

Pediatric Pain Letter

Abstracts and Commentaries on Pain in Infants, Children and Adolescents

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Editorial note

We've come a long way in advancing pediatric pain in the last 20 years. A combination of research discoveries in assessment and treatment, education of health professionals, and lobbying for changes in policies and practices have transformed what happens to many infants, children, and youth in pain. Much remains to be done. The science of pediatric pain is very new and the prospect of further improvements depends on the continuing development of our field. Key questions in basic science, clinical science, the social sciences, epidemiology, and health services research remain to be answered.

The volume and the quality of pediatric pain research are increasing and it is refreshing to see that many different disciplines and medical subspecialties are conducting research in this area. However, there is a disturbing trend. The number of researchers who include pain as an important area is increasing, but the number who devote their career to pediatric pain does not appear to be increasing. Of course both types of researchers are important, but "pain researchers" are needed to advance the

field.

Most of the original researchers in pediatric pain were clinician scientists and there have been very few full-time pediatric pain scientists. There is a significant shortage of scientists devoted to pediatric pain research and, more critically, there do not appear to be a large cadre of up-and-coming researchers. As a group, pediatric pain scientists have not been able to replicate themselves. There are only a handful of new scientists and there are few new laboratories devoted to our field. The original cohort of clinician scientists who began the revolution in pediatric pain research and management are coming to the last third of their careers and soon will be winding down.

The clinician scientist is under threat all over the world because of the pressure on academic health sciences. Two factors seem to be most important. First of all, clinician scientists, the world over, and in all disciplines, have to make major financial sacrifices to stay in research. Secondly, the research questions we have to answer are more complex than those that we faced a decade ago, and thus it is much more difficult to be competitive as a researcher.

"...there is a significant shortage of scientists devoted to pediatric pain research...there do not appear to be a large cadre of up-and-coming researchers..."

There may be a specific problem with pediatric pain because it is often considered not a scientific problem but simply a humanitarian one. Pediatric pain researchers may not get the respect that those in "more important" areas do.

We need basic scientists, clinician scientists, social scientists, epidemiologists, and health services researchers to engage in pediatric pain research. There are no easy solutions and many approaches are needed, but if we don't succeed, clinical progress will stall.

Recent Articles

Anttila P, Metsähonkala L, Mikkelsen M, Helenius H, Sillanpää M. Comorbidity of other pains in schoolchildren with migraine or nonmigrainous headache. *Journal of Pediatrics* 2001;138(2):176-180.

Objective. To compare the frequency of non-headache pain in 10-year-old children with migraines and children with nonmigrainous headaches.

Design. Population-based, prospective, follow-up study.

Setting. Schools, Turku, Finland.

Participants. Schoolchildren (n=513, age=10 years) with primary headache in 1995 and their parents. Of these children, 53 had migraine (29 males) as determined by the International Headache Society criteria and 460 had nonmigrainous headache (228 males). Of the children with migraines, 25 had migraines with aura.

Main Outcome Measures. Parent(s) and children completed a questionnaire regarding frequency and type of headache. Also, the occurrence of other pains in the preceding 6 months was reported using a 3-point scale (never=0, sometimes=1, often=2) for recurrent abdominal pain, limb pain, back pain, neck-shoulder pain, chest pain, throat pain, otalgia, and toothache and then summed to obtain a value between 0 and 16 (sum of other pains).

Results. During the preceding 6 months, mean frequency of migraine attacks was 12.4 (SD=13.0) episodes while mean frequency of nonmigrainous headaches was 7.6 (SD=14.1) episodes. Limb pain was reported sometimes or often by 59% of subjects, recurrent abdominal pain sometimes or often by 50%, neck-shoulder pain sometimes or often by 29%, back pain sometimes or often by 14%, chest pain sometimes or often by 11%, throat pain sometimes or often by 64%, otalgia sometimes or often by 23%, and toothache sometimes or often by 14%. Children with migraines reported significantly more neck-shoulder pain (p=0.003), recurrent abdominal pain (p=0.009), back pain (p=0.028), and otalgia (p=0.015) than children with nonmigrainous headaches. Children with migraines with aura reported significantly more neck-shoulder pain (p=0.001), recurrent abdominal pain (p=0.002), back pain (p=0.028), otalgia (p=0.032), and throat pain (p=0.01) than children with nonmigrainous headaches. There were no significant gender differences in the frequency of other pains between children with migraines and children with nonmigrainous headaches. The median sum of other pains in children with migraines was 4 (interquartile range 2-5) while, for children with nonmigrainous headaches, the

median sum of other pains was 3 (interquartile range 1-4), a significant difference (p=0.002). The sum of other pains correlated positively with the frequency of nonmigrainous headache (r=0.40; 95% CI -0.31-0.47) but there was no correlation between the sum of other pains and the frequency of migraine.

Conclusions. Children with migraine, particularly those with aura, were more prone to other pains than children with nonmigrainous headache. Children with migraines reported more neck-shoulder pain and back pain than children with nonmigrainous headaches. This was unexpected since neck-shoulder pain and back pain was thought to be more closely associated with tension (nonmigrainous) headache. Results indicate that a child with a migraine headache is more likely to report other types of pain, regardless of migraine frequency, and a child with a nonmigrainous headache is more likely to report other types of pain particularly if their headaches are frequent.

Bucher HU, Baumgartner R, Bucher N, Seiler M, Fauchère JC. Artificial sweetener reduces nociceptive reaction in term newborn infants. *Early Human Development* 2000;59(1):51-60.

Objective. To determine whether an artificial sweetener (cyclamate and saccharin), glycine (a sweet amino acid) or breast milk decreases reaction of newborn infants to pain.

Design. Randomized, double-blind, placebo-controlled trial.

Setting. District hospital, Switzerland.

Participants. Healthy term infants (n=80; 4 days old) were randomly assigned to one of four groups; artificial sweetener (n=20; 10 males), glycine (n=20; 10 males), expressed breast milk (n=20; 8 males) or sterile water (n=20; 9 males). Inclusion criteria were: birth weight > 2500 g, born between 37 and 41 weeks gestation, Apgar score > 6 at 5 minutes, and a normal neurological examination.

Intervention. Test solutions were obtained (breast milk from mother) or prepared (2.5 mg/mL cyclamate and 0.25 mg/mL saccharin for artificial sweetener solution; 0.1 mg/mL for glycine solution). Thoracic electrodes were applied to measure heart rate (HR). Each infant received 2 mL of test solution administered with a syringe on the anterior part of the tongue. Two minutes later, the infant's heel was pricked with a 2 mm lancet following a standard procedure for metabolic screening (Guthrie test) and 8 drops of blood were collected. A plaster was then applied. The procedure was videotaped for analysis.

Main Outcome Measures. A multidimensional pain score

was composed by summing ranks of six outcome variables: (1) crying time in seconds between heel prick and plaster application as a percentage of the entire duration of the procedure; (2) crying recovery time after application of plaster; (3) maximal HR change after heel prick compared with baseline before heel prick; (4) HR recovery (time after plaster application until HR falls to within 2 SD of baseline HR); (5) facial pain score, and (6) body pain score. Videotapes were scored by two blinded, independent observers before heel prick and at one-minute intervals throughout the procedure until three minutes after plaster application. Statistical differences between groups were determined using the Van der Waerden rank score test. The effect of confounders (such as sex of infant, nurse, number of lances needed, HR, and activity state before heel prick) was determined in a stepwise linear regression model.

Results. Infants in the artificial sweetener group cried less during blood collection ($p=0.04$), recovered more quickly ($p=0.01$), and their HR recovered more quickly ($p=0.04$) than the other three groups. Infants in the glycine group cried longer after blood collection had stopped ($p=0.01$). The combined rank pain score was lower ($p=0.036$) in infants in the artificial sweetener group. Activity state before heel prick, test solution, and the nurse performing the procedure were the most important confounding factors, while the number of pricks, procedure duration, baseline HR, and sex of infant were not associated with crying.

Conclusions. Like sucrose, artificial sweetener (cyclamate and saccharin) given before a painful procedure significantly reduces crying in infants. Artificial sweetener may be used to relieve pain in infants when sucrose cannot be given (e.g., fructose intolerance).

"...artificial sweetener reduces pain in infants..."

Gormally S, Barr RG, Wertheim L, Alkawaf R, Calinoiu N, Young SN. Contact and nutrient caregiving effects on newborn infant pain responses. *Developmental Medicine & Child Neurology* 2001;43(1):28-38.

Objective. To investigate whether the combined effects of caregiving contact (holding) and sweet taste on infants' response to procedural pain (e.g., heel lance for phenylketonuria (PKU) screening) was greater than the effects of holding or sweet taste alone, whether the effects were additive or interactive, and whether the interventions affected behavioural responses (e.g., crying and facial activity) and physiological responses (e.g., heart rate (HR)

and vagal tone) similarly.

Design. Randomized, controlled, between-subjects, two-factor intervention trial.

Setting. General hospital, Montréal, Canada.

Participants. Healthy term infants ($n=85$; 38 males; age range 2-3 days) were recruited a day before the study and randomly assigned to four groups; control group (no holding with water taste, $n=21$; 9 males), sucrose group (no holding with sucrose taste, $n=22$; 8 males), holding group (holding with water taste, $n=20$; 10 males), and holding and sucrose group (holding with sucrose taste, $n=22$; 11 males). Inclusion criteria included: birth weight > 2.5 kg, uncomplicated prepartum history, labour and delivery, an Apgar score > 7 at 5 minutes, no medical treatments, and no other painful procedures within 24 hours of the PKU heel lance. The four groups did not differ significantly in age, gender distribution, gestational age, weight, mother's age, mother's education level, the ratio of vaginal deliveries to Caesarean section deliveries or proportion of mothers that received epidural analgesia during delivery.

Intervention. Infants in the holding and the holding and sucrose groups were held in the arms of a blinded female research assistant for the duration of the heel lance procedure, beginning 4 minutes before the heel lance procedure was initiated. Infants in the sucrose and the holding and sucrose groups were administered a 24% sucrose solution on the anterior part of the tongue in 3 – 250 μ L portions via pipette, 30 seconds apart, beginning 2 minutes before the heel lance procedure was initiated.

Main Outcome Measures. Each infant was fed and changed at 5:30 a.m. and brought to the observation room where cardiac leads were attached to their chest. After 1.5 hours, the infant was videotaped for 2 minutes to record preintervention crying and facial activity and was monitored to obtain preintervention HR and vagal tone baselines. Heart recording and videotaping continued throughout the procedure. Each infant was then held or placed in a bassinet and given sucrose solution or sterile water, depending on the group to which they had been assigned. Procedure duration, number of heel lances required, number of heel squeezes required to obtain a sufficient blood sample, and blood glucose level were recorded. Videotapes were analyzed for crying and facial activity each second by blinded coders. Crying was determined for preintervention, minute 1, 2, and 3. Facial activity was measured with the Pain Concatenation Score (PCS), the percentage time present per minute of the simultaneous (in one second) occurrence of brow bulge, eye squeeze, nasolabial furrow, and open lips. PCS was determined for preintervention, minute 1, and 2. HR and

vagal tone were determined for preintervention, minute 1, 2, and 3. Each outcome measure was submitted to a contact \times taste \times periods factorial ANCOVA in which periods (minutes 1, 2, and 3) were repeated measures and preintervention baseline was a covariate. Group differences were determined by reduced factorial models that included preintervention, periods and interaction terms if they were significant.

Results. During the preintervention monitoring, the mean percentage time crying was 9.3 (range 2.4-48.9), mean PCS was 0.08 (range 0.03-0.48), mean HR was 128 beats per minute (SD=19), and mean vagal tone index was 3.8 (SD=1.5). Measured at minute 1 during the heel lance procedure, the mean percentage time crying was 93.0 (range 67.6-99.5), mean PCS was 0.78 (range 0.39-0.99), mean HR was 168 beats per minute (SD=18), and mean vagal tone index was 2.1 (SD=1.1). Comparing these values, the heel lance procedure was considered a significant stressor. The procedure duration, number of heel lances required, and blood glucose level did not differ significantly between groups. However, the number of squeezes required was significantly lower for the holding and the holding and sucrose groups (both $p < 0.02$). Behavioural responses (crying and PCS) decreased over time ($F_{2,80}=10.0$, $p < 0.001$ and $F_{1,65}=28.5$, $p < 0.001$ respectively) while physiological responses (HR and vagal tone) did not change over time. Sucrose taste had a significant effect on crying ($F_{1,81}=4.1$, $p < 0.05$) and holding had an effect similar in magnitude but less statistically reliable ($F_{1,81}=3.0$, $p = 0.09$). Sucrose taste and holding appear to have an additive rather than interactive effect on crying ($F_{1,81}=0.80$, $p = 0.37$). Sucrose taste did not have a significant effect on PCS ($F_{1,65}=0.17$, $p = 0.68$) while holding had a significant effect ($F_{1,65}=5.6$, $p < 0.02$). Sucrose taste and holding did not appear to have interactive effect on PCS ($F_{1,65}=0.14$, $p = 0.71$). Neither sucrose taste nor holding alone had an effect on HR but together interacted significantly ($F_{1,61}=8.89$, $p < 0.004$) on HR. Neither sucrose taste, holding or both had a significant effect on vagal tone (all $p > 0.36$). For the physiological measures, sucrose taste and holding appeared to synergistically interact with each other and preintervention levels to reduce HR and lower vagal tone more in infants in whom HR and vagal tone were higher preintervention.

Conclusions. Combined caregiving modalities (e.g., sucrose taste and holding) have a greater effect than either modality independently. The effects of sucrose taste and holding appear to be additive on crying and synergistic on HR and vagal tone. Holding and sweet taste during painful procedures is simple, practical and an effective means of reducing pain experience in infants.

Humphreys PA, Gevirtz RN. Treatment of recurrent abdominal pain: Components analysis of four treatment protocols. *Journal of Pediatric Gastroenterology & Nutrition* 2000;31(1):47-51.

Objective. To compare the effectiveness of several components of published treatment protocols for recurrent abdominal pain (RAP).

Design. Randomized, expanded pretest-posttest control group study.

Setting. Southern California communities, USA.

Participants. Children and adolescents ($n=61$; 26 males; mean age=9.75, range 4-18 years) diagnosed with RAP and their parents or guardians. The children were randomly assigned to four groups; a fibre-only comparison group (group 1, $n=15$), fibre and biofeedback-assisted cultivated low arousal group (group 2, $n=15$), fibre, biofeedback and cognitive-behavioural interventions (group 3, $n=16$), and fibre, biofeedback, cognitive-behavioural and parental support (group 4, $n=15$).

Intervention. Participants were treated over 8 weeks. All groups had an increase in dietary fibre intake (10+ g per child per day). Groups 2, 3, and 4 had biofeedback supplied using small thermal devices. Groups 3 and 4 were taught cognitive interventions and asked to roleplay them to the experimenter to demonstrate competency in these interventions.

Main Outcome Measures. RAP symptomatology was indicated by levels of experienced pain, use of medical services, and use of medications. Levels of experienced pain were measured using the Parents' Pain Observation Record (POR) and the Child's Pain Diary (CPD). Participants rated pain according to a visual analog scale (VAS) of 0 to 7, where 0 represented total absence of pain over seven consecutive days and 7 was extreme pain over seven consecutive days. These ratings were made at pre-treatment days 1-7 and post-treatment days 43-49. Use of medical services and medications were measured using the Record of Health Care Utilization Forms 1 and 2, and the Medication Record (MR). School attendance was measured by the Record of School Attendance Forms 1 and 2.

Results. For groups 2, 3, and 4, analysis of variance showed no significant main effects. For pretest versus posttest, the main effects were: self-reported pain ($F_{1,43}=117.19$, $p < 0.001$); parents' observation of the child asking for help ($F_{1,43}=7.64$, $p < 0.01$); parents' report of child's pain complaints ($F_{1,43}=22.83$, $p < 0.001$); vocal protest ($F_{1,43}=6.53$, $p < 0.02$); other behaviour ($F_{1,43}=6.55$, $p < 0.02$); medication reduction ($F_{1,43}=11.86$, $p < 0.001$), and decreased school absences ($F_{1,43}=8.53$, $p < 0.01$). Given

these results and the small effect sizes for the group by pre-versus post-interaction, it appears the three treatment groups showed improvement but the improvement did not differ from one group to another. Groups 2, 3, and 4 showed more improvement than group 1 on self-reported pain ($F_{1,59}$ for interaction = 10.20, $p=0.002$). Group 1 improved in school absences for RAP ($t_{14}=3.36$, $p=0.005$) and school absences for other reasons ($t_{14}=2.23$, $p=0.043$). For before and after interaction, groups 2, 3, and 4 improved in: school absences for RAP ($t_{45}=7.26$, $p=0.001$); school absences for other reasons ($t_{45}=7.97$, $p=0.001$); asking for help ($t_{45}=2.81$, $p=0.007$); parents' observation of pain ($t_{45}=4.73$, $p=0.001$); verbal protest ($t_{45}=2.61$, $p=0.012$); parents' observation of RAP symptoms ($t_{45}=2.84$, $p=0.007$); medical records for RAP ($t_{45}=2.18$, $p=0.035$) and record of health care utilization ($t_{45}=2.43$, $p=0.019$). In groups 2, 3, and 4, 72% of participants self-reported elimination of pain and 26% self-reported a decrease in pain. For group 1, 7% of participants self-reported elimination of pain and 79% self-reported a decrease in pain. Increased pain was reported by 4% of participants from groups 2, 3, and 4 and 21% of participants from group 1. These results in self-reported pain show that groups 2, 3, and 4 differ significantly from group 1 ($X^2=21.74$, $p<0.01$). Increased dietary fibre was related to pain reduction ($r_{59}=-0.5$, $p<0.001$) and a decrease in symptoms. No significant correlation was found between temperature increase and symptom reduction, for participants taking part in biofeedback.

Conclusions. Increased fibre intake along with biofeedback-assisted cultivated low arousal was an effective treatment. The addition of cognitive-behavioural interactions or parental support in this small sample study did not seem to increase treatment effectiveness. However, because there was not a non-fibre control condition, and there are only a few studies on fibre treatment, more studies are needed to determine if improvements with increased fibre intake only are real or a placebo effect.

Kline RM, Kline JJ, Di Palma J, Barbero GJ. Enteric-coated, pH-dependent peppermint oil capsules for the treatment of irritable bowel syndrome in children. *Journal of Pediatrics* 2001;138(1):125-128.

Objective. To study the efficacy of pH-dependent, enteric-coated peppermint oil capsules in the treatment of symptoms of irritable bowel syndrome (IBS) in children.

Design. Randomized, double-blind, placebo-controlled trial.

Setting. Three pediatric gastrointestinal clinics in Missouri, District of Columbia, and South Carolina, USA.

Participants. Children meeting the Manning or Rome criteria for IBS ($n=42$; 40% males; mean age=12 years, range 8–17 years), displaying IBS symptoms and regular pain in the preceding 2 weeks were randomly assigned to two groups; peppermint oil group ($n=21$) and placebo group ($n=21$). Exclusion criteria included if they were younger than 8 years of age, weighed less than 30 kg, had other chronic diseases or were receiving medications to treat IBS or any medications that could affect abdominal symptoms. Of the children, 83% were white and 17% were African American.

Intervention. Children weighing more than 45 kg were given 2 capsules 3 times per day for 2 weeks. Children weighing between 30 and 45 kg were given 1 capsule 3 times per day for 2 weeks. All capsules were pH-dependent, enteric-coated, hard gelatin capsules. Each peppermint oil capsule contained 187 mg of peppermint oil while the placebo capsules contained arachis oil.

Main Outcome Measures. For each child, the following were obtained; standardized history, physical examination concentrating on IBS, extensive interview (including history of gastrointestinal symptoms and food intolerances), list of recent medications, urinalysis, stool sample for occult blood and parasites, hematology profile, serum *Helicobacter pylori* screen, liver function tests, thyroid function tests, and radiographs. Some children also underwent endoscopy and lactose hydrogen breath tests, depending on clinical need. The study included socioeconomic status and life events for control purposes. The children completed a daily diary to report changes in severity of symptoms, headaches, heartburn, other side effects, worries, and compliance issues. For this study, pre-trial and post-trial measures were obtained by the same investigator on day 1 and day 14. The measures included; (1) detailed neurologic examination, (2) the Gastrointestinal Symptom Rating Scale, (3) a severity of symptom scale ranked by a clinician, (4) a change of symptom scale ranked by a clinician, and (5) questions to monitor other variables (e.g., life events) that could affect the study results.

Results. There was no significant difference between the peppermint oil and placebo groups in terms of socioeconomic status, gender or severity of IBS symptoms. Neurologic examinations at days 1 and 14 showed no abnormalities in either group. All children undergoing endoscopy ($n=3$ for peppermint oil group, $n=5$ for placebo group) showed no organic disease. All children undergoing lactose hydrogen breath tests ($n=4$ for peppermint oil group, $n=7$ for placebo group) had negative test results. After 2 weeks of treatment, 76% of the children receiving peppermint oil showed a change in the

symptom severity scale compared with 19% of children receiving a placebo, a significant difference ($p < 0.001$). As well, 71% of the children receiving peppermint oil showed an improvement in the change of symptom scale compared with 43% of children receiving a placebo, also a significant difference ($p < 0.002$). There was no significant difference between the two groups for the sum of the 15 items from the Gastrointestinal Symptom Rating Scale. Daily diary entries showed the mean self-reported severity of pain symptoms was significantly lower in children receiving peppermint oil than in the children receiving the placebo ($p < 0.03$). Diary measures such as headaches, nose bleeds and sinus problems did not differ significantly between the two groups. No side effects were reported over the 2 weeks by the children or the investigators.

Conclusions. A pH-dependent, enteric-coated peppermint oil capsule reduced the pain experienced by children with IBS as measured by the symptom scales and the daily diary. However, the peppermint oil did not alter other IBS symptoms. This study is limited by its short duration. The authors advocate a larger, multicentre study of peppermint oil to treat children with IBS.

Linder SL, Dowson AJ. Zolmitriptan provides effective migraine relief in adolescents. *International Journal of Clinical Practice* 2000;54(7):466-469.

Objective. To investigate tolerance and efficacy of zolmitriptan for treating migraines in adolescents.

Design. Non-blind, non-placebo controlled, open label drug trial.

Setting. One hundred and forty-four health care centres taking part in a larger international study.

Participants. Of the 2499 patients used in the larger study, this article contains data from a subgroup of patients; children ($n=38$; 18 males; mean age=14.3 years, range 12–17 years) with a history of migraines for at least one year, one to six migraine attacks per month on average, and no evidence of ischaemic heart disease, hypertension, hyperthyroidism or accessory conduction pathways.

Intervention. Patients treated their first two migraine attacks with 2.5 mg of zolmitriptan and subsequent attacks with their choice of 2.5 mg or 5 mg of zolmitriptan with a maximum daily dose of 15 mg. Patients detailed their migraine attacks and response to treatment on diary cards for up to one year.

Main Outcome Measures. Response to treatment for all attacks were analyzed by two-hour headache response (if the headache intensity decreased from moderate or severe to mild or no pain after two hours) and pain-free response (if there was no pain at two hours after the attack,

regardless of the intensity). Response rates for migraine attacks that required a second dose of zolmitriptan were also assessed at two hours later.

Results. For patients treating the initial two migraine attacks, the two-hour headache response rate was 71% and the pain-free response rate was 46%. Subsequent attacks ($n=276$) had a two-hour headache response rate of 80% (88% for 2.5 mg dose and 70% for 5 mg dose) and a pain-free response rate of 66% (76% for 2.5 mg dose and 52% for 5 mg dose). Eighteen percent of subsequent attacks required a second dose. For these attacks, the two-hour headache response rate was 65% (77% for 2.5 mg dose and 56% for 5 mg dose) and the pain-free response rate was 44% (52% for 2.5 mg dose and 36% for 5 mg dose). Mild or moderate intensity adverse events such as pharyngitis or nausea were reported for 55% of patients. No serious adverse events were reported.

Conclusions. This open label study with no controls suggests that zolmitriptan may be effective in treating adolescent migraine headache and is well tolerated. Placebo-controlled studies are needed to fully evaluate zolmitriptan's efficacy.

Editorial Note: The title overstates the effect.

Ljungman G, Gordh T, Sörensen S, Kreuger A. Pain variations during cancer treatment in children: A descriptive survey. *Pediatric Hematology & Oncology* 2000;17(3):211-221.

Objective. To investigate variations in the expression of the pain experience of children being treated for cancer.

Design. Structured interview study.

Setting. Tertiary referral centre, Sweden.

Participants. Children ($n=66$; 33 males; mean age=6.6 years, range 0.7–18.1 years) undergoing cancer treatment at Uppsala University Children's Hospital were assigned to three groups: group 1 consisted of children 1–3 months post diagnosis ($n=27$); group 2 consisted of children 4–9 months post diagnosis ($n=19$); and group 3 consisted of children 10 months or more post diagnosis ($n=20$). The groups had similar age and gender distributions.

Main Outcome Measures. Children underwent 45-minute structured interviews ($n=98$) under standardized conditions at 3-month intervals until 3 months post treatment. The interviews utilized a questionnaire to report on general symptoms and pain. Parents were included in the interviews for children less than 10 years old.

Results. At diagnosis, 49% of subjects reported pain as a symptom of their disease. All general symptoms (e.g.,

depression, nausea, diarrhea, anxiety, constipation, tiredness, and reduced appetite) increased over time after diagnosis except for diarrhea. Almost all cannulations, intravenous ports, subcutaneous injections, and intramuscular injections were performed using EMLA® cream (eutectic mixture of lidocaine-prilocaine) as a topical anesthetic. Lumbar punctures were performed under general anesthesia in 70% of group 1 subjects, 41% of group 2 subjects, and 24% of group 3 subjects. These numbers differed significantly between the three groups. Intense pain in the 3 months prior to interview was experienced significantly more often by children in group 1 (intense pain always present was reported by 65% of group 1, 17% of group 2, and 14% of group 3 and often or very often present by 12%, 9%, and 0% of groups 1, 2, and 3, respectively). The biggest problem was reported by group 1 to be procedure-related pain (44% compared to 41% treatment-related pain and 11% cancer-related pain) and by both group 2 and group 3 to be treatment-related pain (46% compared to 43% procedure-related pain and 11% cancer-related pain for group 2; 49% compared to 29% for procedure-related pain and 15% cancer-related pain for group 3). Systematic pain intensity measurement was used regularly in 26% of group 1, 43% of group 2, and 26% of group 3. The belief that pain was unavoidable was reported by 58% of group 1, 44% of group 2, and 52% of group 3. Four percent of group 1 subjects, 6% of group 2 subjects, and 9% of group 3 subjects reported avoiding asking for help because they believed pain was inevitable. Parents believed they were better judges of their child's pain than nurses and physicians in 20%, 30%, and 41% of groups 1, 2, and 3 respectively.

Conclusions. There are significant variations in expression of pain experience during cancer treatment in children. These variations may be due to an increase in family comfort and knowledge or an effect of changes in causes of pain. Intense pain at cancer diagnosis was common. Difficulties with the disease increased over time, possibly reflecting the increased psychological effect of treatment and the disease. Procedural pain decreased during treatment duration probably for several reasons: children adapted to painful procedures with an altered pain experience; fewer procedures were performed over time; or treatment-related pain intolerance may increase over time. Many painful procedures (e.g., intramuscular injection, subcutaneous injection, needle prick, nasogastric tube insertion) showed variation in pain expression between groups. Other procedures (e.g., intravenous cannulation, inserting needle into subcutaneous intravenous port) did not vary in terms of pain reported, indicating that EMLA® provided adequate analgesia for these procedures. The

authors recommend further study, preferably a longitudinal study.

Powers SW, Mitchell MJ, Byars KC, Benti A-L, LeCates SL, Hershey AD. A pilot study of one-session biofeedback training in pediatric headache. *Neurology* 2001;56(1):133.

Objective. To determine whether peripheral body temperature changes obtained during a session of thermal biofeedback-assisted relaxation training could be maintained at follow-up visits and to summarize headache perception and quality of life after biofeedback-assisted relaxation training.

Design. Pilot study.

Setting. Multidisciplinary pediatric headache centre, Cincinnati, USA.

Participants. Children (n=20; 10 males; mean age=11.6 years, SD=2.2 years) clinically diagnosed with migraines, with 90% meeting the International Headache Society criteria. Of the children, 95% were white.

Main Outcome Measures. The children were taught age-appropriate skills in deep breathing, progressive muscle relaxation, and guided imagery. Children were encouraged to practice the skills they had learned. Peripheral body temperature was measured before training in these skills (PT), at a later time (T1) before and after an hour-long biofeedback-assisted relaxation training session, and also at a subsequent time (T2) before and after children were instructed to "relax as you normally do". The time elapsed between T1 and T2 averaged 150.7 days (SD=77.3 days). Children reported their headache pain using a 0 to 10 scale (10=most pain), headache frequency, and headache duration.

Results. Before biofeedback, children were not able to significantly increase their peripheral body temperature. After biofeedback, a positive change in peripheral body temperature occurred at both T1 (mean=3.3° F, SD=2.5° F) and T2 (mean=3.7° F, SD=4.5° F). Within-subject t tests showed that the changes from PT to T1 were significant (t=-4.087; p<0.01), as were changes from PT to T2 (t=-2.687; p<0.02). At T1, 90% of children could positively change their peripheral body temperature, while at T2, 95% of children could positively change their peripheral body temperature. Headache severity decreased from an average of 5.0 at T1 to an average of 4.5 at T2. Average headache frequency decreased from 12.9 days/month at T1 to 9.7 days/month at T2. Average headache duration also decreased from 6.9 hours at T1 to 5.2 hours at T2. Changes in peripheral body temperature at T2 was positively correlated with a decrease in

headache frequency ($r=0.45$; $p<0.05$).

Conclusions. Relaxation training and thermal biofeedback are promising tools to treat pediatric headache. This study is severely limited by its small sample size and lack of controls. Further studies are needed, particularly regarding how biofeedback-assisted relaxation training may be used most efficiently within home- and clinic-based settings.

Rusy LM, Troshynski TJ, Weisman SJ. Gabapentin in phantom limb pain management in children and young adults: Report of seven cases. *Journal of Pain & Symptom Management* 2001;21(1):78-82.

Objective. To report seven cases (including three pediatric cases) of treatment of phantom limb pain with gabapentin.

Design. Retrospective chart review and telephone interview study.

Setting. Children's Hospital of Wisconsin, USA.

Participants. All patients ($n=7$) presenting with phantom limb pain over a two-year period. Of these patients, three were children (1 male; mean age=7.3 years, $SD=2.9$ years).

Intervention. Patients had received 14-40 mg/kg of gabapentin per day to treat phantom limb pain.

Main Outcome Measures. Charts for the 7 patients were reviewed and follow-up telephone interviews were conducted with each patient except for one patient who had died. Mean follow-up time was 1.74 years.

Results. The chart reviews showed that phantom limb pain was relieved for 6 of 7 patients within 1 week to 2 months after beginning treatment with gabapentin. Side effects included sedation, dizziness, nausea, tremors, memory loss, edema, blurred vision, and numbness. During the follow-up telephone interviews, none of the children and one of the young adults experienced reoccurrence of phantom limb pain, even after discontinuing the medication.

Conclusions. Gabapentin may be useful in the treatment of phantom limb pain in children. Randomized, controlled studies are warranted.

Schanberg LE, Sandstrom MJ, Starr K, Gil KM, Lefebvre JC, Keefe FJ, Affleck G, Tennen H. The relationship of daily mood and stressful events to symptoms in juvenile rheumatic disease. *Arthritis Care & Research* 2000;13(1):33-41.

Objective. To assess the feasibility of a daily diary for use with children with juvenile rheumatic disease, to describe daily variation in mood, stressful events and symptoms in children with juvenile rheumatic disease, and to examine the extent to which daily moods and daily stressful events predict symptoms in children with juvenile rheumatic

disease.

Design. Daily self-report diary.

Setting. Duke University pediatric rheumatology clinic, USA.

Participants. Children ($n=12$; 2 males; mean age=11.42 years, $SD=2.75$ years) diagnosed with juvenile rheumatic disease were recruited. Mean disease duration was 30.18 months ($SD=27.68$ months).

Main Outcome Measures. Children underwent an initial evaluation regarding pain, depression, and recent life events. To establish a baseline for pain, subjects rated their present, average, and worst pain for the previous week using a 100-mm visual analog scale (VAS). To establish a baseline for mood, subjects completed the Children's Depression Inventory (CDI). Subsequently, subjects completed a daily diary for 7 consecutive days without parental intervention. The daily diary included questions regarding daily mood (using the Facial Affective Scale (FAS)), daily stressful events (using the Daily Events Instrument), daily symptoms (using a 100-mm VAS for pain, fatigue and stiffness), and daily functioning level (using 4-point Likert scale). The data was examined using a within-person multilevel fixed effects model.

Results. For the initial evaluation, the children's mean present pain was rated at 32.5 ($SD=23.3$), their mean average pain was rated at 32.2 ($SD=21.0$), and their worst pain was rated at 52.0 ($SD=24.9$). Their mean T score on the CDI was 46.6 (range 37-56), not in the clinically significant range for depression. Compliance was high with 82 of 84 diaries returned. Using the daily diaries, the children reported pain at 30.26 ($SD=20.97$), fatigue at 44.98 ($SD=21.75$), stiffness at 30.27 ($SD=24.08$), moderately positive mood (mean=0.35, $SD=0.21$), an average of 2 daily stressful events ($SD=1.75$), and infrequently cutting back on daily activities due to their disease. Daily mood changes were significantly associated with changes in daily pain, fatigue, stiffness, and cutbacks in activity. Changes in daily stressful events were significantly associated with changes in daily fatigue, stiffness, and cutbacks in activity. Unexpectedly, daily stressful events were unrelated to daily mood. Further analysis showed that daily mood and daily stressful events were independent predictors of both stiffness and cutbacks in activity. Daily mood was a unique predictor of change in daily fatigue.

Conclusions. A series of 7 consecutive daily diaries is a feasible and potentially informative tool when conducting research using children over 7 years old. Symptoms fluctuate greatly on a daily basis and children with juvenile rheumatic disease experience significant levels of pain. Daily mood and daily stressful events significantly

predict daily symptoms. Daily mood also predicts daily pain. Further research such as longitudinal or intervention studies are needed.

Van Boerum DH, Smith JT, Curtin MJ. A comparison of the effects of patient-controlled analgesia with intravenous opioids versus epidural analgesia on recovery after surgery for idiopathic scoliosis. *Spine* 2000;25(18):2355-2357.

Objective. To compare patient-controlled analgesia (PCA) and epidural analgesia in patients who had undergone posterior spinal instrumentation and fusion surgery (PSIF) for idiopathic scoliosis, in terms of pain control and several postoperative parameters such as length of hospital stay.

Design. Retrospective chart survey of a consecutive sample.

Setting. Children's hospital, USA.

Participants. Children (n=50; 15 males; mean age=15.0 years) who had undergone PSIF surgery, assigned to a PCA group (n=30; 7 males) or an epidural group (n=20; 8 males).

Intervention. The PCA group patients were placed on a PCA pump following surgery and instructed on its use. The demand dose and dose interval were titrated for each patient. The epidural group patients had a catheter inserted into the epidural space in the midthoracic spine by the operating surgeon. Patients in this group received 0.1% bupivacaine with morphine sulfate administered at 0.05 mg/kg per hour. Additional doses of 0.03 mg/kg per hour with 30-minute lockout were given by patient-controlled demand.

Main Outcome Measures. Patient records were examined and postoperative parameters such as pain control, day patient tolerated a full diet, last day of emesis, first day of independent ambulation, day of transition to oral pain medications, and length of hospital stay were noted. Pain control was evaluated on day of surgery and postoperative days 1 and 2 using a standardized pain scale (1–10).

Results. Between the PCA group and the epidural group, there was no significant difference ($p < 0.05$) in pain control, last day of emesis, first day of independent ambulation or day of transition to oral pain medications. The epidural group tolerated a full diet earlier ($p = 0.03$) and had a hospital stay that was 0.5 days shorter ($p = 0.04$).

Conclusions. Epidural analgesia, like PCA, effectively controls postoperative pain after PSIF. However, patients receiving epidural analgesia are able to tolerate a full diet earlier and are discharged earlier than patients using PCA.

Review Articles

The *Pediatric Pain Letter* briefly notes the following recent review articles:

Arana A, Morton NS, Hansen TG. Treatment with paracetamol in infants. *Acta Anaesthesiologica Scandinavica* 2001;45(1):20-29.

Paracetamol or acetaminophen is the most widely used analgesic drug in children. This clear and concise review details what is known about the pharmacology of this drug with particular emphasis on the considerable differences between neonates/infants and older children/adults.

Litman RS. Anesthesia and analgesia for newborn circumcision. *Obstetrical & Gynecological Survey* 2001; 56(2):114-117.

Circumcision is still a common surgical procedure in newborns and many of these infants are not protected from the pain. This is a useful, short review of the efficacy of the various approaches that are available.

Malleson PN, Connell H, Bennett SM, Eccleston C. Chronic musculoskeletal and other idiopathic pain syndromes. *Archives of Disease in Childhood* 2001;84(3):189-192.

This short article reviews the major intrinsic and extrinsic factors that have been implicated in chronic musculoskeletal pain. A welcome addition to a limited literature.

Narsinghani U, Anand KJS. Developmental neurobiology of pain in neonatal rats. *Lab Animal* 2000;29(9):27-39.

This review is a very nice summary of the rat literature on neonatal pain. Most of the basic developmental biology of pain uses a rat model, and this review covers much of the currently available data.

Williams DG, Hatch DJ, Howard RF. Codeine phosphate in paediatric medicine. *British Journal of Anaesthesia* 2001;86(3):413-421.

This is an excellent review of the pharmacology of codeine, with an explanation of the genetic variability that influences its effectiveness. Codeine is still extensively used in clinical pediatrics in spite of low efficacy, so this is an important issue.

CD Review

Audio Therapy Innovations Inc. (2001). Baby-Go-To-Sleep Series. Address: Healing Light Fund, PO Box 550, Colorado Springs, CO, USA 80904, **web-site** <http://www.babygotosleep.com> (Prices: Vol. 1, 2 or 3 Cassette, US\$12.95, CD US\$15.95. Vol. 1 & 2 combined, 2 cassette set, US\$19.95, CD, US\$24.95)

These are audio recordings of lullabies with a superimposed heartbeat that are accompanied by a booklet on how to help a baby go to sleep. I listened to the combined volume 1 and 2 CD, which consists of traditional lullabies such as "London Bridge", "Rock-A-Bye Baby", and "Are You Sleeping?". Volume 3 is the "Jesus Loves Me" edition and features lullabies such as "Into My Heart", "Jesus Loves Me", and "Jesus Loves the Little Children". The arrangements are pleasant, slow, and repetitive. The heartbeat is clearly there but not too intrusive. The booklet for parents consists of sensible suggestions.

There are claims that the lullabies have been shown by scientific studies to be effective in calming babies. The abstract of one study was included in the unsolicited package I received. The abstract described a randomized trial that showed an effect of music compared to control in circumcision and heel lance/venipuncture. No effect size was mentioned. There was no music without heartbeat control. The study is to be published in 2002. A 1962 paper by Lee Salk on the benefits of mother's heartbeat as an imprinting stimulus and some press clippings were also included.

The claims on the CD cover and on the website are excessive. For example, the largest print on the CD cover reads "Stops Crying" (2.5-3 cm font) and right below it "Guaranteed" (1 cm font). Superimposed in 1.5 mm font on the Guaranteed is the word "satisfaction". Looking at the CD, one would think that the guarantee relates to stopping crying. On the website, the top banner claims that the tapes will soothe the symptoms of colic.

In summary, these tapes and the suggestions to parents are reasonable tools to help parents soothe a crying child and to aid in falling asleep. There is no scientific evidence that they are better than other soothing music nor is there any evidence that the tapes will effectively treat colic.

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Videotape Review

Medical Audio Visual Communications Inc. (2000). Pediatric Pain Assessment (Nurse Education). Address: PO Box 84548, 2336 Bloor Street West, Toronto, ON, M6S 1T0, Canada, e-mail dwc@mavc.com, tel: 800-757-4868, fax: 905-602-8720, (Price: 23:00 minute videocassette, CAD\$249.00)

This tape is directed at nurses, and is framed in the context of "The Nurses' Station", an informal "living room" interview with a nurse educator on the subject of pediatric pain assessment. The interviewee is a clinical nurse specialist from a children's hospital in South Carolina. Although she was introduced verbally, there was no written reference to her name or affiliation on screen or on the package. The interviewer raises a series of questions dealing with myths about children's pain and pain assessment, which are dispelled by the expert. We found no major faults with the information supplied, but it was rather superficial. The speaker seemed rather nervous and stilted in her presentation, which detracted from her obvious expertise.

The choice of measurement tools presented was rather limited (one faces scale, one slide rule-type tool, and one neonatal composite scale). A few scales, including the Eland Color Tool and the Premature Infant Pain Profile, were described without attribution. There was no discussion of the evidence supporting the use of particular tools.

Better use could have been made of visual aids, including images of more pain measurement tools, as well as film of nurses actually using the tools in clinical settings. We are not convinced that the use of video has been valuable in this case. All the information provided is available inexpensively (or free of charge) in text formats, and the producers have failed to take advantage of the dramatic potential of video to illustrate and demonstrate the techniques, or to provide an emotional background to the need for pain assessment.

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Announcements

Meetings

March 14-17, 2002: *21st Annual Scientific Meeting of the American Pain Society, Baltimore Convention Center, Baltimore, Maryland, USA.* Includes a preconference event on March 14, 2002 entitled "Changing the Face of Pediatric Pain". For more information, contact the American Pain Society, 4700 W. Lake Avenue, Glenview, IL 60025, USA, tel: 847-375-4715, fax: 877-734-8758, website: www.ampainsoc.org/meeting/.

May 23-25, 2002: *Canadian Pain Society 2002 Annual Conference, Hotel Fort Garry, Winnipeg, Manitoba, Canada.* The conference theme is "Back to the Future: Emerging Ideas on Pain Mechanism and Treatment". For more information, contact the Canadian Pain Society, 50 Driveway, Ottawa, ON K2P 1E2, Attention: Sherry Franklin, tel: 613-234-0812, fax: 613-234-9894, web-site: www.canadianpainsociety.ca/winnipeg/.

June 21-25, 2002: *Canadian Anesthesiologists' Society 58th Annual Meeting, Victoria, British Columbia, Canada.* For more information, contact the CAS Meeting Co-ordinator, 1 Eglinton Avenue East, Suite 208, Toronto, ON M4P 3A1, tel: 416-480-0602, fax: 416-480-0320, web-site: www.cas.ca/calendar/.

August 17-22, 2002: *The 10th Triennial World Congress on Pain, San Diego Convention Center, San Diego, California, USA.* Registration forms will be available and call for abstracts issued in September, 2001. Abstracts require sponsorship by an International Association for the Study of Pain member. Abstracts can be submitted online by February 1, 2002 or via hard copy and disk by January 15, 2002 using special Congress forms. Web-site: www.halcyon.com/iasp/02Cong.html.

September 19-22, 2002: *The Fourth International Forum on Pediatric Pain, White Point Beach Resort, Liverpool, Nova Scotia, Canada.* The focus is on the Context of Pediatric Pain: Biology, Family, Society, Culture. Speakers include: Jeff Mogil, Montreal, Canada: Genetics of pain and analgesia; Sunny Anand, Little Rock, USA: Early pain experience (the animal data); Ruth Grunau, Vancouver, Canada: Early pain experience (the human data); Carl von Baeyer, Saskatoon, Canada: Cognitive and social

development; Gustaf Ljungman, Uppsala, Sweden: Effects of chronic illness; Christine Chambers, Vancouver, Canada: Family issues; Ken Craig, Vancouver, Canada: Social influences, culture, ethnicity; Ada Jacox, Detroit, USA: Health centre policies and accreditation; David Joranson, Madison, USA: Governmental policies. Join us for a fabulous time of science and fun. Please mail or fax registration form (found on the web at www.pediatricpain.ca/ifpp) with payment to:

**International Forum on Pediatric Pain
c/o Conventional Wisdom Event Planning
6496 Liverpool Street, Halifax, NS B3L 1Y4
Tel: 902-453-4664 Fax: 902-423-5232
Email: info@conventionalwisdom.ca**

June 15-19, 2003: *The 6th International Symposium on Paediatric Pain, Sydney Convention Centre, Sydney, Australia.* The theme will be "The Big Questions in Paediatric Pain". What are the questions and issues that concern you and the community caring for children in pain? The Scientific Program Committee for the Sydney 2003 meeting would appreciate your participation in an open forum to discuss themes that are important from the perspective of pain researchers, health professionals, parents and children. Ideas can be directed to David Champion dchampion@stvincents.com.au and/or Belinda Goodenough b.goodenough@unsw.edu.au. The Call for Workshop and Poster Abstracts is available at www.dconferences.com.au/ISPP2003.html.

Positions

The Department of Psychology at Dalhousie University and the IWK Health Centre are seeking an **Assistant Professor** (probationary tenure-track) subject to budgetary approval, to support the research of the Pediatric Pain Research Lab at Dalhousie University and the IWK Health Centre. The lab is active in many aspects of pediatric pain and also has a strong presence in distance treatment of child health problems. The applicant will show clear evidence of outstanding research potential and be committed to developing a program of research on some aspect of pediatric pain, distance treatment or related phenomena. A strong research environment and excellent facilities will support the work of the successful applicant. The successful applicant will teach in the Department of Psychology. Clinical opportunities at the IWK Health Centre are available. Applicants for this position should possess a Ph.D. and perhaps postdoctoral experience in a relevant discipline which is likely to be clinical,

developmental, experimental or social psychology but might be in a cognate discipline. Submit a letter of application, a curriculum vitae, copies of publications, and have three letters of reference sent to Dr. Donald Mitchell, Acting Chair of the Department of Psychology, Dalhousie University, Halifax, Nova Scotia, Canada, B3H 4J1, or by Fax 902-494-6585 or email D.E.Mitchell@dal.ca. Inquiries to Dr. Mitchell (tel: 902-494-3839) are welcome. A short list will be drawn up on the basis of applications received by January 30th, 2002, although applications may still be considered after that date until the position is filled.

Short announcements on pediatric pain events will be published free of charge.

We need your help

Your participation in abstracting and writing commentaries for the *Pediatric Pain Letter* is welcomed. Please send submissions according to the specifications outlined in our Author's Kit which can be obtained from Kelly Morris, Managing Editor, *Pediatric Pain Letter*, Pain Research Lab, IWK Health Centre, 5850 University Avenue, Halifax, Nova Scotia, Canada, B3J 3G9, email kamorris@is.dal.ca (requests can be made in writing or by email). Abstracts and commentaries on any aspect of pain in infants, children and/or adolescents are appropriate. We will attempt to use abstracts and commentaries but the editors reserve the right to edit or reject contributions.

Assistants for this issue: Alyson Currie, Bruce Dick, Allan Hennigar.

Correction: In our last issue, Vol. 5 No. 2, the first author of the Commentary "Parents' behaviour in helping children to cope with painful procedures" should have been:

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Subscriptions

One-year subscription is \$25 CDN in Canada, \$35 CDN or \$25 US in other countries. Payment can be made by cheque (payable to Dalhousie University - *Pediatric Pain Letter*), Visa, or MasterCard. Subscribe by sending payment and mailing address to the Managing Editor.

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Note: Over the next few issues we will be modifying the format in an effort to improve the usefulness of the *Pediatric Pain Letter*. Your comments are appreciated.

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