, gait function, and emotion between the two baseline assessments before hippotherapy. During the eight-week hippotherapy program, all participants showed neither adverse effects nor any accidents; all had good compliance. After hippotherapy, there were significant improvements in balance and gait speed in comparison with the baseline assessment ($p < 0.05$), and these effects were sustained for two months after hippotherapy. However, there was no significant difference in emotion after hippotherapy. **CONCLUSION:** We could observe hippotherapy to be a safe and effective alternative therapy for adult patients with brain disorders in improving balance and gait function. Further future studies are warranted to delineate the benefits of hippotherapy on chronic stroke patients.

[PMID: 23342306](#) [PubMed]

13. Disabil Rehabil Assist Technol. 2013 Jan 22. [Epub ahead of print]

Learning and mastery behaviours as risk factors to abandonment in a paediatric user of advanced single-switch access technology.

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Purpose: The present descriptive case study documents the behaviours of a child single-switch user in the community setting and draws attention to learning and mastery behaviours as risk factors to single-switch abandonment. Our observations were interpreted in the context of a longer term school-based evaluation of an advanced single-switch access technology with a nine year-old user with severe spastic quadriplegic cerebral palsy. **Method:** The child completed 25 experiment sessions averaging a rate of three sessions every two weeks. During each session he worked on several blocks of single-switch computer activity using his vocal cord vibration switch. **Results:** Despite high levels of single-switch sensitivity and specificity that suggested a good fit between the participant and the technology, the participant perceived a lower proficiency level of his own abilities, demonstrated impatience and intolerance to interaction errors, and was apprehensive of making mistakes when using his switch in public. **Conclusions:** The benefit of gaining some degree of independent physical access might not necessarily enhance resilience to interaction errors or bouts of poor task performance. On the other hand, the participant's behaviours were consistent with those of a typically developing child learning or mastering any new skill or task. **Implications for Rehabilitation** The attitude and behaviour of a paediatric switch user towards skill development can be risk factors to abandonment of an access technology, despite successful clinical trial with the device. Children with severe disabilities can be associated with the same types of skill development behaviour patterns and achievement motivation as their typically developing peers. Empirical observations of the case participant's switch use behaviours suggest that user training could be adaptive in order to account for individual differences in skill development and achievement motivation.

[PMID: 23336602](#) [PubMed - as supplied by publisher]

14. J Child Neurol. 2013 Feb;28(2):230-5. doi: 10.1177/0883073812471430.

Doing the "talk": disclosure of a diagnosis of cerebral palsy.

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The disclosure to a family of a child's cerebral palsy is an important transformative event that has potential lasting implications. This article highlights specific challenges, the results of research into the disclosure process and what attributes should be sought for in this encounter by health care providers. Illustrative case vignettes are presented to concretely demonstrate the "dos and don'ts" of the disclosure. Suggestions will also be provided to improve the disclosure process.

[PMID: 23345525](#) [PubMed - in process]

Prevention and Cure

15. Dev Med Child Neurol. 2013 Jan 24. doi: 10.1111/dmcn.12080. [Epub ahead of print]

An update on the prevalence of cerebral palsy: a systematic review and meta-analysis.

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AIMS: The aim of this study was to provide a comprehensive update on (1) the overall prevalence of cerebral palsy (CP); (2) the prevalence of CP in relation to birthweight; and (3) the prevalence of CP in relation to gestational age. **METHOD:** A systematic review and meta-analysis was conducted and reported, based on the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses) statement. Population-based studies on the prevalence of CP in children born in 1985 or after were selected. Statistical analysis was carried out using computer package R, version 2.14. **RESULTS:** A total of 49 studies were selected for this review. The pooled overall

prevalence of CP was 2.11 per 1000 live births (95% confidence interval [CI] 1.98-2.25). The prevalence of CP stratified by gestational age group showed the highest pooled prevalence to be in children weighing 1000 to 1499g at birth (59.18 per 1000 live births; 95% CI 53.06-66.01), although there was no significant difference on pairwise meta-regression with children weighing less than 1000g. The prevalence of CP expressed by gestational age was highest in children born before 28 weeks' gestation (111.80 per 1000 live births; 95% CI 69.53-179.78; $p < 0.0327$). INTERPRETATION: The overall prevalence of CP has remained constant in recent years despite increased survival of at-risk preterm infants.

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16. Acta Paediatr. 2013 Jan 17. doi: 10.1111/apa.12164. [Epub ahead of print]

Fetal umbilical artery Doppler in small preterms: (IQ) Neurocognitive outcome at five years of age.

Eger SH, Sommerfelt K, Kiserud T, Markestad T.

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AIM: To investigate if absent or reversed end-diastolic flow in the umbilical artery (AREDF) is associated with neonatal mortality, morbidity or long-term neurocognitive outcome in extremely preterm infants exposed to preeclampsia or intrauterine growth restriction. METHODS: Prenatal Doppler data were retrospectively collected for liveborn infants with gestational age (GA) <28 weeks or birth weight (BW) <1000 g, born small for gestational age (SGA- BW <5(th) percentile for GA) or of mothers with preeclampsia at the four largest university hospitals in Norway during 1999-2000. Neonatal mortality and morbidities, cerebral palsy (CP) and IQ at 5 years of age were compared for infants with or without AREDF. RESULTS: Of 260 infants, 84 were eligible and 71 of them had sufficient Doppler data. Of these, 38 (54%) had AREDF. Of 33 infants born <28 weeks, 7/19 (37%) with AREDF and none of 14 without AREDF had severe cerebral haemorrhage (SCH) ($p=0.01$). AREDF was not significantly associated with mortality, other NICU morbidities, CP or reduced IQ. For the 38 infants with GA =28 weeks AREDF (19/38) was not associated with adverse outcomes. CONCLUSION: AREDF was associated with increased risk of SCH in extremely preterm infants (GA <28 weeks). ©2013 The Author(s)/Acta Paediatrica ©2013 Foundation Acta Paediatrica.

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[PMID: 23331087](#) [PubMed - as supplied by publisher]

17. Am J Hum Genet. 2013 Jan 15. pii: S0002-9297(12)00645-3. doi: 10.1016/j.ajhg.2012.12.011. [Epub ahead of print]

Exonic Deletions in AUTS2 Cause a Syndromic Form of Intellectual Disability and Suggest a Critical Role for the C Terminus.

Beunders G, Voorhoeve E, Golzio C, Pardo LM, Rosenfeld JA, Talkowski ME, Simoncic I, Lionel AC, Vergult S, Pyatt RE, van de Kamp J, Nieuwint A, Weiss MM, Rizzu P, Verwer LE, van Spaendonck RM, Shen Y, Wu BL, Yu T, Yu Y, Chiang C, Gusella JF, Lindgren AM, Morton CC, van Binsbergen E, Bulk S, van Rossem E, Vanakker O, Armstrong R, Park SM, Greenhalgh L, Maye U, Neill NJ, Abbott KM, Sell S, Ladda R, Farber DM, Bader PI, Cushing T, Drautz JM, Konczal L, Nash P, Reyes ED, Carter MT, Hopkins E, Marshall CR, Osborne LR, Gripp KW, Thrush DL, Hashimoto S, Gastier-Foster JM, Astbury C, Ylstra B, Meijers-Heijboer H, Posthuma D, Menten B, Mortier G, Scherer SW, Eichler EE, Girirajan S, Katsanis N, Groffen AJ, Sistermans EA.

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Genomic rearrangements involving AUTS2 (7q11.22) are associated with autism and intellectual disability (ID), although evidence for causality is limited. By combining the results of diagnostic testing of 49,684 individuals, we identified 24 microdeletions that affect at least one exon of AUTS2, as well as one translocation and one inversion

each with a breakpoint within the AUTS2 locus. Comparison of 17 well-characterized individuals enabled identification of a variable syndromic phenotype including ID, autism, short stature, microcephaly, cerebral palsy, and facial dysmorphisms. The dysmorphic features were more pronounced in persons with 3'AUTS2 deletions. This part of the gene is shown to encode a C-terminal isoform (with an alternative transcription start site) expressed in the human brain. Consistent with our genetic data, suppression of *auts2* in zebrafish embryos caused microcephaly that could be rescued by either the full-length or the C-terminal isoform of AUTS2. Our observations demonstrate a causal role of AUTS2 in neurocognitive disorders, establish a hitherto unappreciated syndromic phenotype at this locus, and show how transcriptional complexity can underpin human pathology. The zebrafish model provides a valuable tool for investigating the etiology of AUTS2 syndrome and facilitating gene-function analysis in the future.

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18. *Ginekol Pol.* 2012 Aug;83(8):630-2.

The use of therapeutic whole body cooling in treating hypoxic-ischemic encephalopathy in the newborn--the first case in Poland [Article in Polish]

Gadzinowski J, Gulczynska E, Michniewicz B, Opala T, Buks J.

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Hypoxic-ischemic encephalopathy (ENN) concerns neonates born after 35 completed weeks of gestation. The incidence rate has been shown to be 1-6/1000 births and can lead to significant permanent neurological damage, cerebral palsy and even death. Until the whole body cooling and selective brain cooling methods have been accepted, the treatment of children with ENN was only symptomatic. The article describes the first case of ENN neonatal treatment with the whole body hypothermia in Poland, which took place at the Department of Neonatology Poznan University of Medical Sciences. Currently both methods--whole body hypothermia and selective brain cooling--offer a chance for a normal neurological development and a better life for children born with ENN. Both methods are accessible in a few centers in Poland.

[PMID: 23342890](#) [PubMed - in process]

19. *Obstet Gynecol.* 2013 Feb;121(2 Pt 1):235-40. doi: <http://10.1097/AOG.0b013e31827c5cf8>.

Evaluation of the clinical use of magnesium sulfate for cerebral palsy prevention.

Gibbins KJ, Browning KR, Lopes VV, Anderson BL, Rouse DJ.

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OBJECTIVE: Clinical trials support the efficacy and safety of magnesium sulfate for cerebral palsy prevention. We evaluated the implementation of a clinical protocol for the use of magnesium for cerebral palsy prevention in our large women's hospital, focusing on uptake, indications, and safety. **METHODS:** We performed a review of selected gravidas with threatened or planned delivery before 32 weeks of gestation from October 2007 to February 2011. The primary study outcome was the change in the rate of predelivery administration of magnesium sulfate over this time period. **RESULTS:** Three hundred seventy-three patients were included. In 2007, before guideline implementation, 20% of eligible gravidas (95% confidence interval [CI] 9.1-35.6%) received magnesium before delivery compared with 93.9% (95% CI 79.8-99.3%) in the final 2 months of the study period ($P < .001$). Dosing did not vary significantly over the 4 study years: the median number of treatments was one, the total predelivery median dose ranged from 15 to 48 g, and the median duration of therapy ranged from 3 to 12 hours. After 3 years, magnesium administration was almost universal among patients diagnosed with preeclampsia, preterm labor, or preterm premature rupture of membranes (95.4%), whereas patients delivered preterm for fetal growth restriction were significantly less likely to receive predelivery magnesium (44%, $P < .001$). No maternal or perinatal magnesium-attributable morbidity was noted. Among patients eligible for the protocol who received magnesium, 84.2%

delivered before 32 weeks of gestation. **CONCLUSION:** It is feasible to implement a magnesium sulfate cerebral palsy prevention protocol into clinical practice.

LEVEL OF EVIDENCE: III.

[PMID: 23344271](#) [PubMed - in process]

20. Obstet Gynecol. 2013 Feb;121(2 Pt 1):227-8. doi: <http://10.1097/AOG.0b013e31827f1079>.

Magnesium sulfate, cerebral palsy prevention, and medical protocols.

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[PMID: 23344268](#) [PubMed - in process]

21. Pediatr Neurol. 2013 Feb;48(2):123-129.e1. doi: [10.1016/j.pediatrneurol.2012.10.016](https://doi.org/10.1016/j.pediatrneurol.2012.10.016).

Score for Neonatal Acute Physiology-II and Neonatal Pain Predict Corticospinal Tract Development in Premature Newborns.

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Premature infants are at risk for adverse motor outcomes, including cerebral palsy and developmental coordination disorder. The purpose of this study was to examine the relationship of antenatal, perinatal, and postnatal risk factors for abnormal development of the corticospinal tract, the major voluntary motor pathway, during the neonatal period. In a prospective cohort study, 126 premature neonates (24-32 weeks' gestational age) underwent serial brain imaging near birth and at term-equivalent age. With diffusion tensor tractography, mean diffusivity and fractional anisotropy of the corticospinal tract were measured to reflect microstructural development. Generalized estimating equation models examined associations of risk factors on corticospinal tract development. The perinatal risk factor of greater early illness severity (as measured by the Score for Neonatal Acute Physiology-II [SNAP-II]) was associated with a slower rise in fractional anisotropy of the corticospinal tract ($P = 0.02$), even after correcting for gestational age at birth and postnatal risk factors ($P = 0.009$). Consistent with previous findings, neonatal pain adjusted for morphine and postnatal infection were also associated with a slower rise in fractional anisotropy of the corticospinal tract ($P = 0.03$ and 0.02 , respectively). Lessening illness severity in the first hours of life might offer potential to improve motor pathway development in premature newborns.

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22. Pediatr Neurol. 2013 Feb;48(2):81-94. doi: [10.1016/j.pediatrneurol.2012.08.001](https://doi.org/10.1016/j.pediatrneurol.2012.08.001).

Modeling developmental plasticity after perinatal stroke: defining central therapeutic targets in cerebral palsy.

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Perinatal stroke is presented as the ideal human model of developmental neuroplasticity. The precise timing, mechanisms, and locations of specific perinatal stroke diseases provide common examples of well defined, focal, perinatal brain injuries. Motor disability (hemiparetic cerebral palsy) constitutes the primary adverse outcome and the focus of models explaining how motor systems develop in health and after early injury. Combining basic science animal work with human applied technology (functional magnetic resonance imaging, diffusion tensor imaging, and transcranial magnetic stimulation), a model of plastic motor development after perinatal stroke is presented. Potential central therapeutic targets are revealed. The means to measure and modulate these targets, including evidence-based rehabilitation therapies and noninvasive brain stimulation, are suggested. Implications for clinical trials and future directions are discussed.

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[PMID: 23337000](#) [PubMed - in process]

23. Physiother Theory Pract. 2013 Jan 23. [Epub ahead of print]

Identification of fidgety movements and prediction of CP by the use of computer-based video analysis is more accurate when based on two video recordings.

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This study evaluates the role of postterm age at assessment and the use of one or two video recordings for the detection of fidgety movements (FMs) and prediction of cerebral palsy (CP) using computer vision software. Recordings between 9 and 17 weeks postterm age from 52 preterm and term infants (24 boys, 28 girls; 26 born preterm) were used. Recordings were analyzed using computer vision software. Movement variables, derived from differences between subsequent video frames, were used for quantitative analysis. Sensitivities, specificities, and area under curve were estimated for the first and second recording, or a mean of both. FMs were classified based on the Prechtl approach of general movement assessment. CP status was reported at 2 years. Nine children developed CP of whom all recordings had absent FMs. The mean variability of the centroid of motion (C(SD)) from two recordings was more accurate than using only one recording, and identified all children who were diagnosed with CP at 2 years. Age at assessment did not influence the detection of FMs or prediction of CP. The accuracy of computer vision techniques in identifying FMs and predicting CP based on two recordings should be confirmed in future studies.

[PMID: 23343036](#) [PubMed - as supplied by publisher]

24. Trop Med Int Health. 2013 Jan 18. doi: 10.1111/tmi.12064. [Epub ahead of print]

Brain imaging in normal kids: a community-based MRI study in Malawian children.

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OBJECTIVE: To collect normative MRI data for effective clinical and research applications. Such data may also offer insights into common neurological insults. **METHODS:** We identified a representative, community-based sample of children aged 9-14 years. Children were screened for neurodevelopmental problems. Demographic data, medical history and environmental exposures were ascertained. Eligible children underwent the Neurologic Examination for Subtle Signs (NESS) and a brain MRI. Descriptive findings and analyses to identify risk factors for MRI abnormalities are detailed. **RESULTS:** One hundred and two of 170 households screened had age-appropriate children. Two of 102 children had neurological problems - one each with cerebral palsy and epilepsy. Ninety-six of 100 eligible children were enrolled. Mean age was 11.9 years (SD 1.5), and 43 (45%) were boys. No acute MRI abnormalities were seen. NESS abnormalities were identified in 6 of 96 children (6%). Radiographic evidence of sinusitis in 29 children (30%) was the most common MRI finding. Brain abnormalities were found in 16 (23%): mild diffuse atrophy in 4 (4%), periventricular white matter changes/gliosis in 6 (6%), multifocal punctuate subcortical

white matter changes in 2 (2%), vermian atrophy in 1 (1%), empty sella in 3 (3%) and multifocal granulomas with surrounding gliosis in 1 (1%). Having an abnormal MRI was not associated with age, sex, antenatal problems, early malnutrition, febrile seizures, an abnormal neurological examination or housing quality (all P values >0.05). No predictors of radiographic sinusitis were identified. **CONCLUSION:** Incidental brain MRI abnormalities are common in normal Malawian children. The incidental atrophy and white matter abnormalities seen in this African population have not been reported among incidental findings from US populations, suggesting Malawi-specific exposures may be the cause.

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25. Twin Res Hum Genet. 2013 Jan 21:1-5. [Epub ahead of print]

Neurodevelopmental Outcome Among Multiples and Singletons: A Regional Neonatal Intensive Care Unit's Experience in Turkey.

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Objective: The aim of this study was to compare the neurodevelopmental outcome at 12-18 months' corrected age between multiples and singleton preterm infants. **Methods:** We designed a prospective study of preterm infants (=32 weeks gestation) born and hospitalized in the neonatal intensive care unit between November 2008 and November 2009, whose assessments were performed at 12-18 months' corrected age. Neurodevelopmental impairment was defined as the presence of any one of the following: moderate or severe cerebral palsy, severe bilateral hearing loss or bilateral blindness, mental developmental index score, or psychomotor developmental index score less than 70. Results were compared for both multiples and singleton infants. **Results:** One hundred and fifty-nine multiples and 211 singleton infants were assessed at 12-18 months' corrected age. The neurodevelopmental outcome including all parameters at 12-18 months' corrected age in multiples was not significantly different from singleton preterm infants. **Conclusions:** Multiple gestation in preterm infants is not associated with an increased risk of neurodevelopmental impairment at 12-18 months' corrected age compared with singleton preterm infants. For further information, long term and high participation in neurodevelopmental follow-up and evaluation at pre-school age will be needed.

[PMID: 23331543](#) [PubMed - as supplied by publisher]

26. World Neurosurg. 2013 Jan 17. pii: S1878-8750(13)00139-3. doi: 10.1016/j.wneu.2013.01.078. [Epub ahead of print]

A Primer on Brain-Machine Interfaces, Concepts and Technology: A Key Element in the Future of Functional Neurorestoration.

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Conventionally, the practice of neurosurgery has been characterized by the removal of pathology, congenital or acquired. The emerging complement to the removal of pathology is surgery for the specific purpose of restoration of function. Advances in neuroscience, technology, and the understanding of neural circuitry are creating opportunities to intervene in disease processes in a reparative manner, thereby advancing towards the long sought after concept of neurorestoration. Approaching the issue of neurorestoration from a biomedical engineering perspective is the rapidly growing arena of implantable devices. Implantable devices are becoming more common in medicine and are making significant advancements to improve a patient's functional outcome. Devices such as deep brain stimulators (DBS), vagus nerve stimulators (VNS), and spinal cord stimulators, are now becoming more commonplace in neurosurgery as we utilize our understanding of the nervous system to interpret neural activity and restore function. One of the most exciting prospects in neurosurgery is the technologically-driven field of brain-machine interface

(BMI), also known as brain-computer interface (BCI), or neuroprosthetics. The successful development of this technology will have far reaching implications for patients suffering from a great number of diseases including, but not limited to: spinal cord injury (SCI), paralysis, stroke, or loss of limb. This article provides an overview of the issues related to neurorestoration using implantable devices with a specific focus on brain-machine interface technology.

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27. Zhongguo Dang Dai Er Ke Za Zhi. 2013 Jan;15(1):5-8.

Infant Neurological International Battery predicts neurological outcomes of preterm infants discharged from the neonatal intensive care unit [Article in Chinese]

Luo F, Chen Z, Ma XL, Lin HJ, Bao Y, Wang CH, Shi LP.

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OBJECTIVE: To explore the Infant Neurological International Battery (Infanib) as a screening tool for early detection of gross motor developmental delay in preterm infants discharged from NICU, and to predict their later neuromotor dysfunction (cerebral palsy or motor retardation). **METHODS:** A cohort of preterm infants who were admitted to the neonatal intensive care unit between June 2008 and March 2010 were enrolled in the study. Infanib assessment was performed at corrected age 3-4 months and 6-7 months. Peabody Developmental Motor scale-2 (PDMS-2) and neuro-examinations were used to confirm the last motor retardation. The sensitivity, specificity, positive predictive value and negative predictive value of the Infanib were calculated. **RESULTS:** A total of 147 preterm infants were participated in this study, and 129 infants were followed up at correct age 12 months or more than 12 months. Eleven (8.5%) had cerebral palsy, 28 (21.7%) had motor retardation, and 90 (69.8%) normal motor development. The predictive validity of the Infanib at correct age 3-4 months (n=14) was: sensitivity 84.6%, specificity 75.6%, positive predictive value 60.0% and negative predictive value 91.9%. The predictive validity of the Infanib at correct age 6-7 months (n=117) was: sensitivity 100%, specificity 91.7%, positive predictive value 82.5% and negative predictive value 100%. **CONCLUSIONS:** The Infanib can be used as an appropriate screening tool and validity measurement for early detection of gross motor developmental delay in preterm infants.

[PMID: 23336159](#) [PubMed - in process]

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