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Does the numeric rating scale (NRS) represent the optimal tool for evaluating pain in the triage process of patients presenting to the ED? Results of a multicenter study

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Summary. *Abstract:* Pain evaluation at triage in Emergency Department (ED) is fundamental, as it influences significantly patients color code determination. Different scales have been proposed to quantify pain but they are not always reliable. This study aims to determine a) how important is for triage nurses pain measurement b) reliability of Numeric Rating Scale (NRS), the most used instrument to evaluate pain in Italian EDs, because it frequently shows higher pain scores than others scales. *Methods:* End point 1: a questionnaire was administered to triage nurses in some hospitals of northern Italy. End point 2: 250 patients arriving at the ED referring pain have been evaluated using, randomly, either the NRS or a fake "30-50" scale. *Results:* End point 1: Triage nurses acknowledge to modify frequently the referred pain intensity. This for several reasons: nurses think that patients may exaggerate to obtain a higher priority color code; they may be influenced by specific patients categories (non EU citizens, drugs-addicted, elderly); the pain score referred by patients is not correspondent to nurse perception. End point 2: Data show that the mean value obtained with NRS is significantly ($p<0.05$) higher that the mean obtained with the "30-50" scale. *Conclusion:* Manipulation on pain evaluation performed by nurses might result in a dangerous underestimation of this symptom. At the same time, the use of NRS seems to allow patients to exaggerate pain perception with consequent altered attribution of color code at triage. (www.actabiomedica.it)

Key words: pain, Numeric Rating Scale, Visual Analog Scale, triage

Introduction

Pain is one of the leading symptoms of presentation to the Emergency Department (ED). In Italy, the spread of pain control and treatment had a great pulse due to law 38 published in 2010 (1). According to the American Pain Society (2) pain represents the fifth vital sign; therefore, the evaluation of its intensity should be part of patient assessment and documentation. As pain perception is extremely patient-related, its objective evaluation remains difficult. Nevertheless, pain measurement should be a fundamental part of the assessment of every single patient in order to correctly lead the therapeutic strategy (3).

Assessment scales are validated and shared instruments, whose purpose is welfare improvement through a systematic collection of clinical data. The scales for evaluation of pain proposed in literature have the following features: easiness of use, data recording and processing, comprehension, fulfilling criteria of validity, sensitivity and reliability. Based on different collection criteria, scales can be either subjective or objective.

In subjective scales, the assessment method is based on verbal or analog pain description and can be limited by cognitive and communicative abilities and patient age. The second objective approach implies evaluation of specific behavioral and physiological indices in response to a painful stimulus, so that a score related to pain intensity can be obtained. One of the prevalent scales used is the Numeric Rating Scale (NRS), in which patients indicate verbally or graphically the intensity of the perceived pain assigning a number included between 0 to 10 (4). Another common scale is the Visual Analog Scale (VAS): in this second case patients are asked to analyze a 10 cm line in which at each extremity different pain intensitivies are described, starting from "no pain" to the left up to "the worst pain experienced" to the right.

This study had a dual objective. We focused on evaluation of pain at ED triage because, in this area, the evaluation of this parameter significantly affects the subsequent take in charge of patients. Therefore, our first purpose was to determine whether or not pain evaluation performed by triage nurses could influence code assignment together with the eventual correct use of pain scales for code determination. Secondly, we applied NRS at triage to determine whether patients, influenced by numbers, tend to overestimate their level of pain by assigning a higher numeric value not truly corresponding to their real pain intensity. In previous studies, NRS showed to determine a substantial and widespread increase of pain values. compared to VAS. This might be related to an old school legacy according to which the highest value is more rewarding and 6 represents the minimum threshold. In this study we wanted therefore to compare NRS with another fictitious numerical scale that could not be connected to school evaluation (0 to 10).

Methods

For a 3 months period (January 1st-March 31 2015), we administered to triage nurses working in the Emergency Department of "A. Murri" Hospital in Fermo the "Questionnaire on the use of pain scales in triage" (Appendix 1). In the same period of time, the questionnaire was distributed in other EDs belonging to Marche Region as well as of northern and central Italy (Appendix 2). The collected data were subsequently analyzed using Microsoft Office' Excel, version 2013. A total of 154 nurses answered the questionnaire.

As for the second aim of this study, a numerical measurement scale was administered to all patients older than 14 years who presented in the same period to the ED with pain. Two measuring scales were used: i) the classical NRS numerical scale and ii) a new, non existing scale ranging from 30 to 50, in which 30 corresponded to "absence of pain" and 50 to "worst pain ever experienced", in order to avoid "school" influence. Each patient compiled one scale. The administration of one or the other scale was randomized. A sheet of paper with the inscription "NRS" or "30-50" identifying the type of scale administered was included in non-transparent envelopes. The envelopes were then closed, mixed and numbered from 1 to 250 and opened in consecutive order. Patients data were recorded on a proper file. A total of 250 patients lamenting pain as main symptom participated the study, 125 for each different scale ("30-50" or NRS). The available data are both quantitative and qualitative.

Results

Aim 1

The questionnaire that nurses had to fill included eight questions, the first of which (Appendix 1) aimed to analyze the volume (i.e., number of patients visited per year) of the ED in which the involved nurses used to work. Results showed how 88% of nurses worked in an ED with more than 35.000 accesses, 6% between 20 and 35.000 and a further 6% less than 20.000. The second question investigated the kind of pain scale locally adopted. 126 nurses (81.8%) used NRS, 12 (7.8%) VAS and 16 (10.4%) claimed to use other types of instruments. Thirdly, nurses were asked to assign a score from 0 to 100 to indicate the usefulness of pain quantification at triage. 37 nurses (24%) affirmed pain measurement is essential (100) in triage; 28 (18.2%) responded 90, 32 (20.8%) 80, 14 nurses (9.1%) chose 70. For the remaining nurses (43-27.9%) the importance had a relevance quantifiable in a value definitely

inferior to 50. As for the fourth question ("when the patient main symptom is pain, in which percentage do you quantify it by using the adopted assessment scale?"), 16 nurses answered "<30%", 24 "30-50%", 55 "51-80%", while 59 nurses indicated ">80%". In the fifth question, we asked whether they believed patients answer on pain would depend on the attempt to receive a higher priority code. As shown in Figure 1, only 3 nurses were convinced that this was not the case, whereas 11 nurses answered "1-30%", 22 "31-50%", 61 "51-80%", and finally 57 responded ">80%".

The sixth question, instead, investigated the frequency by which the triage nurses tend liberally to interpret patients' pain, thus modifying patient's evaluation. 50 nurses affirmed to never modify the intensity of the pain reported by patient, while the others declared, in varying proportions, to change the value reported by the patients (Figure 2). Furthermore, for those who aknowledged to alter in some cases the intensity of pain reported by patient, we asked whether this modification was related to specific patients' categories. For 56.7% of nurses the answer was "yes", thus confirming the existence of categories. Among these categories we must mention specific ethnic groups, different social classes (i.e. people using drugs or alcohol, homeless) and age groups. In 43.3% of cases, instead the answer was negative (Figure 3) .

Question 8 investigated the existence of internal protocol in which pain intensity is included and contributes to assignment of the priority code and, if so, whether triage nurses follow it or modify patient's referred values in order to assign a more reasonable color code. For 8 nurses (5.2%) "There are no protocols that modify the priority code according to pain", 70 nurses (45.45%) claimed to strictly apply pain protocols, whereas the remaining 49.35% (76 nurses) admitted to modify patients' answer in order to assign a more appropriate (according to the nurse personal evaluation) color code. Therefore, we asked these last nurses in which percentage this was done, and the most frequent response was 30-50% (Figure 4).

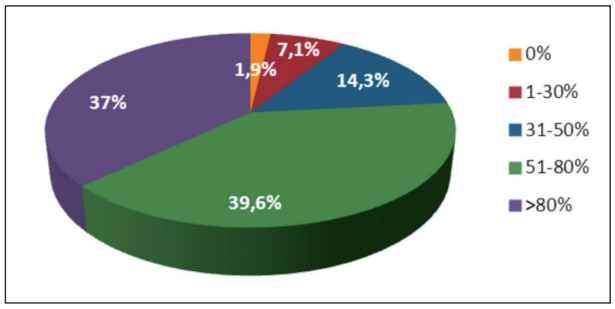

Figure 1. Attempt to obtain a higher priority code

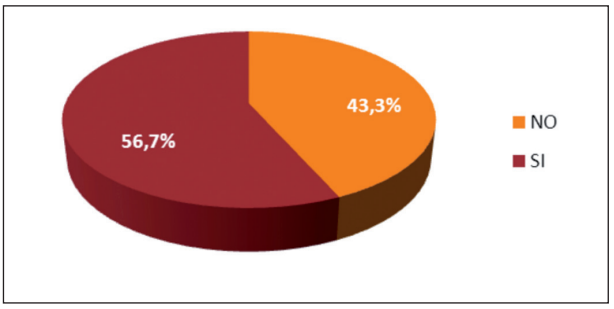

Figure 3. Personal evaluation of pain depending on different patients categories

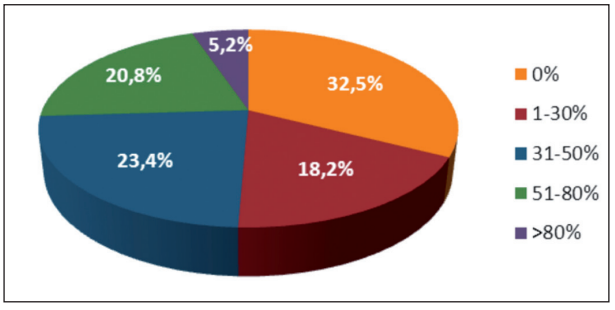

Figure 2. Modification of pain perceptions

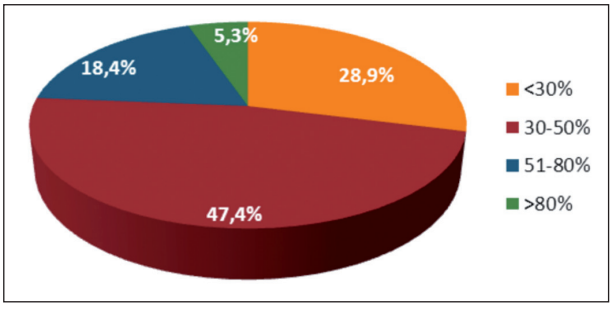

Figure 4. Modification of patients answers in determining color priority code

Aim 2

Data analysis comparing pain measurement obtained with NRS and the "30-50" showed how, with NRS, the value assigned by patient was 1.78 higher than that awarded by "30-50" scale. Although further confirmation is needed, we observed a statistically significant difference ($p<0.05$) between the pain values reported with the NRS scale (which has an average value of 7.3) and the fictitious "30-50" (average value 41 converted into the 1 to 10 scale is equivalent to 5.5). As suggested, NRS might be related to pain overestimation as the patient, due to a scholar "memory", unconsciously starts from a minimum psychological threshold (represented by 6) and therefore might assign a higher value. As a consequence, the "30-50" scale is likely to be more objective scale and comparable to VAS, although this should be the subject of another, specifically addressed study. We also must mention that, as for other assessment tools, this scale has limitations, especially with elderly and foreigners. Very importantly, the use of the "30-50" scale could positively influence color code assignment as, according to triage guidelines, a pain level superior or equal to 7 determines a yellow code. In the present study, although performed in a relatively small sample of patients, pain evaluation measured applying the NRS scale obtains an average value of 7.36 resulting in a yellow code whereas using the "30-50" scale the average normalized value is 5.5, which corresponds to a green code. This certainly can significantly modify dynamics of triage and Emergency Department. The two samples under study are described in Tables 1 and 2.

Table 1. Pain assessment with NRS

Sample size		125	
Males	73		58%
Females	52		42%
Average age		51.9	
Average pain referred		7.36	
Standard deviation		2.15	
Variance		4.62	

Table 2. Pain assessment with "30-50" scale

Sample size		125	
Males	57		46%
Females	68		54%
Average age		50.2	
Average pain referred		5.5*	
Standard deviation		2.73	
Variance		7.44	

*normalized value

Conclusions

"Oligo-analgesia" is a term coined in 1989 by Wilson and Pendleton and indicates the inadequate recognition and treatment of pain (5). The problem with oligo-analgesia in patients accessing the ED is widespread and the attention from the medical staff is still insufficient. In our study, several contradictions have emerged, although the majority of nurses judges pain assessment at triage of crucial relevance. Most nurses participating the study acknowledged to change the intensity of pain reported by patients, in order to assign the color code considered more appropriate. Moreover, many nurses also are influenced by certain categories of "fragile" patients. As for other operating Units but particularly for Emergency Departments, pain assessment and management remain a crucial topic and further investigations are needed. There is a sort of "skepticism" that pushes triage nurses to personally interpret the pain, rather than rely on patients judgment. Nurses' efforts is to reconcile the patients signs with their personal intuition and sensitivity, thus leading sometimes to pain underestimation by medical staff (6). Frequently nurses tend to believe that patients emphasize the perceived pain in order to be assigned a higher priority code and access more easily to treatment. Therefore, pain underestimation remains an important issue and, although some improvements have been obtained, it is essential to investigate the problem and make pain truly become the "fifth vital sign".

In recent years, the use and analysis of pain measurement instruments have been investigated. The present study has focused on the adequacy of NRS that, despite being easily and quickly applicable, therefore being suitable for the ED setting, presents some biases attributable to self-assessment.

Pain, widely considered as the "fifth vital sign", is a symptom often underestimated. The Authors' personal perception is that the evaluation of pain at triage can be compared to a chess game, in which players are represented by patients and nurses. Everyone, more or less unconsciously, tends to provide an interpretation and quantification that goes to their advantage. According to the authors of the present study, this work might suggest some interesting ideas for pain correct management. Firstly, we suggest that a more "aseptic" measurement scale should be proposed; at the same time, training programs should be organized, aimed to motivate nurses in investigating the fifth vital sign and teach to avoid personal interpretations of pain.

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Appendix 1.

Questionnaire on use of pain scales at triage

We kindly ask you to answer the following questions by choosing one of the multiple choices available.

1. The volume (i.e., number of patients per year) of your ED is:
   - <20.000
   - 20.000-35.000
   - >35.000
2. In your ED what scale is adopted to measure pain?
   - NRS
   - VAS
   - other (please specify)……
3. According to you, on a scale from 0 to 100 how relevant is pain measurement at triage?
   Nr….
4. When the patient main symptom at triage is pain, in what percentage do you quantify it by using the adopted assessment scale?
   - 0%
   - 1-30%
   - 31-50%
   - 51-80%
   - >80%
5. In what percentage do you believe patient's answer on pain might depend on the attempt to receive a higher priority code?
   - 0%
   - 1-30%
   - 31-50%
   - 51-80%
   - >80%

6. When you investigate pain at triage, do you tend to modify patient's evaluation, and if so, in what percentage?
   - 0%
   - 1-30%
   - 31-50%
   - 51-80%
   - >80%

7. If you answer to the previous question was affirmative, are there specific patients' categories that are mostly related to your modification according to your personal interpretation (for instance social classes, ethnic categories, age classes)?
   - yes
   - no

8. Does pain intensity contribute to color code assignment?
   - there are no protocols that allow to modify the priority code according to pain
   - I strictly apply pain protocol
   - Sometimes I modify patient's answer in order to assign a more appropriate code according to my personal evaluation

9. If the answer to the previous question was "Sometimes I modify patient's answer in order to assign a more appropriate code according to my personal evaluation", in what percentage of patients does this happen?
   - <30%
   - 30-50%
   - 51-80%
   - >80%

Appendix 2

- Ospedale "A. Murri" di Fermo (A.S U R. Area vasta n. 4)
- Ospedale "S. Maria della Misericordia" di Urbino (A.S U R. Area vasta n. 1)
- Ospedale "Madonna del Soccorso" di San Benedetto del Tronto (A.S.U.R . Area vasta n. 5)
- Ospedale "Engles Profili" di Fabriano (A.S U R. Area Vasta n. 2)
- Ospedale "S. Maria della Scaletta" di Imola
- Ospedale "Luigi Sacco" di Milano
- Azienda Ospedaliero-Universitaria di Parma
- Ospedale Regionale "Umberto Parini" di Aosta
- Azienda ospedaliera universitaria integrata Verona-Borgo Trento
- Azienda ospedaliera "S. Croce e Carle" di Cuneo
- Ospedale degli infermi di Biella
- Azienda Ospedaliera-Universitaria di Bologna