

Monday 13 December 2010

This free weekly bulletin lists the latest research on cerebral palsy (CP), as indexed in the NCBI, PubMed (Medline) and Entrez (GenBank) databases. These articles were identified by a search using the key term "cerebral palsy".

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Interventions

1. Paediatr Perinat Epidemiol. 2011 Jan;25(1):88-96. doi: 10.1111/j.1365-3016.2010.01164.x. Epub 2010 Oct 18.

Feasibility and reliability of classifying gross motor function among children with cerebral palsy using population-based record surveillance.

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For conditions with wide-ranging consequences, such as cerebral palsy (CP), population-based surveillance provides an estimate of the prevalence of case status but only the broadest understanding of the impact of the condition on children, families or society. Beyond case status, information regarding health, functional skills and participation is necessary to fully appreciate the consequences of the condition. The purpose of this study was to assess the feasibility and reliability of enhancing population-based surveillance by classifying gross motor function (GMF) from information available in medical records of children with CP. We assessed inter-rater reliability of two GMF classification methods, one the Gross Motor Function Classification System (GMFCS) and the other a 3-category classification of walking ability: (1) independently, (2) with handheld mobility device, or (3) limited or none. Two qualified clinicians independently reviewed ed evaluations from medical records of 8-year-old children residing in southeast Wisconsin, USA who were identified as having CP ($n = 154$) through the Centers for Disease Control and Prevention's Autism and Developmental Disabilities Monitoring Network. Ninety per cent ($n = 138$) of the children with CP had information in the record after age 4 years and 108 (70%) had adequate descriptions of gross motor skills to classify using the GMFCS. Agreement was achieved on 75.0% of the GMFCS ratings (simple kappa = 0.67, 95% confidence interval [95% CI 0.57, 0.78], weighted kappa = 0.83, [95% CI 0.77, 0.89]). Among case children for whom walking ability could be classified ($n = 117$), approximately half walked independently without devices and one-third had limited or no walking ability. Across walking ability categories, agreement was reached for 94% (simple kappa = 0.90, [95% CI 0.82, 0.96], weighted kappa = 0.94, [95% CI 0.89, 0.98]). Classifying GMF in the context of active records-based surveillance is feasible and reliable. Future surveillance efforts that include functional level among children with cerebral palsy may provide important information for monitoring the impact of the condition for programmatic and policy purposes.

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PMID: 21133973 [PubMed - in process]

2. Pediatrics. 2010 Dec;126 Suppl 3:S111-9.**Health inequity in children and youth with chronic health conditions.**

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BACKGROUND: Over the last decades, there have been great advances in health care delivered to children with chronic conditions, but not all children have benefitted equally from them. **OBJECTIVES:** To describe health inequities experienced by children with chronic health conditions. **METHODS:** We performed a literature review of English-language studies identified from the Medline, Centers for Disease Control and Prevention, National Cancer Institute, and Cystic Fibrosis Foundation Web sites that were published between January 1985 and May 2009, included children aged 0 to 18 years, and contained the key words "incidence," "prevalence," "survival," "mortality," or "disparity" in the title or for the following health conditions: acute leukemia, asthma, attention-deficit/hyperactivity disorder (ADHD), autism spectrum disorders, cerebral palsy, cystic fibrosis, diabetes mellitus, Down syndrome, HIV/AIDS, major congenital heart defects, major depressive disorder, sickle cell anemia, spina bifida, and traumatic brain injury. **RESULTS:** Black children had higher rates of cerebral palsy and HIV/AIDS, were less likely to be diagnosed with ADHD, had more emergency department visits, hospitalizations, and had higher mortality rates associated with asthma; and survived less often with Down syndrome, type 1 diabetes, and traumatic brain injury when compared with white children. Hispanic children had higher rates of spina bifida from Mexico-born mothers, had higher rates of HIV/AIDS and depression, were less likely to be diagnosed with ADHD, had poorer glycemic control with type 1 diabetes, and survived less often with acute leukemia compared with white children. **CONCLUSIONS:** Serious racial and ethnic health and health care inequities persist for children with chronic health conditions.

PMID: 21123473 [PubMed - in process]

3. Acta Med Iran. 2010 May-Jun;48(3):154-7.**Comparison of modified Ashworth scale and Hoffmann reflex in study of spasticity.**

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Spasticity is one of the common complications in upper motor neuron lesions and without appropriate treatment it causes disturbances in movement pattern. Assessments of patients are effective in patient's management. Modified Ashworth scale (MAS) is one of the criteria in qualitative assessment of spasticity, and there are lots of controversies about its validity. The purpose of this study is to compare MAS with electrophysiological indices of spasticity. The spasticity of upper limb muscles in patients with hemiplegic cerebral palsy are measured and recorded by MAS. Then electrophysiological indices of Hoffmann reflex (H reflex) and ratio of maximum range of action potential of combined movement of flexor carpi radialis (FCR) for upper limb and soleus for lower limb were estimated. Data of 11 patients with age range 4 to 6 were analyzed. There is no significant correlation between degree of spasticity and electrophysiological indices.

PMID: 21137650 [PubMed - in process]

4. Acta Orthop Belg. 2010 Oct;76(5):651-7.**Split tibialis posterior tendon transfer for correction of spastic equinovarus hindfoot deformity.**

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Equinovarus hindfoot deformity is one of the most common deformities in children with spastic paralysis ; it is usu-

ally secondary to cerebral palsy. Split tibialis posterior tendon transfer is performed to balance the flexible spastic varus foot and is preferable to tibialis posterior lengthening, as the muscle does not lose its power and therefore the possibility of a valgus or calcaneovalgus deformity is diminished. We retrospectively evaluated 33 consecutive ambulant patients (38 feet) with flexible spastic varus hindfoot deformity. Twenty-eight presented unilateral and five bilateral involvement. The mean age at operation was 10.8 yrs (range 6-17) and the mean follow-up was 10; yrs (4-14). There were 20 hemiplegic feet, 11 diplegic and 7 quadriplegic. Eighteen feet also presented an equinus position of the hindfoot, requiring Achilles tendon lengthening. The surgical technique applied was similar to the one described by Green et al, with four skin incisions, two on either side of the foot and ankle. The evaluation of the results was carried out using Kling and Kaufer's clinical criteria. Results were graded excellent or good for 34 out of 38 feet (89.5%). Twenty feet were graded excellent, indicating that the children managed to walk with a plantigrade foot without fixed or postural deformity and did not have callosities. Fourteen feet were graded good in children who walked with less than 50° varus, valgus or equinus of the hindfoot and had no callosities. Four were graded poor, with recurrent equinovarus deformity. The feet with poor results presented a residual varus deformity due to intraoperative technical errors.

PMID: 21138221 [PubMed - in process]

5. Exp Brain Res. 2010 Dec 8. [Epub ahead of print]

Functioning of peripheral Ia pathways in infants with typical development: responses in antagonist muscle pairs.

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In muscle responses of proprioceptive origin, including the stretch/tendon reflex (T-reflex), the corresponding reciprocal excitation and irradiation to distant muscles have been described from newborn infants to older adults. However, the functioning of other responses mediated primarily by Ia-afferents has not been investigated in infants. Understanding the typical development of these multiple pathways is critical to determining potential problems in their development in populations affected by neurological disease, such as spina bifida or cerebral palsy. Hence, the goal of the present study was to quantify the excitability of Ia-mediated responses in lower limb muscles of infants with typical development. These responses were elicited by mechanical stimulation applied to the distal tendons of the gastrocnemius-soleus (GS), tibialis anterior (TA) and quadriceps (QAD) muscles of both legs in twelve 2- to 10-month-old infants and recorded simultaneously in antagonist muscle pairs by surface EMG. Tendon taps alone elicited responses in either, both or neither muscle. The homonymous response (T-reflex) was less frequent in the TA than the GS or QAD muscle. An 80 Hz vibration superimposed on tendon taps induced primarily an inhibition of monosynaptic responses; however, facilitation also occurred in either muscle of the recorded pair. These responses were not influenced significantly by age or gender. Vibration alone produced a tonic reflex response in the vibrated muscle (TVR) and/or the antagonist muscle (AVR). However, for the TA muscle the TVR was more frequently elicited in older than younger infants. High variability was common to all responses. Overall, the random distribution and inconsistency of muscle responses suggests that the gain of Ia-mediated feedback is unstable. We propose that during infancy the central nervous system needs to learn to set stable feedback gain, or destination of proprioceptive assistance, based on their use during functional movements. This will tailor the neuromuscular connectivity to support adaptive motor behaviors.

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6. Gait Posture. 2010 Dec 3. [Epub ahead of print]

Lycra® arm splints improve movement fluency in children with cerebral palsy.

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AIMS: To determine changes in upper limb movement substructures that denote fluency of movement in children with cerebral palsy (CP) following lycra® splint wear. Secondly, to explore the efficacy of lycra® splints for those with spastic and dystonic hypertonia. **DESIGN:** Randomised clinical trial whereby participants were randomised to parallel groups with waiting list control. **METHOD:** Sixteen children (mean age 11.5 years SD=2.2) with hypertonic upper limb involvement (13 hemiplegia, 4 quadriplegia) were recruited. Children were randomly allocated either to a control group or to wear the lycra® splint for a period of three months. Three-dimensional (3D) upper limb kinematics was used to assess four functional tasks at baseline, on initial lycra® splint application, three months after lycra® splint wear, and immediately after splint removal. Movement substructures of the motion of the wrist joint center were analysed. **RESULTS:** A significant difference was observed between baseline and three months of lycra® splint wear in the movement substructures; movement time, percentage of time and distance in primary movement, jerk index, normalised jerk and percentage of jerk in primary and secondary movements. The magnitude of changes in normalised jerk and the percentage of jerk in the primary movement from baseline to three months was greatest in children with dystonic hypertonia. **CONCLUSIONS:** The results indicate that lycra® arm splinting induced significant changes in movement substructures and motor performance in children with CP. This research demonstrates that fluency of movement can be quantified and is amenable to change with intervention.

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7. Infant Behav Dev. 2010 Dec 1. [Epub ahead of print]

Approximate entropy used to assess sitting postural sway of infants with developmental delay.

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Infant sitting postural sway provides a window into motor development at an early age. The approximate entropy, a measure of randomness, in the postural sway was used to assess developmental delay, as occurs in cerebral palsy. Parameters used for the calculation of approximate entropy were investigated, and approximate entropy of postural sway in early sitting was found to be lower for infants with developmental delay in the anterior-posterior axis, but not in the medial-lateral axis. Spectral analysis showed higher frequency features in the postural sway of early sitting of infants with typical development, suggesting a faster control mechanism is active in infants with typical development as compared to infants with delayed development, perhaps activated by near-fall events.

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8. J Neurosci Methods. 2010 Nov 30. [Epub ahead of print]

Statistical Spatial Filtering for a P300-based BCI: Tests in able-bodied, and Patients with Cerebral Palsy and Amyotrophic Lateral Sclerosis.

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The effective use of brain-computer interfaces (BCI) in real-world environments depends on a satisfactory throughput. In a P300-based BCI, this can be attained by reducing the number of trials needed to detect the P300 signal. However, this task is hampered by the very low signal-to-noise-ratio (SNR) of P300 event related potentials. This paper proposes an efficient methodology that achieves high classification accuracy and high transfer rates for both disabled and able-bodied subjects in a standard P300-based speller system. The system was tested by three subjects with cerebral palsy (CP), two subjects with amyotrophic lateral sclerosis (ALS), and nineteen able-bodied subjects. The paper proposes the application of three statistical spatial filters. The first is a beamformer that maximizes the ratio of signal power and noise power (Max-SNR). The second is a beamformer based on the Fisher criterion (FC). The third approach cascades the FC beamformer with the Max-SNR beamformer satisfying simultaneously sub-optimally both criteria (C-FMS). The calibration process of the BCI system takes about 5minutes to collect data

and a couple of minutes to obtain spatial filters and classification models. Online results showed that subjects with disabilities have achieved, on average, an accuracy and transfer rate only slightly lower than able-bodied subjects. Taking 23 of the 24 participants, the averaged results achieved a transfer rate of 4.33 symbols per minute with a 91.80% accuracy, corresponding to a bandwidth of 19.18 bits per minute. This study shows the feasibility of the proposed methodology and that effective communication rates are achievable.

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9. Nanomedicine (Lond). 2010 Nov;5(9):1317-29.

Intrinsic targeting of inflammatory cells in the brain by polyamidoamine dendrimers upon subarachnoid administration.

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Aim: Understanding the interactions between nanomaterials and disease processes is crucial for designing effective therapeutic approaches. This article explores the unusual neuroinflammation targeting of dendrimers (with no targeting ligands) in the brain, with significant consequences for nanoscale materials in medicine. **Method:** The in vivo biodistribution of fluorescent-labeled neutral generation-4- polyamidoamine dendrimers (4 nm) in a rabbit model of cerebral palsy was explored following subarachnoid administration. **Results:** These dendrimers, with no targeting ligands, were localizing in activated microglia and astrocytes (cells responsible for neuroinflammation), even in regions far moved from the site of injection, in newborn rabbits with maternal inflammation-induced cerebral palsy. **Conclusion:** This intrinsic ability of dendrimers to localize inactivated microglia and astrocytes can enable targeted delivery of therapeutics in disorders such as cerebral palsy, Alzheimer's and multiple sclerosis.

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