

Identification of pain in neonates by medical students, residents in Pediatrics and Neonatology*

Reconhecimento da dor no recém-nascido por alunos de medicina, residentes de Pediatria e Neonatologia

Anna Paula Marques da Silva¹, Rita de Cássia Xavier Balda², Ruth Guinsburg³

* Received from the Neonatal Pediatrics Discipline, Department of Pediatrics, Paulista School of Medicine, Federal University of São Paulo (EPM-UNIFESP). São Paulo, SP.

SUMMARY

BACKGROUND AND OBJECTIVES: Learning about the painful phenomenon during medical qualification shapes future clinical practice. This study aimed at evaluating the perception and understanding of pain in neonates (NN) by medical students, residents in Pediatrics and Neonatology.

METHOD: Cross-sectional study with 180 students from the 1st to the 6th year of medicine, 42 residents in Pediatrics and 20 residents in Neonatology, from 2009 to 2010. Twelve theoretical questions about NN pain were applied. Respondents examined 3 photos: premature under mechanical ventilation, term baby receiving injection and pre-term baby submitted to tracheal aspiration, and scored pain intensity in the visual analog scale. Each student examined 2 panels with 8 photos of the face of 2 term NN, being one photo per panel with facial mimic of pain; and the student would point the photo of the NN with pain. Chi-square and ANOVA were used for statistical analysis.

RESULTS: Mean number of right answers for theor-

etical questions has increased from 9 among students of the 1st and 2nd year of the medical course, to 11 for residents in Neonatology. Less than 75% of respondents have identified the painful face in panels 1 and 2, with no difference between students and residents. There has been no difference between students and residents in scores for the two premature photos. For the term NN receiving injection, residents in Pediatrics ($p = 0.008$) and Neonatology ($p = 0.036$) have scored more pain than students of the 3rd and 4th year of the Medical course.

CONCLUSION: Medical course students and residents were no different in identifying pain in neonates.

Keywords: Facial expression, Neonate, Pain, Pain evaluation, Teaching.

RESUMO

JUSTIFICATIVA E OBJETIVOS: O aprendizado a respeito do fenômeno doloroso durante a formação médica molda a prática clínica futura. O objetivo deste estudo foi avaliar a percepção e o conhecimento dos alunos de graduação em Medicina, residentes de Pediatria e de Neonatologia a respeito da dor no recém-nascido (RN).

MÉTODO: Estudo transversal com 180 alunos do 1^o ao 6^o anos de Medicina, 42 residentes de Pediatria e 20 de Neonatologia, no período de 2009 e 2010. Foram aplicadas 12 questões teóricas sobre dor no RN. Os entrevistados examinaram 3 fotos: prematuro em ventilação mecânica, a termo recebendo injeção e pré-termo submetido à aspiração traqueal, e assinalaram em escala analógica visual a intensidade da dor. Cada aluno examinou 2 painéis de 8 fotos da face de dois RN a termo, sendo 1 foto por painel com mímica facial de dor presente; e o aluno apontava a foto do RN

1. Graduating Medical Student, Paulista School of Medicine, Federal University of São Paulo (UNIFESP). São Paulo, SP, Brazil.

2. Doctor in Sciences by the Federal University of São Paulo. Neonatologist of the Neonatal Pediatrics Discipline, Paulista School of Medicine, Federal University of São Paulo (EPM-UNIFESP). São Paulo, SP, Brazil.

3. Professor of Neonatal Pediatrics, Paulista School of Medicine, Federal University of São Paulo (EPM-UNIFESP). São Paulo, SP, Brazil.

Correspondence to:
Ruth Guinsburg, M.D.
Rua Vicente Felix 77/09
01410-020 São Paulo, SP.
Phone/Fax: (11) 5084-0535
E-mail: ruthgbr@netpoint.com.br

com dor. Na análise estatística empregaram-se os testes Qui-quadrado e ANOVA.

RESULTADOS: Nas questões teóricas, o número médio de acertos se elevou de 9 nos alunos do 1º e 2º anos do curso de Medicina, para 11 nos residentes em Neonatologia. Nos painéis 1 e 2, menos de 75% dos entrevistados reconheceram a face de dor, sem diferenças entre alunos e residentes. Não houve diferenças entre alunos e residentes quanto aos escores assinalados para as duas fotos do prematuro. Para o RN a termo recebendo injeção, os residentes em Pediatria ($p = 0,008$) e Neonatologia ($p = 0,036$) atribuíram mais dor do que os alunos do 3º e 4º anos do curso médico.

CONCLUSÃO: Os alunos do curso de medicina e residentes não diferiram quanto ao reconhecimento da presença de dor em recém-nascidos.

Descritores: Avaliação da dor, Dor, Ensino, Expressão facial, Recém-nascido.

INTRODUCTION

Technological advances are increasing very premature and / or severely ill neonates survival. Pain is frequent during procedures to save their lives.

It is estimated that every neonate (NN) admitted to an Intensive Care Unit (ICU) receives approximately 50 to 150 potentially painful procedures per day¹⁻³. In spite of this, measures to relieve pain are still seldom used and it is estimated that only in 3% of potentially painful situations any specific analgesic or anesthetic procedure is indicated and, that coadjuvant techniques are used to minimize pain in just 30% of cases^{3,4}. so, there is an unbalance between the frequency of potentially painful procedures in NN and pain treatment in this group of patients⁵. Such unbalance is due to the difficulty to evaluate a subjective phenomenon such as pain and to the limited availability of safe therapeutic resources for this age group⁶⁻⁸. In this sense, another concern becomes important: the deficient teaching of such aspects to health professionals⁹⁻¹¹.

Learning about neonatal patients pain during the medical course and the qualification of Pediatrics and neonatal intensive care specialists may shape the future physician, pediatrician or neonatologist with regard to the concern with this subject in their clinical practice. Several studies indicate that deficient medical knowledge about pain contributes for its inadequate treatment^{9,10,12,13}.

First year medical students' attitudes were analyzed before and five months after a brief pain course. After the course, attitudes revealed more complexity in address-

ing pain, major emphasis in the fact that pain is real and not imaginary, and a strong belief that working with painful patients is rewarding¹⁴. In a different study¹⁵, 219 medical students were evaluated in the beginning of the clinical cycle as to the impact of a brief pharmacotherapy course on their behaviors. Students were divided in two groups: control and trained. After the course, trained students remembered how to solve already discussed problems and were able to apply their skills to solve new problems regarding analgesia.

Practical training, as it is the case with medical residency (MR), is an interesting field to evaluate the impact of teaching on medical performance. A national survey of medical residency programs in Pediatrics and Gynecology / Obstetrics (GO) in the United States to determine the curricular content and predominant practices with regard to circumcision has indicated that in total 26% of programs teaching circumcision failed to teach anesthesia / analgesia for the procedure¹⁰.

In a new national survey of medical residency in Pediatrics¹⁶, family medicine and GO about the teaching of analgesic techniques for circumcision in neonates has shown that 97% of programs really taught analgesic techniques for the procedure, with an increase as from 1998. However, only 84% of programs reported the frequent use of analgesia for circumcision, that is, a significant number of NN may not receive analgesia for such procedure, in spite of the effective teaching of the techniques to residents. So, there seem to be deficiencies in physicians' education, both in graduation and MR, about pain evaluation and treatment in different age groups^{17,18}. This study aimed at analyzing the knowledge of medical graduation students from the first to the sixth year, of residents in Pediatrics (R-PED) from first and second year and of residents in Neonatology (R-NEO) from first and second year, corresponding to the third and fourth year of residency in Pediatrics of a Public Federal University of São Paulo, about pain in the neonatal period. Specific objectives were to evaluate whether medical graduation students, residents in Pediatrics and Neonatology believe that NN feels and responds to pain and whether they recognize neonatal pain facial expression, analyzing whether there are changes during medical qualification.

METHOD

This study was carried out after the approval of the Ethics Committee, Federal University of São Paulo (UNIFESP), (opinions 1167/09 and 1161/10), with

the agreement of the Medical Course Board of Directors of the Graduation Pro-Rector and of the Medical Residency Committee of the Extension Pro-Rector, in addition to the Medical Residency Committee of the Pediatrics Department of the institution. This is a transversal study with prospective data collection, carried out by means of interviews with a pre-developed questionnaire and NN photos, analyzed by students of the first to sixth year of the medical graduation course, students of MR in Pediatrics (R1 and R2) and Neonatology (R3 and R4).

Sample was made up of 180 students being raffled 30 students of each Medical graduation course year, 15 males and 15 females, in addition to 62 residents from a universe of 67 residents in Pediatrics and Neonatology, UNIFESP, being 24 from the first year of residency in Pediatrics (R1), 23 from the second year of residency in Pediatrics (R2), 11 (R3) from the first year of residency in neonatal Pediatrics and 9 from the second year of residency in neonatal Pediatrics (R4).

Five residents did not fill the survey questionnaire: 2 R1 for being on vacations during the evaluation period, 2 R2 due to refusal, and 1 R4 due to medical leave. For the students, sample size calculation took into account that for NN pain-related questions, the chance at random to get it right would be 50% and, if there was an effective teaching during the course, the rate of right answers for each proposed question would rise to 90%. Considering 90% of sample power and an alpha error of 5%, there would be the need to evaluate 25 students from each medical course year. For residents, there has been no sample size calculation since we intended to analyze the whole R-PED and R-NEO universe being trained in the institution.

To develop the questionnaire we had to photograph three neonates admitted to the neonatal ICU during a potentially painful procedure, after the informed consent of the guardian: one premature with tracheal tube under mechanical ventilation (Figure 1); 1 term neonate submitted to intradermal vaccine injection (Figure 2) and one premature with tracheal tube under mechanical ventilation and physical therapy (airways aspiration – Figure 3). The indication of such procedures was always patients' clinical need and never the need to photograph them.

Then, we photographed two term neonates, after parents' informed consent. Each neonate was photographed in eight different times (T) being T1: rest, T2: light stimulation – natural light on neonate's face; T3: rest, T4 heel friction with cotton soaked with alcohol, T6: rest, T7:

heel puncture to collect glycemia test by reagent tape and T8: rest. Each set of eight photos was called "panel", that is, two different panels were prepared, each panel with eight photos of the same neonate, and each photo focused on children's facial expression at the moment they was exposed to a specific procedure, being Panel 1 exemplified in figure 4. Capillary glycemia collection indication came from the assistant physician of the unit. After their informed consent, interviews consisted of a questionnaire with:

- Demographics: age, gender, religion, presence of fixed partner, number of children, previous hospitalizations and socio-economic level¹⁹.
- Questions regarding personal beliefs about the existence of NN pain asked with short sentences, with statements where respondents should mark the options true or false.

After filling the questionnaire, each responded received a photo of each one of the three photographed neonates (mechanical ventilation, receiving intradermal injection and submitted to tracheal aspiration). After 1 minute of observation for each photo, the responded answered the following question: "Do you believe that the NN is feeling pain, yes or no?". If the answer was yes he should mark in a horizontal visual analog scale measuring 100 millimeters, how much pain he thought the neonate was feeling for each photo presented. Then, participants received the two panels with the photos of two neonates and, again, after 1 minute of observation for each panel, the respondent should answer to the following question: "In which photo do you think the neonate is feeling pain?"

Categorical variables were described in frequency, and numerical variables by central trend measurements, according to respondents' category: basic cycle (1st and 2nd year of medicine), intermediate cycle (3rd and 4th years of medicine), internship (5th and 6th years of medicine), R-PED (R1 and R2 in Pediatrics) and R-PED and R-NEO (R3 and R4 in Pediatrics with qualification in Neonatology). The rate of right and wrong answers to "beliefs about neonatal pain", marked as true or false, and the rate of right pain faces were compared among participants categorized according to the qualification cycle by Chi-square test. Comparison of pain intensity extracted from the measurement in cm of visual analog scales was made with Analysis of Variance, with location of differences by Bonferroni's multiple comparisons method. All tests considered significant $p < 0.05$. Statistical program used was SPSS 17.0.

RESULTS

Demographics are shown in table 1. There is a higher prevalence of females among R-PED and R-NEO, as compared to graduation students, and this difference is due to the method used. The percentage of respondents stating being Caucasian and with fixed partner was higher among R-PED and R-NEO. Belonging to socio-economic classes A or B was less frequent among R-PED as compared to R-NEO and medical graduation students.

As to beliefs and myths about NN pain, results are shown in table 2. It is noted that 100% of respondents believe that NN feels pain; between 80% and 100% believe that the neonate feels as pain as adults or more. There is significant increase, as Pediatrics and Neonatology specialization develops, in the understanding that the premature feels as much or more pain than a term neonate, that there is no pain tolerance phenomenon, that the lack of weeping during painful procedures does not mean lack of pain and that analgesia is, in general, beneficial for the neonate submitted to painful procedures (Questions 3, 4, 6 and 11). As to pain evaluation (Questions 5 and 8) and the cost-benefit ration of the use of analgesics (Question 11) in the neonatal period, the rate of right answers in all five analyzed categories was in general low.

Mean number of right answers increased during medical graduation and specialization in Pediatrics and Neonatology, rising to a mean of 9 right answers in

the basic cycle to 11 right answers among R-NEO. Bonferroni's multiple comparisons test shows that R-NEO got more questions right than basic cycle students ($p = 0.002$), intermediate cycle ($p = 0.001$) and internship ($p = 0.033$). There were no significant differences in the number of right answers among categorized students in the 3 learning cycles or between R-PED and R-NEO.

Pain facial expression identification in the panels is described in table 3. There have been no differences among different analyzed categories (students and residents) both for Panel 1 and Panel 2. It calls the attention that only 25% to 35% of respondents have recognized pain face in Panel 1, the same being true for 65% to 75% of respondents for Panel 2.

With regard to photos for visual analog evaluation of pain intensity (Table 4), scores were similar among medical students of all cycles and R-PED and R-NEO with regard to premature under mechanical ventilation (Figure 1). For the term neonate receiving intradermal injection (Figure 2) more intensity was attributed by R-PED ($p = 0.008$) and R-NEO ($p = 0.036$) as compared to intermediate cycle students, without differences among other groups. For the premature submitted to tracheal aspiration (Figure 3), there has been just a trend of basic cycle students to attribute higher pain intensity as compared to intermediate cycle students ($p = 0.054$). Regardless of qualification duration, respondents have attributed more pain to the term NN (NN 2) than to prematures (NN 1 and 3).

Table 1 – Demographics of medical graduating students (M) and residents in Pediatrics and Neonatology

	1 st - 2 nd M n = 60	3 rd - 4 th M n = 60	5 th - 6 th M n = 60	R-PED n = 42	R-NEO n = 20	p-value
Age*	20.5 ± 1.7	23.1 ± 1.8	24.9 ± 1.9	26.3 ± 1.4	29.2 ± 1.2	< 0.001
Female**	30 (50%)	31 (52%)	30 (50%)	33 (79%)	19 (95%)	< 0.001
Caucasian**	42 (70%)	50 (83%)	50 (83%)	34 (81%)	20 (100%)	0.043
Christian**	39 (65%)	41 (68%)	40 (67%)	19 (45%)	14 (70%)	0.121
Fixed partner**	15 (25%)	27 (45%)	37 (62%)	28 (67%)	15 (75%)	< 0.001
No children*	60 (100%)	59 (98%)	58 (97%)	42 (100%)	19 (95%)	NS
Previous hospitalization**	29 (48%)	26 (43%)	30 (50%)	24 (57%)	9 (45%)	0.728
SEL A or B**	46 (77%)	46 (77%)	47 (78%)	20 (51%)	17 (85%)	0.006

R-PED = residents in Pediatrics; R-NEO = residents in Neonatology.

SEL = socio-economic level; *mean ± standard deviation; **number (%); NS = non significant.

Table 2 – Right notions about neonatal pain, according to answers about myths and beliefs answered by residents in Pediatrics and Neonatology

	1 st - 2 nd MED n = 60	3 rd - 4 th MED n = 60	5 th 6 th n = 60	R-PED n = 42	R- NEO n = 20	p-value
Right 1	NN feels pain (V)					NS
N (%)	60 (100%)	59 (98%)	60 (100%)	42 (100%)	20 (100%)	
Right 2	NN feels less pain the adults (F)					0,171
N (%)	51 (85%)	56 (93%)	53 (88%)	40 (95%)	20 (100%)	
Right 3	Premature NN feels less pain than term NN (F)					0,014
N (%)	47 (78%)	43 (72%)	52 (87%)	38 (91%)	20 (100%)	
Right 4	Longer ICU stay and more exposure to painful procedures make NN more tolerant to pain (F)					0,030
N (%)	44 (73%)	44 (73%)	48 (80%)	40 (95%)	18 (90%)	
Right 5	NN does not respond to pain in a consistent and organized way (F)					0,475
N (%)	32 (53%)	34 (57%)	31 (52%)	19 (45%)	7 (35%)	
Right 6	No weeping during or after a painful procedure means that NN is not feeling pain (F)					0,037
N (%)	57 (95%)	52 (87%)	57 (95%)	42 (100%)	20 (100%)	
Right 7	Most NN who sleep after a painful procedure are not feeling pain (F)					0,753
N (%)	51 (85%)	52 (87%)	53 (88%)	35 (83%)	19 (95%)	
Right 8	There is no reliable and valid way to evaluate such a subjective phenomenon as pain, especially in patients who do not speak (F)					< 0,001
N (%)	30 (50%)	29 (48%)	30 (50%)	38 (91%)	14 (70%)	
Right 9	NN do not need analgesics as adults (F)					0,821
N (%)	58 (97%)	58 (97%)	56 (93%)	41 (98%)	19 (95%)	
Right 10	NN pain relief, especially prematures, is not essential because they do not have memory for pain (F)					NS
N (%)	60 (100%)	60 (100%)	59 (98%)	42 (100%)	20 (100%)	
Right 11	In some situations, pain relief may be more deleterious for NN than pain itself (F)					< 0,001
N (%)	15 (25%)	20 (33%)	21 (35%)	26 (62%)	19 (95%)	
Right 12	Untreated pain of the severely ill NN may influence personality or behavior of the child later on (V)					0,290
N (%)	55 (92%)	51 (85%)	52 (87%)	35 (83%)	20 (100%)	
No of right answers	9.3 ± 1,6	9.3 ± 1.7	9.5 ± 1.5	10.4 ± 1.3	10.8 ± 0.9	< 0.001

R-PED = residents in Pediatrics; R-NEO = residents in Neonatology; NS = non significant.

Table 3 – Stimulation pointed as “pain face” by medical students (M), residents in Pediatrics and Neonatology in both series of photos.

	1 st - 2 nd MED n = 60	3 rd - 4 th MED n = 60	5 th - 6 th MED n = 60	R-PED n = 42	R-NEO n = 20	p-value
Right P1						0.823
N	21	17	21	15	5	
%	35	28	35	36	25	
Right P2						0.924
N	43	41	45	29	15	
%	72	68	75	69	75	
Right P1 e P2						0.752
N	19	15	16	15	5	
%	32	25	27	36	25	
Wrong P1 & P2						0.698
N	15	8	8	13	5	
%	25	13	13	31	25	

R-PED = residents in Pediatrics; R-NEO = residents in Neonatology; P = panel.

Tabela 4 – Intensidade da dor para as fotos dos recém-nascidos 1, 2 e 3, de acordo com residentes de Pediatria e Neonatologia

	1 st - 2 nd MED n = 60	3 rd - 4 th MED n = 60	5 th - 6 th MED n = 60	R-PED n = 42	R-NEO n = 20	p-value *
RN 1						0.267
Mean ± SD	56 ± 27	49 ± 29	56 ± 31	45 ± 36	57 ± 34	
Median	61	56	61	48	69	
CI 95%	46-63	42-57	49-62	41-73	41-73	
RN 2						0.002
Mean ± SD	65 ± 28	62 ± 26	70 ± 26	80 ± 22	81 ± 23	
Median	74	67	77	91	95	
CI 95%	58-72	55-69	63-77	73-87	71-92	
RN 3						0.020
Mean ± SD	56 ± 26	42 ± 28	45 ± 29	56 ± 29	54 ± 30	
Median	62	45	49	59	49	
CI 95%	49-63	34-49	37-53	47-65	39-68	

R-PED = residents in Pediatrics; R-NEO = residents in Neonatology.

CI 95% = confidence interval of 95%; * refers to one-way ANOVA for differences among groups.

DISCUSSION

Results indicate that myths pervading resistance to treat NN pain are not established among medical students, R-PED and R-NEO because there has been a high rate of right answers to the 12 questions, thus showing an effective teaching of these concepts during Pediatrics and Neonatology specialization, with mean of 11.8 right answers among residents.

However, a significant number of respondents from all medical qualification cycles failed to recognize the pain face and there has been no evolution of this recognition during physician and specialist qualification. Finally, students and residents have attributed moderate intensity pain to the premature patient under mechanical ventilation, submitted or not to tracheal aspiration, also without noticeable changes along the 10 years of study.



Figure 1 – Premature under mechanical ventilation



1



2



3



4



5



6



7



8



Figure 2 – Term neonate receiving intradermal injection.

Figure 4 – Panel with 8 photos of the same neonate and only one corresponds to the face at painful stimulation (Photo 5).



Figure 3 – Premature under tracheal aspiration

This way, although there is content acquisition during the different stages of medical qualification, it seems that such learning is not transferred to practical situations because graduating students have poorly recognized the presence of NN pain and considered that prematures' pain is not severe. Such situation is slightly changed in the term neonate submitted to a procedure strongly related to pain in the minds of adults and children (injection), for which pain scored in the visual analog scale suggests that students and residents believe that some attitude is needed to minimize it.

These findings may be due to few discussions about pain in general and, specifically in Pediatrics, in medical curricula. During the six years of medicine in the university where the population of our survey study,

there are formal classes about pain in neurophysiology, during training programs in Anesthesiology and Oncology.

In addition, professors of the medical graduation course, including Pediatrics, report pain as a symptom of different diseases, without a specific vision of concepts, mechanisms, consequences and nociception evaluation. In residency in Pediatrics of the same institution, there is formal pain training in the Rheumatology outpatient setting where R1 stays for approximately 10 h/year, and discussion of pain-related problems at bedside and in different outpatient settings.

In R-NEO, there are daily discussions about pain evaluation and treatment at bedside since the topic is mandatory for patients' daily evolution. There is a written routine of easy access in the neonatal ICU, in addition to two formal classes per year (4 h of theoretical activity / year) on how to address critically ill neonate pain. So, the specific and formal teaching about pain in general during medical qualification is minimal and mainly addresses surgical questions, while during specialization in Pediatrics and Neonatology, teaching is during daily practice, depending on the concepts and prejudices of physicians teaching residents.

The shortage of teaching about pain in different age groups in medical courses has been reported by different authors²⁰⁻²³. In the University of Helsinki, where there was no formal pain course at the time of the study, 430 medical students were interviewed²¹ and it was found that attitudes about pain evaluation and treatment have matured along the graduation years. Other authors indicate that a multidisciplinary curriculum on pain improves practical actions of medical students and residents in terms of pain evaluation and treatment in different age groups²⁰⁻²³.

So, some curriculum interventions may influence and even change attitudes, beliefs and behaviors of medical students and graduating physicians^{14,18=24}. The effects of a formal 4-hour program on pain evaluation and treatment in the Fist Aid Sector were evaluated among residents¹⁸. After the program, residents had increased their ability to recognize and treat several painful conditions. In a different survey, after a 10-hour course for residents on palliative care and pain management of cancer patients it was observed best practices in terms of opioid prescription²⁴. The analysis of 63 medical clinic residents before and after an intervention to decrease pain management deficiencies has shown that formal education during the school year improves residents'

ability to evaluate pain, decreases opioid prescription fear and resistance and enhances pain evaluation and treatment documentation²⁵.

Results of the evaluation of beliefs, concerns and concepts of 72 residents in Medical Clinic and Pediatrics before and after a 4-hour course about chronic pain treatment in non-cancer patients were recently published²⁶. After the course, residents have substantially changed their concepts and beliefs about opioid prescription for such patients, they were more consistent in putting into practice current recommendations and were less fearful of opioid consequences.

The need to intervene in physicians' theoretical and practical qualification is reinforced by a recent study aiming at analyzing attitudes and knowledge of 1204 newly graduated physicians of different specialties, including pediatricians, with regard to the use of opioids. This study has observed a negative attitude and an inadequate pain management of cancer patients by most respondents.

Among the factors associated to pain understanding and handling, there were medical specialty, previous use of a valid tool to evaluate pain presence and intensity, self-perception of pain understanding, experience with opioid prescription and education in treating cancer pain. Authors have concluded that formal education and practical training are critical for the best practice of young physicians²⁷.

So, to effectively implement a more adequate pain management in neonatal intensive care units, there is the need to not only structure the formal knowledge about the subject, but also to effectively create conditions of practical learning with dynamic participation of different involved professionals in the care and comfort of the NN with regard to the learning of the young physician. Without harmony between what is taught and what is practiced, future physicians will continue to have difficulties to treat NN pain in a simultaneously human and rational way.

CONCLUSION

Among the limitations of this study, it has to be stressed that it was a transversal study not following the same student during his/her learning, but considering different students in different learning stages. Such design implies care with any causal conclusion, but raises hypotheses and suggestions of interventions to be observed by future studies. In addition, this study was carried out in a single center and its generalization should

take into account the reproducibility of pain teaching conditions found in the program we described. In spite of such limitations, this is a unique study found in the literature trying to evaluate existing concepts and prejudices among graduating physicians with regard to neonatal pain management, while it evaluates pain recognition by future physicians in patients who still do not verbalize what they feel.

ACKNOWLEDGMENTS

To Ana Claudia Yoshikumi Prestes, for helping with the photos used in the study. To CNPq for the scientific initiation scholarship in 2009 and 2010 for APMS.

REFERENCES

1. Barker DP, Rutter N. Exposure to invasive procedures in neonatal intensive care an at admissions. *Arch Dis Child Fetal Neonatal Ed* 1995;72(1):F47-8.
2. Simons SH, van Dijk M, Anand KS, et al. Do we still hurt newborn babies? A prospective study of procedural pain and analgesia in neonates. *Arch Pediatr Adolesc Med* 2003;157(11):1058-64.
3. Prestes AC, Guinsburg R, Balda RC, et al. The frequency of pharmacological pain relief in university neonatal intensive care units. *J Pediatr* 2005;81(5):405-10.
4. Carbajal R, Rousset A, Danan C, et al. Epidemiology and treatment of painful procedures in neonates in intensive care units. *JAMA* 2008;300(1):60-70.
5. Carbajal R, Nguyen-Bourgain C, Armengaud JB. How can we improve pain relief in neonates? *Expert Rev Neurother* 2008;8(11):1617-20.
6. Stevens BJ, Franck LS. Assessment and management of pain in neonates. *Paediatr Drugs* 2001;3(7):539-58.
7. Abu-Saad HH, Bours GJ, Stevens B, et al. Assessment of pain in the neonate. *Semin Perinatol* 1998;22(5):402-16.
8. Slater R, Cantarella A, Franck L, et al. How well do clinical pain assessment tools reflect pain in infants? *PLoS Med* 2008;5(6):e129.
9. Lavies N, Hart L, Rounsefell B, et al. Identification of patient, medical and nursing staff attitudes to postoperative opioid analgesia: stage 1 of a longitudinal study of postoperative analgesia. *Pain* 1992;48(3):313-9.
10. Howard CR, Howard FM, Garfunkel LC, et al. Neonatal circumcision and pain relief: current training practices. *Pediatrics* 1998;101(3 Pt 1):423-8.
11. Howard VA, Thurber FW. The interpretation of infant pain: physiological and behavioral indicators used by NICU nurses. *J Pediatr Nurs* 1998;13(3):164-74.
12. Daudt AW, Hadlich E, Facin MA, et al. Opiates in pain management: correct or underestimated use? Data from a university hospital. *Rev Assoc Med Bras* 1998;44(2):106-10.
13. Chermont AG, Guinsburg R, Balda RC, et al. What do pediatricians know about pain assessment and treatment in newborn infants? *J Pediatr* 2003;79(3):265-72.
14. Wilson JF, Brockopp GW, Kryst S, et al. Medical students' attitudes toward pain before and after a brief course on pain. *Pain* 1992;50(3):251-6.
15. de Vries TP, Henning RH, Hogerzeil HV, et al. Impact of a short course in pharmacotherapy for undergraduate medical students: an international randomised controlled study. *Lancet* 1995;346(8988):1454-7.
16. Yawman D, Howard CR, Auinger P, et al. Pain relief for neonatal circumcision: a follow-up of residency training practices. *Ambul Pediatr* 2006;6(4):210-4.
17. Weissman DE, Ambuel B, Norton AJ, et al. A survey of competencies and concerns in end-of-life care for physician trainees. *J Pain Symptom Manage* 1998;15(2):82-90.
18. Jones JB. Assessment of pain management skills in emergency medicine residents: the role of a pain education program. *J Emerg Med* 1999;17(2):349-54.
19. Associação Brasileira de Empresas de Pesquisa (ABEP) [homepage on theInternet]. Critério de Classificação Econômica Brasil 2009 [citado 2011 May10]. Available from: <http://www.marketanalysis.com.br/arquivos-download/biblioteca/cceb-1.pdf>
20. Mavis BE, Ogle KS, Lovell KL, et al. Medical students as standardized patients to assess interviewing skills for pain evaluation. *Med Educ* 2002;36(2):135-40.
21. Niemi-Murola L, Nieminen JT, Kalso E, et al. Medical undergraduate students' beliefs and attitudes toward pain: how do they mature? *Eur J Pain* 2007;11(6):700-6.
22. Ali N, Thomson D. A comparison of the knowledge of chronic pain and its management between final year physiotherapy and medical students. *Eur J Pain* 2009;13(1):38-50.
23. Stevens DL, King D, Laponis R, et al. Medical students retain pain assessment and management skills long after an experiential curriculum: a controlled study. *Pain* 2009;145(3):319-24.
24. Ury WA, Rahn M, Tolentino V, et al. Can a pain management and palliative care curriculum improve the opioid prescribing practices of medical residents? *J Gen Intern Med* 2002;17(8):625-31.
25. Scott E, Borate U, Heitner S, et al. Pain management

practices by internal medicine residents--a comparison before and after educational and institutional interventions. *Am J Hosp Palliat Care* 2008;25(6):431-9.

26. Roth CS, Burgess DJ. Changing residents' beliefs and concerns about treating chronic noncancer pain with opioids: evaluation of a pilot workshop. *Pain Med* 2008;9(7):890-902.

27. Kim MH, Park H, Park EC, et al. Attitude and know-

ledge of physicians about cancer pain management: young doctors of South Korea in their early career. *Jpn J Clin Oncol* 2011;41(6):783-91.

Submitted in November, 09, 2011.

Accepted for publication in January 13, 2012.

Conflict of interests: None – Sponsorship: Scientific Initiation Scholarship (PIBIC), granted by CNPq.