Central European Journal of Nursing and Midwifery

Cent Eur J Nurs Midw 2017;8(1):572–579
doi: 10.15452/CEJNM.2017.08.0004

ORIGINAL PAPER

A COMPARISON OF THREE SELF-REPORT PAIN SCALES IN CZECH PATIENTS WITH STROKE

Petra Mandysová[1,2], Adriana Nedvědová[1], Edvard Ehler[2,1]

[1]*Faculty of Health Studies, University of Pardubice, Czech Republic*
[2]*Department of Neurology, Pardubice Hospital, Hospitals of the Pardubice Region, Czech Republic*

Received December 14, 2016; Accepted February 6, 2017.

Abstract

Aim: The first aim was to determine the performance of three self-report pain scales, the combined Visual Analogue Scale / Numerical Rating Scale (VAS/NRS), NRS, and Faces Pain Scale – Revised (FPS-R), in a study on pain in Czech patients with stroke. The second aim was to compare the patients' overall pain scale preference rankings and preference rankings by gender, the location of the brain damage, and cognitive functioning. *Design*: The design was cross-sectional. *Methods:* Eighty hospitalized patients with stroke evaluated their pain using the mentioned scales and subsequently expressed their preference rankings of the scales. The data were described and analysed using descriptive and inferential statistics. *Results*: Nineteen (24%) patients reported pain using at least one scale. Overall, pain intensity scores varied by 0–1 point in 75 (93.8%) patients, and the highest Spearman correlation was 0.997 ($p < 0.001$) between the VAS/NRS and the NRS. Overall, the NRS had the highest preference ranking (it ranked first or second in 75% of the cases). *Conclusion*: Correlations across all three scales were moderate to high; therefore, they appear equivalent. The scales can be recommended for clinical use in patients with stroke, provided they are able to collaborate.

Keywords: stroke, pain scale, Faces Pain Scale – Revised, Numerical Rating Scale, Visual Analogue Scale.

Introduction

Pain is a frequent problem in patients with stroke. First, pain is a common complication after stroke that is linked to fatigue, depression, greater cognitive and functional decline, and reduced quality of life. Several types of post-stroke pain (PSP) exist, such as musculoskeletal pain (including shoulder pain), central post-stroke pain, spasticity-related pain, headache, and complex regional pain syndrome. Additionally, patients with stroke can have pre-existing co-morbidities (e.g. arthritis, or diabetic neuropathy) that may cause pain (Harrison, Field, 2015; Nesbitt et al., 2015; Choi-Kwon et al., 2016; Paolucci et al., 2016).

The reported prevalence of pain in patients with stroke varies due to differences in study designs, definitions of pain types, and the different populations being investigated. In fact, many patients with stroke do not report pain unless asked by the health care provider.

Corresponding author: Petra Mandysová, Faculty of Health Studies, University of Pardubice, Průmyslová 395, Pardubice, Czech Republic, email: Petra.Mandysova@upce.cz

However, assessment of pain in patients with this diagnosis may be quite challenging due to stroke-related clinical problems, such as cognitive, speech, or affective impairments. Finally, even if pain has been identified, its management may not be sufficient (Dogan et al., 2010; Raffaeli et al., 2013; Smith et al., 2013; Harrison, Field, 2015).

Accurate pain assessment is an important part of the nurse's role; in fact, pain has been designated the "fifth vital sign". Because pain is a subjective experience, self-report pain scales are considered the most accurate. An important requirement is that patients understand the request to rate their pain. Alternatively, observational assessment is conducted; for this purpose, numerous behavioural assessment tools have been developed (Gregory, 2015).

Various self-report pain scales exist, such as the verbal rating scale (VRS), the visual analogue scale (VAS), the numerical rating scale (NRS), the faces pain scale (FPS), and the Iowa Pain Thermometer (IPT) (Li et al., 2009; Dogan et al., 2010; Hjermstad et al., 2011). Numerous adaptations of the scales exist. For example, the FPS exists in several versions containing a differing number of faces or face depictions of varying design. Similarly, the VAS

exists with or without numbers, and the NRS exists with or without word anchors (Price et al., 2008; Dogan et al., 2010). The IPT is a modified VRS containing pain descriptors for varying levels of pain intensity that are shown alongside a pain "thermometer" (Li et al., 2009). In addition, an 11-point adaptation of the original 13-point IPT, the Revised Iowa Pain Thermometer (IPT-R) has been developed (IPT-R) (Ware et al., 2015).

Although no specific scale has been developed for the assessment of pain in patients with stroke, the FPS as well as the revised FPS (FPS-R) have been used in several studies for this purpose. Their main advantage is that they are quite easy to administer and do not require speaking, reading, or writing (Tang et al., 2013; Chuang et al., 2014; Harrison, Field, 2015). Speech disorders and inability to complete verbal scales can be encountered especially in patients with left-sided brain damage. In patients with right-sided brain damage, unilateral spatial neglect may develop; such patients tend to ignore anything that is located on one side of their visual field (i.e., generally the left side) and can have difficulty using horizontally presented scale. Therefore, in patients with visuospatial neglect, vertical pain scales are sometimes used (Benaim et al., 2007; Dogan et al., 2010).

In the Czech Republic, the VAS is recommended for assessing spasticity-related PSP (Ehler et al., 2009). However, empirical evidence on the performance of pain scales in Czech patients with stroke is lacking. Similarly, their preference for using the individual pain scales has not yet been described.

Aim

The aim was to compare the performance of three self-report pain scales – the combined VAS/NRS, NRS, and FPS-R – in a study focusing on pain in a cohort of Czech adult patients with stroke. Specifically, the first aim was to examine the relationship between the patients' pain intensity using the above-mentioned three scales and ultimately, to determine whether consistent results could be obtained regardless of the selected pain scale. The second aim was to determine the preference for using the individual pain scales. Part of the aim was to compare the patients' overall preference rankings as well as their preference rankings by gender, the location of the brain damage, and cognitive functioning.

Methods

Design

We conducted a cross-sectional correlational study of adult patients with stroke who were hospitalized in the neurological department of a regional hospital. A pilot study was conducted on 15 patients to test the feasibility of the study design and to verify the clarity of instructions provided to the patients. The instructions were in a written form; however, they were presented by the researcher verbally. The results of the pilot study were not included in the actual study.

Sample

Convenience sampling was used. Eighty-three patients hospitalized with stroke were approached; 3 patients refused to participate. Therefore, the actual study involved 80 patients (38 men; 42 women; average age 71.0 ± 13.7; age range 22–94) with either ischaemic (n = 67) or haemorrhagic (n = 13) stroke. Thirty-nine patients had unilateral brain damage of the left hemisphere (LHD), and 41 patients had unilateral damage of the right hemisphere (RHD). The inclusion criteria were: age ≥ 18 years, willingness to collaborate and sign an informed consent, sufficient level of consciousness (LOC), ability to understand the researcher's instructions. The ability to understand instructions was tested by asking patients to use the pain scales to indicate hypothetical pain intensity according to the researcher's directions. Aetiologies of pain could be varied (either pre-morbid conditions or stroke-related pains).

Data collection

Data were collected in the neurological department of a regional Czech hospital between June and September 2016. First, the patients underwent a brief cognitive exam using the Mini-Cog, which involves a three-word recall task (0–3 points) and a clock-drawing interference task (0 or 2 points); the patient "passes" the test if the total score is ≥ 3 points (McCarten et al., 2011).

Next, the patients were asked to rate their current pain intensity using three self-report pain scales: the combined VAS/NRS, NRS, and the FPS-R. The scales were presented in a horizontal format; the order in which they were shown to the patients rotated according to a set sequence.

A Czech version of the VAS/NRS was used (Hakl, Hřib, 2007). It consists of a black horizontal line with an 11-point scale (0–10 from left to right), a red horizontal V-shaped scale, and two pain descriptors in Czech: one ("without pain") located at the left

"end" of the scale and one ("pain as bad as you can imagine") at the other end. The patients marked a position on the scale that corresponded to their pain intensity. Next, the researcher obtained the pain intensity score by measuring the distance (in centimetres) from the zero end of the scale to the patient's mark. The obtained distance was rounded to the nearest whole number.

The NRS (a Czech version was used) consists of a horizontal 11-point line (0 to 10 from left to right) and the following two Czech word anchors: "no pain" (= 0) and "unbearable pain" (= 10) (Rokyta et al., 2012). The patients made a mark on the scale that represented their pain level.

The FPS-R consists of 6 faces representing no pain to worst pain (International Association for the Study of Pain, IASP, 2014). The patients selected the face that best represented their pain intensity. Subsequently, the corresponding score was determined by the researcher according to the instructions (i.e., from left to right, the faces represent pain intensity = 0, 2, 4, 6, 8, and 10) (IASP, 2014).

Data analysis

The obtained data were entered into a Microsoft Excel spreadsheet, and pain scores and preference rankings were described and summarized using descriptive statistics. Additional computations were conducted using the SPSS 23.0 statistical software (IBM SPSS, Inc., Chicago, Illinois).

The relationship between self-rating pain scales was determined using the Spearman rank order correlation coefficient r_s. The coefficient can range from – 1 to + 1; values ≥ |0.80| represent a very strong relationship, values between |0.30| and |0.80| represent a moderate relationship, and values ≤ |0.30| represent a weak relationship between the two studied variables (Kraska-Miller, 2014). The significance level $\alpha = 0.01$ (set by default in SPSS).

To analyse preference rankings by gender, the location of the brain damage, and cognitive functioning, the patients were always divided into two subgroups: female/male (for gender); LHD/RHD (for the location of the brain damage); normal/abnormal (for cognitive functioning based on the Mini-Cog result). Mann Whitney U Test was used to compare pain scale preference rankings expressed by the three above-mentioned patient subgroups.

Results

Overall, 46 (58%) patients were successful on the Mini-Cog (score ≤ 2); the remaining patients were not. Sixty-one (76%) patients did not have any pain (pain intensity was 0 using all three scales). The remaining 19 (24%) patients reported pain using at least one scale. Eighteen (23%) patients reported pain using all three scales, and an additional patient reported pain using the VAS/NRS and NRS (Table 1). As for the patients who reported pain, their median score as well as the most frequent score (the mode) was the same for the NRS and VAS/NRS: 3 points; for the FPS-R, it was 4 points. The reported pain intensity ranged from 2 to 6 points using the FPS-R and from 1 to 8 points using both the NRS and the VAS/NRS.

Table 1 Overall pain intensity in patients reporting pain

Pain scale	n	median	mode	min.	max.
FPS-R	18	4	4	2	6
NRS	19	3	3	1	8
VAS/NRS	19	3	3	1	8

n – number of respondents; FPS-R – Faces Pain Scale – Revised; NRS – Numerical Rating Scale; VAS/NRS – combined Visual Analogue Scale / Numerical Rating Scale

Comparisons of individual patients' reported pain intensity ratings using the three pain scales revealed that pain intensity scores varied by 0–1 point and 2–4 points in 75 (93.8%) and 5 (6.3%) patients, respectively (Table 2). Spearman correlations reached 0.957 ($p < 0.001$) between the VAS/NRS and the FPS-R, 0.972 ($p < 0.001$) between the NRS and the FPS-R, and 0.997 ($p < 0.001$) between the VAS/NRS and the NRS.

Among the 19 patients reporting pain using at least one pain scale, pain intensity scores varied by 0–1 point in 14 (73.7%) cases and by 2–4 points in 5 (26.3%) cases (Table 2). For these 19 patients, Spearman correlations reached 0.647 ($p = 0.003$) between the VAS/NRS and the FPS-R, 0.744 ($p < 0.001$) between the NRS and the FPS-R, and 0.864 ($p < 0.001$) between the VAS/NRS and the NRS.

As for the patients' preference rankings, the FPS-R was placed first in 37 (46.3%) cases, the NRS in 29 (36.3%) cases, and the VAS/NRS in 14 (17.5%) cases (Table 3). Overall, the NRS was placed either first or second by three quarters of the patients; the FPS-R and the VAS/NRS were placed first or second in slightly more than 60% of the cases.

Table 2 Comparisons of reported pain intensities

Pain score variation (points)	All three scales n (%)	VAS/NRS vs. NRS n (%)*	VAS/NRS vs. FPS-R n (%)*	NRS vs. FPS-R n (%)*
Comparisons of pain intensities in all patients (N = 80)				
0	64 (80.0)	77 (96.3)	64 (80.0)	64 (80.0)
1	11 (13.8)	2 (2.5)	11 (13.8)	13 (16.3)
2	2 (2.5)	0 (0.0)	3 (3.8)	1 (1.3)
3	2 (2.5)	1 (1.3)	1 (1.3)	2 (2.5)
4	1 (1.3)	0 (0.0)	1 (1.3)	0 (0.0)
Total	80 (100.0)	80 (100.0)	80 (100.0)	80 (100.0)
Comparisons of pain intensities in patients reporting pain (N = 19)				
0	3 (15.8)	16 (84.2)	3 (15.8)	3 (15.8)
1	11 (57.9)	2 (10.5)	11 (57.9)	13 (68.4)
2	2 (10.5)	0 (0.0)	3 (15.8)	1 (5.3)
3	2 (10.5)	1 (5.3)	1 (5.3)	2 (10.5)
4	1 (5.3)	0 (0.0)	1 (5.3)	0 (0.0)

*N – total number of respondents; n – number of respondents; NRS – Numerical Rating Scale; FPS-R – Faces Pain Scale – Revised; VAS/NRS – combined Visual Analogue Scale / Numerical Rating Scale; *p = < 0.01*

Table 3 Preference rankings of pain scales (N = 80)

Pain Scale Ranking	FPS-R		NRS		VAS/NRS	
	n (%)	Cumulative n (%)	n (%)	Cumulative n (%)	n (%)	Cumulative n (%)
1st	37 (46.3)	37 (46.3)	29 (36.3)	29 (36.3)	14 (17.5)	14 (17.5)
2nd	12 (15.0)	49 (61.3)	31 (38.8)	60 (75.0)	37 (46.3)	51 (63.8)
3rd	31 (38.8)	80 (100.0)	20 (25.0)	80 (100.0)	29 (36.3)	80 (100.0)

N – total number of respondents; n – number of respondents; NRS – Numerical Rating Scale; FPS-R – Faces Pain Scale – Revised; VAS/NRS – combined Visual Analogue Scale / Numerical Rating Scale

Among women, the FPS-R was the most preferred scale in 9 (21.4%) cases, the NRS in 19 (45.2%) cases, and the VAS/NRS in 14 (33.3%) cases (Table 4). Among men, the FPS-R was the most preferred scale in 28 (73.7%) cases and the NRS in 10 (26.3%) cases; the VAS/NRS was not placed first in any of the cases. According to the Mann Whitney U Test, gender-based difference between pain scale rankings was statistically significant for the FPS-R (U = 226.000; $p < 0.001$) and the VAS/NRS (U = 126.000; $p < 0.001$) (Table 5). For the FPS-R, the ranking was higher for men (Mean Rank = 25.5) than for women (Mean Rank = 54.1); for the VAS/NRS, the ranking was higher for women (Mean Rank = 24.5) than for men (Mean Rank = 58.2). Gender-based difference between the NRS rankings was not statistically significant.

Table 4 Preference rankings of pain scales by gender, the location of the brain damage, and cognitive functioning (N = 80)

Pain Scale Ranking	Pain Scale	Gender		Total (n)	Brain Damage		Total (n)	Cognitive functioning		Total (n)
		Female n (%)	Male n (%)		RHD n (%)	LHD n (%)		NORM n (%)	ABN n (%)	
1	FPS-R	9 (21.4)	28 (73.7)	37	18 (43.9)	19 (48.7)	37	23 (50.0)	14 (41.2)	37
	NRS	19 (45.2)	10 (26.3)	29	18 (43.9)	11 (28.2)	29	14 (30.4)	15 (44.1)	29
	VAS/NRS	14 (33.3)	0 (0.0)	14	5 (12.2)	9 (23.1)	14	9 (19.6)	5 (14.7)	14
	Total (n)	42	38	80	41	39	80	46	34	80
2	FPS-R	2 (4.8)	10 (26.3)	12	8 (19.5)	4 (10.3)	12	7 (15.2)	5 (14.7)	12
	NRS	12 (28.6)	19 (50.0)	31	15 (36.6)	16 (41.0)	31	22 (47.8)	9 (26.5)	31
	VAS/NRS	28 (66.7)	9 (23.7)	37	18 (43.9)	19 (48.7)	37	17 (37.0)	20 (58.8)	37
	Total (n)	42	38	80	41	39	80	46	34	80
3	FPS-R	31 (73.8)	0 (0.0)	31	15 (36.6)	16 (41.0)	31	16 (34.8)	15 (44.1)	31
	NRS	11 (26.2)	9 (23.7)	20	8 (19.5)	12 (30.8)	20	10 (21.7)	10 (29.4)	20
	VAS/NRS	0 (0.0)	29 (76.3)	29	18 (43.9)	11 (28.2)	29	20 (43.5)	9 (26.5)	29
	Total (n)	42	38	80	41	39	80	46	34	80

ABN – abnormal; FPS-R – Faces Pain Scale – Revised; LHD – left hemisphere damage; N – total number of respondents; n – number of respondents; NORM – normal; NRS – Numerical Rating Scale; RHD – right hemisphere damage; VAS/NRS – combined Visual Analogue Scale/Numerical Rating Scale

Among patients with RHD, the FPS-R was the most preferred scale in 18 (43.9%) cases, and so was the NRS (Table 4). The VAS/NRS was the most preferred scale in 5 (12.2%) cases. As for patients with LHD, the FPS-R was the most preferred scale in 19 (48.7%) cases, the NRS in 11 (28.2%) cases, and the VAS/NRS in 9 (23.1%) cases. Based on the Mann Whitney U Test, the difference between pain scale rankings expressed by patients with RHD and LHD was not statistically significant for any of the three scales (Table 5).

Among patients with normal cognitive functioning, the FPS-R was the most preferred scale in 23 (50.0%) cases, the NRS in 14 (30.4%) cases, and the VAS/NRS in 9 (19.6%) cases (Table 4). Among patients with abnormal cognitive functioning, the FPS-R was the most preferred scale in 14 (41.2%) cases, the NRS in 15 (44.1%) cases, and the VAS/NRS in 5 (14.7%) cases. The Mann Whitney U Test revealed that the difference between pain scale rankings expressed by patients with normal and abnormal cognitive functioning was not statistically significant for any of the three scales (Table 5).

Table 5 Comparison of pain scale preference rankings by gender, the location of the brain damage, and cognitive functioning (N = 80)

Comparison of pain scale preference rankings by gender						
Ranked Pain Scale	**Women n**	**Women mean of ranks**	**Men n**	**Men mean of ranks**	**U**	**p-value**
FPS-R	42	54.1	38	25.5	226.000	**0.000**
NRS	42	38.1	38	43.1	697.500	0.302
VAS/NRS	42	24.5	38	58.2	126.000	**0.000**
Comparison of pain scale preference rankings by the location of the brain damage						
Ranked Pain Scale	**RHD n**	**RHD mean of ranks**	**LHD n**	**LHD mean of ranks**	**U**	**p-value**
FPS-R	41	40.6	39	40.4	795.000	0.962
NRS	41	36.8	39	44.4	648.000	0.120
VAS/NRS	41	44.4	39	36.4	640.500	0.097
Comparison of pain scale preference rankings by cognitive functioning						
Ranked Pain Scale	**NORM n**	**NORM mean of ranks**	**ABN n**	**ABN mean of ranks**	**U**	**p-value**
FPS-R	46	38.7	34	42.9	700.500	0.387
NRS	46	41.4	34	39.3	740.000	0.663
VAS/NRS	46	42.4	34	38.0	696.500	0.366

ABN – abnormal; FPS-R – Faces Pain Scale – Revised; LHD – left hemisphere damage; N – total number of respondents; n – number of respondents; NORM – normal; NRS – Numerical Rating Scale; p-value – level of significance; RHD – right hemisphere damage; U – Mann Whitney U Test Statistic; VAS/NRS – combined Visual Analogue Scale / Numerical Rating Scale; U – Mann Whitney U Test Statistic

Discussion

The study explored the use of three pain scales in Czech patients with stroke from two related perspectives. First, it studied the equivalency of pain intensity levels across the scales, and by doing so it aimed to determine whether consistent results could be obtained regardless of the selected pain scale. Second, the study aimed to find out which of the scales the patients preferred.

An important finding emerged already at the time of patient enrolment: all patients were able to understand instructions for the use of pain scales, regardless of their Mini-Cog result. Previous studies on pain scales in patients with stroke (e.g. Benaim et al., 2007; Chuang et al., 2014) typically excluded patients with cognitive deficits. However, according to previous research, cognitive impairment practically did not inhibit older adults' ability to use a variety of pain scales including the FPS, the NRS, and the VRS (Taylor et al., 2005). Similarly, a review of the literature on pain assessment in patients with dementia concluded that the VRS, the horizontal VAS, and the FPS could be administered even to patients in a more advanced stage of the disease (Scherder, Plooij, 2012).

Minimum and maximum pain scores as well as the mode and median were identical for only two of the scales (VAS/NRS and NRS); however, the discrepancy observed between these two scales and the FPS-R can be partially explained by the fact that the FPS-R scoring options do not include even numbers. Overall, the pain intensity levels were identical (i.e., pain intensity varied by 0 points) in most (80–96.3%) patients and, the relationship between the scales was strong ($r_s \geq 0.957$) and statistically significant for all paired comparisons. However, the findings supporting the idea that the three scales are equivalent were affected by the fact that most patients did not have pain.

Among patients with pain, the pain intensity levels were identical in most patients (84.2%) for only two scales (VAS/NRS and NRS). Still, for the other paired pain scale comparisons among patients with pain, the scores varied by more than one point in approximately one fifth of the cases at most. The relationship between the scales was moderate to strong (r_s = 0.647–0.864) and statistically significant for all paired comparisons. Hence, the results unequivocally support the idea that the VAS/NRS and NRS are equivalent in patients with stroke regardless of their cognitive functioning as long as the patients have a sufficient level of consciousness and are able to understand instructions concerning the correct use of the scales. The FPS-R was reasonably equivalent as well, more so in comparison with the NRS (r_s = 0.744) than with the VAS/NRS (r_s = 0.647).

Moderate to high correlations were obtained in several other studies focusing on the relationship between various self-report pain scales (including the FPS, VAS, VRS, and NRS) in patients with stroke. However, the studies did not always use identical versions of the scales. For example, Benaim et al. (2007) and Dogan et al. (2010) used the vertical FPS with 7 facial expressions, whereas we used the horizontal FPS-R containing 6 faces.

As for the second aim, overall, the patients' opinion concerning the FPS-R preference ranking was not uniform. The FPS-R was ranked first by the highest number of patients; simultaneously, it was ranked last by the highest number of patients as well. Overall, the NRS appeared to be the most preferred scale – it was ranked first or second by the highest number of patients (75%).

The comparison of pain scale preference rankings by gender, the location of the brain damage, and cognitive functioning revealed statistically significant differences only for gender-based results concerning the FPS-R and the VAS/NRS. Almost three quarters of the men indicated that the FPS-R was the most preferred scale, and the scale was placed second by all the remaining men. On the other hand, for almost three quarters of the women, the FPS-R was the least preferred scale. It was the NRS that was ranked first by the highest number of women (45.2%).

Our findings were partially congruent with those reported by other researchers. A Spanish study on pain scale preference among the elderly found that men preferred the FPS-R (Miró et al., 2005), which is identical to our findings. A study conducted with Czech women after gynaecological surgery revealed that the NRS was the most preferred scale (in 43% of the cases) (Mandysová, Kadlečková, 2015), which is almost identical to our findings as well. Still, other previously published gender-based results are in stark contrast to our results. For example, according to the mentioned Spanish study, the FPS-R was the most preferred scale not only among men but also among women (Miró et al., 2005).

As for the comparisons of scale preference rankings by the location of the brain damage, patients with LHD placed the FPS-R either first or last in slightly more cases than patients with RHD. The NRS was placed first by patients with RHD rather than by patients with LHD. Overall, the VAS/NRS was placed first in a fairly small number of cases.

There is only partial agreement between our results and the results of the mentioned study of patients with stroke, conducted in France (Benaim et al., 2007). While the FPS was the most preferred scale in patients with LHD (50%), which is comparable to our findings, the VAS was the most preferred scale in patients with RHD (46%), which is in disagreement with our findings. The discrepancy may have been related to the fact that different versions of the pain scales were used (e.g., the horizontal 6-face FPS-R and the VAS/NRS in our study versus the vertical 7-face FPS and the VAS in the French study). As mentioned, patients with RHD may ignore anything that is located on one side of their visual field. Therefore, patients in our study may have found using the FPS-R and the VAS/NRS difficult. Conversely, Benaim et al.'s study (2007) avoided any possible problems due to visual field deficits by presenting the scales vertically. The NRS contains less visual information and is based on numbers that increase in value from left to right in a predictable way; therefore, patients in our study may have found the scale easier.

Comparisons of pain scale preference rankings by cognitive function revealed that most patients with abnormal Mini-Cog (44.1%) preferred the FPS-R, whereas most patients with normal Mini-Cog (43.5%) preferred the VAS/NRS. In a Chinese study conducted with older patients after surgery, most patients with cognitive impairment (52.4%) preferred the FPS-R as well; on the other hand, most patients without cognitive impairment (53.3%) preferred the IPT, considerably fewer patients (24.3%) preferred the FPS-R, and even fewer patients (18.1%) preferred the NRS (Li et al., 2009). However, caution is required when performing the comparisons as in the above mentioned Chinese study, the VAS/NRS was not among the used pain scales. Furthermore, the study used the Mini Mental State Examination (rather than the Mini-Cog) to assess cognitive function. Overall, any comparisons are of limited value as in

most studies, patients select the most preferred pain scale from a rather narrow range of options (typically, they consider 2–3 scales).

The study's limitation is the sample size and the fact that purposive sampling was used. Because of this, we could not use the chi-square test of association to discover if there was a relationship between scale preference and gender, the location of the brain damage, and cognitive functioning. In addition, patients with stroke who have a decreased LOC or who have communication difficulties resulting from the stroke may require other pain assessment methods, e.g. observational measurement (Nesbitt et al., 2015). However, apart from assessing the patients' LOC and their ability to collaborate, communication difficulties were not examined in greater depth. Finally, patients were not tested for visuospatial neglect.

Nonetheless, the sample size was large enough to provide unequivocal results concerning the relationship between pain intensity levels as in all cases, it was statistically significant. The results indicate that any of the studied scales (the VAS/NRS, NRS, and FPS-R) could be used in patients with stroke who are able to collaborate and communicate. At the same time, further research may be necessary to more clearly determine scale preference from the patients' viewpoint.

Conclusion

The study aimed to compare the performance of three self-report pain scales, the combined VAS/NRS, NRS, and FPS-R, in a study on pain in Czech patients with stroke and to determine whether they are equivalent. The second aim was to compare the patients' overall pain scale preference rankings and preference rankings by gender, the location of the brain damage, and cognitive functioning.

An important conclusion is that provided that patients with stroke are able to collaborate, they can use self-report scales. The reported pain scores across the three scales correlated reasonably well. The VAS/NRS and the NRS appeared equivalent, and to a great extent, so did the FPS-R and the NRS.

Preference rankings did not reveal unequivocal results. Overall, the NRS appeared to be the most preferred scale. However, men preferred mainly the FPS-R. To some extent, our findings supported the conclusions of earlier studies. However, in most cases, other study populations and other versions of the pain scales were involved.

The findings have implications for use in clinical practice in all acute care departments where patients with stroke receive treatment and care, mainly in departments of neurology and rehabilitation. While the study complements findings concerning the use of pain scales in Czech patients, it is relevant from the international point of view as well because research on pain assessment in patients with stroke has received only limited attention. Further validation of the findings may be beneficial.

Ethical aspects and conflict of interest

The study was conducted in agreement with ethical recommendations set out in the Declaration of Helsinki of 1964, as revised in 2013, and it was approved by the Ethics Committee at the Faculty of Health Studies, University of Pardubice. All participants were informed of the purpose of the study and of the fact that participation was voluntary. All of them agreed to be included in the research, which they expressed by signing the informed consent form. All data were treated as confidential. The authors declare that the study has no conflict of interest.

The study was funded by the Internal Grant Agency of the University of Pardubice (grant SGS 2016005).

Author contribution

Conception and design (PM, AN), data collection (AN), data analysis and interpretation (PM, AN), draft of the manuscript (PM), critical revision of the manuscript (AN, EE), final version of the manuscript (PM).

References

Benaim C, Froger J, Cazottes C, Gueben D, Porte M, Desnuelle C, Pelissier JY. Use of the Faces Pain Scale by left and right hemispheric stroke patients. *Pain.* 2007;128(1–2):52–58.

Choi-Kwon S, Choi SH, Suh M, Choi S, Cho KH, Nah HW, Song H, Kim JS. Musculoskeletal and central pain at 1 year post-stroke: associated factors and impact on quality of life. *Acta Neurologica Scandinavica*. 2016 Jun 6. doi: 10.1111/ane.12617. [Epub ahead of print].

Chuang LL, Wu CY, Lin KC, Hsieh CJ. Relative and absolute reliability of a vertical numerical pain rating scale supplemented with a faces pain scale after stroke. *Physical Therapy*. 2014;94(1):129–138.

Dogan SK, Ay S, Oztuna D, Aytur YK, Evcik D. The utility of the Faces Pain Scale in the assessment of shoulder pain in Turkish stroke patients: its relation with quality of life and psychologic status. *International Journal of Rehabilitation Research*. 2010;33(4):363–367.

Ehler E, Vaňásková E, Štětkářová I. Standard komplexní léčby spasticity po cévní mozkové příhodě. *Česká a slovenská neurologie a neurochirurgie*. 2009;72/105(2):179–181. (in Czech)

Gregory J. The complexity of pain assessment in older people. *Nursing Older People*. 2015;27(8):16–21.

Hakl M, Hřib R. Farmakoterapie léčby onkologické bolesti. *Interní medicína*. 2007;9(6):299–300. (in Czech)
Harrison RA, Field TS. Post stroke pain: identification, assessment, and therapy. *Cerebrovascular Diseases*. 2015;39(3–4):190–201.
Hjermstad MJ, Fayers PM, Haugen DF, Caraceni A, Hanks GW, Loge JH, Fainsinger R, Aass N, Kaasa S; European Palliative Care Research Collaborative (EPCRC). Studies comparing Numerical Rating Scales, Verbal Rating Scales, and Visual Analogue Scales for assessment of pain intensity in adults: a systematic literature review. *Journal of Pain and Symptom Management*. 2011;41(6):1073–1093.
International Association for the Study of Pain. *Face Pain Scale – Revised home*. Washington, D.C.: International Association for the Study of Pain; 2014 [cited 2015 Jun 16]. Available from: http://www.iasp-pain.org/Education/Content.aspx?ItemNumber=1519&navItemNumber=577
Kraska-Miller M. *Nonparametric statistics for social and behavioral sciences*. Boca Raton, FL: CRC Press Taylor & Francis Group; 2014.
Li L, Herr K, Chen P. Postoperative pain assessment with three intensity scales in Chinese elders. *Journal of Nursing Scholarship*. 2009;41(3):241–249.
Mandysová P, Kadlečková Z. The performance of three pain intensity scales and their preferences among Czech women with acute postoperative pain. *Central European Journal of Nursing and Midwifery*. 2015;6(3):298–305.
McCarten JR, Anderson P, Kuskowski MA, McPherson SE, Borson S. Screening for cognitive impairment in an elderly veteran population: acceptability and results using different versions of the Mini-Cog. *Journal of the American Geriatrics Society*. 2011;59(2):309–313.
Miró J, Huguet A, Nieto R, Paredes S, Baos J. Evaluation of reliability, validity, and preference for a pain intensity scale for use with the elderly. *Journal of Pain*. 2005;6(11):727–735.
Nesbitt J, Moxham S, Ramadurai G, Williams L. Improving pain assessment and management in stroke patients. *BMJ Quality Improvement Reports*. 2015;4(1):u203375.w3105.
Paolucci S, Iosa M, Toni D, Barbanti P, Bovi P, Cavallini A, Candeloro E, Mancini A, Mancuso M, Monaco S, Pieroni A, Recchia S, Sessa M, Strambo D, Tinazzi M, Cruccu G, Truini A; Neuropathic pain special interest group of the Italian Neurological Society. Prevalence and time course of post-stroke pain: a multicenter prospective hospital-based study. *Pain Medicine*. 2016;17(5):924–930.
Price DD, Patel R, Robinson ME, Staud R. Characteristics of electronic visual analogue and numerical scales for ratings of experimental pain in health subjects and fibromyalgia patients. *Pain*. 2008;140(1):158–166.
Raffaeli W, Minella CE, Magnani F, Sarti D. Population-based study of central post-stroke pain in Rimini district, Italy. *Journal of Pain Research*. 2013;6:705–711.
Rokyta R, Kršiak M, Kozák J. *Bolest.* 2. vyd. Praha: Tigis; 2012. (in Czech)
Scherder EJ, Plooij B. Assessment and management of pain, with particular emphasis on central neuropathic pain, in moderate to severe dementia. *Drugs and Aging.* 2012;29(9):701–706.
Smith JH, Bottemiller KL, Flemming KD, Michael Cutrer F, Strand EA. Inability to self-report pain after a stroke: a population-based study. *Pain*. 2013;154(8):1281–1286.
Tang WK, Liang H, Mok V, Ungvari GS, Wong KS. Is pain associated with suicidality in stroke? *Archives of Physical Medicine and Rehabilitation.* 2013;94(5):863–866.
Taylor LJ, Harris J, Epps CD, Herr K. Psychometric evaluation of selected pain intensity scales for use with cognitively impaired and cognitively intact older adults. *Rehabilitation Nursing*. 2005;30(2):55–61.
Ware LJ, Herr KA, Booker SS, Dotson K, Key J, Poindexter N, Pyles G, Siler B, Packard A. Psychometric evaluation of the Revised Iowa Pain Thermometer (IPT-R) in a aample of diverse cognitively intact and impaired older adults: a pilot study. *Pain Management Nursing*. 2015;16(4):475–482.

