

Verbal and Non-verbal Rating Scales in the Determination of Pain Severity in Trauma Patients in the Emergency Department

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Received 2014 December 08; Revised 2015 March 17; Accepted 2015 April 08.

Abstract

Background: Using subjective tools for pain assessment is essential, but may confuse healthcare professionals in some clinical situations. It is also useful to assess pain severity objectively. Several observational pain scales have been developed, but they are mostly for intensive care units and not for the emergency department (ED).

Objectives: The purpose of the present study was to compare the verbal rating scale (VRS) and Nonverbal Rating Scale (NVRS) in the determination of pain severity in patients with limb trauma, in the ED of a general hospital in Kashan, Iran, in 2014.

Methods: This observational, prospective study was conducted on 450 traumatic patients admitted to the trauma ED of Shahid Beheshti Hospital in 2014. The tool used in this study consisted of three parts: demographic data, VRS, and NVRS scores at 7 time points, from arrival until 4 hours. The statistical analysis was conducted using the two-tailed Student's t-test, Mann-Whitney U test, Pearson correlations, and repeated measures. The data analysis was conducted using SPSS software, version 16.

Results: The average age of the participants was 35.2 years, and the extremities were the most common painful area (66.2%). The mean VRS and NVRS pain intensity ratings upon arrival were 6.16 (± 2.63) and 3.06 (± 2.17), respectively. The estimation of pain was lower in the NVRS when compared to the VRS, and the scores in these two tools showed a significant correlation. One-hundred and seventy-two of the patients received interventions for pain relief; 60 patients received analgesics and 112 patients (24.8%) received non-pharmacological interventions, such as stabilization of the injured extremity.

Conclusions: This study indicated that the modified version of the adult NVPS in step with the VRS is a useful tool for pain intensity assessment in the ED.

Keywords: Emergency Care, Trauma, Pain Measurement, Pain Rating Scales

1. Background

Pain is a common reason that brings patients to the emergency department (ED). More than one-third of ED patients have moderate to severe pain (1), and it has been estimated that 75% of the patients in the ED experience some level of pain (2). In trauma patients, the prevalence and severity of pain is even higher (3). Uncontrolled pain has physiologically adverse consequences, such as an unstable hemodynamic status, and alterations in immune system functioning; moreover, it has a variety of psychosocial effects, including anxiety, posttraumatic stress disorder, and disorientation (4). Therefore, the efficient and prompt control of pain is among the essential duties of healthcare professionals in the ED, a duty that has moral, ethical, legal, and clinical dimensions (2).

Multiple studies have shown that pain is frequently under-treated in the ED. The underestimation of pain levels and overestimation of pain relief from analgesia and oligoanalgesia, (the inadequate prescribing of analgesia for patients in pain) are common in the ED (1, 3, 5, 6). This

often results in the mismanagement of pain and its consequences (3). One study showed that only 60% of those patients with pain received analgesics that were administered after lengthy delays (median: 90 minutes), and 74% of the patients were discharged with moderate to severe pain (7).

The poor accuracy of nurses' pain assessments contributes to the under-treatment of pain (1), and excellence in pain assessment is a pivotal area for successful pain management (5). The well-accepted fact that pain is a personal and individual experience has led to the situation in which pain expression by patients' is considered to be the gold standard of pain assessment (5). Pain assessment tools have been developed to assist nurses in assessing pain more accurately, to minimize bias, and to obtain reliable, valid data (8). The Verbal Rating Scale (VRS) and Visual Analogue Scale (VAS) are similar, and validated pain scales can subjectively assess a patient's pain (9). In these scales, the patients are asked to rate their pain on a scale of 0-10, with 0 being no pain and 10 being the most severe

pain imaginable (3).

Using these tools seems simple but, as a matter of fact, the assessment of pain is often very difficult. One study showed that, despite the common use of the VAS in the ED and its apparent simplicity, 11% of the adults and 25% of the elderly failed to understand the concept of its use (6). Some patients do not report pain, or do so inadequately due to communication difficulties. Additionally, some patients may assume that the expression of pain might bother the staff, or may even report higher pain to justify their coming to the ED. Some patients may even deny that they have pain in order to avoid treatment or being admitted into the hospital. The environment, patient's perceptions, expressions, and beliefs are also barriers to effective pain assessment (8).

The use of subjective tools for pain assessment is essential, but it may confuse healthcare professionals in some clinical situations (8). Therefore, it might be useful to use a complementary tool to assess the severity of pain objectively. Pain is a subjective symptom, but it has some consequences and clues that can be measured objectively; for example, one can easily see patients crying and moaning, or trying to splint an area of the body because of pain. However, some observational pain scales have been developed, mostly in intensive care units. These tools contain both behavioral (movement, facial clues, posturing) and physiological (increased heart rate, respiratory rate, blood pressure, perspiration, pallor) indicators of pain (4, 10). For the time being, the use of objective and nonverbal pain assessment tools is limited to intensive care units, but this area requires expansion to emergency departments.

2. Objectives

The current study was designed to compare the VRS and Nonverbal Rating Scale (NVRS) in the determination of pain severity in patients with limb trauma in the ED of a general hospital in Iran/Kashan.

3. Methods

3.1. Study Design

This was an observational, prospective study using tools constructed for this purpose. It was conducted in the ED of the Shahid Beheshti Hospital in Kashan, Iran, from September to November of 2014. The Shahid Beheshti Hospital is the only general hospital in the city of Kashan that provides medical services for about 400,000 inhabitants. The ED receives patients suffering from cardiac, gastrointestinal, neurological, and surgical problems, and

this hospital has a special ED department for trauma patients. Shahid Beheshti is a referral hospital in the region, and it covers part of the crowded and vital highways connecting the south and north of Iran, which explains the high rate of admission: 80 - 100 patients per day (30,000 per year) in the ED. Upon arrival, the patients are evaluated by a triage nurse before being examined by a physician.

3.2. Subjects

After obtaining institutional research board and administrative approvals, all of the patients arriving in the trauma ED who met the inclusion criteria were recruited sequentially into the study. The inclusion criteria were: (1) injuries due to a trauma, (2) age > 18 years, (3) stabilized condition with regard to airway, breathing, and circulation, (4) Glasgow Coma Scale score > 13 (on a 3 - 15 scale, where 3 indicates no sign of function and 15 is full function), (5) reporting the existence of pain (at least score 1) according to the VRS, and (6) the ability to answer the questions. Those patients who required cardiopulmonary resuscitation, endotracheal intubation, or transfer to intensive care units during the data collection, and those with addictions or who exhibited opiate abuse were excluded from the study. The sample size was determined using the formula $n = z^2 pq / E^2$, with the following assumptions: the prevalence of patients reporting pain in the ED was 75% (11), a 95% confidence interval, and 4% error. The sample size was calculated to be 450 subjects, which were entered sequentially into the study.

3.3. Measurement

The patients' pain was evaluated from admission to a maximum of 4 hours. If the patients were discharged sooner, the data during their stay in the ED was entered into the analysis. The patients were asked about their demographic data and the intensity of pain on the VRS and NVRS upon arrival. Then, at 30, 60, 90, 120, 180, and 240-minute intervals, the pain was evaluated again. The VRS and NVRS results for each patient were documented.

The severity of the pain was measured using a VRS of 0 to 10, with 0 showing no pain and 10 the worst pain the patient could imagine. Moderate pain was defined as 4 - 6, while severe pain was considered to be 7-10. The VRS has been documented to be a valid and reliable instrument when compared with the patient's self-report using the Visual Analog Scale (VAS) in the ED (12).

The modified version of the adult nonverbal pain scale from the University of Rochester Medical Center was used in this study, and was developed for the assessment of pain in intensive care units. It has five dimensions, including facial expression, activity, guarding, physiology (vital signs),

and respiratory (4). The respiratory domain is for patients on ventilators and the physiology domain is not a reliable indicator in the ED, since many patients are anxious. In addition, the physiology domain has been reported to be the weakest performer in this tool (10). Therefore, these domains were removed, and a new category, called pain expression, was added to the modified instrument. Each of the 4 categories is scored from 0 - 2, which results in a total score between 0 and 8 (Table 1).

The pain was categorized from no pain to the worst pain possible (0 no pain; 1 - 2 sore, mild pain; 3-5 moderate pain; 6 - 7 severe pain; 8 most severe pain). The content validity of the modified NVRS was approved by 10 experts; then, it was completed for 20 patients by 2 nurses simultaneously. The inter-observer reliability was 0.8. In addition, the pharmacological and non-pharmacological interventions were also recorded.

3.4. Statistical Analysis

The data were statistically analyzed using SPSS for Windows version 16, and were described by the frequencies, means, and standard deviations. The Pearson product-moment correlations between the VRS and NVRS were calculated to assess the degree of association between them. Relevant subgroup analyses were performed using the two-tailed Student's t-test and Mann-Whitney U test. The pain scores in the different intervals were analyzed using repeated measures, and a significance level of 0.05 was used for all of the tests.

In order to facilitate the analysis, we classified the pain intensity into four categories for the VRS: mild pain (1 - 3 on the VRS), moderate pain (4 - 7 on the VRS), and severe pain (8-10 on the VRS). The three categories for the NVRS included: mild pain (1 on the NVRS), moderate pain (2 - 5 on the NVRS), and severe pain (6 - 8 on the NVRS).

3.5. Ethical Consideration

The ethical committee of the Kashan University of Medical Sciences approved the study protocol. In addition, written informed consent was signed by all subjects, and the patients could exit the study at any time during the research. The subjects' personal information was kept confidential, and the study protocol was based on the Helsinki declaration.

4. Results

The data of 450 patients was included in this study. The majority of the patients ($n = 374$) were male (83.3%), and the mean age of the subjects was 35.2 years-old. Most of the patients (55.1%) arrived at the ED during the morning

shift (8:00 am until 2:00 pm). Overall, the patients suffered mostly from open wounds (42.2%), contusions (18.9%), multiple traumas (12%), and fractures (11.6%). The extremities were the most common painful area (66.2%) (Table 2), and only 33.3% of the patients were brought to the ED by the emergency medical services. Table 2 shows the demographic data of the patients participating in the study.

The mean VRS and NVRS pain intensity ratings upon arrival were $6.16 (\pm 2.63)$ and $3.06 (\pm 2.17)$, respectively. According to the VRS, 70 (15.5%) patients reported the worst pain (score 10), 137 (30.4%) had severe pain (score 7 - 9), 171 (38%) had moderate pain (score 4-6), and 72 (16%) had mild pain (score 1 - 3) upon arrival. On the NVRS, 9 patients had the worst pain (score 8), 71 (15.8%) patients reported severe pain (score 6-7), 147 (32.6%) patients had moderate pain (score 3 - 5), and 188 (41.8%) had mild pain (score 1 - 2), while in 35 patients (7.8%) no pain (score 0) was recorded upon arrival. The estimation of the pain was lower in the NVRS when compared to the VRS, even after considering the differences in the possible maximum score. Overall, the scores in the two tools had a significant correlation (Table 3).

One-hundred and seventy-two patients (38.2%) received interventions for pain relief; 60 patients (13.3%) received analgesics and 112 patients (24.8%) received non-pharmacological interventions, such as stabilization of the injured extremity. The mean time for receiving the first analgesic was $41 (\pm 20.4)$ minutes, with a range of 5 to 90 minutes, while the mean time for receiving the non-pharmacological interventions was $12 (\pm 3.1)$ minutes (range: 5 - 20 minutes).

The pain intensity in the VRS had a significant relationship with the intervention for pain relief upon arrival, and at the 30 and 60-minute intervals. The pain intensity measured by the NVRS had a significant relationship with the intervention at all of the time intervals (Table 4).

The repeated measures analysis showed that nearly 91% of the variability in the pain in the VRS was accounted for by the time interval and not by the intervention (partial eta squared = 0.09, $P = 0.338$). On the NVRS, the 80% pain relief could be accounted for by the time interval ($P = 0.0001$) (Figures 1 and 2).

5. Discussion

The purpose of this study was to compare the VRS and NVRS in the determination of pain severity in traumatic patients in the ED. The results showed that the VRS and NVRS scores had a significant correlation, and both could be used for the estimation of pain in the ED. Overall, the pain severity was less in the NVRS when compared to the VRS. The emergency department is the "shop window" of

Table 1. Modified Nonverbal Rating Scale

Categories	0	1	2
Face	No particular expression or smile	Occasional grimace, tearing, frowning, wrinkled forehead	Frequent grimace, tearing, frowning, wrinkled forehead
Activity (movement)	Lying quietly, normal position	Seeking attention through movement or slow, cautious movement	Restless, excessive activity and/or withdrawal reflexes
Guarding	Lying quietly, no positioning of hands over areas of body	Splinting areas of the body, tense	Rigid, stiff
Pain expression	Expressing no pain	Moaning	Calling or crying

Table 2. Characteristics of the Participants

Demographic Data	Results
Age (years) SD	5.28 (13.53)
Gender (M/F) (%)	83.3/16.7
Kind of trauma, No. (%)	
Fractures	52 (11.6)
Dislocation	39 (8.7)
Sprains/strains	13 (2.9)
Contusions	85 (18.9)
Wounds	190 (42.2)
Burns	17 (3.8)
Multiple kinds	54 (12)
Location of injuries, No. (%)	
Head	47 (10.4)
Extremities	298 (66.2)
Chest	12 (2.7)
Abdominopelvic	24 (5.3)
Back	14 (3.1)
Multiple locations	55 (12.2)
Mechanism of injury: No. (%)	
Fall	85 (18.9)
Accident	149 (33.1)
Fight	41 (9.1)
Sudden hit	152 (33.8)
Other	23 (5.1)
Multiple trauma (yes/no) (%)	27 / 73

healthcare services and, for many patients; it is a first contact place in the hospital. The literature has reported that 78% of ED patients complained of pain and, for these patients, the pain was their chief complaint (13). In this study, the pain severity was almost high at the time of arrival in the ED. Other studies and settings have also reported a high severity of pain in the ED using verbal rating scales (1, 7, 14-

18).

Although the results of several studies have indicated that patients expect pain relief in the ED (1, 19), it has been demonstrated that the under-treatment of pain in the ED can result in undesirable consequences for the patients (5). The majority of the patients in this study reported moderate to severe pain, but did not receive adequate pain man-

Table 3. Correlation Between the VRS and NVRS to Determine the Pain Intensity

Time (Minutes)	VRS	NVRS	R	P Value
Arrival	6.16 ± 2.63	3.06 ± 2.17	0.635	0.0001
30	6.09 ± 2.64	3.10 ± 2.09	0.592	0.0001
60	5.25 ± 2.53	2.62 ± 1.92	0.556	0.0001
90	5.39 ± 2.17	2.29 ± 1.59	0.400	0.0001
120	5.35 ± 2.16	2.23 ± 1.72	0.467	0.0001
180	5.27 ± 2.23	2.13 ± 1.80	0.473	0.0001
240	5.27 ± 2.07	2.07 ± 1.80	0.539	0.0001

Table 4. Interventions According to Pain Intensity on the VRS and NVRS at Different Time Intervals

Pain Intensity at Different Time Intervals (Minutes)	Pain Intervention		P Value
	Yes	No	
Arrival			
VRS	7.47 ± 2.18	5.35 ± 2.56	0.0001
NVRS	4.52 ± 1.91	2.17 ± 1.8	0.0001
30			
VRS	7.23 ± 2.12	5.20 ± 2.67	0.0001
NVRS	4.37 ± 1.84	2.12 ± 1.71	0.0001
60			
VRS	6.21 ± 2.23	5.02 ± 2.66	0.0001
NVRS	3.47 ± 1.94	1.87 ± 1.57	0.0001
90			
VRS	5.37 ± 2.10	5.43 ± 2.28	0.766
NVRS	2.70 ± 1.65	1.76 ± 1.348	0.0001
120			
VRS	5.22 ± 2.13	5.55 ± 2.21	0.826
NVRS	2.66 ± 1.84	1.60 ± 1.30	0.0001
180			
VRS	5.10 ± 2.27	5.63 ± 2.14	0.303
NVRS	2.46 ± 1.92	1.42 ± 1.26	0.002
240			
VRS	5.13 ± 2.08	5.58 ± 2.06	0.439
NVRS	2.37 ± 1.91	1.42 ± 1.347	0.009

agement while in the ED. Duignan and Dunn (5) reported that the mean patient pain intensity (while at rest) was 6.4, while the mean nurse assessment of the patient's pain intensity at rest was 5.2. This score was comparable with our study.

Pain management is well documented as poorly managed in EDs around the world; in addition, analgesia in

EDs is often inadequate with regard to the route, dosage, and frequency (6). Some of this mismanagement might be due to poor pain assessment; however, several barriers to pain assessment in the ED can be overcome by better assessment tools (8). Carroll and Bowsher (8) suggest that pain assessment is the most important part of the nurse's job, since the nurse spends more time with the patient

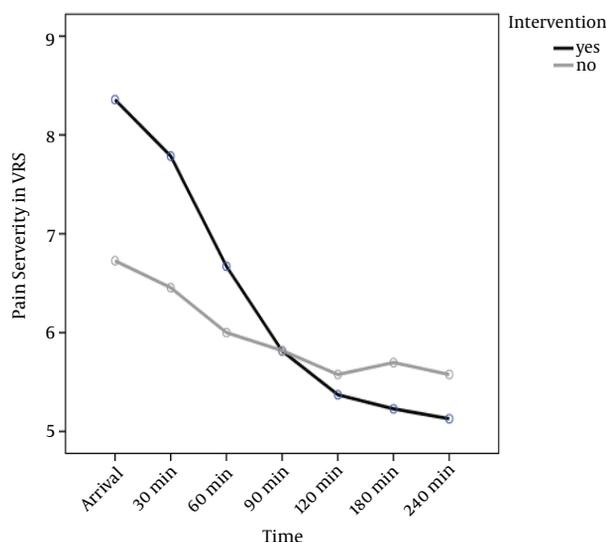


Figure 1. Pain Severity on the VRS According to the Intervention and Time Interval

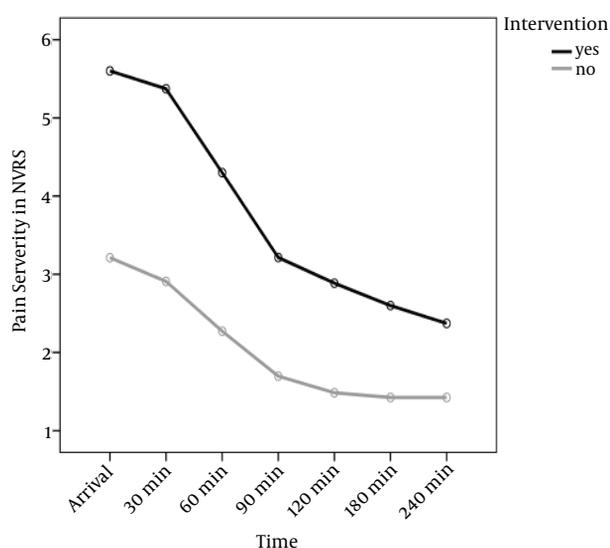


Figure 2. Pain Severity on the NVRS According to the Intervention and Time Interval

than any other team member. Pain and pain assessment have also been identified as being vital for judging a patient's progress, the impact and efficiency of treatment, and for arriving at a proper diagnosis. Overall, pain assessment tools aim to enhance the patient's verbal expression of their suffering, and their subjective experience (8).

Many studies have compared two or three pain assessment tools; for example, Tcherny-Lessenot et al. (13) assessed patients' pain on two scales (numerical descrip-

tor scale or a verbal pain intensity scale), and these two scales were found to be correlated. Among the verbal rating scales, the numeric rating scale (NRS) was found to be a valid instrument for verbal pain assessment in the ED (12). The patients preferred the NRS over the VAS, while the reliability and validity were established in a manner similar to the VAS; furthermore, only 2% failed to understand its use (6). On the other hand, better responsiveness, ease of use, and good applicability were related to the visual analogue scale and verbal rating scale (20). In this study, the mean patient pain intensity rating was found to be 6.16 as evaluated by the VRS, while the mean assessment of the patients' pain intensity as evaluated by the NVRS was 3.06 at the arrival time. The estimation of the pain was lower in the NVRS when compared to the VRS, even after considering the 2 point difference in the possible maximum score.

Puntillo and colleagues (1) found that the triage nurses' ratings were significantly lower, as evaluated by the NRS. In Iran, Modanloo et al. (17) suggested that by increasing the estimation of the patients' pain expression, the nurses reported significantly less pain and, vice versa, when the patients estimated less pain, the nurses estimated more. The differences between the nurses' and patients' pain intensity scores were dependent on the patient's chief complaint (1). Overall, the pain intensity accuracy rates of the ED nurses were less than 50% across the various chief complaints, and patients with musculoskeletal pain had their pain intensity underestimated 95% of the time (1). These studies show the pitfalls of pain assessment in the ED.

Most of the research comparing pain assessment tools in emergency departments has been focused on subjective rating scales, and we did not find any similar research comparing the VRS and NVRS in the ED. In the absence of a gold standard, it is not clear which scale is better in the determination of pain severity in the ED. The NVRS can successfully estimate the pain severity, and had an acceptable correlation with the VRS. It seems that the NVRS can be used in ED, especially for patients with communication problems and those who may not report their pain accurately. Additionally, the NVRS was more successful in the determination of the pain severity changes considering the interventions for pain relief, although it should be considered that this scale might underestimate the pain severity.

This research study has demonstrated that comprehensive adequate pain management remains an elusive goal within the emergency nursing setting. Before any intervention for the treatment of pain, an exact and accurate assessment of pain intensity is crucially important. This study has indicated that the VRS is a useful tool for pain assessment in the ED, and introduced the modified version of the adult nonverbal pain scale for use in the ED to assess pain intensity nonverbally, without patient interference.

Moreover, it is a valid and reliable pain assessment tool for use in the ED. This modified tool expands a nurse's ability for pain assessment, although its usage requires more study.

Acknowledgments

The authors would like to thank the nurses, the staff and, mostly, the trauma patients of the Shahid Beheshti Hospital's ED.

Footnotes

Authors' Contribution: Negin Masoudi Alavi was responsible for the study concept and design, made critical revisions to this paper, participated in the data analysis, and supervised this study. Mohammad Sadegh Aboutalebi participated in study concept, performed the data collection and literature search, and prepared the first draft of the manuscript. Zohre Sadat revised the study draft.

Funding/Support: This study was supported by the deputy of research, Kashan University of Medical Sciences in Kashan, Iran (Grant no: 9392).

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