

Pediatric Pain Letter

Abstracts and Commentaries on Pain in Infants, Children and Adolescents

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Editorial

Welcome to this edition of the *Pediatric Pain Letter*. In this issue, we explore the epidemiology of cancer pain in children, an issue that has been relatively under-studied. Key studies by Gustaf Ljungman and by Angela Miser are reviewed. In addition, we have abstracts of recent interesting articles on sickle cell pain and on neonatal pain assessment, management, and late consequences.

An article on the use of thiopental for endotracheal intubation of neonates (Bhutada et al., 2000) raises the question of why pediatricians are still debating the issue. For the past 20 years, pediatric anesthesia practice has included general anesthesia and muscle paralysis as the standard of care for non-emergent intubation of infants and newborns of any age and gestational development, except under very unusual circumstances (such as an intra-oral tumour or significant airway deformity). Endotracheal intubation without anesthesia produces well-defined physiological stress responses (hypertension, hypoxia, bradycardia), as well as being technically more difficult. This is confirmed by Bhutada's study, but most anesthesiologists would judge a placebo-controlled trial of anesthesia for intubation to be unethical. The time has come to concentrate on developing safe techniques for anesthesia and intubation by non-anesthesiologists, not on whether anesthesia is indicated.

On another note, the recent *International Symposium on Pediatric Pain* in London, England, was

well attended and was deemed a success by all involved. The quality of poster sessions and plenary presentations speaks to the exciting advances being made in our field. In particular, the inter-disciplinary nature of research in children's pain makes these conferences intriguing, and often more thought-provoking than individual discipline conferences. We are looking forward to seeing many of you at the 3rd *International Forum on Pediatric Pain* in Halifax, Canada, in September, and at the next *International Symposium* in Sydney, Australia in 2003.

Abstracts

Epidemiology of pain in children with cancer

Elliott SC, Miser AW, Dose AM, Betcher DL, O'Fallon JR, Ducos RS, Shah NR, Goh TS, Monzon CM, Tschetter L. Epidemiologic features of pain in pediatric cancer patients: a co-operative community-based study. *Clinical Journal of Pain* 1991;7:263-268.

Objective. To gather epidemiologic data in order to assist in the development of future pain management studies and to examine the feasibility of conducting formal pain intensity assessment in a cooperative group setting.

Design. Survey.

Setting. Mayo Clinic and 8 North Central Cancer Treatment Group member institutions.

Participants. Pediatric cancer patients (n=160; 100 boys; median age= 7 years, range 1-19; 82.5% were out-patients and 17.5% were in-patients) of which 73% were in remission, 11% were in relapse following a remission and the remaining had never had a remission.

Main Outcome Measures. Data on age, sex, tumour type and status, anti-cancer therapy and presence or absence of pain was collected from each child with current or past malignancy. Where pain was present, the etiology, severity and management were assessed. Severity was assessed using a categorical scale (none, mild, moderate, severe, very severe) and by using the picture face scale, a visual analogue scale (VAS) and a verbal descriptor scale. All children were administered all measures even though younger children would not complete all of them. Severity

of pain was assessed simultaneously and independently by an investigator, usually a nurse or physician. Pain from diagnostic or therapeutic procedures performed within the preceding 48 hours was excluded.

Results. Of the 117 children in tumour remission, 12 reported pain (6 had treatment-related pain, 1 had treatment and unrelated pain, 5 had unrelated pain). Of the 43 patients with active malignancy (relapse or no remission), 16 reported pain (4 had cancer-related pain, 8 had treatment-related pain, 3 had cancer-related and unrelated pain). Out of the 28 children who reported pain, 21 reported mild pain, 5 reported moderate pain and 2 reported severe pain. Treatment-related pain accounted for 57.8% of overall pain while 21.1% was cancer-related. Correlations between pairs of scales completed by the patients were 0.72-0.73 (p<0.001). Correlations between investigators and patients scores were 0.46-0.53 (p<0.02), however, for younger children there was no significant correlation between investigators' and patients' scores.

Conclusions. A low prevalence of pain was found in the pediatric cancer population surveyed (17.5%), however, this is likely the result of the small number of inpatients surveyed (n=28). Of the pain reported, treatment-related pain predominated, with cancer-related pain only accounting for 21.1%. Pain assessment by both investigator and child appears to be a feasible method for monitoring pain in children with cancer, at least in older children.

Ljungman G, Gordh T, Sörensen S, Kruger A. Pain in paediatric oncology: interviews with children, adolescents and their parents. *Acta Paediatrica* 1999; 88:623-630.

Objective. To evaluate the extent and causes of pain, methods for pain intensity monitoring, principles of pain management and adverse effects of pain treatment in pediatric oncology patients.

Design. Interview.

Setting. Paediatric Oncology Unit, Uppsala University Children's Hospital, Sweden.

Participants. Children (n=55; 28 male; median age=6.1 years, range 0.8-19.2) and their families. Interview had to be conducted between 1 month after diagnosis and 3 months post-treatment.

Main Outcome Measures. Children and their parents participated in structured interviews (45-75 minutes long) with 2 nurses and a medical social worker. Children

less than 10 years-old were interviewed with their parents (n=40); children 10 years and older were interviewed separately (n=15).

Results. Prior to treatment, 60% of children had experienced pain and 36% were in pain often or very often. Nausea was a common problem, however, 62% reported that pain was a bigger problem. Forty-nine percent of children reported that treatment-related pain (e.g. mucositis, limb pain, abdominal/anal pain, dyspepsia and conjunctivitis) was the worst problem, whereas 38% reported that procedure-related pain was the worst. Intramuscular and subcutaneous injections and venepuncture were reported as very painful by over 30% of children. Strategies to reduce procedural pain included EMLA prior to venepuncture and injections, general anaesthesia or sedation for lumbar puncture, and general anaesthesia for bone marrow aspirations and biopsies. Side effects of pain treatment, reported by both children and parents, included euphoria, tolerance, nausea, vomiting, dyspepsia and constipation. Pain evaluation methods used in the hospital were visual analogue scales and faces scales, but not with any consistency. Most parents (95%) believed that children as young as 3-4 years could accurately self-report pain. Parents also believed that they were better at assessing their child's pain than the medical staff. In general, 58% of parents were satisfied with the level of care their child was receiving

Conclusions. Pain is a primary concern of pediatric oncology patients and pain evaluation in the hospital setting appears to be unsystematic. In particular, those children with shorter disease duration appear to be the most concerned about treatment- and procedure-related pain. From the interviews, it would seem that significant improvements could be made in terms of pain evaluation and pain treatments. Increased education for parents and children about pain and pain treatment, systematic use of pain analysis and pain intensity measurement and regular contact with pain management teams can significantly improve communication about pain and the treatment of pain in the pediatric oncology patient.

Ljungman G, Kreuger A, Gordh T, Berg T, Sorensen S, Narinder R. Treatment of pain in pediatric oncology: a Swedish nationwide survey. *Pain* 1996;68:385-394.

Objective. To evaluate the extent and cause of pain, as well as the use of methods for pain evaluation, principles of pain management, side effects of pain treatment and the educational needs of physicians and nurses regarding these questions.

Design. Survey.

Setting. Forty-seven departments of pediatrics in Swedish hospitals.

Participants. Nurses and physicians in charge of and working in pediatric oncology departments. One physician and one nurse responded from 35 of the 47 departments contacted.

Main Outcome Measures. A 42-item questionnaire which queried extent and causes of pain, methods of pain evaluation, pain management strategies, side effects of pain treatment and educational needs.

Results. Forty percent of physicians and nurses estimated that moderate to intense pain is observed in children with cancer and 70% estimated that this pain occurs terminally. Treatment-related pain was identified as the biggest problem in children with cancer by 41% of respondents and 72% believed that pain could be treated more effectively. In order to evaluate pain, 31% of pediatric departments use a visual analogue scale (VAS) and 23% use a faces scale; analysis of pain quality and type was a routine procedure in 37% of the departments. Sixty-three percent of the departments practice the World Health Organization's (WHO, 1986) ladder principle of pain management and 67% administer opioids on a time schedule rather than on demand. Thirty percent of the departments provided information about effects and side effects of opioids prior to pain treatment. Seventy-two percent of all surveyed believed that pain could be treated more effectively and 67% believed that more time was needed for management of pain.

Conclusions. Pain is a common symptom in pediatric oncology in Sweden. Pain due to treatment and procedures, as opposed to the disease itself, is the greatest problem. Physicians and nurses report a high need for education in different areas of pain evaluation and treatment especially in the evaluation of pain type and quality and monitoring of pain intensity. Recommendations for improving pain diagnostics and treatment include increasing education, regular use of pain analysis and regular contacts with pain treatment teams.

McGrath PJ, Hsu E, Cappelli M, Luke B. Pain from pediatric cancer: A survey of an outpatient oncology clinic. *Journal of Psychosocial Oncology* 1990;8(2/3): 109-124.

Objective. To provide a critique of previous research in pediatric cancer and to report on the sources of pain experienced by patients at a pediatric cancer clinic.

Design. Survey.

Setting. Pediatric oncology clinic, Children's Hospital of Eastern Ontario.

Participants. Children (n=77; 45 males; age range 2–19 years) and their parents. Sixty-five percent were diagnosed with leukemia, 18% with lymphomas, 10% with some type of solid tumour and 6% with a brain tumour.

Main Outcome Measures. Ratings of patients' worst pain, usual pain and pain experienced in the past week were obtained using a 10 cm visual analogue scale. Scores were calculated by measuring, in centimetres, the place where the respondents marked the line. For children under 7, only the parent reported the amount of pain, for children over 7 both parent and child reported the amount of pain.

Results. Mean correlation between parent and child pain ratings was 0.59 ($p < 0.001$). Almost half the children reported experiencing severe pain from their disease at sometime. On average, the reported worst pain was twice as severe as the usual pain and the pain reported in the past week was slightly less than the usual pain. Thirty-five to 40% reported moderate to severe pain from chemotherapy treatment; 28% reported moderate to severe pain from venepuncture; 78% reported moderate to severe pain from bone marrow aspiration; 61% reported moderate to severe pain from lumbar puncture; and 23% reported moderate to severe pain from finger prick procedure.

Conclusions. Many children with cancer experience pain from the disease as well as diagnostic procedures and treatments. For about 33% of children, pain from venepuncture and chemotherapy is a serious problem. Prospective epidemiological surveys that detail the causes and nature of pain from pediatric cancer and related procedures, routine queries determining children's pain and development of better methods to control pain are needed in pediatric oncology.

Miser AW, Dothage JA, Wesley RA, Miser JS. The prevalence of pain in a pediatric and young adult cancer population. *Pain* 1987;29:73-83.

Objective. To define the prevalence and etiologies of pain in a population of pediatric and young adult cancer patients and define areas for future therapeutic investigation.

Design. Survey.

Setting. Pediatric Branch of the National Cancer Institute

Participants. Sixty in-patients (IP) and 70 out-patients (OP) between 0 and 25 years of age with advanced cancer were sampled twice on a 2 week rotating basis for a total of 356 patient visits.

Main Outcome Measures. A record was made of tumour

type, tumour status, the presence or absence of pain, analgesic medication being received by the patient on the day of visit and the patient's school or work attendance. For patients reporting pain, the etiology of the pain was determined and severity was assessed by the patient and an investigator. Patients over 7 years of age rated severity using a 100 mm visual analogue scale (VAS). Patients who were below 8-years-old or otherwise unable to assess their pain using a VAS were assessed only by the investigators score.

Results. Over the 356 visits, pain was found to be present in 54% of total IP and 26% of total OP. For patients in pain: pain was associated with relapse during 54% of IP visits and 30% of OP visits; 57.5% of IP and 36% of OP were receiving some type of narcotic analgesic; and 2% of IP and 26% of OP were receiving non-narcotic analgesics. The median VAS scores were 22 mm (patient scored) and 20 mm (investigator scored) for IP and 18.5 mm (patient scored) and 15 mm (investigator scored) for OP. Pearson correlations between the patient and investigator VAS scores showed a strong correlation ($r=0.75$). For those reporting moderate pain (51–75 mm) was present in 28% of the IP and 17% of OP and severe pain (76–100 mm) was reported in 10% of IP and 7% of OP. The predominant cause of pain in both IP and OP was treatment-related (65.5% and 82% respectively) rather than tumour-related. 62.5% of all IP and 68% of all OP were attending work or school. Of those in pain, 51.3% of IP and 56% of OP attended work or school.

Conclusions. Although prevalence of pain was high, VAS scores demonstrated satisfactory pain control. This suggests that an aggressive pain management approach can provide adequate analgesia for most children, even high risk populations. Due to the high incidence of treatment related pain found in this sample, new strategies should be developed for management of therapy-related pain as well as cancer-related pain. Efforts must also be directed at the rehabilitation of potentially cured patients with or without pain in order to get more of them back into school or work.

Miser AW, McCalla J, Dothage JA, Wesley M, Miser JS. Pain as a presenting symptom in children and young adults with newly diagnosed malignancy. *Pain* 1987;29:85-90.

Objective. To describe the importance of pain as a presenting symptom of cancer in children and young adults.

Design. Survey.

Setting. Pediatric Branch of the National Cancer Institute.

Participants. Consecutive patients with newly diagnosed malignancy evaluated and accepted for treatment (n=92; median age=16 years, range 0.5–24). Ten patients had non-Hodgkin's lymphoma, 23 had acute leukemia, 14 had osteosarcoma, 21 had Ewing's sarcoma, 1 had neuroblastoma and 23 had soft tissue sarcoma.

Main Outcome Measures. Patients were evaluated for tumour type and location, performance status using the Karnofsky score and presence of pain. For those patients reporting pain, the duration, etiology and location were recorded. The severity of pain at the initial presentation was assessed as a composite score using a 100 mm visual analogue scale by the patient, family (when available) and investigator.

Results. Most patients (78%) reported pain as a symptom of their cancer prior to presentation. For 31 of those patients, pain had been the sole initial symptom and 26 had experienced pain in combination with another symptom. Overall, pain had been present for a median of 74 days (range 3–821 days) prior to beginning cancer therapy. The median duration of pain following the initiation of cancer therapy was 10 days. Functional status at presentation was significantly lower for patients in pain compared to those not in pain (p=0.004). Of the patients reporting pain, 212 had a VAS score below 25 mm, 28 had scores of 25–50 mm and 21 scored above 50 mm. Mean VAS scores were 26.4 mm for acute leukemia, 16.5 mm for lymphoma, 34 mm for Ewing's sarcoma, 51.8 mm for osteosarcoma and 36.3 mm for soft tissue sarcoma. Analgesics were being used by 44 of the 70 patients experiencing pain, 22 were taking a narcotic analgesic alone, 17 were taking a non-narcotic analgesic alone and 5 were taking both. The presence or absence of sleep disturbance due to pain at time of presentation was assessed in 69 of the 70 patients in pain. 14 reported a mild sleep disturbance (awakened by pain but able to return to sleep without analgesic), 22 reported a moderate disturbance (awakened but able to return to sleep after taking analgesic) and 6 reported severe disturbance (awakened and unable to return to sleep because of pain in spite of use of analgesics).

Conclusion. Persistent pain in a child or young adult may be a very important indicator of serious disease and requires careful evaluation. Inadequate prescription of analgesics by physicians for patients experiencing pain continues to be a significant problem in the management of these children and young adults. The short duration of pain following the initiation of cancer treatment reflects the ability to attain rapid tumour regression in the majority of newly diagnosed pediatric malignancies.

Commentary

Pain is one of the symptoms most feared by children with cancer, and it is a central problem in pediatric oncology. Although pain treatment has improved in the last decade, numerous studies show that pain still is common in pediatric oncology. This is also the case in pediatric patients in general (Schechter, 1989; Walco et al., 1994).

Pain in children with cancer can be essentially of four basic etiologies: 1) treatment-related (e.g., pain as side-effects of chemotherapy, tumour surgery and radiation); 2) procedure-related (e.g., pain due to lumbar puncture (LP), bone marrow aspiration (BMA), biopsies); 3) cancer-related (e.g., pain due to infiltration of the tumour in various organs or tissues); and 4) pain of other etiology. In the abstracted pediatric studies, treatment-related and procedure-related pain dominated in contrast to the preponderance of tumour-related pain found in series with adult patients. This difference may be partly due to the generally more aggressive multimodality therapy regimens used in most diagnoses in pediatric oncology, which lead to a significant volume of treatment-related pain problems. Furthermore, the high initial rate of response of childhood malignancies to treatment results in a rapid reduction, and often even disappearance, of tumour-related pain. Finally, children with unresponsive or relapsing refractory cancer often deteriorate rapidly.

There are a number of studies on the epidemiology of pain in children with cancer. Miser and colleagues (1987b) followed 92 children and adolescents (median age, 16 years) with newly diagnosed malignancy at the pediatric branch of the National Cancer Institute over a 26-month period. At the time of first evaluation, 78% were experiencing pain that had been present for a median duration of 74 days (range 3–821 days) prior to start of cancer treatment, and 62% experienced pain as the first symptom of cancer. In a second study, Miser et al. (1987) evaluated the pain experienced by 139 children and young adults (median age, 16 years). Of these, 54% of in-patients and 26% of out-patients were experiencing some degree of pain at the time of assessment. Using a pain "thermometer" type of 100 mm visual analogue scale completed by patients and by one of the investigators, the median score was 22 mm for inpatients and 18.5 mm for outpatients. Treatment-related pain due to mucositis, surgery, neuropathy, and infection predominated in both groups, and 35% of inpatients and 18% of outpatients had

tumour-related pain. Of patients experiencing pain, 58% of inpatients and 36% of outpatients used opioid analgesics. McGrath and colleagues (1990) surveyed 77 outpatients (aged 2-19 years) at a pediatric oncology clinic and found an incidence of moderate to severe pain (30-100 mm on a VAS) at BMA of 78%, mean 49 mm. The corresponding values for LP, venepuncture, finger prick, chemotherapy and disease were (% VAS \geq 30, mean VAS) 61%, 45 mm; 28%, 20 mm; 23%, 18 mm; 41%, 25; and 37%, 24 mm respectively. Elliott et al. (1991) surveyed all 160 children (28 inpatients and 132 outpatients) in a co-operative group including both community-based and tertiary-care institutions seen during a 1-week period. Pain was reported by 39% of inpatients and 13% of outpatients. Side-effects of anti-cancer treatment accounted for 58%, cancer-related pain for 21%, and unrelated pain for 21%. Ljungman and colleagues (1996) surveyed the pain problems in Sweden through a national questionnaire study for nurses and physicians, and in a second study, they surveyed the pain problems through a regional investigation with structured interviews for children and parents (Ljungman et al., 1999). At diagnosis 60% had experienced cancer-related pain ever, and 36% often or very often. Treatment- and procedure-related pain were greater problems than cancer-related pain, and thus most pain experienced by children with cancer had iatrogenic origin. The major treatment-related pain problems were mucositis, abdominal pain, limb pain, and pain associated with dyspepsia. In a third study performed by Ljungman et al. (2000) on 66 children and their families, it was found that 49% of patients experienced cancer-related pain at diagnosis, and that pain varied during cancer treatment in children. Intensive pain during the last 3 months before the interview was more common at the beginning of treatment (1-3 months after diagnosis) according to 65% of families when children and parents often believed that pain treatment could be better. The corresponding figures for the intermediate period (4-6 months) and the final period (>10 months) were 17 and 14% respectively. Procedure- and treatment-related pain were the major problems initially. Procedural pain gradually decreased, but treatment-related pain was constant and dominating. For some procedures pain was rated highest initially, lower during the second period, and higher again during the final part of treatment.

The results and conclusions of these and other studies is that pain is still a big problem in children with cancer, and it is implied that pain diagnostics and treatment in children with cancer can be improved through increased: education of professionals, repeated information to families about pain and pain treatment, cooperation with children

and parents, use of pain analysis and measurement, documentation of analysis and measurement, establishment of explicit memoranda and routines for pain- diagnostics and treatment, and cooperation between nurses and physicians in the implementation of these routines.

Future research on pain in children with cancer should include more sophisticated epidemiological studies that will guide our treatment. We know that many children with cancer have pain. We need to know under what circumstances which children have pain and how they will respond to different treatments.

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Recent Articles

Axia G, Bonichini S, Benini F. Attention and reaction to distress in infancy: a longitudinal study. *Developmental Psychology* 2000;35(2):500-504.

Objective. To determine the existence of a relationship between look duration and duration of distress in infants during vaccination.

Design. Longitudinal, repeated measures study.

Setting. Pediatricians' offices.

Participants. Infants (n=31; 16 boys) assessed at 3, 5 and 11 month immunizations.

Main Outcome Measures. All infants received immunizations in three steps; orally followed by an upper arm injection and an upper leg injection. Immunizations were video-taped from 60 seconds prior to oral vaccination to 90 seconds following second injection. Videos were scored using Izard's (1979) Maximally Discriminative Facial Movement Coding System (MAX). Duration of attention was assessed one week following immunization with standardized visual stimuli; infants' eye movement was video-recorded and assessed by a trained experimenter. In terms of attention, a stimulus can be "attention getting" (simple orientation) or "attention holding" (fixation of stimulus) where the former involves looking at the stimulus for <500 ms and the latter for >500 ms. Measures taken for look duration included total fixation time, mean duration of fixation, mean duration of first fixation and longest fixation.

Results. All infants displayed pain-distress expressions. Duration of first pain-distress expression decreased with age ($p < 0.001$). Total duration of pain-distress in the 90 seconds following inoculation also decreased with age ($p < 0.001$). Total duration of fixation, mean duration of fixation, number of fixations and orientations all decreased with age (p 's < 0.001). Nine of 24 (above levels of chance) correlations between look duration and duration of facial expression of pain-distress were significant at each age level (p 's < 0.05).

Conclusions. Duration of visual attention seems to be correlated with duration of pain-distress expression in infants. Those infants who can quickly regulate negative emotion, look at visual stimuli for a shorter duration of time. This lends support to the notion that individual differences in look duration are related to a nervous system mechanism.

Beyer JE. Judging the effectiveness of analgesia for children and adolescents during vaso-occlusive events of sickle cell disease. *Journal of Pain and Symptom Management* 2000;19(1):63-72.

Objective. To examine pain and the effectiveness of analgesia during vaso-occlusive events (VOE) in children and adolescents with sickle cell disease (SCD).

Design. Descriptive, exploratory study.

Setting. Hospital inpatient unit.

Participants. A convenience sample of 21 African-American children with SCD (11 female; mean age=12.5 years, range 6.3-15.8) were enrolled in the study during hospitalization for VOE after they and their caregiver provided written consent. Exclusion criteria were presence of developmental delays or major complications of SCD. Some participants (67%) had complications (enuresis, serious infection, splenic sequestration, aplastic crisis, avascular hip necrosis, retinopathy, stroke, and/or acute chest syndrome) that manifested before study enrollment.

Main Outcome Measures. During a 2-hour segment of a VOE an interview was conducted to collect demographic data and record administration of all IV medication. Pain intensity scores were recorded at the beginning and end of the interview using the African-American version of the Oucher (0-100 scale) and the Adolescent Pediatric Pain Tool (APPT).

Results. Primary analgesics delivered via continuous infusion and/or PCA were nalbuphine (n=17; low (≤ 0.75 mg/kg/hr), medium (0.076-0.12 mg/kg/hr) or high (≥ 0.13 mg/kg/hr) levels), fentanyl (n=3; 0.1-0.5 mg/kg/hr) **editorial note:** this dosage appears to be an error in the original article) and hydromorphone (n=1; 0.004 mg/kg/hr). Four children had PCA pumps during the interview. Alternating oral doses of acetaminophen and ibuprofen were administered 24 hours a day and acetaminophen with codeine was administered prior to discontinuing IV analgesic. Hydroxyzine was sometimes given to potentiate the effect of analgesic medications. Correlations between the Oucher and APPT (graphic rating scale) scores ranged from 0.80 to 0.82 so only Oucher scores were used in further analysis. Initial pain scores were divided into low (1-33; n=5), moderate (34-67; n=9) and severe (68-100; n=6) pain. The level of IV drug administered for the low pain group was low (n=3) or high (n=2). For the moderate pain group drug levels were none (n=2; 1 could not receive any medications that would mask symptoms), low (n=5; 2 were being weaned for discharge, 3 had PCA pumps in

addition to IV drips) or moderate (n=2; both were being weaned and dosage had been reduced from earlier levels). For the high pain group drug levels were none (n=3; all had been weaned and were only receiving oral analgesics), low (n=1) or moderate (n=2; 1 had a PCA pump in addition to IV drip).

Conclusion. In this sample SCD related pain was not well-controlled. Seventy-one percent of the children reported moderate to severe pain even though standard protocols were followed, however, these findings may not represent their overall experience. Controlling pain from SCD appears to be a complex process that requires frequent pain ratings and continuous adjustment of comfort measures, in particular analgesics. Further research is required to determine the most effective medications, dosages and mode of delivery for children and adolescents with SCD.

Bhutada A, Sahni R, Rastogi S, Wung JT. Randomised controlled trial of thiopental for intubation in neonates. *Arch Dis Child Fetal Neonatal Ed* 2000;82(1):F34-F37.

Objective. To assess the effects of premedication with thiopental on heart rate (HR), blood pressure (BP) and oxygen saturation (SpO₂) in infants during Nasotracheal intubation.

Design. A randomised, placebo controlled, non-blinded study.

Setting. Neonatal intensive care unit.

Participants. Neonates (n=30; mean birth weight=3.27 kg) requiring semi-elective intubation for respiratory failure management or prior to general anesthesia for elective surgery.

Intervention. Neonates were randomly assigned to a study (6mg/kg thiopental; 0.24 ml/kg of a 2.5% solution) or control (placebo, equivalent volume of physiological saline) group.

Main Outcome Measures. Electrocardiogram (ECG), arterial pressure waveform and transcutaneous oxygen saturation were monitored continuously 10 minutes prior to, during and 20 minutes following intubation.

Results. During intubation, HR increased to a greater degree in infants premedicated with thiopental (12.0 vs. -0.5 bpm; p<0.03). Mean BP increased to a lesser degree in thiopental premedicated infants (-2.9 vs. 4.4 mmHg; p<0.002). Mean time to intubate was lower for the study group than for the control group (2.70 vs. 5.08 minutes; p<0.04). There was no difference in oxygen saturation between groups.

Conclusion. Infants premedicated with thiopental prior to intubation maintain vital signs closer to baseline values

than infants receiving no premedication. It remains to be determined whether or not the lessening of otherwise typical acute HR drop and increased BP during intubation has a significant long-term benefit for the infant, regardless, premedication appears to reduce unnecessary infant distress.

Goodenough B, Perrott DA, Champion GD, Thomas W. Painful pricks and prickle pains: is there a relation between children's ratings of venipuncture pain and parental assessments of usual reaction to other pains? *The Clinical Journal of Pain* 2000;16:135-143.

Objective. To investigate whether self-reports of venipuncture pain intensity from children can be usefully predicted by the mother's assessment of the child's typical behavioural reaction to everyday pain.

Design. Survey.

Setting. Blood collection centre in Sydney, Australia.

Participants. Children (n=88; age range 3-12 years) who had participated in a larger study investigating whether children could use visual analogue scales to rate intensity versus unpleasantness of needle pain. Equal number of boys and girls were selected from two age levels (3-7 years and 8-12 years). The children had scheduled blood collection via venipuncture. Inclusion criteria: children who were accompanied by their mother who remained during the procedure, children whose family's first language was English, cases in which no topical anesthetic had been applied to the needle site and the child and parent were not being coached through venipuncture with coping techniques.

Main Outcome Measures. The FACES pain scale was given to the child to measure the level of pain intensity. An ordinal scale was used to code the intensity of each child's facial, vocal, verbal and motor reactions to needle pain (by trained independent rater); 0 being nil and 3 being severe. The focus was on the degree of relative change in reaction rather than on an absolute criteria. A standardized questionnaire was completed by the child's mother on how anxious she thought her child was about the needle and how much she thought the needle would hurt, using the FACES scale. Also using the FACES scale, the mother was asked to rate her child's usual reaction to 6 different painful events.

Results. Only 12 children reported that the needle did not hurt and they tended to be in the older age group (p=0.0005). Children in the younger age group rated their pain higher than older children (p=0.016). Parent and child needle pain ratings at the time of venipuncture were

well correlated ($r=0.6$). Overall, 39% of children reported that the needle hurt less than expected (less pain group), 23% said the needle hurt more than expected (more pain group), 31% indicated that the needle hurt the same as expected (same pain group). For children in the same pain group and less pain group, 24% and 16% (respectively) of the variance could be accounted for by the parental estimates of other pain. For the more pain group, 88% of the total variance could be accounted for by parental estimates of usual reactions to everyday pain. Forty-five percent of parents indicated that their child's facial reaction was the most important indicator of pain, 27% indicated having relied on verbal reaction, 18% on motor reaction and 10% on vocal response. There was low to moderate positive correlations between the child's self report and observer ratings of the child's reaction.

Conclusions. The results suggest that a knowledge of the child's usual reaction to other painful events may assist in identifying those children likely to report the most needle pain and distress. The results also suggest that mother's reports can be a reliable measure of these usual reactions.

Gray L, Watt L, Blass EM. Skin-to-skin contact is analgesic in healthy newborns. *Pediatrics* 2000;105(1):e14.

Objective. To determine the effect of skin-to-skin contact (kangaroo care), between mothers and infants, in reducing the pain experience of heel lance.

Design. Prospective randomized controlled trial.

Setting. Boston Medical Centre.

Participants. Healthy newborns, randomly assigned to a skin-to-skin contact group ($n=15$) and a no-contact control group ($n=15$).

Intervention. In the skin-to-skin contact group, mothers reclined at a 45 degree angle on a hospital bed and held their infants against the front of their upper body.

Main Outcome Measures. Heart rate (HR) was monitored and the infants' face was video-recorded for a 2-minute baseline period. This was followed by the heel lance procedure and blood collection (mean times: experimental group=159 seconds; control group=155 seconds) and a 3 minute recovery period.

Results. Skin-to-skin contact reduced crying by 82% and grimacing by 65% from control levels during heel lance ($p<0.0001$). HR of infants in the skin-to-skin contact group increased by 8–10 beats per minute (bpm) during blood collection and remained stable during recovery. HR of control infants rose by 36–38 bpm to an asymptote of 160 bpm and the plateau was sustained throughout the first

minute of recovery. The pattern of HR activity showed a significant effect of time and a reliable treatment by time interaction ($p<0.0001$).

Conclusions. Skin-to-skin contact is an effective intervention against acute pain experienced during heel stick procedures. Moreover, skin-to-skin contact is easily implemented and safe. The rate of cooperation evidenced in this study (88%) suggests that parents would be willing to incorporate this intervention as a method of pain reduction instead of pharmacological or sucking interventions.

Grunau R, Holsti L, Whitfield MF, Ling E. Are twitches, startles, and body movements pain indicators in extremely low birth weight infants? *Clinical Journal of Pain* 2000;16:37-45.

Objectives. To identify body movements of low birth weight infants that are specifically related to either distress or pain.

Design. Observational study.

Setting. Neonatal intensive care unit of a children's hospital.

Participants. Four independent groups of 16 infants with birth weights less than 1000 g (mean weight=782 g, range 555–1000; mean post-conceptual age=29 weeks, range 24–35). Groups differed on the type of procedure during assessment (endotracheal tube suctioning, chest physiotherapy, diaper change or naso-gastric (NG) feed) and procedures differed in their invasiveness (most invasive (suctioning); primarily tactile (physiotherapy and diaper change); non-invasive (NG feeding)). Exclusion criteria were any major congenital anomalies or administration of analgesics or sedatives in the 24 hours prior to assessment.

Main Outcome Measures. The National Observation of Newborn Behavior (NONB) is a behavioural rating system of many behaviours that are summarized in three groups of autonomic stress signals, motor stress signals and motor stability. In addition to the NONB behaviours, arm and leg extensions were identified. Behaviours were each assessed for 2 minutes before and during the procedure. A Neonatal Medical index was used as a measure of global illness severity from birth. The number of invasive events in the last 24 hours was recorded.

Results. Analysis was restricted to 15 behaviours with a minimum incidence of 10%. These behaviours included: autonomic stress signals of startle, body twitch, facial twitch, and extremities twitch; motor stress signals of finger splay, grimace, diffuse squirm; motor stability

signals of flexed arm(s), flexed leg(s), foot clasp, grasping, hand on face, hand to mouth, leg brace and mouthing. Only three of these behaviours (finger splay, grimace and leg extension) differed among procedures. Facial grimace was observed more often in the suctioning procedure and least in the NG feeding but was not significantly different after controlling for the number of invasive procedures in the last 24 hours. Finger splay was observed more often during the suctioning and diaper change than during NG feeding. While leg extension showed an overall significant difference among procedures, there were no pair-wise differences between procedures.

Conclusions. Of the behaviours studied, facial grimace, finger splay and leg extension were rare at baseline and increased during invasive procedures. Facial grimace did not account for differences among procedures after controlling for time since last invasive treatment suggesting that this behaviour may be a stress indicator associated with sensitization or windup. Finger splay appears to be a stress indicator since it was more prevalent during suctioning and diaper change compared with NG feeding.

Jain A, Rutter N. Local anaesthetic effect of topical amethocaine gel in neonates: randomised controlled trial. *Archives of Disease in Childhood* 2000;82(1):F42-F45.

Objective. To assess the efficacy of the topical local anesthetic 4% amethocaine gel (Ametop) in neonates.

Design. Randomized double-blind controlled trial.

Setting. Postnatal wards or neonatal intensive care unit of an urban hospital.

Participants. Healthy infants (n=60; gestational age 29–42 weeks; weight 1.03–4.62 kg) in their first week after birth were stratified by gestational age into 3 groups: term (>37 weeks), mildly preterm (33–37 weeks), and moderately preterm (<33 weeks). Unwell, ventilated or sedated infants were excluded.

Main Outcome Measures. Either 1.5 g Ametop or 1.5 g placebo gel was applied to the dorsum of one foot, left for one hour and removed. Nothing was applied to the other foot (control). Beginning with the control foot, von Frey hairs (a series of graded nylon filaments) were used to stimulate the treated area to elicit the cutaneous withdrawal reflex. To determine the presence of anesthetic action the difference in filament thickness between the control and treated foot was recorded. To measure the strength of anesthetic action the difference in deforming weight between the control and treated foot was recorded.

Results. The median difference in von Frey hair number

(filament thickness) was 1 for the placebo group and 2 for the Ametop group (p=0.005). Defining anesthetic action as a difference in thickness of 2 or more revealed that 54.8% of infants treated with Ametop showed anesthetic action compared with 17.2% of infants treated with placebo (p=0.003). The mean difference in deforming weight was 3.9 g for the placebo group and 18.9 g for the Ametop group (p=0.02). Ametop application resulted in temporary localized erythema in 2 children.

Conclusion. Ametop appears to have an anesthetic effect on neonatal skin. Invasive procedures that pierce the skin of neonates are common so a safe and effective topical anesthetic would be a valuable asset. Further research is required to elucidate time of onset, duration of action and clinical efficacy.

Oberlander TF, Grunau RE, Whitfield MF, Fitzgerald C, Pitfield S, Saul JP. Biobehavioral pain responses in former extremely low birth weight infants at four months' corrected age. *Pediatrics* 2000;105(1):e6.

Objective. To directly examine pain responses to an acute noxious stimulus (finger lance) between former extremely-low-birth-weight (ELBW) infants and full-birth-weight (FBW) infants at four months corrected age. Of particular interest was altered pain reactivity in ELBW infants experiencing acute pain in a site distal to previous repeated injury (heel).

Design. Observational study.

Setting. Bio-behavioural research unit.

Participants. Twenty-four former ELBW infants at 4 months corrected chronological age (CCA) and a control group of 21 full-term, healthy infants at 4 months.

Intervention. While seated in their mothers' lap, infants underwent a finger lance for blood collection while connected to a Respirace monitor (Wims, Miami, FL.) and were videotaped. Measures of facial reactivity and cardiac autonomic responses were used.

Main Outcome Measures. Respirace monitor recorded continuous electrocardiogram (ECG) and respiratory signal from a baseline state and through the finger lance procedure. The procedure was video-taped and coded using the Neonatal Facial Coding System (NFCS). Videotape was coded for the three segments of the procedure; baseline, lance and recovery.

Results. Post-hoc analyses indicated significantly increased facial action from baseline to lance (p<0.001) but no differences in facial pain scores between the ELBW and FBW infants. During the first 2 seconds of recovery, 43% of ELBW infants showed no facial action

versus 12% of FBW infants, suggesting that ELBW infants were quicker to return to baseline following lance ($p=0.05$). For both groups, physiological responses were in the directions expected from baseline to lance to recovery. Although no significant differences were apparent between the groups, a trend toward less intense parasympathetic withdrawal in the lance phase and sustained sympathetic response throughout recovery was apparent in the ELBW infants.

Conclusion. Both the study and control group responded to the lance similarly in their physiologic and behavioural responses, however, some subtle differences were apparent in cardiac, autonomic and facial responses. This may suggest that former ELBW infants are less physiologically able to modulate initial and recovery responses to an acute pain event. It remains unclear whether these findings indicate long-term effects of early pain experience or a developmental lag in pain response.

Rosmus C, Johnston CC, Chan-Yip A, Yang F. Pain response in Chinese and non-Chinese Canadian infants: is there a difference? *Social Science and Medicine* 2000;51:175-184.

Objective. To describe the behavioural pain responses of Canadian-born Chinese infants receiving routine immunizations and compare them with responses of non-Chinese infants under similar conditions.

Design. Observational, comparative study.

Setting. Pediatric clinic held by a Chinese pediatrician and a suburban pediatric practice in the same city.

Participants. Convenience sample of 26 Chinese (infants: 14 male; mean age=62.2 days; mean weight=3335 g; Apgar 8/9; mothers: mean age=28.5 years; mean parity=1.6; vaginal delivery $n=20$; caesarean section $n=6$) and 26 non-Chinese (infants: 13 male; mean age=62.3 days; mean weight=3514 g; Apgar 8/9; mothers: mean age=30.5 years; mean parity=1.7; vaginal delivery $n=23$; caesarean section $n=3$) infants and their mothers. Inclusion criteria were: non-eventful full-term pregnancy; spontaneous vaginal deliveries or non-complicated planned caesarean sections; 5-minute Apgar scores of 8–10; birth weight >2500 g; normal post-partum course; no invasive investigations or treatments (except circumcision); and for the Chinese group both parents had to be of Chinese descent. In the Chinese group all parents were born in Asia and had at least 1 parent and/or grand-parent who was born in China. Seven of the non-Chinese mothers were born in Europe or the Middle East as were their parents and grand-parents and 19 were born in Canada, 8 of whom had parents and/or

grand-parents born outside Canada. Mothers spoke Cantonese, Mandarin, English or French.

Intervention. Routine immunization administered by a pediatrician to the right or left quadriceps muscle with the infant lying supine on the examination table. Mothers did not hold the infant for 30 seconds from the time of needle insertion.

Main Outcome Measures. English, Chinese and French versions of a questionnaire which included: a demographic information section; the baby diary; and the Suin-Lew Asian Self-Identity Acculturation (SL-ASIA) scale (1–5) for Chinese mothers (English and French Canadian mothers completed sections on generational background). Immunizations were video and audio taped for 60 seconds. Cry spectrographs were generated using Fast Fourier Transform (FFT). The Neonatal Facial Coding System (NFCS) was used to analyse video samples. CSPEECH software was used to extract latency to cry, maximum fundamental frequency and peak spectral energy.

Results. Acculturation scores for the Chinese group indicated Chinese affiliation (mean score=2.01, $SD=0.24$). Chinese parents had lower education levels and more worked in service industry occupations than non-Chinese parents ($p's<0.0005$). More Chinese mothers bottle-fed their babies (20 vs. 13; $p<0.01$). Inter- and intra-rater reliability was above 0.88 (kappa coefficient) for cry analysis variables and was between 72 and 100% for individual facial actions. There were correlations between latency to cry and cry duration for the Chinese group ($r=-0.48$; $p<0.05$) and between facial and cry variables in both groups ($r=0.4$ to 0.6 ; $p<0.05$). Mean group scores were higher for Chinese infants for all facial actions and for 3 of 5 cry variables. A MANOVA showed a main effect of group (Chinese or not) ($p<0.003$) with contributions from brow bulge ($p<0.01$), duration ($p<0.014$) and cry bursts ($p<0.001$).

Conclusion. Cultural effects on response to acute pain may exist in infants as young as 2-month-old and infants of Asian descent may exhibit a greater pain response than non-Asian Canadian infants. Differences in mother-infant interactions and socio-economic factors (education and occupation) between the groups may be important in shaping infants' responses. Further research is required to improve the understanding of cultural effects on longer lasting type pain and chronic pain.

Announcements

Meetings

September 3–7, 2000: *Headache World 2000, London, UK.* Organized in association with the British Association for the Study of Headache. For further information contact the Headache World 2000 Congress Secretariat at MediTech Media Ltd., 125 High Holborn, London, WC1V 6QA, UK, tel +44 (0)-171-404-7151, fax +44 (0)-171-404-6946, email secretariat@headache2000.com, or visit the web-site at www.headache2000.com.

September 28–October 1, 2000: *3rd Biennial International Forum on Pediatric Pain, White Point Beach Resort, Nova Scotia, Canada.* The topic of the meeting will be acute and procedural pain. For further information contact Kate Finlayson of Conventional Wisdom, tel 902-453-4664, fax 902-423-5232, email katefin@chebucto.ns.ca, web-site www.dal.ca/~pedpain/ifpp.

October 28–29, 2000: *Inaugural Meeting of Asian Society of Paediatric Anaesthesiologists, Kandang Kerbau Women's and Children's Hospital, Singapore.* The meeting is open to all working in pediatric anesthesia or interested in any aspect of pediatric anesthesia. The scientific program will include plenary sessions and symposia on various topics in the field (e.g., regionals, pharmacology, acute resuscitation, etc.). For further information, please contact Dr. Choo Shu May, fax +65-291-2661 or email aspa@kkh.com.sg.

November 15–18, 2000: *6th International Congress of Behavioural Medicine, Carlton Crest Hotel, Brisbane, Australia.* For further information, contact the Congress Secretariat: PO Box 1280, Milton, QLD, 4064, Australia, tel +61 (0) 7-3858-5410, fax +61 (0) 7-3858-5510, web-site <http://www.icbm2000.conf.au>.

June 26–29, 2001: *2nd World Congress of the World Institute of Pain: Pain Management in the 21st Century, Istanbul Convention and Exhibition Center, Istanbul, Turkey.* For further information, contact Cengiz Topel Mah, Dilan Tur Congress International, Dereyolu Sok. Umut - 2 Apt., 80630 Etiler, Istanbul, Turkey, tel +90-212 257-86-67 (PBX), fax +90-212-265-54-74, email info@dilan.com.tr, web-site www.dilan.com.tr/wip2001.

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

If you would like to participate

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. An Author's Kit can be obtained from Jill Hatchette, Managing Editor, *Pediatric Pain Letter*, Psychology Department, Dalhousie University, Halifax, Nova Scotia, B3H 4J1; email jhatchet@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.

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Assistants for this issue: Alyson Currie, Andrea Gregory and Michael Houlihan.