

# Neonatal pain assessment program II: an innovative strategy to increase knowledge translation. Case report\*

*Programa de avaliação da dor neonatal II: uma proposta inovadora para facilitar a transferência do conhecimento. Relato de caso*

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## ABSTRACT

**BACKGROUND AND OBJECTIVES:** Hospitalized newborns are often submitted to painful and stressing procedures. Adequately measuring and evaluating pain favor its control in this population. For such, education and training strategies are important, emphasizing computer-based technology, which involves software, multimedia packages and network connection. This article aimed at describing the Neonatal Pain Assessment Program II.

**CASE REPORT:** The platform used to host the Neonatal Pain Assessment Program II is the Modular Object-Oriented Dynamic Learning Environment (Moodle). The program is made up of eight modules addressing contents regarding pain anatomy and physiology, neonatal pain indicators, use of pain evaluation tools, in addition to detailed explanations of four specific tools to evaluate newborn pain. Resources such as audio presentations, formative evaluation exercises with photos and videos, texts for additional reading and discussion forums are also used.

**CONCLUSION:** Computer-based teaching may be considered important knowledge translation facilitator. So, we believe that this initiative, considered novel and innovative, shall favor the use of clinical evidences in different neonatal assistance scenarios, as well as shall enhance knowledge and skills of health students and professionals with regard to neonatal pain evaluation.

**Keywords:** Distance education, Educational technology, Newborn, Pain, Pain assessment, Pain prevention and control.

## RESUMO

**JUSTIFICATIVA E OBJETIVOS:** Recém-nascidos internados são frequentemente submetidos a procedimentos dolorosos e estressantes. Mensurar e avaliar a dor adequadamente favorecem seu controle nessa população. Para tanto, estratégias de educação e treinamento são relevantes, destacando-se o ensino mediado por tecnologia, que envolve o uso de *softwares*, pacotes multimídia e conexão em rede. O presente artigo teve como objetivo descrever o Programa de Avaliação da Dor Neonatal II.

**RELATO DO CASO:** A plataforma utilizada para hospedar o Programa de Avaliação da Dor Neonatal II é o *Modular Object-Oriented Dynamic Learning Environment (Moodle)*. O programa é composto por oito módulos, abordando conteúdos referentes à anatomia e fisiologia da dor, indicadores de dor neonatal, utilização de instrumentos de avaliação da dor, além de abordagem detalhada de quatro instrumentos específicos de avaliação da dor no recém-nascido. Recursos como apresentações com áudio, exercícios de avaliação formativa utilizando fotografias e vídeos, disponibilização de textos para leitura complementar, e fóruns de discussão também são utilizados.

**CONCLUSÃO:** O ensino mediado por tecnologia pode ser considerado um importante facilitador na transferência do conhecimento. Assim, acredita-se que essa iniciativa, considerada inédita e inovadora, favorecerá a utilização de evidências científicas nos diferentes cenários de assistência neonatal, bem como ampliará o conhecimento e a habilidade de estudantes e profissionais de saúde quanto à avaliação da dor no neonato.

**Descritores:** Avaliação da dor, Dor, Educação à distância, Prevenção e controle da dor, Recém-nascido, Tecnologia educacional.

## INTRODUCTION

Newborn (NB) pain is considered routine for most neonatal assistance units. Recent studies point to the high and concerning number of painful procedures performed during their hospitalization, in addition to the inefficacy of analgesic strategies in neonatal units<sup>1-4</sup>. Currently, studies indicate that NB pain may activate cortical areas of term and preterm neonates<sup>5-7</sup>, which reinforces recommendations and protocols being published in the attempt to favor its control<sup>8-10</sup>.

Pain is a complex, subjective and multidimensional phenomenon, expressed predominantly in verbal terms, which is not the

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case of NB due to their verbalization inability, being necessary to consider other parameters, especially behavioral and physiological parameters, to confirm its presence<sup>11</sup>. The lack of verbal complaint associated to the lack of specific response pattern make NB pain evaluation dependent on indirect methods.

It should be stressed that pain evaluation involves not only its measurement with specific tools, but also clinical reasoning and decision-making as from measurements. So, in addition to providing pain evaluation, tools contribute to the evaluation of analgesic efficacy of interventions, of responses of a same NB to different pain episodes along time and, also, different responses of different newborns to similar painful situations.

Currently, the scientific literature has numerous tools to evaluate NB pain. The high number of published scales shows the difficulty of establishing a valid and reliable scale<sup>11</sup>. Additionally, no tool available to date is considered ideal<sup>11</sup>.

It is necessary to use tools with adequate psychometric properties and indicated for the context in which pain occurs, such as clinical condition and gestational age. It is also important a deep evaluator's knowledge about the tool to be applied and its particularities. Finally, it is critical the development of accurate observation skills to simultaneously notice multiple pain indicators and also to establish specific time intervals to evaluate neonatal pain<sup>12</sup>. So, education and training strategies aimed at neonatal pain evaluation may be considered extremely important for the practice of professionals providing direct assistance to this population.

In the traditional teaching model, activities are in general offered in a vertical and mechanical way, with individual and normative approach which makes difficult the sharing of experiences as well as the association between theoretical content and practice<sup>13</sup>. So, computer-mediated teaching (CMT) is proliferating among health professionals along the last decade<sup>14</sup>. Currently, online teaching is aimed at qualifying adults in graduation and post-graduation levels, extension, sequential and ongoing education courses<sup>15</sup>. Such models involve computer-mediated strategies, such as software and multimedia packages, and also online teaching strategies, which necessarily involve network connections and may be used as training, enhancing and professional updating tools.

Several advantages may be attributed to CMT, especially temporal flexibility, spatial decentralization, collaboration and communication among users, increased confidence of users with regard to learning, development of IT-related skills, active learning process directed by the user, development of safe learning environments, meeting of different learning needs and decreased teaching time<sup>14-16</sup>. In a quasi-experimental study, Berger et al.<sup>17</sup> have compared the effects of online course, online course facilitated by the teacher and instructor-mediated classroom course, offered to 1661 nurses. There has been no significant difference on learning and users' satisfaction with regard to the different teaching strategies; however, the online course has shown better cost-effectiveness: USD 4.05 per student for the online course and USD 59.35 per student for the instructor-mediated classroom course.

With regard to neonatal assistance, the literature shows the de-

velopment and evaluation of CMT models<sup>13,14,18-20</sup>. Only the software proposed by Gibbins et al.<sup>14</sup> refers to neonatal pain evaluation by means of the Premature Infant Pain Profile (PIPP): 68 health professionals have participated in the training and 95% of them were very happy with the software; in addition, users have positively evaluated aspects related to clarity of instructions, easiness to access content and format.

So, CMT strategies may be considered knowledge translation facilitators, especially when used to change practices and improve clinical outcomes<sup>21</sup>. Knowledge translation is defined as a dynamic and interactive process involving synthesis, dissemination, exchange and ethical application of knowledge to improve health, health-related products and services quality and to strengthen health assistance system<sup>22</sup>.

There is a major gap between research results and NB pain-related clinical practice<sup>23</sup>. Several factors contribute to such gap and, especially in Brazil, research results are predominantly produced in English, professionals do not have the habit of looking for evidences to be used at bedside, there is limited access to complete articles published in arbitrated journals, and it is difficult to critically identify and evaluate evidences of quality.

Considering such obstacles, a computer-mediated education strategy was devised aiming at enhancing knowledge and skills of health students and professionals with regard to evaluating NB pain. This initiative is considered novel and innovative for neonatal assistance and care in Brazil, and contributes to minimize this gap and to make easier the use of scientific evidences in the clinical practice.

### Initial experience

The Neonatal Pain Evaluation Program (PAD-Neo) was created in 2010, financed by International Association for the Study of Pain<sup>\*</sup> (IASP) - Developing Countries Project: Initiative for Improving Pain Education, 2009-2010. In a pioneer fashion, specific tools for neonatal pain evaluation were used, which were validated and consecrated by the international scientific literature.

The program was developed based on the Addie model, acronym for analysis, design, development, implementation and evaluation<sup>24</sup>. The analysis stage has involved extensive literature survey and establishment of neonatal pain evaluation tools to be addressed by the course, of virtual learning environment, of hardware and software needs, of image capturing methods (video and pictures), in addition to determining target audience. The following stages (design and development) consisted in planning and developing program objectives, as well as theoretical and practical contents, didactic resources and evaluation tools. The evaluation stage was carried out initially from the perspective of program users, involving 10 health professionals and graduation and post-graduation students.

The "Modular Object-Oriented Dynamic Learning Environment" (Moodle) was the platform used to host PAD-Neo. This is open and free software developed as from a social constructivist approach of education and which allows the development of interactive and collaborative online courses, in addition to learning management of virtual groups and communities<sup>25</sup>. Program

content was distributed in modules and the activities of each module were planned to be developed along one week, with approximately two to three weekly hours of activities.

Module 1, in addition to detailed information about the course, had a pre-test made up of 20 multiple-choice questions regarding the subject of the course, with the purpose of evaluating previous users' knowledge.

Modules 2 to 4 had contents on aspects of anatomy and physiology related to NB pain, indicators of neonatal pain and use of neonatal pain evaluation tools. To help the application of tools in the clinical practice, validated and simple scales were selected, as follows: Neonatal Facial Coding System (NFCS<sup>26</sup>), Neonatal Infant Pain Scale (NIPS<sup>27</sup>), Premature Infant Pain Profile (PIPP<sup>28</sup>) and Crying, Requires Oxygen for saturation above 95%, Increased vital signs, Expression, Sleepless (CRIES<sup>29</sup>).

It is important to stress that in all modules, discussion forums, additional reading texts and formative evaluation exercises specific for the content of each module were used. At the end of Module 8, a post-test made up of 20 multiple-choice questions and a form with Likert-type questions related to format and content, adequacy of exercises and additional reading, adequacy of activities and workload were applied.

PAD-Neo was evaluated by 10 users, who have integrally completed all activities during the proposed period. In the pre-test, mean number of correct answers was  $13 \pm 1.88$  from a total of 20 questions, and in the post-test,  $16 \pm 2.41$  ( $p=0.006$ ). One should also stress that users have reported that they were happy or very happy with the following PAD-Neo aspects: workload (43.4 and 56.6%, respectively), organization and content (22.5 and 75%), virtual learning environment (22 and 76%), content applicability (33.3 and 66.7%), and didactic resources (32.5 and 62.5%). Users suggestions included increasing the number of pictures and videos used to apply neonatal pain evaluation scales.

### Development of PAD-Neo II

Positive results obtained with the first version, as well as the originality of the initiative, have shown the importance of this education strategy in Brazil. So, we decided to update the program, which started to be called PAD-Neo II and is being developed with the sponsoring of the Research Support Foundation of the State of Minas Gerais (FAPEMIG), Universal Tender, 2013-2015. For such, not only needs observed by researchers themselves along initial program development and evaluation were considered, but also comments offered by users. We decided to maintain course hosting platform (Moodle), given its ease of use and available resources, as well as basic program structure, that is, modular format, use of four pain evaluation tools, use of resources such as discussion forums, exercises, and additional reading texts, among others.

In the second version of the program, we decided to maintain Module 1 with informative features and presentation with general orientations about the development of the course, by means of user's guide and timetable, among other resources. In addition, we have maintained the pre-test, made up of multiple-choice updated questions related to the subject of the course. Modules 2 to

4 content was updated with regard to anatomy and physiology aspects, neonatal pain indicators and use of NB pain evaluation tools. Available educational and support resources include audio presentations on the subject, formative evaluation exercises, additional reading texts, in addition to discussion and operational forums.

Similar to the initial version, PAD-Neo II Modules 5 to 8 address specific scales for neonatal pain evaluation. However, authors considered necessary to replace two tools, namely PIPP and CRIES. PIPP scale was recently updated and reviewed and was called PIPP-Revised<sup>30</sup>; although pain indicators have been maintained, instructions and consequently the scoring method of the tool were changed<sup>30</sup>, so, this version was adopted. Additionally the CRIES scale was replaced by the BIIP tool. CRIES was developed to evaluate postoperative pain; however, other included tools (NFCS, NIPS AND PIPP) were also validated for this purpose and, in addition, they have more robust psychometric properties as compared to CRIES. It should be also stressed that such scale considers ideal oxygen saturation as above 95%. However, this index does not confirm current recommendations, especially for preterm neonates, where desirable oxygen saturation levels vary between 85 and 93%<sup>32</sup>. We, then, decided to replace CRIES by BIIP, developed and validated by Holsti & Grunau<sup>31</sup> and Holsti et al.<sup>33</sup>, which considers NB behavioral status, facial mimic and hands movements as indicators. Both tools, PIPP-R and BIIP, went through transcultural and content validation processes for our proposal and respective manuscripts are being prepared.

So, the last four modules are made up of an audio presentation where information about the tools is detailed (NFCS, NIPS, PIPP-R and BIIP), as well as about indicators and scoring methods; exercises including pictures and videos of NBs in painful and/or potential painful conditions; discussion forum; operational forum; additional reading texts.

Formative evaluation exercises based on videos and pictures are considered of particular importance and differential in the initiative since they simulate daily painful situations in neonatal assistance. The presentation of real scenarios in real time helps evaluators' training and enhances their capacity of simultaneously observing multiple pain indicators; this may also improve the use of neonatal pain evaluation tools in the clinical practice<sup>12</sup>. For this reason, PAD-Neo II has several pictures and four videos per module, which are used as exercises.

At the end of the course we have maintained the form to evaluate workload, content organization, virtual environment, content applicability and didactic resources.

It is noteworthy that, at the moment, PAD-Neo II is in process of completion. Next, program format and content shall be validated. So, eight information technology or related areas professionals, eight neonatal nursing professionals and eight professionals with experience in distant education will be invited to participate in this validation process<sup>34,35</sup>. PAD-Neo II shall be initially evaluated by IT or related areas professionals and technical corrections shall be made, if needed. Then, neonatal nursing and education professionals will evaluate and, if needed, corrections and adaptations shall also be made.

## CONCLUSION

Computer-mediated teaching strategies may be extremely important to change practices, in this case, neonatal pain evaluation in healthcare settings. As from the results of the first version of the program, we believe that PAD-Neo II will allow the translation of specific knowledge and skills and is distinguished by the use of robust and internationally recognized tools for neonatal pain evaluation. We hope that PAD-Neo II as extension strategy for health area graduation students as well as for professionals involved with neonatal assistance, as soon as its validation process is completed, shall contribute to the teaching process of this subject. We also expect to measure the effects of the course in the clinical practice, not only regarding professional practices but also neonatal outcomes.

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