Cerebral Palsy ALLIANCE

NEWS
Cerebral Palsy Research

Monday 19 May 2014

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Interventions and Management

1. J Child Neurol. 2014 May 11. [Epub ahead of print]

The Concept of a Toolbox of Outcome Measures for Children With Cerebral Palsy: Why, What, and How to Use

Wright FV1, Majnemer A.

Accurate and well-targeted measurement of a child's abilities and participation in daily activities pre- and post-intervention is essential to understanding the effects of therapies provided by pediatric practitioners. There is growing interest in identification of outcome core sets for specified client groups. This article elaborates on the concepts to consider when selecting and interpreting measures from an outcomes toolbox for children with cerebral palsy. Principles discussed include use of self-report measures to open a dialogue with the child/parent; a holistic assessment approach to identify a child's challenges, strengths, and contextual factors that can influence functioning; links between measurement and heightened engagement of the child/family in the rehabilitation process and goals; and the need to plan the evaluation and dialogue aspects of the assessment process. If clinicians across the international rehabilitation community draw from the same toolbox, the end result could be a cohesive approach and common language to outcome measurement.

PMID: 24820336 [PubMed - as supplied by publisher]

2. Eur J Paediatr Neurol. 2014 Apr 15. pii: S1090-3798(14)00061-0. doi: 10.1016/j.ejpn.2014.04.009. [Epub ahead of print]

Identifying relevant areas of functioning in children and youth with Cerebral Palsy using the ICF-CY coding system: From whose perspective

Schiariti V1, Mâsse LC2.

AIMS: A standardized methodology endorsed by the World Health Organization was used to select the most relevant International Classification of Functioning, Disability and Health for children and youth (ICF-CY) categories to inform the development of the ICF Core Sets for CY with Cerebral Palsy (CP). The aim of this study was to appraise comparatively the results of the four studies included in the preparatory phase of the project exploring relevant areas of functioning in CY with CP. METHODS: ICF-CY categories identified in the preparatory studies - systematic review, global expert survey, qualitative study, and clinical study - were ranked. We compared

the ranking percentile scores of the categories across studies. RESULTS: Each study emphasized different ICF-CY components and provided unique categories. Professionals from the health, education and social sectors described areas of functioning that were well distributed across the ICF-CY components (global expert survey), CY with CP and caregivers highlighted areas within the components activity and participation (a & p) and environmental factors (qualitative study), while the research community and clinical encounters mainly focused on body functions and a & p (systematic review and clinical study). INTERPRETATION: This study highlights the need to consider all relevant perspectives when describing the functional profile of CY with CP.

PMID: 24813657 [PubMed - as supplied by publisher]

3. J Child Orthop. 2014 May 14. [Epub ahead of print]

Prevalence and pattern of upper limb involvement in cerebral palsy.

Makki D1, Duodu J, Nixon M.

PURPOSE: The aim of this study was to determine the prevalence and pattern of upper limb involvement in children with cerebral palsy (CP), how this relates to function and how well these problems are recognised and treated. METHODS: One hundred consecutive patients with CP attending non-hand-related clinics were assessed. Function was assessed according to the Gross Motor Functional Classification System (GMFCS), the Manual Ability Classification System (MACS) and the ABILHAND-Kids system, and correlated to age and pattern of upper limb involvement. Patients were examined for contractures in the shoulder, elbow, wrist and hand. Concerns about the appearance of the hand were also assessed in older children. RESULTS: Overall, 83 % of patients had upper limb involvement, 36 % had a demonstrable contracture and 69 % had reduced hand control. The most common contracture patterns were the thumb in palm with clasp hand, shoulder adduction with internal rotation and wrist flexion with pronation. The thumb in palm with clasp hand pattern was associated with the greatest functional disability, followed by wrist flexion with pronation. Single contractures such as elbow flexion caused significant disability, whereas swan-neck contractures were, by far, less debilitating. Children aged 12 years and older had more concerns about the appearance of their hand. The ABILHAND score was strongly correlated to both the GMFCS and the MACS score. CONCLUSION: Different patterns of upper limb involvement exist in CP and some have a significant impact on function and cause cosmetic concerns that should not be underestimated, particularly in older Children.

PMID: 24824566 [PubMed - as supplied by publisher]

4. J Child Neurol. 2014 May 11. [Epub ahead of print]

The State of the Evidence for Intensive Upper Limb Therapy Approaches for Children With Unilateral Cerebral Palsy.

Sakzewski L1, Gordon A, Eliasson AC.

Children with unilateral cerebral palsy experience difficulties with unimanual and bimanual upper limb function, impacting independence in daily life. Targeted upper limb therapies such as constraint-induced movement therapy, bimanual training, and combined approaches have emerged in the last decade. This article reviews the scientific rationale underpinning these treatments and current evidence to improve upper limb outcomes and goal attainment. Intensive models of therapy achieved modest to strong effects to improve upper limb function compared to usual care. Dose-matched comparisons of bimanual and unimanual training demonstrated similar gains in upper limb outcomes. The optimum timing, dose and impact of repeat episodes of intensive upper limb therapies require further investigation. Characteristics of children who achieve clinically meaningful outcomes remain unclear. Key components of intervention include collaborative goal setting with families and intensive repetitive, incrementally challenging, task practice. Choice of treatment approach should be governed by child/family goals and preferences, individual, and contextual factors.

PMID: 24820334 [PubMed - as supplied by publisher]

5. Pediatr Phys Ther. 2014 May 9. [Epub ahead of print]

Effect of Virtual Reality on Upper Extremity Function in Children With Cerebral Palsy: A Meta-analysis: A Meta-analysis.

Chen YP1, Lee SY, Howard AM.

PURPOSE: To systematically examine the effect of virtual reality (VR) on upper extremity (UE) function in children with cerebral palsy (CP) and assess the association among VR effects and children's characteristics and an intervention protocol. METHOD: A systematic literature search was conducted in PubMed, CINAHL, Cochrane, and PsycINFO up to June 2013. Research studies involving children with CP that used VR as the intervention method and UE outcome measures were included. RESULTS: The search yielded 14 research articles, including 3 randomized controlled trials and 11 case series. Overall, VR provided a strong effect size (d = 1.00) when comparing pre- and postintervention. In subgroup analyses, younger children receiving home-based or laboratory-based VR and using an engineer-built VR system showed better improvement. CONCLUSIONS AND IMPLICATIONS: Virtual reality is a viable tool to improve UE function in children with CP. However, a more vigorous research design is needed to make a conclusive recommendation.

PMID: 24819682 [PubMed - as supplied by publisher]

6. Pediatr Phys Ther. 2014 May 9. [Epub ahead of print]

Estimating Energy Expenditure for Different Assistive Devices in the School Setting.

Lephart K1, Utsey C, Wild DL, Fisher SR.

PURPOSE: This case report describes a simple means of estimating energy costs for a child with cerebral palsy using different assistive devices within a school setting. KEY POINTS: A 9-year-old boy, Gross Motor Function Classification Scale level III, was assessed over 8 ambulation trials using a posterior walker and using forearm crutches. Each trial was followed by a fine motor accuracy task. An energy expenditure index (EEI) was calculated for each device. For the posterior walker, EEI was 47% higher overall compared with forearm crutches. Fine motor accuracy and task completion time were similar for both devices. CONCLUSION: EEI was a straightforward method of estimating the energy costs of different assistive devices. Measurement procedures described in this case were time efficient in the field and provided a reasonable estimation of energy expenditure to help decide objectively which assistive device would best fit the needs of the student. VIDEO ABSTRACT: For more insights from the authors, see Supplemental Digital Content 1, available at http://links.lww.com/PPT/A63.

PMID: 24819680 [PubMed - as supplied by publisher]

7. J Child Neurol. 2014 May 11. [Epub ahead of print]

Rationale for Using Botulinum Toxin A as an Adjunct to Upper Limb Rehabilitation in Children With Cerebral Palsy.

Hoare B.

Cerebral palsy describes a group of disorders of movement and posture that result from disturbances in the developing brain. Although the brain lesion is nonprogressive, the secondary physical symptoms change with time and growth. If left untreated, symptoms may result in the development of physical impairment and impede independent performance of daily tasks. Intramuscular injection of botulinum neurotoxin A is a relatively safe and effective adjunct to upper limb therapy. Botulinum neurotoxin A primarily aims to reduce muscle overactivity, thereby reducing the development of increased muscle stiffness that can lead to permanent changes. With a specific focus on the physiological action of botulinum neurotoxin A, this article describes the secondary symptoms of cerebral palsy and their different contributions. To highlight research directions and future implications for clinical practice, this article also documents the recent scientific evidence for upper limb botulinum neurotoxin A and proposes a preventive clinical model that aims to mitigate the effects of increasing upper limb impairment.

PMID: 24820338 [PubMed - as supplied by publisher]

8. Nat Neurosci. 2014 Mar;17(3):449-54. doi: 10.1038/nn.3642. Epub 2014 Feb 2.

Imagined gait modulates neuronal network dynamics in the human pedunculopontine nucleus.

Tattersall TL1, Stratton PG1, Coyne TJ2, Cook R3, Silberstein P3, Silburn PA4, Windels F1, Sah P1.

The pedunculopontine nucleus (PPN) is a part of the mesencephalic locomotor region and is thought to be important for the initiation and maintenance of gait. Lesions of the PPN induce gait deficits, and the PPN has therefore emerged as a target for deep brain stimulation for the control of gait and postural disability. However, the role of the PPN in gait control is not understood. Using extracellular single-unit recordings in awake patients, we found that neurons in the PPN discharged as synchronous functional networks whose activity was phase locked to alpha oscillations. Neurons in the PPN responded to limb movement and imagined gait by dynamically changing network activity and decreasing alpha phase locking. Our results indicate that different synchronous networks are activated during initial motor planning and actual motion, and suggest that changes in gait initiation in Parkinson's disease may result from disrupted network activity in the PPN.

PMID: 24487235 [PubMed - indexed for MEDLINE]

9. Pediatr Phys Ther. 2014 May 9. [Epub ahead of print]

Effect of Functional Electrical Stimulation on Activity in Children With Cerebral Palsy: A Systematic Review: A Systematic Review.

Chiu HC1, Ada L.

PURPOSE: To determine whether functional electrical stimulation (FES) is effective and whether it is more effective than activity training alone. METHOD: MEDLINE, CINAHL, EMBASE, Cochrane, Web of Science, and PEDro databases were searched for randomized trials. Studies of randomized trials were included if the participants were children (<18 years old) with spastic cerebral palsy, who underwent a program of FES that involved electrical stimulation during practice of an activity. Measures of activity that best reflected the activity trained were examined. RESULTS: Five randomized trials were included. Three trials reported statistically significant between-group differences in favor of FES compared with no FES. Two trials reported no statistically significant between-group differences of FES compared with activity training alone. CONCLUSION: The available evidence suggests that FES is more effective than no FES but that it has a similar effect as activity training alone in cerebral palsy.

PMID: 24819681 [PubMed - as supplied by publisher]

10. Orthopade. 2014 May 11. [Epub ahead of print]

Long-term results of reconstructive surgery in infantile cerebral palsy patients with high hip dislocation : Is hip screening necessary [Article in German]

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

BACKGROUND: Hip dislocation as a result of neurogenic hip displacement is a common focal motor symptom in children with infantile cerebral palsy (ICP). In addition to contracture of the hip joint, in up to 65 % of cases patients suffer from pain which leads to further loss of function and often to limitations in important basic functions, such as lying, care, sitting, standing and transfer. METHODS: In order to avoid hip dislocation and to be able to implement therapy at an early stage, screening programs have been developed in recent years which clearly demonstrate the risks of hip displacement in ICP depending on the ability to walk. An investigation of the natural course is practically impossible because as a rule patients with painful neurogenic hip displacement receive surgical therapy. PATIENTS: In this study 96 patients with high hip dislocation grade IV on the Tönnis classification were included and 68 could be followed up. The average age at the time of surgery was 10.9 years and the mean follow-up period was 7.7 years. In the postoperative course 6 out of 91 reconstructed hips became redislocated and a proximal femoral resection was carried out in one female patient. The migration index according to Reimers was 14.0 % at the time of the follow-up examination. CONCLUSION: Revision procedures can be avoided by screening programs. These should be strived for so that the neuro-orthopedic treatment on operation planning is not first initiated when pain occurs and revision procedures, such as angulation osteotomy or proximal femoral resection can be avoided.

The reconstruction should also involve minimal deformation of the femoral head. In order to implement this, the interdisciplinary cooperation between neuropediatricians, social pediatriatricians and neuro-orthopedists should be intensified in the future.

PMID: 24816981 [PubMed - as supplied by publisher]

11. Med Sci Sports Exerc. 2014 May 12. [Epub ahead of print]

Variability in Measuring Physical Activity in Children with Cerebral Palsy.

Mitchell LE1, Ziviani J, Boyd RN.

INTRODUCTION: To establish the variability in the measurement of habitual physical activity (HPA) using the ActiGraph GT3X+ accelerometer in children with cerebral palsy (CP). METHOD: Repeated measures: Independently ambulant children with unilateral CP (n=30; aged 11y3m [2y4m]) completed standardized tasks over two consecutive days wearing an ActiGraphGT3X+ accelerometer and heart rate monitor. Testing protocol comprised five minutes of seated rest (REST), walking at light (LW), moderate (MW) and vigorous (VW) pace, and rapid stepping on/off a step (STEP). Agreement was calculated between days using intra-class correlation coefficients (ICC; two-factor mixed agreement model). Minimum detectable difference was calculated (MDD=[SDv1-ICC]x1.96xv2). Performance variability: Participants (n=102) wore an ActiGraphGT3X+ accelerometer for four days in the community. Activity counts were converted into activity intensity using uni-axial derived cut points to classify the time spent in moderate-to-vigorous physical activity (MVPA). Between-day intra-class reliability coefficients (R) and Spearman-Brown prophecy formula (ICCdesired/[1-ICCdesired])([1-ICCestimated]/ICCestimated) were calculated. RESULTS: Agreement between repeated measures was strong for light and MVPA (ICC=0.80). For MVPA, the MDD was 1412 counts·minute. In the community, 345 days (87%) were recorded. Three days of monitoring produced acceptable variability estimates of MVPA (R=0.63-0.73). Spearman-Brown prophecy analysis estimated three days would achieve a reliability coefficient of 0.7, and 11 days would achieve 0.9. CONCLUSION: Measurement of HPA using the ActiGraph GT3X+ accelerometer is reliable under controlled walking and stepping conditions, as well as in a community environment in independently ambulant children and adolescents with CP.

PMID: 24824775 [PubMed - as supplied by publisher]

12. Eur J Paediatr Neurol. 2014 Apr 25. pii: S1090-3798(14)00076-2. doi: 10.1016/j.ejpn.2014.04.012. [Epub ahead of print]

Prospective controlled cohort study to evaluate changes of function, activity and participation in patients with bilateral spastic cerebral palsy after Robot-enhanced repetitive treadmill therapy.

Schroeder AS1, Homburg M2, Warken B2, Auffermann H2, Koerte I3, Berweck S4, Jahn K5, Heinen F2, Borggraefe I6.

BACKGROUND: Robot-enhanced therapies are increasingly being used to improve gross motor performance in patients with cerebral palsy. AIM: To evaluate gross motor function, activity and participation in patients with bilateral spastic cerebral palsy (BS-CP) after Robot-enhanced repetitive treadmill therapy (ROBERT) in a prospective, controlled cohort study. METHODS: Participants trained for 30-60 min in each of 12 sessions within a three-week-period. Changes in Gross Motor Function Measure (GMFM 66) scores, standardized walking distance, self-selected and maximum walking speed (ICF domain "Activity"), and Canadian Occupational Performance Measure (COPM; "Participation") were measured. Outcome measures were assessed three weeks in advance (V1), the day before (V2) as well as the day after, and 8 weeks after ROBERT (V3 + V4). RESULTS: 18 patients with BS-CP participated; age 11.5 (mean, range: 5.0-21.8) years, body weight 36.4 (15.0-72.0) kg. GMFCS levels I-IV were: n = 4; 5; 8; 1. There was no significant difference comparing V1 and V2. GMFM 66 (total +2.5 points, Dimension D +3.8 and E +3.2) and COPM (Performance +2.1 points, Satisfaction +1.8 points) showed statistically significant improvements for V3 or V4 compared to V1 or V2 representing clinically meaningful effect sizes. Age, GMFCS level, and repeated ROBERT blocks correlated negatively with GMFM improvement, but not with COPM improvement. INTERPRETATION: Following ROBERT, this prospective controlled cohort study showed significant and clinically meaningful improvements of function in ICF domains of "activity" and "participation" in patients with BS-CP. Further assessment in a larger cohort is necessary to allow more specific definition of factors that influence responsiveness to ROBERT program.

PMID: 24821475 [PubMed - as supplied by publisher]

13. Curr Sports Med Rep. 2014 May-Jun;13(3):163-8. doi: 10.1249/JSR.0000000000000058.

Preparing for events for physically challenged athletes.

Simon LM1, Ward DC.

The participation in sports for physically challenged athletes continues to expand in multiple domains from recreational, novice, and competitive to elite competitions such as the Paralympics. Physically challenged athletes have various disabilities such as visual impairments, spinal cord injuries, amputations, cerebral palsy, or other neuromuscular impairments and have different levels of functional ability within these broad categories. The spectrum of medical illnesses and musculoskeletal injuries seen with sports is similar to that of able-bodied athletes; however medical teams caring for athletes with disabilities need to be familiar with medical risks such as skin breakdown, thermoregulation problems, dehydration, autonomic dysreflexia, infections, orthotic and prosthetic issues, and psychiatric comorbidities that may be encountered. The medical team preparation for events involving physically challenged athletes should include obtaining appropriate medical supplies, ensuring disability-compatible access to medical areas, and preparing for emergency extraction from adaptive equipment.

PMID: 24819007 [PubMed - in process]

14. J Child Neurol. 2014 May 11. [Epub ahead of print]

Health-Related Physical Fitness for Children With Cerebral Palsy.

Maltais DB1, Wiart L, Fowler E, Verschuren O, Damiano DL.

Low levels of physical activity are a global health concern for all children. Children with cerebral palsy have even lower physical activity levels than their typically developing peers. Low levels of physical activity, and thus an increased risk for related chronic diseases, are associated with deficits in health-related physical fitness. Recent research has provided therapists with the resources to effectively perform physical fitness testing and physical activity training in clinical settings with children who have cerebral palsy, although most testing and training data to date pertains to those who walk. Nevertheless, on the basis of the present evidence, all children with cerebral palsy should engage, to the extent they are able, in aerobic, anaerobic, and muscle-strengthening activities. Future research is required to determine the best ways to evaluate health-related physical fitness in nonambulatory children with cerebral palsy and foster long-term changes in physical activity behavior in all children with this condition.

PMID: 24820339 [PubMed - as supplied by publisher]

15. J Phys Act Health. 2014 May 9. [Epub ahead of print]

Energy Expenditure in Adolescents with Cerebral Palsy: Comparison of the Sensewear Armband and Indirect Calorimetry.

Koehler K1, Abel T, Wallmann-Sperlich B, Dreuscher A, Anneken V.

BACKGROUND: Inactivity and overweight are major health concerns in children and adolescents with disabilities. Methods for the assessment of activity and energy expenditure may be affected negatively by the underlying disability, especially when motor function is impaired. The purpose of this study was to assess the validity of the SenseWear armband in adolescents with cerebral palsy and hemiparesis. METHODS: Ten volunteers (age: 13.4 ± 1.6 years) were equipped with SenseWear armbands (Model MF, BodyMedia, Pittsburgh, PA) on the hemiparetic and non-hemiparetic side of the body. Energy expenditure was measured at rest and during treadmill exercise (speed range: 0.85 to 2.35 m/s). Indirect calorimetry served as independent reference method. RESULTS: The

mean error was between -0.6 and 0.8 kcal/min and there were no significant differences between SenseWear and indirect calorimetry at any speed. Differences between body sides in expenditure (mean: -0.2 to 0.0 kcal/min) and step count (mean: -3.4 to 9.7 steps/min) were not significant. CONCLUSIONS: The validity of the SenseWear armband does not appear to be negatively affected by cerebral palsy during laboratory treadmill exercise. Future field studies are necessary to assess the validity and practicability energy expenditure and physical activity in children and adolescents with physical disabilities.

PMID: 24828791 [PubMed - as supplied by publisher]

16. J Speech Lang Hear Res. 2014 May 13. doi: 10.1044/2014_JSLHR-S-13-0292. [Epub ahead of print]

Predicting Speech Intelligibility with A Multiple Speech Subsystems Approach in Children with Cerebral Palsy.

Lee J, Hustad KC, Weismer G.

PURPOSE: Speech acoustic characteristics of children with cerebral palsy (CP) were examined with a multiple speech subsystem approach; speech intelligibility was evaluated using a prediction model in which acoustic measures were selected to represent three speech subsystems. METHOD Nine acoustic variables reflecting different subsystems, and speech intelligibility, were measured in 22 children with CP. These children included 13 with a clinical diagnosis of dysarthria (SMI), and nine judged to be free of dysarthria (NSMI). Data from children with CP were compared to data from age-matched typically developing children (TD). RESULTS Multiple acoustic variables reflecting the articulatory subsystem were different in the SMI group, compared to the NSMI and TD groups. A significant speech intelligibility prediction model was obtained with all variables entered into the model (Adjusted R-squared = .801). The articulatory subsystem showed the most substantial independent contribution (58%) to speech intelligibility. Incremental R-squared analyses revealed that any single variable explained less than 9% of speech intelligibility variability. CONCLUSIONS Children in the SMI group have articulatory subsystem problems as indexed by acoustic measures. As in the adult literature, the articulatory subsystem makes the primary contribution to speech intelligibility variance in dysarthria, with minimal or no contribution from other systems.

PMID: 24824584 [PubMed - as supplied by publisher]

17. J Child Neurol. 2014 May 11. [Epub ahead of print]

Trends in Communicative Access Solutions for Children With Cerebral Palsy.

Myrden A1, Schudlo L, Weyand S, Zeyl T, Chau T.

Access solutions may facilitate communication in children with limited functional speech and motor control. This study reviews current trends in access solution development for children with cerebral palsy, with particular emphasis on the access technology that harnesses a control signal from the user (eg, movement or physiological change) and the output device (eg, augmentative and alternative communication system) whose behavior is modulated by the user's control signal. Access technologies have advanced from simple mechanical switches to machine vision (eg, eye-gaze trackers), inertial sensing, and emerging physiological interfaces that require minimal physical effort. Similarly, output devices have evolved from bulky, dedicated hardware with limited configurability, to platform-agnostic, highly personalized mobile applications. Emerging case studies encourage the consideration of access technology for all nonverbal children with cerebral palsy with at least nascent contingency awareness. However, establishing robust evidence of the effectiveness of the aforementioned advances will require more expansive studies.

PMID: 24820337 [PubMed - as supplied by publisher]

18. J Oral Rehabil. 2014 May 14. doi: 10.1111/joor.12185. [Epub ahead of print]

Association between anticonvulsant drugs and teeth-grinding in children and adolescents with cerebral palsy.

Ortega AO1, Dos Santos MT, Mendes FM, Ciamponi AL.

The relation between teeth-grinding and the use of drugs acting on the central nervous system of cerebral palsy (CP) patients has not yet been described. The aim of this research was to evaluate the presence or absence of teeth-grinding (sleep and/or awake periods) in normal and in CP children and adolescents, as well as the association of teeth-grinding and use of anticonvulsant drugs. The sample consisted of 207 children and adolescents, divided into three groups: G1, individuals with CP who did not take anticonvulsant drugs; G2, individuals with CP administered medications on a regular basis; and CG, normal individuals. Logistic regression analyses were performed to evaluate the association of teeth-grinding with some variables. No significant statistical differences were observed regarding the presence or absence of teeth-grinding when G1 and G2 were compared. However, compared with the CG, a statistically significant difference was determined, with the CG showing fewer children presenting teeth-grinding ($P < 0{\cdot}001$). Among those children/adolescents prescribed drug therapy, the barbiturate group showed a greater frequency of teeth-grinding. CP children and adolescents show a greater and significant presence of grinding of the teeth compared with normal individuals. Subjects taking barbiturate drugs showed greater presence of teeth-grinding, than those who were taking medications from the other groups of anticonvulsant drugs.

PMID: 24824732 [PubMed - as supplied by publisher]

19. Comput Intell Neurosci. 2014;2014:870160. doi: 10.1155/2014/870160. Epub 2014 Apr 14.

A tensor-product-kernel framework for multiscale neural activity decoding and control.

Li L1, Brockmeier AJ2, Choi JS3, Francis JT4, Sanchez JC5, Príncipe JC2.

Brain machine interfaces (BMIs) have attracted intense attention as a promising technology for directly interfacing computers or prostheses with the brain's motor and sensory areas, thereby bypassing the body. The availability of multiscale neural recordings including spike trains and local field potentials (LFPs) brings potential opportunities to enhance computational modeling by enriching the characterization of the neural system state. However, heterogeneity on data type (spike timing versus continuous amplitude signals) and spatiotemporal scale complicates the model integration of multiscale neural activity. In this paper, we propose a tensor-product-kernel-based framework to integrate the multiscale activity and exploit the complementary information available in multiscale neural activity. This provides a common mathematical framework for incorporating signals from different domains. The approach is applied to the problem of neural decoding and control. For neural decoding, the framework is able to identify the nonlinear functional relationship between the multiscale neural responses and the stimuli using general purpose kernel adaptive filtering. In a sensory stimulation experiment, the tensor-product-kernel decoder outperforms decoders that use only a single neural data type. In addition, an adaptive inverse controller for delivering electrical microstimulation patterns that utilizes the tensor-product kernel achieves promising results in emulating the responses to natural stimulation.

PMID: 24829569 [PubMed - in process] Free PMC Article

20. Zhongguo Zhong Xi Yi Jie He Za Zhi. 2014 Apr;34(4):431-4.

Treatment of cerebral palsy children by integrative medical sequential method: a clinical efficacy observation [Article in Chinese]

Wang LF, Zhang J, Chen XC, He L, Zhao XY.

OBJECTIVE: To observe the efficacy of integrative medical sequential method in treating cerebral palsy (CP) children's intelligence development, muscular tension, serum interleukin 6 (IL-6), and tumor necrosis factor alpha

(TNF-alpha). METHODS: Totally 111 CP children were randomly assigned to the control group (50 cases) and the treatment group (61 cases). All patients received comprehensive rehabilitation training and intravenous dripping of Monosialotetrahexosylganglioside Sodium Injection for 10 days. But those in the treatment group additionally received Chinese medical enema for brain resuscitation, relieving rigidity of muscles and activating collaterals for 14 days. Then they started another medication cycle and lasted for a total of 6 cycles. Serum IL-6 levels and TNF-alpha contents were determined before treatment. Scoring for muscular tension, Gesell score for intelligence development, contents of serum IL-6 and TNF-alpha were assessed before and after treatment in the two groups. RESULTS: Compared with before treatment in this group, muscular tension, Gesell scores for intelligence development all decreased in the two groups ($P < 0.05$). As for inter-group comparison, the decrement was more obvious in the treatment group than in the control group ($P < 0.05$). The total effective rate was 86.9% in the treatment group and 76.0% in the control group ($P < 0.05$). The contents of IL-6 and TNF-alpha were obviously reduced in the treatment group and the control group after treatment ($P < 0.01$). The decrement was more obvious in the treatment group ($P < 0.05$). CONCLUSION: The two treatment methods were effective for CP children, but the efficacy was superior in the treatment group than in the control group, indicating integrative medical methods could play a synergistic effect and optimize the treatment program for CP.

PMID: 24812898 [PubMed - in process]

Prevention and Cure

21. Cochrane Database Syst Rev. 2014 May 13;5:CD001145. [Epub ahead of print]

Late (> 7 days) postnatal corticosteroids for chronic lung disease in preterm infants.

Doyle LW1, Ehrenkranz RA, Halliday HL.

BACKGROUND: Many preterm infants who survive go on to develop chronic lung disease. This is probably due to persistent inflammation in the lungs. Corticosteroids have powerful anti-inflammatory effects and have been used to treat established chronic lung disease. However, it is unclear whether any beneficial effects outweigh the adverse effects of these drugs. OBJECTIVES: To determine the relative benefits and adverse effects associated with late (> 7 days) postnatal systemic corticosteroid treatment compared with control (placebo or nothing) in the preterm infant with evolving or established chronic lung disease.

SEARCH METHODS: We sought randomised controlled trials (RCTs) of postnatal corticosteroid therapy from the Cochrane Central Register of Controlled Trials (CENTRAL 2013, Issue 8), MEDLINE (1966 through August 2013), handsearching paediatric and perinatal journals, and by examining previous review articles and information received from practising neonatologists. When possible, we contacted authors of all studies to confirm details of reported follow-up studies or to obtain any information about long-term follow-up where none had been reported. SELECTION CRITERIA: We selected RCTs of postnatal corticosteroid treatment initiated after seven days after birth in preterm infants with evolving or established chronic lung disease for this review. DATA COLLECTION AND ANALYSIS: We extracted and analysed data regarding clinical outcomes including mortality, chronic lung disease, death or chronic lung disease, failure to extubate, complications in the primary hospitalisation, and long-term health outcomes

MAIN RESULTS: Twenty-one RCTs enrolling a total of 1424 participants were eligible for this review. All were randomised controlled trials, but the methods for random allocation were not always clear. Allocation concealment, blinding of the intervention and blinding of the outcome assessments were mostly satisfactory. Late steroid treatment was associated with a reduction in neonatal mortality (at 28 days), but not mortality at discharge or latest reported age. Benefits of delayed steroid treatment included reductions in failure to extubate by three, seven or 28 days, chronic lung disease at both 28 days and 36 weeks' postmenstrual age, need for late rescue treatment with dexamethasone, discharge on home oxygen, and death or chronic lung disease at both 28 days and 36 weeks' postmenstrual age. There was a trend towards an increase in risk of infection and gastrointestinal bleeding, but not necrotising enterocolitis. Short-term adverse affects included hyperglycaemia, glycosuria and hypertension. There was an increase in severe retinopathy of prematurity, but no significant increase in blindness. There was a trend towards a reduction in severe intraventricular haemorrhage, but only 247 infants were enrolled in five studies reporting this outcome. The trends to an increase in cerebral palsy or abnormal neurological examination were

partly offset by a trend in the opposite direction in death before late follow-up. The combined rate of death or cerebral palsy was not significantly different between steroid and control groups. Major neurosensory disability, and the combined rate of death or major neurosensory disability, were not significantly different between steroid and control groups. There were no substantial differences between groups for other outcomes in later childhood, including respiratory health or function, blood pressure or growth, although there were fewer with a clinically important reduction in the forced expired volume in one second (FEV1) on respiratory function testing.

AUTHORS' CONCLUSIONS: The benefits of late corticosteroid therapy may not outweigh actual or potential adverse effects. Although there continues to be concern about an increased incidence of adverse neurological outcomes in infants treated with postnatal steroids, this review of postnatal corticosteroid treatment for chronic lung disease initiated after seven days of age suggests that late therapy may reduce neonatal mortality without significantly increasing the risk of adverse long-term neurodevelopmental outcomes. However, the methodological quality of the studies determining the long-term outcome is limited in some cases; in some studies the surviving children have only been assessed before school age, when some important neurological outcomes cannot be determined with certainty, and no study was sufficiently powered to detect increased rates of important adverse long-term neurosensory outcomes. Given the evidence of both benefits and harms of treatment, and the limitations of the evidence at present, it appears prudent to reserve the use of late corticosteroids for infants who cannot be weaned from mechanical ventilation and to minimise the dose and duration of any course of treatment.

PMID: 24825542 [PubMed - as supplied by publisher]

21. Am J Perinatol. 2014 May 12. [Epub ahead of print]

Length of Latency with Preterm Premature Rupture of Membranes before 32 Weeks' Gestation.

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Objective: The objective of the article is to describe latency for patients with preterm premature membrane rupture (PPROM) between 240/7 and 316/7 weeks' gestation. Study Design: Secondary analysis of data collected prospectively in a multicenter clinical trial of magnesium sulfate for cerebral palsy prevention. Women with PPROM and fewer than six contractions per hour at enrollment who were candidates for expectant management (n=1,377) were included in this analysis. Length of latency was calculated in days by subtracting the time of delivery from the time of membrane rupture. Results: At each week of gestation, median latency between 24 and 28 weeks was similar at approximately 9 days, but it was significantly shorter with PPROM at 29, 30, and 31 weeks ($p<0.001$). In addition, the percentage of patients remaining undelivered at 7 days and 14 days was similar for PPROM between 24 and 28 weeks, but it decreased significantly after that. For each gestational age, the proportion of patients remaining pregnant declined in a fashion similar to an exponential pattern. Conclusion: Median latency after PPROM is similar from 24 to 28 weeks' gestation, but it shortens with PPROM at and after 29 weeks.

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Early (< 8 days) postnatal corticosteroids for preventing chronic lung disease in preterm infants.

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BACKGROUND: Chronic lung disease remains a major problem in neonatal intensive care units. Persistent inflammation in the lungs is the most likely underlying pathogenesis. Corticosteroids have been used to either prevent or treat chronic lung disease because of their potent anti-inflammatory effects. OBJECTIVES: To examine the relative benefits and adverse effects of postnatal corticosteroids commenced within the first seven days of life to preterm infants at risk of developing chronic lung disease. SEARCH METHODS: We sought randomised controlled trials (RCTs) of postnatal corticosteroid therapy from the Cochrane Central Register of Controlled Trials (CENTRAL, 2013, Issue 8), MEDLINE (1966 to August 2013), handsearching paediatric and perinatal journals, and

by examining previous review articles and information received from practising neonatologists. We contacted authors of all studies, where possible, to confirm details of reported follow-up studies, or to obtain any information about long-term follow-up where none had been reported. SELECTION CRITERIA: We selected RCTs of postnatal corticosteroid treatment within the first seven days of life (early) in high-risk preterm infants for this review. Most studies evaluated the use of dexamethasone but we also included studies that assessed hydrocortisone, even if it was used primarily to manage hypotension.

DATA COLLECTION AND ANALYSIS: We extracted and analysed data regarding clinical outcomes that included mortality, chronic lung disease, death or chronic lung disease, failure to extubate, complications during the primary hospitalisation, and long-term health outcomes.

MAIN RESULTS: Twenty-nine RCTs enrolling a total of 3750 participants were eligible for inclusion in this review. The overall risk for bias was probably low as all were randomised controlled trials, and most trials have used rigorous methods. There were significant benefits for the following outcomes: lower rates of failure to extubate and decreased risks of chronic lung disease at both 28 days and 36 weeks' postmenstrual age, death or chronic lung disease at 28 days and 36 weeks' postmenstrual age, patent ductus arteriosus and ROP, including severe ROP. There were no significant differences in the rates of neonatal or subsequent mortality, infection, severe intraventricular haemorrhage, periventricular leukomalacia, necrotising enterocolitis or pulmonary haemorrhage. Gastrointestinal bleeding and intestinal perforation were important adverse effects. The risks of hyperglycaemia, hypertension, hypertrophic cardiomyopathy and growth failure were also increased. In the 12 trials that reported late outcomes, several adverse neurological effects were found at follow-up examinations, including developmental delay (not defined), cerebral palsy and abnormal neurological examination. However, major neurosensory disability was not significantly increased, either overall in the seven studies where this outcome could be determined, or in the two individual studies where the rates of cerebral palsy or abnormal neurological examination were significantly increased. Moreover, the rates of the combined outcomes of death or cerebral palsy, or of death or major neurosensory disability, were not significantly increased. Dexamethasone was used in most studies (n = 20); only nine studies used hydrocortisone. In subgroup analyses by type of corticosteroid, most of the beneficial and harmful effects were attributable to dexamethasone; hydrocortisone had little effect on any outcomes except for an increase in intestinal perforation and a borderline reduction in patent ductus arteriosus.

AUTHORS' CONCLUSIONS: The benefits of early postnatal corticosteroid treatment (= 7 days), particularly dexamethasone, may not outweigh the adverse effects of this treatment. Although early corticosteroid treatment facilitates extubation and reduces the risk of chronic lung disease and patent ductus arteriosus, it causes short-term adverse effects including gastrointestinal bleeding, intestinal perforation, hyperglycaemia, hypertension, hypertrophic cardiomyopathy and growth failure. Long-term follow-up studies report an increased risk of abnormal neurological examination and cerebral palsy. However, the methodological quality of the studies determining long-term outcomes is limited in some cases; the surviving children have been assessed predominantly before school age, and no study has been sufficiently powered to detect important adverse long-term neurosensory outcomes. There is a compelling need for the long-term follow-up and reporting of late outcomes, especially neurological and developmental outcomes, among surviving infants who participated in all randomised trials of early postnatal corticosteroid treatment. Hydrocortisone in the doses and regimens used in the reported RCTs has few beneficial or harmful effects and cannot be recommended for the prevention of chronic lung disease.

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Cognitive Outcomes of Preterm Infants Randomized to Darbepoetin, Erythropoietin, or Placebo.

Ohls RK1, Kamath-Rayne BD, Christensen RD, Wiedmeier SE, Rosenberg A, Fuller J, Lacy CB, Roohi M, Lambert DK, Burnett JJ, Pruckler B, Peceny H, Cannon DC, Lowe JR.

BACKGROUND: We previously reported decreased transfusions and donor exposures in preterm infants randomized to Darbepoetin (Darbe) or erythropoietin (Epo) compared with placebo. As these erythropoiesis-stimulating agents (ESAs) have shown promise as neuroprotective agents, we hypothesized improved neurodevelopmental outcomes at 18 to 22 months among infants randomized to receive ESAs. METHODS: We performed a randomized, masked, multicenter study comparing Darbe (10 μg/kg, 1×/week subcutaneously), Epo (400 U/kg, 3×/week subcutaneously), and placebo (sham dosing 3×/week) given through 35 weeks' postconceptual age, with transfusions administered according to a standardized protocol. Surviving infants were evaluated at 18 to

22 months' corrected age using the Bayley Scales of Infant Development III. The primary outcome was composite cognitive score. Assessments of object permanence, anthropometrics, cerebral palsy, vision, and hearing were performed. RESULTS: Of the original 102 infants (946 ± 196 g, 27.7 ± 1.8 weeks' gestation), 80 (29 Epo, 27 Darbe, 24 placebo) returned for follow-up. The 3 groups were comparable for age at testing, birth weight, and gestational age. After adjustment for gender, analysis of covariance revealed significantly higher cognitive scores among Darbe (96.2 ± 7.3; mean ± SD) and Epo recipients (97.9 ± 14.3) compared with placebo recipients (88.7 ± 13.5; P = .01 vs ESA recipients) as was object permanence (P = .05). No ESA recipients had cerebral palsy, compared with 5 in the placebo group (P < .001). No differences among groups were found in visual or hearing impairment. CONCLUSIONS: Infants randomized to receive ESAs had better cognitive outcomes, compared with placebo recipients, at 18 to 22 months. Darbe and Epo may prove beneficial in improving long-term cognitive outcomes of preterm infants.

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