Original Article

Evaluation of Patients Using Numeric Pain-Rating Scales

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Abstract

Background: The identification of pain as a finding, the assessment of treatment and care decision and success makes its measurement necessary
Aims: The aim of the descriptive design study is to determine assessment differences in numeric rating scales.
Methods: This descriptive study was performed on 360 patients. The data were collected by face-to-face interview technique by the researcher with six numeric rating scales frequently preferred for clinical use. The numeric rating scale questions included four positive evaluations and a negative assessment. Chi-square, Pearson correlation tests were used to evaluate the data.
Results: Patients were 18-80 years of age. The mean age was 48.3±14.7, 95% of the patients weren't informed about the pain assessment. Patients evaluated the 5-item scale as easier to use, quick responsive, sensitivity, and appropriate for clinical applications compared with other scales, and the 101-item scale was rated as a complex scale. Significant differences were found between positive evaluations of numeric rating scales and age, marital status, educational status, having previous surgery, having chronic disease and receiving information about pain assessments.
Conclusions: All scales used in the study correlated with each other. Determinations of patients' perceptions of postoperative pain assessments will contribute to pain management in the clinics.
Keywords numeric pain scales, nurse, pain assessment, patient

Introduction

In 1994, the International Association for the Study of Pain described pain as an unpleasant, sensory and emotional experience associated with current or potential tissue damage (Chamorro, 2016). The American Pain Society (APS) in 1996, and the International Association for the Study of Pain (IASP) in 2001 recognized pain as the 5th vital sign. Findings require an objective assessment of pain and the measurement of pain using a valid scale. Pain should be assessed as part of vital signs when the individual's life signs are obtained (Chamorro 2016; Horgas 2017; Morone&Weiner 2013). This assessment is necessary to determine the appropriate treatment for pain and to ensure successful pain management decisions (McCormick & Law, 2016). Many one-dimensional and multidimensional scales are currently used to measure pain (Carpenito-Moyet, 2012). All aspects, such as location, time, intensity, spread, duration, and quality of the pain; features that start, reduce or increase pain; and findings accompanying pain, should be addressed by using multidimensional scales. The commonly used multidimensional scales include the McGill-Melzack Pain Questionnaire and the McCaffery Pain Questionnaire (IASP, 2005; Strand, Ljunggren, Bogen&Ask, 2008). Multidimensional scales for pain assessment are difficult to understand and long, and this situation limits the use of these scales compared to one-dimensional scales (Eti- Aslan 2002).One-dimensional scales are intended to directly measure pain severity using self-assessment. These scales enable the patient to objectively convert pain severity into numbers, words, facial expressions or colours and remove the different interpretations between the patient and the health care professional. Numeric rating scales (NRSs), verbal rating scales (VRSs), visual analogue scales (VASs) and face pain scales (FPSs) are one-dimensional scales (Eti-Aslan 2002; Hicks, VonBaeyer&Spafford, 2001). The NRS is widely used in clinical practice (Li Liu&Herr, 2007) because it is easy to use and effective (Tandon, et al. 2016) and is a valid and reliable measurement of pain severity. In practice, patients are asked to select the number that best describes their pain severity. Zero indicates no pain, and the highest number is the worst pain imaginable. The NRS that is used in research and the clinic consists of equally spaced scales of 5, 6, 11, 21 or 101 items (Conrad, 2016).Patients' understanding and interpretation of the scale used is important. Different pain scales were found to be appropriate and understandable for pain evaluations in studies that used one-dimensional pain severity scales. However, patients' pain scale preferences were different across variables, such as age, education level, and gender (Ahmad et al 2015; Aziato, Dedey&Marfo 2015; Gagliese, Weizblit&Ellis 2005; Herr, Spratt&Mobily, 2004; Li, Herr&Chen, 2009; Li, Liu & Herr, 2007; Mandysova&Kadleckova, 2015; Tan&Özyurt, 2006; Taylor&Herr, 2003; Yazıcı Sayın&Akyolcu, 2014). No comparative studies of patient evaluations of NRS types were found. The present study was designed to determine patients' evaluations and the affecting factors related to the NRS used in the evaluation of postoperative pain. Comparisons of NRSs using the terms 'as easier to use', 'quicker to respond to', 'more sensitive', and 'more

appropriate for clinical application' and "as a complex" will guide clinical preferences. The present study will help patients choose the right pain treatment and care using effective measurement/identification of patient pain, evaluations of the success of treatment and care, and prevention of postoperative pain, which adversely affects the healing process, and will also be a positive literary contribution related to the subject.

Methods: ***Aims and research questions:***he aim of this study is to determine the assessment differences in NRSs. The following research questions were proposed:

Are there any differences between patients' evaluations of NRS types?Do the evaluations of NRSs change with the descriptive characteristics of the patients?Are repeated measurements of NRS types consistent?Are there correlations between measurements across NRS types?

What are patients' opinions of NRS types?

Design

This study used a descriptive design.: ***Populations and sampling:*** This descriptive study was conducted in Turkey in the surgical clinics of a hospital (general surgery, orthopaedics, urology, cardiovascular surgery, otolaryngology, plastic surgery, neurosurgery, ophthalmology, thoracic surgery) in Central Anatolia. A total of 5670 surgeries were performed in one year in the institution. This number was considered the study population. The sample size was determined to be 360 patients using sampling of a known population. The inclusion criteria for the patients in the study were as follows: being in the postoperative period, experiencing pain, being over 18 years of age, having no visual or auditory impairment, and having no cognitive or psychological illness or disability. The researcher collected the data using face-to-face interviews for an average of 25 minutes.***Data collection and instruments:*** The study was completed between July 1, 2016 and January 30, 2017, and 360 patients were selected using the sampling method according to the order of surgery. The distribution of the patients by clinic was 87 (24.2%) orthopaedics, 61 (16.9%) general surgery, 51 (14.2%) urology, 36 (10.0%) cardiovascular surgery, 32 (8.9%) otolaryngology, 29, 24 (6.7%) neurosurgery, 21 (5.7%) eyes and 19 (5.3%) chest surgery. A questionnaire prepared by the researchers that considered the literature and consisted of 14 questions was used in the survey (Eti-Aslan 2002; Eriksson, Wikström, Arestedt, Fridlund, Broström, 2014). The questionnaire included descriptive characteristics of the patients and evaluations of 6 NRSs that are commonly used in clinics.Patient evaluations of the NRSs were based on four positive and one negative statement. The positive statements according to which the patients were asked to evaluate the scales were "easy to use", "quick response", "sensitivity", and "appropriate for clinical applications", and the negative statement asked about whether the scale was "complex". The patients were asked to describe their current pain severity using the six NRSs before and after the survey form was implemented. The six NRSs used in the study are listed below (Figure 1).***Analysis of data:*** The data are summarized as the number, percentage, mean and standard deviation. The chi-square test evaluated differences between dependent variables according to independent variables. The relationship between scale scores was assessed by the Pearson correlation test.***Ethical process:*** Written permission of the relevant institution and permission of the Necmettin Erbakan University Meram Faculty of Medicines Ethics Committee dated 17.06.2016 and numbered 2016/613 were obtained before starting the research. Informed consent was obtained from all patients who participated in the study.

Results

Descriptive characteristics of the patients: The patients were 18-80 years old, and the mean age was ($\bar{X}$) 48.3 ± 14.7 years. A total of 54.7% of the patients were male, 45.3% were female, 82.2% were married, 28.6% were primary school graduates, 24.4% were literate, 20% were high school graduates, and 51.4% were employed. A total of 54.7% had major surgery, 61.9% had a history of surgery, and 51.7% had chronic disease based on patient health histories. A total of 95.8% of the patients were never informed by the healthcare professionals about pain assessments prior to the research implementation process (Table 1). ***Patients' evaluations of NRSs:*** Patients were asked to evaluate the six NRSs in terms of "easy to use", "quick response", "sensitivity", "appropriate for clinical applications" and "complex". Patients' preferences were matched for ease of use and quick response. A total of 59.4% of the patients stated that NRS-5 was easy to use and allowed a quick response, 59.2% of patients said that it was appropriate for clinical applications. A total of 81.1% of the patients stated that NRS-101 was complex. Patients rated the NRS-5, NRS-6, NRS-11 (0-10) and NRS-11 (0-100) as non-complex (0.0-0.5%). Patients evaluated the NRS as easy to use, quick to respond to, sensitive, and appropriate for clinical applications as the number of items on the scales decreased and evaluated the scales as difficult or complex to understand as the number of items increased (Table 2).***Scale preferences according to descriptive characteristics of the patients:*** Whether patient characteristics affected the evaluations of the scales was investigated, and had a history of surgery, chronic illness and previous information about pain assessment significantly altered the patients' ratings of the scales as easy to use, quick to respond to, sensitive, and appropriate for clinical applications ($p<0.05$) (data not shown). Gender, having a profession and the size of the surgery performed did not significantly impact the scale ratings ($p\geq0.05$). There was a significant difference in perceiving an NRS as complex only for age, education status and receiving information about the pain assessment ($p <0.05$). Other descriptive characteristics did not affect the perception of scale complexity ($p> 0.05$).The preference ratios for the scales with fewer items for positive evaluation statements and the scales containing more items for negative evaluation (the most complex scale) increased with patient age.Married patients' generally preferred the scales with fewer items, singles preferred scales that contained more items. This preference is consistent with our conclusion that singles were younger and had higher education levels.Scales with fewer items were most preferred at all levels of education. However, subjects with undergraduate and higher education degrees preferred scales that contained more items than subjects with lower education levels.Patients with surgical history and chronic illness (with clinical experience) preferred scales with fewer items for positive perception.All patients who received information about the pain assessment did not prefer scales with fewer items, but obtaining information increased the orientation for scales containing more items.A very strong correlation ($0.90 < r <1.00$) in the positive direction was found between scales that were "easy to use", "quick response", "sensitivity to pain measurement", and "appropriate for clinical applications" and patient evaluations. A weak correlation ($0.20 < r <0.39$) was found between the scales that the patients considered complex and that were "easy to use", "quick response", "sensitivity", and "appropriate for clinical applications", and these correlations were significant ($p <0.05$).***Examination of the relationship between NRSs:*** A positive and very strong correlation was found between

NRS-5, NRS-6, NRS-11 (0-100), NRS-21 and NRS-101 (0.90<r<1.00). A positive and moderate correlation (0.40<r<0.69) was found between the NRS-11 (0-10) and the other scales, and the relationship between NRS types was statistically significant (p<0.05) (Table 3). ***Examination of the relationship between repetitive measurements in*** NRSs: Positive and very strong (0.90 < r <1.00) and statistically significant (p<0.05) correlations were found between the two measurements of the NRS-5, NRS-6, NRS-11(0-100), NRS-21 and NRS-101 with 20- to 30-minute intervals when there was consistency between repeated measurements of the scales examined. A positive moderate (0.40 <r <0.69) and significant (p <0.05) correlation was found between the initial and final pain levels on the 11-item scale. The measurements of each of the NRS performed at different times were consistent (Table 4). ***Participants' opinions on the*** **NRSs:** Examination of the participants' opinions revealed that the following: Measuring pain facilitated self-expression (99.4%). The measurement of pain made participants believe the health care professional was interested in his/her pain or treatment (99.4%).Learning what the scale numbers meant from health professionals made the scales more useful (99.2%).It is not sufficient to merely ask the patient to assign numbers for pain severity, but it is also good to observe the numbers (98.6%), and this view may be on a ruler or line (98.3%).Scales with fewer numbers were more easily understood (97.8%).These instruments are needed for pain assessments (97.2%).Verbal expression in addition to the numbers improves patient understanding of the scales (97.2%).Images, such as colours or facial expressions, also improve patients' understanding of the scales 96.9%).Verbal xpression and visuals may be present to improve patient understanding of thescales 95.6%).Expression with numbers makes it easy to identify pain (86.1%).Each of the scales allows for pain diagnosis (69.7%).In contrast, their views on the NRS demonstrated that the following:The NRS was insufficient for the definition of pain alone (56.7%).It is difficult to evaluate pain using numbers (34.2%).Pain cannot be expressed using numbers (3.6%).The scale was perceived as better as the number of items on the scale increased (3.3%).It was revealed to the patients that the number "0" expressed the "absence of pain". Their verbal expressions of the numerical values given for the pain were elicited. Only 78 (21.7%) patients were able to respond to this question, and 282 (78.3%) patients could not think of a verbal response for the numbers. Therefore, patients used the expression "mild pain" for values between 1-6, the expression "I have pain" for values between 1 and 5, the expression "a little" for values between 1 and 4, the expression "moderate pain" for values between 2 and 8, the expression "much pain" for values between 4 and 10, the expression "severe" for values between 5 and 10, the expression "irresistible" for values between 6 and 10, the expression "too much" for values between 7 and 10, and the expression "very severe pain" for values between 9 and 10.Patients' striking opinions for verbal responses of numbers and their expressions are as follows:The numbers should be expressed in words.Verbal expression and visuals with the numbers make the scale more understandable.Number 1 may indicate that there is no pain.Number 10 should be called 'severe pain that cannot be answered'.Numbers 7 through 10 should indicate 'pain medication is needed'.Note.*In this group, 23 of the participants had a bachelor's degree, and one participant had a postgraduate degree. **It was classified according to surgery group in the Ministry of Health of the Republic of Turkey.

Figure 1. Numeric Rating Scale

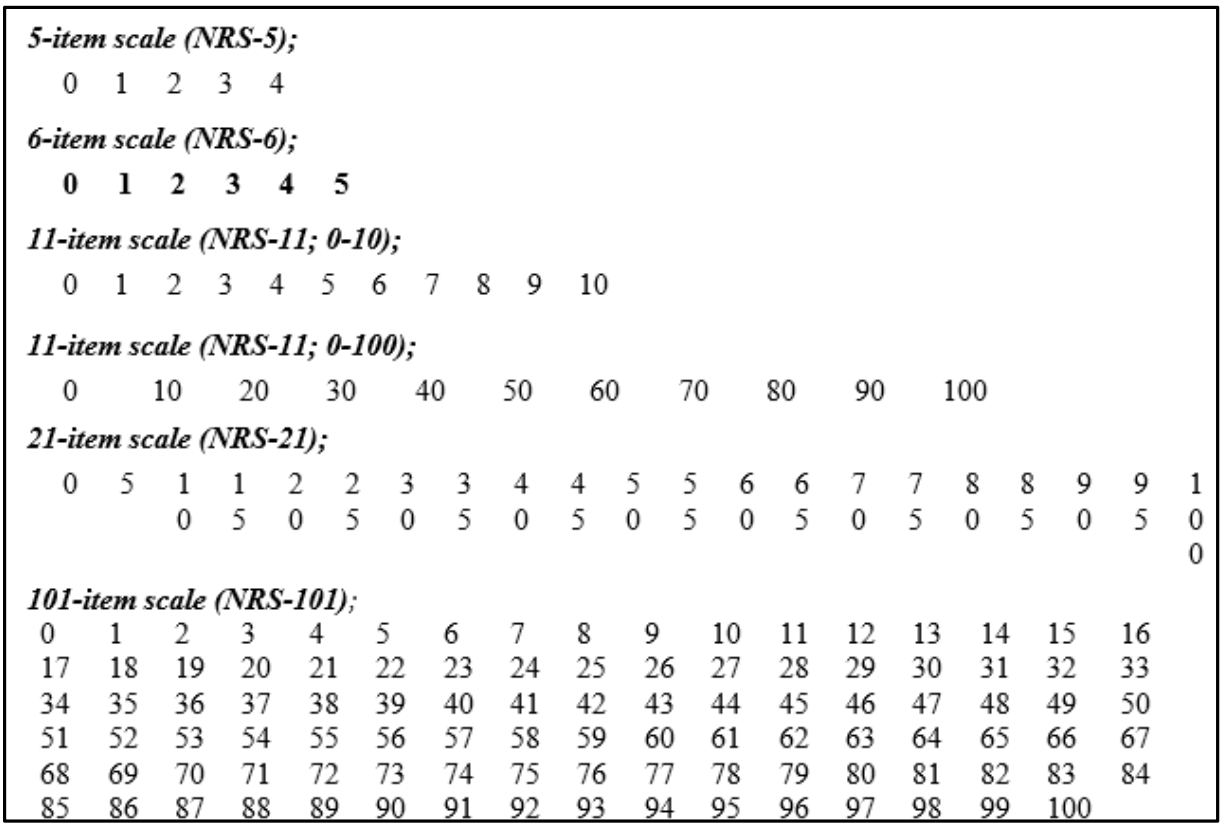

Table 1. Descriptive Characteristics of the Patients (n:360)

Features	n (%)
Age($\bar{X}$: 48.3±14.7)	
18-24 (adolescent)	31 (8.7)
25-44 (young)	111 (30.8)
45-59 (middle age)	116 (32.2)
60-74 (old)	97 (26.9)
75-80 (elderly)	5 (1.4)
Gender	
Male	197 (54.7)
Female	163 (45.3)
Marital status	
Married	296 (82.2)
Single	64 (17.8)
Educational status	
Illiterate	37 (10.3)
Literate	88 (24.4)
Elementary school	103 (28.6)
Secondary school	36 (10.0)
High school	72 (20.0)
Bachelor's degree and postgraduate degree*	24 (6.7)
Having a profession	
Yes	185 (51.4)
No	175 (48.6)
The size of the operation **	
Major operation	197 (54.7)
Middle operation	76 (21.1)
Minor operation	87 (24.2)
Had a history of surgery	
Yes	223 (61.9)
No	137 (38.1)
Having chronic illness	
Yes	186 (51.7)
No	174 (48.3)
Getting information about the pain assessment	
Yes	345 (95.8)
No	15 (4.2)

Note.*In this group, 23 of the participants had a bachelor's degree, and one participant had a postgraduate egree. *It was classified according to surgery group in the Ministry of Health of the Republic of Turkey.

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Table 2. The patients' evaluations regarding to numeric rating scales (n: 360)

Scales	NRS-5		NRS-6		NRS-11 (0-10)		NRS-11 (0-100)		NRS-21		NRS-101	
Expressions	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Easy to use	214	59.4	73	20.3	44	12.2	21	5.8	3	0.8	5	1.4
Quick response	214	59.4	73	20.3	44	12.2	21	5.8	3	0.8	5	1.4
Sensitivity to pain measurement	214	59.4	73	20.3	45	12.5	19	5.3	3	0.8	6	1.7
Appropriate for clinical applications	213	59.2	73	20.3	45	12.5	21	5.8	3	0.8	5	1.4
Complex	2	0.5	-	-	1	0.3	-	-	65	18.1	292	81.1

Table 3. Examination of the Relationship Between NRSs

:ales	**atistical nalysis**	**NRS-5**	**NRS-6**	**NRS-11 (0-10)**	**NRS-11 (0-100)**	**NRS-21**	**NRS-101**
RS-5							
RS-6		0.949 **0.000**					
RS-11 (0-10)		0.580 **0.000**	0.694 **0.000**				
RS-11(0-100)		0.907 **0.000**	0.921 **0.000**	0.578 **0.000**			
RS-21		0.914 **0.000**	0.921 **0.000**	0.575 **0.000**	0.994 **0.000**		
RS-101		0.912 **0.000**	0.926 **0.000**	0.573 **0.000**	0.989 **0.000**	0.993 **0.000**	

Note. * Pearson Correlation Analysis

Table 4. Examination of the Relationship between Repetitive Measurements in NRSs

:ales	**RS-5**	**RS-6**	**RS-11 (0-10)**	**NRS-11 (0-100)**	**NRS-21**	**NRS-101**
			First pain measurement			
nal pain measurement	998 **000**	982 **000**	600 **000**	998 **000**	997 **000**	995 **000**

Note. * Pearson Correlation Analysis

Discussion

Pain assessment and management is an important part of pain research. Numerous studies have been conducted that contribute to the literature in study areas related to the pain assessment scales used in clinics (Li Liu&Herr, 2007; Li et al. 2009; Yazıcı

Sayın&Akyolcu, 2014). However, no studies of patients' perceptions of NRS were performed.

Statistically significant differences were found between age groups, marital status, educational status, having previous surgery, having chronic illnesses and obtaining previous information about the pain assessment according patient evaluations of finding appropriate for clinical applications in the study ($p<0.05$). However, gender, having a profession, and the size of the surgery performed did not have a significant difference ($p\geq0.05$). Significant differences were found between the perception of the complexity of the NRS according to age, education status, and information on pain assessment ($p <0.05$). The scales of other descriptive properties did not affect the complexity perceptions ($p\geq0.05$). Physical and perceptual changes that occur with ageing may affect preference. A significant effect on patient preferences across age was found for one-dimensional scales in a study that supported this study (Yazıcı Sayın&Akyolcu, 2014). Previous studies of an age-scale preference effect using one-dimensional scales of the patients concluded that patient comprehension and preference did not vary with age (Gagliese et al., 2005; Herr et al., 2004; Li Liu&Herr, 2007; Li et al., 2009; Mandysova &Kadleckova, 2015; Peters, Patijn, Lame 2007; Tan & Özyurt, 2006).Gender did not affect patient evaluations on the scales in the present study. Some studies demonstrated that gender did not significantly affect scale preferences, which is consistent with our results (Herr et al., 2004; Li Liu&Herr, 2007; Peters, Patijn, Lame 2007; Taylor and Herr 2003). However, other studies also found that gender significantly influenced the choice and understandability of scales (Ferreira Valente, Riberio&Jensen, 2011; Yazici Sayin&Akyolcu, 2014; Tan&Özyurt, 2006). These different results suggest that the response to pain according to gender may vary depending on pain severity and the scales used to measure pain.In the study, the most positive patient evaluations were for NRS-5, which contained fewer items, and the most complex perception ratio was NRS-101 for all education levels. The difference between education level was significant. The higher the level of education was, the more likely it was that the NRS containing more items would be preferred or not perceived as complex, and the results supported this view. Similarly, previous studies support the conclusion that education significantly affected the one-dimensional scale preferences of the patients (Li et al., 2009, Tan&Özyurt, 2006; Yazıcı Sayın&Akyolcu, 2014). In contrast, previous studies reported that the education level did not significantly influence preference of one-dimensional pain scales (Herr et al., 2004, Li Liu&Herr, 2007, Mandysova&Kadleckova, 2015; Peters, Patijn, Lame 2007). Therefore, the more complex scales may become understandable with increasing education levels.The present study found consistency between repeated measurements of each of the six NRS types(Table 4). The presence of positive intermediate or very strong correlations between the six NRS measurements suggest that the scales may be used interchangeably(Table 3). We did not find a study that examined only the relationship between NRSs when studies that examined the relationship between the scales were examined. A strong correlation was found in studies in which the relationship between NRS and other one-dimensional scales were examined (Bahreini, Jalili&Maradi-Lakeh, 2015; Breivik et al., 2008; Mandysova&Kadleckova 2015). These results suggest that the use of NRS, VRS, VAS and FPS, which is used to measure pain severity, are interchangeable. The opinions of patients about the use of NRSs also support this conclusion.Positive expressions were emphasized, and scale use was found to be useful. Most of the patients were found to be in need of assessment tools to assess pain when the opinions of the patients on the use of NRS were examined in this study. In one study, the vast majority of patients wanted to use a scale to evaluate pain and stated that they could better express their pain by using a scale, which is similar to our study results. A total of 87.3% of the patients stated that they found it very easy to express their pain by using an NRS, the evaluation was not exhausting, and they were confident of the number they indicated (Yazıcı Sayın&Akyolucu, 2014). In a study of patient perceptions of the use of NRSs for postoperative pain assessment, patients stated that "the use of pain scales allows communication between health professionals" and "they think the pain they experience as a way to communicate with health care professionals" (Eriksson et al., 2014). This study is consistent with the literature.Most of the patients in the present study expressed that "telling the scales by the health professionals would make the scale more useful". Most of the patients were not previously informed by health professionals about the use of pain scales (Table 1). Significant differences between the patients who were informed and not informed about the pain assessment suggested that receiving information would improve understanding and make the scales easier to use and that the perception of the complexity of the scales would evaporate for all of the NRSs. The reason health care personnel do not use postoperative pain scales in their studies is that they "see pain as a natural result of surgery". Nurses did not have sufficient knowledge of pain management, and they did not use any scale for assessment but predicted subjective pain (Yılmaz&Gürler, 2011). Taylor and Stanbury (2009) reported that nurses were confident in the pain complaints reported by the patient, and they acted according to their experience in their practice. Changing the behaviours of health professionals may affect the use of scales. These studies and our results suggest that health professionals cannot effectively use the scales because they do not have sufficient information about the use

of NRSs or they cannot spend time informing patients about the scale.Slightly more than half of the patients in the present study stated that an NRS alone was insufficient to define their own pain, and some patients stated that they had difficulties evaluating their pain with NRSs. Therefore, patients in the present study suggested "The addition of visuals and verbal expressions to the written representation of numbers helps to better understand the scales when NRS is used". Tan and Özyurt(2006) stated that patients struggled with interpretation and changes in NRSs. Yazır-Sayın and Akyolcu(2014) emphasized that the scales used should be shorter, simpler, more understandable and supported by numeric, visual and verbal cues to improve patients' understanding, which is similar to our results. In another study, patients wanted to "explain their pain in their own words" and found it insufficient to use only one scale for pain severity (Hanks, 2008). Patients in a study by Eriksson et al.(2014) stated that the use of NRS alone was insufficient, that it was difficult to interpret the NRS, and that it was difficult to assess patients' pain. Another study indicated that there were difficulties in pain assessment with NRSs (Taylor and Stanbury, 2009).

Conclusions: In conclusion, examination of patients' perceptions of the NRS demonstrated that the highest response was given for the NRS-5 for the positive evaluations and the NRS-101 as the complex evaluation. These results demonstrate that scales with fewer items are fegarded as scales that are "easy to use", "quick response", "sensitivity", and "appropriate for clinical applications", while scales that contain more items are perceived as "the most complex scales". Patients perceived the scales more favourably as the number of items in the numerical scales decreased and experienced difficulty in perceiving the scale as the number of items increased. Support of the numeric scale used with verbal-visual expressions/scales will facilitate patient understanding. No education for the use of scales was given in terms of the efficacy of pain management. It is important that patients are informed about the measuring instrument used. Repetition of studies similar to this study in other patient pain groups using other scales that measure pain severity are recommended.

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