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COMPARING DIAGNOSTIC ACCURACY OF DIRECT QUESTIONING *VERSUS* SCHEMATIC EVALUATION OF CHRONIC PAIN LOCALIZATION

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SUMMARY – None of the previous studies localized pain in comparison with graphic scheme. Our aim was to investigate the validity of direct questioning about the main pain localization in comparison with schematic evaluation. In this cross-sectional study, 331 patients, mean age 49.4±10.72 years, localized their main pain site anatomically with manikin and by direct questioning. Two methods were employed to localize pain: direct questioning and schematic evaluation (manikin). Sensitivity, specificity, accuracy, positive predictive value (PPV), negative predictive value (NPV), positive likelihood ratio (PLR), negative likelihood ratio (NLR) and odds ratio (OR) were used to compare these two methods. Study patients answered in both methods. The sensitivity and PPV were mostly in a weak range, while accuracy, specificity and NPV were mostly in good range. Kappa index was in the marginal reproducibility range. Pain in the left part of the body had a higher OR (OR=9). PLR for pain in the right part of the body was 28.03. NLR for all questions was located in the small and rarely important change probability group. Negative answer in direct questioning was more reliable than a positive one. Pain localization in the left side of the body was more reliable.

Key words: *Manikins; Chronic pain; Pain measurement; Surveys and questionnaires; Data accuracy; Iran*

Introduction

Chronic pain is a major health problem[1,2] and is known to be very common in the community[2,3]. It is also one of the routine causes of physician referral. Fast and exact localization can help the physician diagnose the origin of pain and plan to treat it as soon as possible. There are some studies checking validity and reliability of different questionnaires assessing different types of pain in Iranian patients[4-6]. However, none of them localized pain in comparison with graphic scheme. Two main questionnaires have been used for localizing pain by researchers. Some researchers have used written questionnaire (direct questioning) and others have used a manikin (schematic questioning)[7-10]. The manikin can be seen as an attractive component that gives some variation in questionnaire surveys[7] and can be used at all levels of education and cultures. Comparing the accuracy of written questionnaire with a manikin can help physicians and researchers choose a manikin or written question-

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naire. The aim of this study was to assess the validity of direct questioning in comparison with a manikin (the gold standard questionnaire) to evaluate the main pain localization in patients with chronic pain.

Material and Methods

A cross-sectional study was performed in the Khatam-Al-Anbia Pain Clinic, Tehran, Iran, between 2008 and 2010. Three hundred and thirty-one patients between 16 and 83 years of age with chronic pain were enrolled in the study. The study protocol was approved by the Ethics Committee of the Shefa Research Center, Khatam Alanbia Hospital. An informed written consent was obtained by all patients before enrollment in the study. The researcher filled out the questionnaire with patient demographic data, quality and quantity of pain, and patient medical history. The visual analogue scale (VAS) was used to quantify pain. We had two main variables in this research: "schematic questioning" and "direct questioning". In the schematic questioning, patients pointed the main pain site on the manikin (Fig. 1). Direct questioning consisted of eleven main questions and each question consisted of three sub-questions (right, middle and left side of the body).

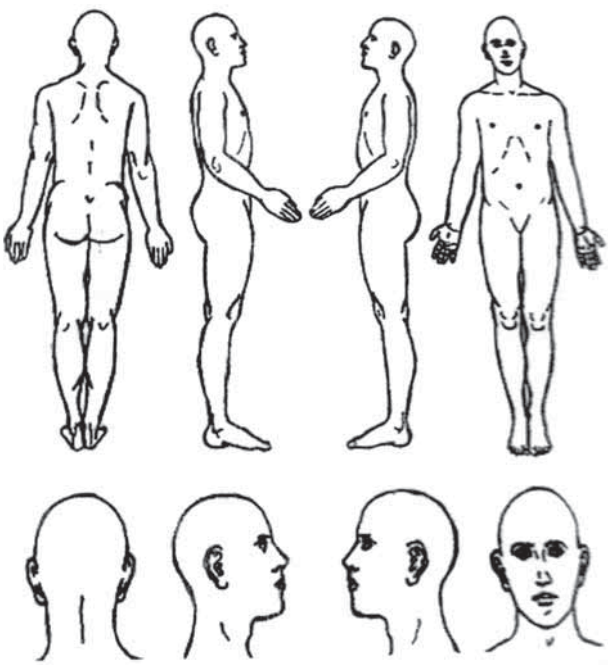

Fig. 1. Schematic figure for localizing pain (pain manikin).

These eleven questions were as follows: 1) head, face and mouth; 2) neck and throat; 3) shoulder, arm and hand; 4) chest and upper back; 5) abdomen; 6) lower back and gluteal; 7) pubic area and leg; 8) pelvic area; 9) genital area and rectum; 10) multiple joints; and 11) whole body pain (Table 1).

All quantitative variables were expressed as mean ± standard deviation (SD). To compare the answers in these two questionnaires, we set schematic questioning as our gold standard (in this study) and compared direct questioning results with schematic questioning using the parameters of sensitivity, specificity, accuracy, positive predictive value (PPV), negative predictive value (NPV), positive likelihood ratio (PLR), negative likelihood ratio (NLR) and odds ratio (OR) with their 95% confidence interval (95% CI). Firstly, we determined true-positive, true-negative, false-positive and false-negative items and then calculated all indices. We also analyzed data by kappa to find the ratio of agreement between schematic questioning and direct questioning. There was no missing values in these variables.

We categorized the diagnostic accuracy indices (sensitivity, specificity, accuracy, PPV and NPV) as good (>0.8), acceptable (0.6-0.8) and weak (lower than 0.6). The reason to be more preoccupied than usual by these cut-offs was that we were comparing symptoms in the same patient by two different methods of questioning. So, we expected higher agreement than in usual situations such as agreement between two observers, two measurements at two different times in one sample, and similar examples. Considering categorization of likelihood ratios, PLR greater than 10 or NLR less than 0.1 generate large and often conclusive changes from direct questioning to schematic evaluation probability[11,12]. PLR between 5 and 10 or NLR between 0.2 and 0.1 generate moderate changes from direct questioning to schematic evaluation probability[11,12]. PLR from 2 to 5 and NLR from 0.5 to 0.2 result in small (but sometimes important) shifts in probability, and likelihood ratios from 0.5 to 2 result in small and rarely important changes in probability[11,12]. Also kappa index was categorized in three groups: excellent reproducibility (kappa >0.75), good reproducibility ($0.4 \leq K \leq 0.75$) and marginal reproducibility ($0 \leq K < 0.4$)[13].

Considering OR, we divided it into three groups: OR ≥3, high agreement; 2≤ OR <3, borderline agreement; and OR <2, low agreement.

Table 1. Direct question: which parts of your body you feel pain in?

Specify the main pain location			
Head, face and mouth	Left	Middle	Right
Neck and throat	Left	Middle	Right
Shoulder, arm and hand	Left	Middle	Right
Chest and upper back	Left	Middle	Right
Abdomen	Left	Middle	Right
Lower back and gluteus	Left	Middle	Right
Pubic region and leg	Left	Middle	Right
Pelvic area	Left	Middle	Right
Genital and rectal area	Left	Middle	Right
Multiple joints	Left	Middle	Right
Whole body pain	Left	Middle	Right

Considering type I error (α) = 0.05, the sensitivity, specificity and PLR were equal to 0.8, 0.8 and 2.74, respectively; total sample size estimated to be 331 according to the PLR formula for calculating sample size.

All statistical tests were done by SPSS 21.0 software. The value of $p<0.05$ was considered significant in all analyses.

Table 2. Basic characteristics of patients referred due to pain in one part of the body

Variable	Value
Age, mean (±SD) (yrs)	49.4±10.7
VAS, mean (±SD)	6.74±2.3
Male sex, n (%)	60 (18.1%)
Education, %	
Illiterate	7.6
Primary school (5-year education)	18.4
Secondary school (11-year education)	31.4
University degree	21.5
Occupation, %	
Housewife	28.2
Office worker	38.8
Worker	9
Farmer	2.7
Other	21.3
Marital status, n (%)	
Single	17 (5.2)
Married	300 (91.2)
Widowed	6 (1.8)
Divorced	5 (1.5)

n = number; SD = standard deviation; VAS = visual analogue scale

Results

The study included 331 patients with chronic pain. The mean patient age was 49.4±10.72 years. Among them, 81.9% were female, 91.2% were married and 39.8% had secondary school (11 years of education) (Table 2). The mean VAS score was 6.7.

The results on all indices were reported from 33 questions. Sensitivity was good in one question, acceptable in five, and under 0.6 in 27 remaining questions (Table 3). When we grouped the answers according to regions (left, right or middle part of the body) or total anatomical part (head and neck, trunk and limb), we found that three areas such as the right and left parts of the body and the limbs were in good range, and the other three areas were in acceptable range (Table 4). Good sensitivity was recorded for the left pubic/leg (82.2%; 95% CI: 74.7, 87.8), indicating that 82.2% of patients who really suffered pain in the left pubic/leg area (according to schematic questioning) expressed their pain on direct questioning as well. The lowest score for sensitivity was recorded for the left side of the body and it was 18.2% (95% CI: 8.6, 34.4), indicating that just 18.2% of patients who really had any pain in the left side of the body (according to schematic questioning) expressed their pain on direct questioning (Table 4).

Measuring the specificity of patient answers showed that most of them were in good range and just four answers were in the acceptable range. The highest specificity was 99% (95% CI: 97.1, 99.7), which was related to the right and left side of the body, meaning that 99% of patients who really did not have any pain in the right side of the body (according to schematic questioning) said they did not have pain in this area on direct questioning. The specificity for the left leg and pubic area was 61.4% (95% CI: 54.5, 67.8) as the lowest score (Table 4).

We also calculated PPV, which was more practical in clinic in comparison with sensitivity and specificity. We found that 13 answers were in acceptable range and other questions were under 0.6. The PPV of pa-

Table 3. Diagnostic value and 95% confidence interval of direct questioning in comparison with schematic evaluation of pain localization according to the exact anatomic site in patients suffering from pain

	Sensitivity (95%CI)	Specificity (95%CI)	PPV (95%CI)	NPV (95%CI)	Accuracy (95%CI)	PLR (95%CI)	NLR (95%CI)	OR (95% CI)	Kappa
Left part of head, face and mouth	68.3 (55.8, 78.7)	88.6 (84.2, 91.8)	68.3 (55.8, 78.7)	88.5 (84.2, 91.8)	84.8 (80.6, 88.3)	7.73 (4.80, 12.46)	0.47 (0.36, 0.61)	0.61 (0.33, 1.12)	0.52
Middle part of head, face and mouth	52 (41, 62.8)	88.6 (84.1, 91.9)	58 (46.2, 68.9)	85.9 (81.1, 89.6)	80.1 (75.4, 84)	4.55 (3.04, 6.82)	0.54 (0.43, 0.69)	0.78 (0.46, 1.31)	0.42
Right part of head, face and mouth	60.3 (48.4, 71.1)	92.4 (88.6, 95.0)	67.2 (54.8, 77.7)	90 (85.8, 93)	85.8 (81.6, 89.2)	7.93 (4.99, 12.60)	0.43 (0.32, 0.58)	0.74 (0.39, 1.37)	0.55
Left part of neck and throat	42.5 (28.5, 57.8)	90 (86, 93)	37 (24.5, 51.4)	91.9 (88.2, 94.6)	84.3 (80, 87.8)	4.26 (2.59, 7.03)	0.64 (0.49, 0.83)	1.26 (0.70, 2.28)	0.31
Middle part of neck and throat	45.6 (35.7, 55.8)	89.2 (84.7, 92.5)	61.2 (49.2, 72)	81.4 (76.31, 85.7)	77.3 (72.5, 81.5)	4.22 (2.75, 6.48)	0.61 (0.50, 0.74)	0.53 (0.32, 0.87)	0.38
Right part of neck and throat	46 (31.0, 61.6)	91.5 (87.8, 94.2)	40.5 (27, 55.5)	93.1 (89.6, 95.5)	86.4 (82.3, 89.7)	5.40 (3.24, 9.02)	0.59 (0.44, 0.80)	1.25 (0.67, 2.37)	0.35
Left part of shoulder, arm and hand	63.9 (54.5, 72.3)	78.9 (73.1, 83.8)	59.5 (50.4, 68)	81.7 (76.2, 86.4)	74 (69, 78.4)	3.03 (2.27, 4.06)	0.46 (0.35, 0.59)	1.21 (0.77, 1.89)	0.42
Middle part of shoulder, arm and hand	29.7 (17.5, 45.8)	95.6 (92.6, 97.4)	45.8 (27.9, 64.9)	91.5 (87.9, 94.2)	88.2 (84.3, 91.3)	6.72 (3.25, 13.90)	0.74 (0.60, 0.91)	0.50 (0.24, 1.01)	0.29
Right part of shoulder, arm and hand	61.5 (52.1, 70.1)	82 (76.4, 86.5)	62.6 (53.2, 71.2)	81.2 (75.6, 85.8)	75.2 (70.3, 79.6)	3.41 (2.48, 4.69)	0.47 (0.37, 0.60)	0.95 (0.60, 1.50)	0.44
Left part of chest and upper back	45.2 (33.4, 57.5)	91.4 (87.5, 94.2)	54.9 (41.4, 67.7)	87.9 (83.5, 91.2)	82.8 (78.3, 86.5)	5.28 (3.28, 8.51)	0.60 (0.48, 0.75)	0.68 (0.38, 1.18)	0.39
Middle part of chest and upper back	45.4 (33, 58.5)	87.7 (83.3, 91)	42.4 (30.6, 55.1)	89 (84.7, 92.2)	80.7 (76.1, 84.7)	3.69 (2.41, 5.66)	0.62 (0.49, 0.80)	0.88 (0.52, 1.49)	0.32
Right part of chest and upper back	58.3 (42.2, 72.9)	91.5 (87.8, 94.2)	45.6 (32.2, 59.8)	94.7 (91.5, 96.8)	87.9 (84, 91)	6.88 (4.32, 10.97)	0.46 (0.31, 0.67)	0.60 (0.29, 1.18)	0.44
Left part of abdomen	50 (29.9, 70.1)	95.8 (93, 97.5)	43.5 (25.6, 63.2)	96.8 (94.1, 98.2)	93 (89.8, 95.3)	11.96 (6.00, 23.83)	0.52 (0.34, 0.81)	0.77 (0.30, 1.90)	0.43
Middle part of abdomen	46.2 (31.6, 61.4)	97.6 (95.1, 98.8)	72 (52.4, 85.7)	93.1 (89.7, 95.5)	91.5 (88, 94.1)	19.25 (8.59, 43.13)	0.55 (0.41, 0.74)	3.00 (1.23, 8.35)	0.52
Right part of abdomen	56.5 (36.8, 74.4)	95.4 (92.5, 97.3)	48.2 (30.7, 66)	96.7 (94, 98.2)	92.8 (89.4, 95.1)	12.44 (6.66, 23.23)	0.46 (0.29, 0.73)	0.71 (0.28, 1.73)	0.48
Left part of lower back and gluteus	49.4 (39, 59.8)	82.9 (77.7, 87.1)	50 (39.5, 60.5)	82.6 (77.4, 86.8)	74.3 (69.4, 78.7)	2.89 (2.04, 4.10)	0.61 (0.49, 0.76)	1.02 (0.65, 1.61)	0.32
Middle part of lower back and gluteus	61.1 (52.5, 69)	78 (72.8, 83.2)	64.5 (55.8, 72.4)	75.4 (69.1, 80.7)	71.3 (66.2, 75.9)	2.78 (2.07, 3.73)	0.50 (0.40, 0.63)	1.19 (0.77, 1.82)	0.39
Right part of lower back and gluteus	49.4 (39.3, 59.6)	85.1 (80.1, 89.1)	55 (44.1, 65.4)	82.1 (76.8, 86.3)	75.5 (70.6, 79.8)	3.32 (2.30, 4.80)	0.60 (0.48, 0.73)	1.25 (0.79, 1.99)	0.36
Left part of pubic and leg area	82.2 (74.7, 87.8)	61.4 (54.5, 67.8)	57.6 (50.4, 64.5)	84.4 (77.6, 89.3)	69.5 (64.3, 74.2)	2.13 (1.76, 2.58)	0.29 (0.20, 0.43)	0.29 (0.18, 0.47)	0.40
Middle part of pubic and leg are	38.5 (24.9, 54.1)	88 (83.8, 91.2)	30 (19.1, 43.6)	91.5 (87.6, 94.2)	82.2 (77.7, 85.9)	3.21 (1.94, 5.31)	0.70 (0.55, 0.90)	0.69 (0.39, 1.19)	0.24
Right part of pubic and leg area	79 (71.3, 85)	68.7 (61.9, 74.7)	62.9 (55.3, 69.8)	82.9 (76.4, 87.9)	72.8 (67.8, 77.3)	2.52 (2.02, 3.16)	0.30 (0.22, 0.43)	0.45 (0.28, 0.72)	0.46
Left part of pelvic area	28.3 (18.5, 40.8)	96.7 (93.8, 98.2)	65.4 (46.2, 80.6)	85.9 (81.6, 89.4)	84.3 (80, 87.8)	8.53 (4.00, 18.21)	0.74 (0.63, 0.87)	4.78 (2.30, 11.15)	0.32
Middle part of pelvic area	18.5 (10.4, 30.8)	98.2 (95.8, 99.2)	66.7 (41.7, 84.8)	86.1 (81.8, 89.5)	85.2 (81, 88.6)	10.26 (3.65, 28.83)	0.83 (0.73, 0.94)	8.80 (3.50, 28.44)	0.24
Right part of pelvic area	23.7 (14.7, 36)	97.1 (94.3, 98.5)	63.6 (43, 80.3)	85.4 (81.1, 88.9)	84 (79.6, 87.6)	8.07 (3.55, 18.35)	0.79 (0.68, 0.91)	5.63 (2.62, 13.82)	0.28
Left part of genital and rectum area	42.9 (24.5, 63.4)	97.1 (94.6, 98.5)	50 (29, 71)	96.2 (93.4, 97.8)	93.7 (90.5, 95.8)	14.76 (6.56, 33.23)	0.59 (0.41, 0.85)	1.33 (0.52, 3.58)	0.44
Middle part of genital and rectum area	40.6 (25.5, 57.7)	97 (94.4, 98.4)	59.1 (38.7, 76.7)	93.8 (90.6, 96)	91.5 (88, 94.1)	13.50 (6.26, 29.08)	0.61 (0.46, 0.82)	2.11 (0.91, 5.30)	0.44

	Sensitivity (95%CI)	Specificity (95%CI)	PPV (95%CI)	NPV (95%CI)	Accuracy (95%CI)	PLR (95%CI)	NLR (95%CI)	OR (95% CI)	Kappa
Right part of genital and rectum area	41.7 (24.5, 61.2)	97.1 (94.5, 98.4)	55.6 (31.7, 72.7)	95.5 (92.6, 97.3)	93 (89.8, 95.3)	14.21 (6.39, 31.60)	0.60 (0.43, 0.84)	1.75 (0.69, 4.81)	0.43
Multiple joints in the left side	22.9 (13.3, 36.5)	93.6 (90.2, 95.9)	37.9 (22.7, 56)	87.8 (83.6, 91)	83.4 (79, 87)	3.60 (1.82, 7.15)	0.82 (0.70, 0.96)	2.06 (1.14, 3.84)	0.20
Multiple joints in the mid side	22.7 (10.1, 43.4)	97.7 (95.4, 98.9)	41.7 (19.3, 68)	94.7 (91.6, 96.6)	92.8 (89.4, 95.1)	10.03 (3.46, 29.05)	0.79 (0.63, 0.99)	2.43 (0.96, 6.93)	0.26
Multiple joints in the right side	27.9 (16.8, 42.7)	94.8 (91.6, 96.8)	44.4 (27.6, 62.7)	89.8 (85.9, 92.7)	86.1 (82, 89.4)	5.36 (2.692, 10.66)	0.76 (0.63, 0.92)	2.07 (1.08, 4.12)	0.27
Left part of whole body pain	18.2 (8.6, 34.4)	99 (97.1, 99.7)	66.7 (35.4, 87.9)	91.6 (88.1, 94.2)	90.9 (87.4, 93.6)	18.06 (4.74, 68.87)	0.83 (0.70, 0.97)	9.00 (2.77, 46.35)	0.25
Middle part of whole body pain	26.1 (12.6, 46.5)	98.7 (96.7, 99.5)	60 (31.3, 83.2)	94.7 (91.7, 96.7)	93.7 (90.5, 95.8)	20.09 (6.10, 66.17)	0.75 (0.59, 0.96)	4.25 (1.39, 17.36)	0.34
Right part of whole body pain	28.1 (15.6, 45.4)	99 (97.1, 99.7)	75 (46.8, 91.1)	92.8 (89.4, 95.2)	92.2 (88.7, 94.6)	28.03 (8.00, 98.31)	0.73 (0.58, 0.90)	7.67 (2.32, 39.89)	0.38

All values are expressed as percentages except for PLR and NLR; 95%CI = 95% confidence interval; PPV = positive predictive value; NPV = negative predictive value; OR = odds ratio; PLR = positive likelihood ratio; NLR = negative likelihood ratio; p<0.001 all.

Shading legend:

Sensitivity, specificity, accuracy, PPV, NPV:

good | acceptable | weak

PLR and NLR:

large and often conclusive changes in probability | moderate changes in probability | small changes in probability | small and rarely important changes in probability

Kappa:

excellent reproducibility | good reproducibility | marginal reproducibility

OR:

high agreement | borderline agreement | low agreement

tients with pain in the right side of the body was 75% (95% CI: 46.8, 91.1) as the highest score, and in clinical practice it means that if patients with pain were asked the question: do you have any pain in the right side of the body? and answered "YES", the possibility of correct answer was 75%. The lowest score of 30% was recorded for the middle leg/pubic area (Table 3).

Another index we calculated was NPV and it was found to be as useful as PPV in clinical practice. In NPV, all answers were in good range except for the answer to the question about pain in the "middle gluteal and lower back area", with the lowest score of 75.4% (95% CI: 69.1, 80.7), meaning that the possibility of correction of negative answer to the clinician's question about pain in this region was 75.4%. Moreover, the highest score was recorded for the answer to the right abdomen pain question, with 96% for NPV (Table 3).

Another index we calculated was accuracy and this index was within good range in 25 answers and within acceptable range in eight answers. The highest value was related to the answers to two questions: pain in "middle of the body" and "left side of genital area and rectum" with 93.7% (95% CI: 90.5, 95.8) accuracy each. Comparing direct questioning with schematic questioning about pain in these two areas, this index indicated that 93.7% of patients answered the questions correctly. Also, the lowest accuracy value of 69.5% was related to the answer to the question about pain in the left leg and pubic area (95% CI: 64.3, 74.2). The accuracy of combined variables was in the acceptable range. The lowest accuracy of 71.6% was related to the trunk (95% CI: 66.5, 76.2) (Table 4).

The kappa index was in good reproducibility in 14 answers and in marginal reproducibility in other groups. The mean kappa was 0.37. The kappa index for the right part of head, face and mouth was 0.55, indicating that the degree of coordination of the answers to direct questioning with schematic questioning was 55% (Table 4).

We also calculated OR index in this study. Higher OR shows higher agreement between two types of

Table 4. Diagnostic value and 95% confidence interval of direct questioning in comparison with schematic evaluation of pain localization according to regions (left, right or middle part of the body) or total anatomic part (head and neck, trunk and limb) in patients suffering from pain

	Sensitivity (95%CI*)	Specificity (95%CI)	PPV (95%CI)	NPV (95%CI)	Accuracy (95%CI)	PLR (95%CI)	NLR (95%CI)	OR (95% CI)	Kappa
Left part	88.7 (84, 92.1)	46.2 (36.4, 56.3)	80.8 (75.6, 85.2)	61.4 (49.7, 72)	76.7 (71.9, 81)	1.65 (1.36, 2.00)	0.24 (0.16, 0.38)	0.54 (0.33, 0.88)	0.38
Midline	78.5 (72.4, 83.6)	61.1 (52.4, 69.2)	76.7 (70.5, 81.9)	63.6 (54.8, 71.7)	71.9 (66.8, 76.5)	2.02 (1.60, 2.54)	0.35 (0.26, 0.47)	0.90 (0.58, 1.38)	0.40
Right part	84.2 (79.1, 88.3)	54.4 (44.2, 64.3)	83.2 (78, 87.4)	56.3 (45.8, 66.3)	76.1 (71.3, 80.4)	1.85 (1.47, 2.33)	0.29 (0.20, 0.41)	0.93 (0.58, 1.48)	0.39
Head and neck	75 (67.4, 81.3)	79.2 (72.8, 84.5)	74.5 (66.9, 80.8)	79.7 (73.2, 84.9)	77.3 (72.5, 81.5)	3.61 (2.68, 4.86)	0.32 (0.24, 0.42)	0.97 (0.60, 1.57)	0.54
Trunk	75 (68.9, 80.3)	64.9 (55.6, 73.1)	80.9 (74.9, 85.7)	56.7 (48, 65)	71.6 (66.5, 76.2)	2.14 (1.64, 2.78)	0.38 (0.30, 0.50)	1.41 (0.92, 2.18)	0.38
Limb	86.7 (81.8, 90.4)	47.2 (37.3, 57.4)	81.2 (76, 85.6)	57.3 (46, 67.9)	75.8 (70.9, 80.1)	1.64 (1.34, 2.01)	0.28 (0.19, 0.42)	0.67 (0.41, 1.06)	0.36

All values are expressed as percentages except for PLR and NLR; 95%CI = 95% confidence interval; PPV = positive predictive value; NPV = negative predictive value; OR = odds ratio; PLR = positive likelihood ratio; NLR = negative likelihood ratio; p<0.001 all.

Shading legend:

Sensitivity, specificity, accuracy, PPV, NPV:

good	acceptable	weak

PLR and NLR:

large and often conclusive changes in probability	moderate changes in probability	small changes in probability	small and rarely important changes in probability

Kappa:

excellent reproducibility	good reproducibility	marginal reproducibility

OR:

high agreement	borderline agreement	low agreement

questioning (direct *versus* schematic questioning). According to this index, just eight answers were in the high agreement group. The maximum value of OR=9 (95% CI: 2.77, 46.35) referred to the left part of whole body pain, meaning that the odds of expressing the presence or absence of pain (concordance cells in the χ^2 table) in this region were nine times higher than contradictory expressing of pain (different expression of pain on direct questioning and schematic questioning). So, there was higher agreement with OR lower than nine compared to other situations.

The results of PLR tell us that 13 questions were in small change probability, eleven questions were in conclusive change probability, and in moderate change probability in another nine questions. The left pubic and leg area was one of the questions in the small change probability group with PLR=2.13, meaning that positive answer to the main pain in this location moderately increased the probability of true pain existing in this region. The PLR for the right part of whole body pain as a large change group representative was 28.03. It means that the ratio of the presence of pain to its absence at this location based on direct questioning, when there was pain according to schematic questioning, was 28.03.

The last calculated index was NLR. Out of 33 questions, 25 questions were in the small and rarely important probability group, and eight questions were in the small change group. The left part of the pubic and leg region NLR was 0.29, meaning that negative answer in this location moderately decreased the probability of real pain in this location. The ratio of absence of pain to its presence in this location was 0.29 on direct questioning, when there actually was no pain according to schematic questioning.

Discussion

Our findings showed that out of 33 answers on each index, one answer in sensitivity, 29 answers in

specificity, no answer in PPV, and all answers in NPV were in good range. Kappa index was in good reproducibility in 14 answers and OR was in the good agreement group in 5 answers. PLR in 20 answers and NLR in none of the answers were in the conclusive or moderate change probability group.

Sensitivity was weak in 27 items and it showed that most of the patients who indicated a specific point in the graph as the main pain source did not specify it in the direct questioning method. So, we concluded that unmatched answers may occur due to the lack of focus to direct questioning as the second questioning technique.

Unlike sensitivity, specificity index was in a good range in most of the items. Thus, we believe that negative answers to most of the questions were more reliable than positive ones. This finding is completely in discordance with a previous study reporting poor specificity for shoulder pain[14].

Sensitivity and specificity are population-based indexes. However, clinicians need indexes that are interpretable at the individual level. Therefore, we also calculated PPV and NPV, which explain the probability that subjects with/without pain on direct questioning may actually have/have not reported it on a manikin. In our study, the PPV in 20 items was in the weak range, meaning that asking about the main pain through direct questioning in a clinic is not a reliable method for determining it and patients answer inaccurately to the clinician's questions. Also, as shown in Table 4, we found that PPV for the head and neck regional pain was lowest, i.e. pain localization was poor, and it may be a consequence of the common nerve supply of this region. NPV was in good range in all questions except for one question and we can trust the patients' negative answers.

The prevalence and severity of pain is different in various parts of the body[3,15], and it can affect the prevalence-dependent indexes such as PPV and NPV. One of the reasons that our indexes were different for particular parts of the body could be the variable prevalence and severity of pain in different parts.

Considering accuracy, we did not have any answers in weak range. Most of the items were in good range, so we can conclude that if we ask patients just by the direct questioning method, the answer is correct most of the time.

We calculated the likelihood ratio because it was the best item of diagnostic evaluation. PLR expresses the change in odds favoring the presence of pain location given a positive test. The highest PLR of 28.03 was detected for the right part of whole body pain. Based on this PLR, if a clinician suspected that patient had pain in any location and showed it on the manikin, it would increase the probability of true localization to 99.6%.

According to OR results, it seems that the odds of localizing the genital region pain on the manikin was better than true answers to direct questioning, maybe due to the shame to talk about that but showing it on the manikin is easier. It was one of our logics for selecting pain drawing as a gold standard. Moreover, it is easier for everybody to understand, and seems logical for children, illiterates and persons with different languages. Although some studies have shown acceptable repeatability for pain drawing[10], other authors believe that it is less than acceptable for clinical practice[16].

Similar to various validity indexes in different parts of the body found in our study, one study of musculoskeletal pain has also shown that different body regions have different test-retest reliability for the measurement of pain distribution and location[17].

Kappa showed direct questioning as the gold standard, while these two methods of measuring pain were not in agreement at all. This finding needs special attention because our measurements were our starting point of therapy management. When these measurements were not in agreement, we may have identified both of them mistakenly. Van den Hoven *et al*. report on 75% mean agreement between two types of questions and this agreement was not different according to sex. However, in older age and low education groups, the agreement was reduced. They have considered written questions as the main inquiry method and compared the use of a manikin with direct questioning, which is inverse to our design[7]. Another study has also shown higher agreement between different questionnaires and pain manikin than our study, and it may be due to the more localized pain (knee pain) in a different setting (primary care)[18]. We evaluated pain in different parts of the body and in a referral setting. Anyhow, their findings were better than our kappa (0.37)[7,18]. One reason for such a low kappa in our study could be the low importance of pain drawing, even quantitatively, on classifying the cause of pain using artificial neural network[19]. Previous studies as-

sessed a questionnaire of detecting diabetic neuropathy in comparison with quantitative scorings[20], peripheral neuropathic pain with different causes[21], and work-related musculoskeletal pain[22]. However, similar studies in the field of chronic pain are rare despite our expectation. So, our results may be useful for many researchers and clinicians in this field.

The strength of our study was using multiple statistical parameters for comparing two types of questionnaires. Moreover, we considered these different indexes for different anatomic sites of the body with different classifications (single components or complex parts). Moreover, we used both sides of the manikin (back and front) to evaluate the pain location, like some other studies[7,9,14,19], which is more logical than using only the front side of the manikin.

Our study had some limitations. There was a verification bias. It means that despite the patients' vision importance in seeing the manikin and selecting the real pain point, we did not check the vision of patients during the study. Gender bias may be another bias because women were the majority of study patients. However, a previous study has shown that agreement between two methods is not sex dependent[7]. Another source of bias in our study could be the disease spectrum bias. The mean (±SD) VAS was 6.74±2.28, meaning that most patients were in the range of high intensity pain, and this range of pain intensity may have influenced our findings.

Conclusion

In the holistic view, we understood that the status of specificity in comparison with sensitivity and of NPV in comparison with PPV was better, meaning that negative answers were more reliable than positive ones. Additionally, pain on the left side of the body was better localized.

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Sažetak

USPOREDBA DIJAGNOSTIČKE TOČNOSTI IZRAVNOG ISPITIVANJA I SHEMATSKE PROCJENE LOKALIZACIJE KRONIČNE BOLI

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Dosad nisu objavljene studije u kojima bi se lokalizacija boli uspoređivala s grafičkim prikazom. Cilj našega istraživanja bio je ispitati vrijednost izravnog ispitivanja o glavnom bolnom dijelu tijela u usporedbi s procjenom na shematskom prikazu. Ova križna studija uključila je 331 bolesnika srednje dobi 49,4±10,72 godina; bolesnici su pokazali glavno bolno mjesto na shematskom antomskom modelu ljudskog tijela i opisali ga izravnim ispitivanjem. Dakle, dvije metode su primijenjene za lokaliziranje boli: izravno ispitivanje i shematski anatomski model ljudskog tijela. Osjetljivost, specifičnost, točnost, pozitivna prediktivna vrijednost (PPV), negativna prediktivna vrijednost (NPV), pozitivni omjer vjerojatnosti (PLR), negativni omjer vjerojatnosti (NLR) i omjer izgleda (OR) primijenjeni su u usporedbi dviju metoda. Bolesnici su svoje odgovore dali pomoću obiju metoda. Osjetljivost i PPV uglavnom su bili u nižem rasponu, dok su točnost, specifičnost i NPV bili u dobrom rasponu. Indeks kappa bio je u graničnom rasponu reproducibilnosti. Bol u lijevom dijelu tijela pokazala je viši OR (OR=9). PLR za bol u desnom dijelu tijela bio je 28,03. NLR za sva pitanja bio je u skupini manje i rijetko važne promjene vjerojatnosti. Negativni odgovor kod izravnog ispitivanja bio je pouzdaniji od pozitivnog odgovora. Lokalizacija boli na lijevoj strani tijela bila je pouzdanija.

Ključne riječi: *Anatomski modeli; Kronična bol; Bol, mjerenje; Ankete i upitnici; Podaci; Kronična bol; Anketa i upitnik; Točnost podataka; Iran*