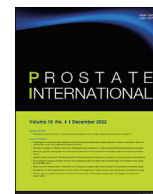




Contents lists available at ScienceDirect

Prostate International

journal homepage: <https://www.journals.elsevier.com/prostate-international>

Research Article

Comparison of three questionnaire forms used in the diagnosis of lower urinary tract symptoms: A prospective study

Muhammet Guzelsoy*, Anil Erkan, Murat Ozturk, Salim Zengin, Soner Coban, Ali R. Turkoglu, Akif Koc

Department of Urology, Bursa Yuksek Ihtisas Education and Research Hospital, University of Health Sciences, Bursa, Turkey

ARTICLE INFO

Article history:

Received 1 April 2022

Received in revised form

16 May 2022

Accepted 1 June 2022

Available online 9 June 2022

Keywords:

Education

Lower urinary tract symptoms

Patient health questionnaire

Prostate

Prostatic hyperplasia

ABSTRACT

Purpose: Questionnaire forms (QFs) are used in the evaluation of all patients presenting with lower urinary tract symptoms (LUTSs). Our study aims to investigate the compatibility of the three QFs with each other and to investigate the relationship between education level and complete completion of these forms.

Materials and methods: A total of 224 patients between February 2018 and February 2019 were included. The patients were divided into 3 groups as primary, intermediate, and advanced according to their education level and the patients who gave incomplete answers to the questions were determined.

Results: The mean age of the patients was $61.0 \pm 7.57(45-85)$, International Prostate Symptom Score (IPSS) value was $16.2 \pm 8.3(1-35)$, the international incontinence form–male lower urinary tract symptoms (ICIQ-MLUTS) value was $16.5 \pm 7.9(0-38)$, the visual prostate symptom score (VPSS) value was $9.9 \pm 3.0(3-16)$. There was a significant correlation between the three QFs ($P < 0.05$). The correlation between IPSS and ICIQ-MLUTS was strong ($r = 0.745$). The incomplete response rate was 32.1% ($n = 72$) in ICIQ-MLUTS, 16.5% ($n = 37$) in VPSS, and 10.7% ($n = 24$) in IPSS ($P < 0.05$). The incomplete response rate was not affected by education. The rate of patients who could be questioned with ICIQ-MLUTS but not with the other two QFs varied between 12.9% and 85.2%, depending on the symptoms.

Conclusions: Each QF has its advantages and disadvantages. The strong correlation between IPSS and ICIQ-MLUTS found in our study indicates that these tools can be used interchangeably in daily clinical practice. ICIQ-MLUTS can evaluate symptoms that are not present in other QFs. In the evaluation of illiterate patients, VPSS should be used without any alternative.

© 2022 Asian Pacific Prostate Society. Publishing services by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

Lower urinary tract symptoms (LUTSs) are one of the most common clinical manifestations in men, their frequency increases with age and are often associated with prostate enlargement.¹ Prostate, which grows macroscopically with aging, leads to bladder outlet obstruction over time. The clinical symptoms occurring in this picture are called LUTS. Interestingly, the number of patients diagnosed with benign prostate hyperplasia (BPH) has been increasing over the years.² In addition, there are many diseases (ureter lower end stone, urinary tract infection, bladder

tumor, foreign body, urethral strictures, etc.) that cause LUTS. Therefore, the guidelines recommend that the patient presenting with LUTS should be evaluated with anamnesis, questionnaire forms (QFs), physical examination including digital rectal examination, urinalysis, prostate specific antigen (PSA), kidney function tests, uroflowmetry, and post-voiding residual urine volume (PVR).³

In the evaluation of male LUTS, the International Prostate Symptom Score (IPSS),⁴ the international consultation on incontinence questionnaire–male lower urinary tract symptoms (ICIQ-MLUTS),⁵ and the visual prostate symptom score (VPSS)⁶ are frequently used QFs. IPSS consists of 8 questions, 7 of which question storage and voiding functions, and 1 question about the quality of life (QoL).⁴ ICIQ-MLUTS consists of 13 questions analyzing the storage, voiding, and post-voiding symptoms and each question has its question about Qo.⁵ VPSS is a form in which

* Corresponding author. Department of Urology, Bursa Yuksek Ihtisas Education and Research Hospital, University of Health Sciences, Mimar Sinan Mah, Emniyet Cad, Polis Okulu karsisi No:35, 16310 Yildirim, Bursa, Turkey.

E-mail address: muhammetguzelsoy@yahoo.com.tr (M. Guzelsoy).

4 pictograms are used for patients who are illiterate or have a low education level.⁶

The objective of our study was to investigate the compatibility of QF with each other, the relationship between the response rates and education level. This study is the first to compare two different QFs and one pictogram.

2. Materials and methods

The study was designed as a cross-sectional study and conducted under the ethical principles of the Declaration of Helsinki. Ethics approval was received from the Bursa Yuksek Ihtisas Education and Research Hospital Clinical Research Ethics Committee (approval number: 66519339-900-01/2015/06/05). All patients were informed about the objectives of the study and their written consent according to institutional guidelines was obtained.

A total of 350 patients who applied first time to the urology outpatient clinic with the complaint of LUTS between February 2018 and February 2019 were included in the study. Patients with a known anatomical anomaly in the lower urinary tract system, neurological disease, active urinary tract infection, those with a history of urological surgery, pelvic radiation, bladder tumor, foreign body, urethral stricture, chronic pelvic pain syndrome, nocturnal polyuria, distal ureter or bladder stone, those with a PSA ≥ 10 ng/mL or a PSA between 4-10, but who had prostate cancer detected following biopsy, patients aged under 50 or over 80 years and those with voiding volume < 150 cc or a PVR > 300 cc were excluded from the study. Rejecting participation after being informed was also determined as exclusion criteria.

All patients were examined with age, height, weight, BMI, educational level, PSA, IPSS, ICIQ-MLUTS, VPSS, uroflowmetry parameters, and prostate volume. Validated QFs were presented to patients in Turkish language.^{7,8}

The first, third, fifth, and sixth IPSS questions, "a" options of the second–sixth ICIQ-MLUTS questions, and the third question of VPSS was accepted as voiding functions. The second, fourth, and seventh IPSS questions, "a" options of the seventh–fourteenth ICIQ-MLUTS questions, and the first and second questions of VPSS were accepted as storage functions. The eighth IPSS question, "b" options of all ICIQ-MLUTS, and the fourth question of VPSS were accepted as QoL.

According to the IPSS total score, the patients were considered mild symptomatic if they scored between 1 and 7, and moderate-to-severe symptomatic if they scored 8 or more.³

Based on the education levels, patients were separated as elementary (literate + primary school graduates; education group 1), intermediate (secondary + high school graduates; education group 2), and advanced (university graduates; education group 3). First of all, the answers of the patients who answered the questions without any help were recorded to determine the level of intelligibility when the QFs were read-only by the patient. Then, the unanswered questions were explained in more detail and impartially by the physician to manage the disease correctly, and it was ensured that all questions were answered.

Serum PSA levels were evaluated using commercially available kits. Prostate volume was measured using transrectal ultrasonography 7.5 MHz rectal probe. Uroflowmetry was performed while the patient was standing, and urine volume and maximal flow rate were recorded during voiding. In patients who voided less than 150 cc volume, uroflowmetry was repeated and the uroflowmetry with the highest volume was included in the analysis. Immediately after uroflowmetry, PVR was measured using ultrasonography with a 7.5 MHz linear probe with the patient in the supine position. PVR was calculated with the formula recommended by the International Continence Society, width (left to

right) x depth (anterior to posterior) x length (cranial to caudal) x 0.52 (mL).⁹

2.1. Statistical analysis

The compliance of continuous and discrete variables to normal distribution was examined using the Shapiro Wilk test. According to normality test results, variables were reported as descriptive statistics with mean \pm standard deviation and median (interquartile range) values. Categorical variables were expressed as n (%), and the Chi-square test was used for intergroup comparisons. The correlation analysis was performed with Pearson or Spearman's correlation analysis depending on the distribution of data. The correlation coefficient (r) was graded as very weak (0.00-0.19), weak (0.20-0.39), moderate (0.40-0.59), strong (0.60-0.79), and very strong (0.80-1.00). Receiver-operator characteristic (ROC) curve analysis was performed to estimate sensitivity and specificity. Analyses of the study were performed using SPSS (IBM Corp. Released 2015. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.) program, and in statistical analysis, $P < 0.05$ values were considered statistically significant.

3. Results

Thirty-two of the patients invited to the study were excluded from the study with their request, and 94 of them were excluded because they met the exclusion criteria. The demographic data and symptom scores of the remaining 224 patients according to their education level are summarized in Table 1. As can be seen in the Table 1, the patients in Group 3 applied with a lower PSA value, prostate volume, and ICIQ-MLUTS score, although it was not statistically significant. On the other hand, they applied with lower scores in the VPSS voiding section and in all sections of IPSS except voiding section, statistically significantly. Interestingly, the amount of post-void residual urine was found to be higher, statistically significantly in group 3.

Strong correlations were found between the voiding, storage, and total scores obtained in IPSS and ICIQ-MLUTS. However, when the correlation analysis was performed between the IPSS questions and the corresponding questions in the ICIQ-MLUTS form, a strong correlation was found only with questions 3 and 6 ($r = 0.61$, $r = 0.65$) and a very strong correlation with question 7 of the IPSS. The correlations between QFs are shown in Table 2.

When patients answered the QFs without any help, the rate of incomplete responses were 32.1% ($n = 72$) in ICIQ-MLUTS, 16.5% ($n = 37$) in VPSS, and 10.7% ($n = 24$) in IPSS ($P < 0.05$). Accordingly, the incomplete response rate was significantly higher in ICIQ-MLUTS than the IPSS and VPSS scales ($P < 0.001$ and $P = 0.005$, respectively). In addition, the incomplete response rate was significantly higher in VPSS than IPSS ($P = 0.017$). Table 3 shows incomplete response rates of the QFs according to the education level of the patients. The lowest incomplete response rate was found in the patients who filled IPSS. The most easily filled form in the low education group was the VPSS, but the difference between the groups was not statistically significant ($P > 0.05$). Although the percentage of completing all QFs increases according to education level, the difference is not statistically significant ($P > 0.05$).

The cut-off values of ICIQ-MLUTS total and VPSS total scores, which can predict moderate-to-severe symptomatic patients according to the IPSS score, are examined in Fig. 1. ROC curve analysis was performed to estimate the sensitivity and specificity of ICIQ-MLUTS total score and VPSS total score for predicting the moderate-to-severe LUTS, and the cut-off point was determined as > 12 for ICIQ-MLUTS, total score > 9 for VPSS total score. The area under the curve for ICIQ-MLUTS total score was 0.883 (sensitivity

Table 1
Demographic data and symptom scores of the patients

	Total	Education Level			p
		Elementary (literate + primary) (Group 1; n = 120)	Intermediate (secondary + high school) (Group 2; n = 73)	Advanced (university) (Group 3; n = 31)	
AGE	61.2 ± 7.26 (50-79)	62.0 ± 7.69 (45-79)	59.9 ± 7.21 (45-85)	59.2 ± 7.22 (49-75)	0.066
BMI	27.5 ± 3.9 (19.2-45.5)	27.9 ± 3.98 (19.2-39.8)	27.3 ± 3.82 (20.2-45.5)	26.5 ± 3.91 (19.8-33.9)	0.327
PSA	2.03 ± 1.9 (0.08-9.90)	1.68 ± 2.2 (0.28-9.90)	1.76 ± 1.5 (0.20-6.44)	1.50 ± 1.1 (0.08-3.90)	0.083
MFR	11.5 ± 4.5 (2.1-25)	11.50 ± 4.7 (2.1-25)	11.35 ± 4.1 (2.2-19.9)	11.45 ± 3.5 (5.0-17.2)	0.972
AFR	5.7 ± 2.6 (0.7-15)	5.5 ± 2.6 (1.1-15)	5.9 ± 2.6 (0.7-14)	5.6 ± 2.1 (1.0-9.9)	0.727
VV	275 ± 140 (150-684)	265 ± 142 (150-684)	277 ± 134 (150-681)	300 ± 143 (150-606)	0.209
PV	50.6 ± 30.6 (13-271)	54.3 ± 35.2 (14-271)	47.1 ± 26.3 (13-161)	45.9 ± 16.8 (15-94)	0.299
PVR	67.1 ± 75.8 (0-290)	77.9 ± 78 (0-295)	43.5 ± 58 (0-285)	91.6 ± 97.2 (0-295)	0.003*
IPSS TOTAL	16.2 ± 8.3 (1-35)	17.0 ± 8.1 (1-35)	16.1 ± 8.7 (1-32)	12.7 ± 7.3 (5-34)	0.045*
IPSS VOIDING	9.1 ± 5.3 (0-20)	9.4 ± 5.3 (0-20)	9.2 ± 5.6 (0-19)	7.4 ± 4.8 (0-20)	0.201
IPSS STORAGE	7.0 ± 3.8 (0-15)	7.4 ± 3.8 (0-15)	6.6 ± 3.8 (0-14)	5.3 ± 3.1 (1-14)	0.019*
IPSS QoL	4.3 ± 0.1 (0-6)	4.4 ± 1.5 (0-6)	4.3 ± 1.5 (0-6)	3.7 ± 1.4 (1-6)	0.044*
ICIQ-MLUTS TOTAL	16.5 ± 7.9 (0-38)	17.0 ± 8.5 (0-38)	16.6 ± 7.8 (2-34)	13.5 ± 5.9 (5-27)	0.111
ICIQ-MLUTS VOIDING	9.1 ± 4.8 (0-19)	9.2 ± 5.1 (0-19)	9.6 ± 4.4 (0.19)	7.9 ± 4.4 (0-18)	0.240
ICIQ-MLUTS STORAGE	7.3 ± 4.5 (0-24)	7.8 ± 4.7 (0-24)	7.0 ± 4.4 (1-18)	5.6 ± 3.1 (1-14)	0.089
ICIQ-MLUTS QoL	45.6 ± 2.1 (0-130)	45.7 ± 32.8 (0-126)	49.1 ± 33.6 (0-130)	36.1 ± 25.9 (0-90)	0.266
VPSS TOTAL	9.9 ± 3.0 (3-16)	10.0 ± 3.1 (3-15)	9.8 ± 3.3 (3-16)	9.8 ± 2.0 (7-15)	0.816
VPSS VOIDING	3.3 ± 0.8 (1-5)	3.4 ± 0.9 (1-5)	3.4 ± 0.8 (1-5)	2.7 ± 0.5 (2-4)	0.003*
VPSS STORAGE	6.8 ± 2.7 (0-12)	6.7 ± 2.7 (0-12)	6.9 ± 3.0 (0-12)	6.8 ± 2.1 (4-12)	0.709
VPSS QoL	3.3 ± 0.1 (0-6)	3.3 ± 1.4 (0-6)	3.4 ± 1.4 (0-6)	2.7 ± 1.1 (1.5)	0.088

The results in the table are given as mean ± std deviation (min-max). BMI: Body mass index, PSA: prostate specific antigen, MFR: maximal flow rate, AFR: average flow rate, VV: voiding volume, PV: prostate volume, PVR: post-void residual volume, QoL: quality of life, IPSS: International Prostate Symptom Score, ICIQ-MLUTS: International Consultation on Incontinence Questionnaire Male Lower Urinary Tract Symptoms, VPSS: Visual Prostate Symptom Score.

Table 2
Correlations of the questionnaires with each other

	ICIQ-MLUTS VOIDING	VPSS VOIDING
IPSS VOIDING	r = 0.708*	r = 0.410*
IPSS Q1 (Incomplete) emptying)	r = 0.502*Q6	-
IPSS Q3 (Intermittency)	r = 0.610*Q5	-
IPSS Q5 (Weak stream)	r = 0.534*Q4	r = 0.389*Q3
ICIQ-MLUTS Q4	-	r = 0.355*Q3
IPSS Q6 (Straining)	r = 0.655*Q3	-
ICIQ-MLUTS VOIDING	-	r = 0.310*
	ICIQ-MLUTS STORAGE	VPSS STORAGE
IPSS STORAGE	r = 0.624*	r = 0.386*
IPSS Q2 (Frequency)	r = 0.432*Q13	r = 0.217 (p = 0.004) Q1
ICIQ-MLUTS Q13	-	r = 0.237*Q1
IPSS Q4 (Urgency)	r = 0.528*Q7	-
IPSS Q7 (Nocturia)	r = 0.853*Q14	r = 0.703*Q2
ICIQ-MLUTS Q14	-	r = 0.718*Q2
ICIQ-MLUTS STORAGE	-	r = 0.492*
	ICIQ-MLUTS TOTAL	VPSS TOTAL
IPSS TOTAL	r = 0.745*	r = 0.422*
ICIQ-MLUTS TOTAL	-	r = 0.474*
	ICIQ-MLUTS QoL	VPSS QoL
IPSS QoL	r = 0.328*	r = 0.343*
ICIQ-MLUTS QoL	-	r = 0.457*

*p = 0.001, IPSS: International Prostate Symptom Score, ICIQ-MLUTS: International Consultation on Incontinence Questionnaire Male Lower Urinary Tract Symptoms, VPSS: Visual Prostate Symptom Score, QoL: quality of life.

77.71%, specificity 90.62%, p < 0.001), and for VPSS, total score was 0.751 (sensitivity 60.56%, specificity 82.76%, p < 0.001), showing that ICIQ-MLUTS total score > 12 and VPSS total score > 9 were significantly related to an increased risk of developing moderate-to-severe LUTS. In addition, when the areas under the curve of ICIQ-MLUTS total score and VPSS total score were compared (0.883 vs. 0.751), a significant difference was determined (P < 0.001).

When the sensitivity and specificity of the groups were evaluated according to these cut-off values, the sensitivity and specificity of ICIQ-MLUTS was found to be higher in all groups. The detailed sensitivity and specificity rates of the groups are summarized in Table 4.

4. Discussion

Urodynamic examination including pressure-flow study is considered the gold standard in the diagnosis of BPH-related LUTS.¹⁰ However, urodynamic studies are invasive and time-consuming and have certain morbidity.¹¹ In addition, the preliminary results of the UPSTREAM study showed that routine urodynamic testing in patients referred for surgery due to BPH-related LUTS is not supported and that performing urodynamic examination does not reduce the surgical operations.¹² Under these circumstances, the patient's complaints and other parameters come to prominence. In determining the severity of complaints objectively in patients consulting with LUTS, their QFs are the most valuable tool.³ There are many QFs used for this purpose; however, although the symptoms investigated by these QFs are similar, these tools involve different questions. There is also symptom QFs with pictograms that can be used in the illiterate and low-educated patient groups.⁶

IPSS is the first introduced male LUTS evaluation form.⁴ It is simple, practical, and sensitive to change in treatment. IPSS categorizes patients as asymptomatic (0 points), mild (1-7 points), moderate (8-19 points), and severe (20-35 points).³ It does not question hesitancy, incontinence, and post-void symptoms.¹³ ICIQ-MLUTS has been introduced as a result of a multinational, multi-center study conducted by International Continence Society in 199.¹⁴ ICIQ-MLUTS is comprehensive form than IPSS. Its main advantage is that it questions the continence status and evaluates the effects of symptoms on patients' QoL one by one.¹⁵ It was reported in a study that these two QFs can be used interchangeably, and a high agreement was found between IPSS and ICIQ-MLUTS (r = 0.879).¹⁵ To fill in the IPSS and ICIQ-MLUTS, it is necessary to

Table 3
Distribution of the patients who could not full-filled the questionnaires according to their education level

	Elementary (literate + primary) (Group 1; n = 120)	Intermediate (secondary + high school) (Group 2; n = 73)	Advanced (university) (Group 3; n = 31)	p
IPSS	58.3% (14/24)	29.2% (7/24)	12.5% (3/24)	0.913
ICIQ-MLUTS	63.9% (46/72)	23.6% (17/72)	12.5% (9/72)	0.089
VPSS	54.1% (20/37)	35.1% (13/37)	10.8% (4/37)	0.915

IPSS: International Prostate Symptom Score, ICIQ-MLUTS: International Consultation on Incontinence Questionnaire Male Lower Urinary Tract Symptoms, VPSS: Visual Prostate Symptom Score.

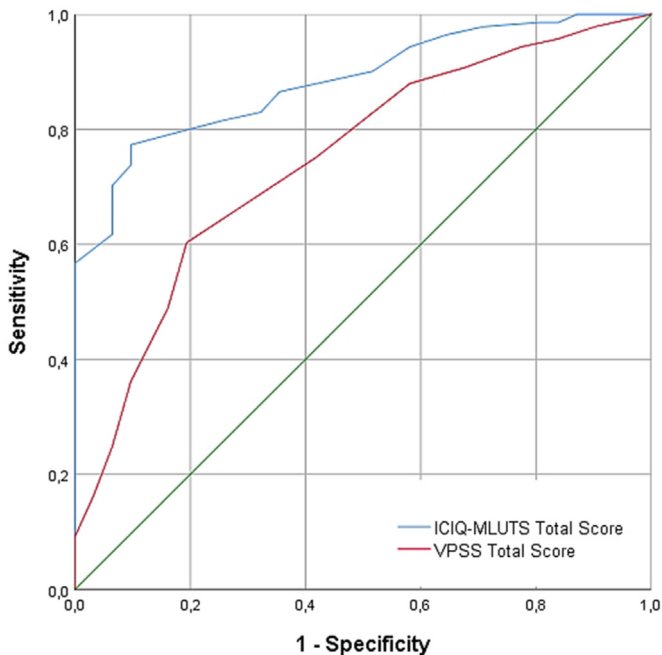


Fig. 1. Receiver-operator characteristic (ROC) curves for determining the middle-severe BPH patients. The area under the curve (AUC) is 0.883 for ICIQ-MLUTS total score with $P < 0.001$ and 0.751 for VPSS total score with $p < 0.001$. ICIQ-MLUTS: International Consultation on Incontinence Questionnaire Male Lower Urinary Tract Symptoms, VPSS: Visual Prostate Symptom Score.

be literate and have an education level enough to evaluate the questions.¹⁶ For patients without these features, VPSS using pictograms has been recommended. It is often used to evaluate the illiterate and low-educated patient populations.⁶ Studies have found a significant correlation between IPSS and VPSS.^{6,17,18} In our study, in which three QFs were compared, a strong correlation was found between IPSS and ICIQ-MLUTS ($r = 0.745$), and a moderate correlation was found between VPSS, IPSS, and ICIQ-MLUTS ($r = 0.422$, $r = 0.474$, respectively). On the other hand, we found a weak-moderate correlation between the QFs in evaluating QoL. No study could be found in the literature investigating the correlation between ICIQ-MLUTS and VPSS.

Table 4
Sensitivity and specificity rates of the groups according to cut-off values

	Questionnaire	AUC (95% CI)	Sensitivity	Specificity	p
Elementary (literate + primary) (Group 1; n = 120)	VPSS	0,72(0,57-0,88)	60%	77%	0,009
	ICIQ-MLUTS	0,89(0,82-0,96)	78%	93%	<0,001
Intermediate (secondary + high school) (Group 2; n = 73)	VPSS	0,83(0,71-0,94)	64%	81%	0,001
	ICIQ-MLUTS	0,89(0,81-0,98)	81%	82%	<0,001
Advanced (university) (Group 3; n = 31)	VPSS	0,64(0,38-0,9)	60%	72%	0,29
	ICIQ-MLUTS	0,88(0,74-1)	80%	86%	0,005

AUC (95% CI): Area Under Curve (95% confidence interval, lower-upper bound), VPSS: Visual Prostate Symptom Score, ICIQ-MLUTS: International Consultation on Incontinence Questionnaire Male Lower Urinary Tract Symptoms.

It was observed that the patients could not fill the questionnaires completely. There were differences between the ICIQ-MLUTS, IPSS and VPSS questionnaires in terms of the incomplete response rate ($P < 0.05$). ICIQ-MLUTS is the questionnaire that questions patients in the most detailed way and has the most questions among the three questionnaires. In a study, the filling rates of VPSS and IPSS at first encounter were investigated and it was seen that VPSS was filled more completely.¹⁹ In our study, the highest incomplete response rate was found in ICIQ-MLUTS. This poor performance of ICIQ-MLUTS can be explained by the high number of questions and the fact that each question has a separate QoL scale. While VPSS was expected to have the lowest incomplete response rate since it had fewer questions and a visual structure, it was IPSS which was the most easily filled-in questionnaire by the patients. However, it is a well-known fact that patients must have a certain level of education to fill out the IPSS form completely.^{16,20} In our study, the lowest incomplete response rate was obtained in the IPSS. This finding can also be interpreted as “the QF that the patients can understand and answer the most easily is IPSS”.

When examined according to education levels, it was observed that the tendency to leave blanks in the forms decreased as the education level increased in all QFs. The VPSS was the most easily filled QF in the low-educated group. However, the results were not statistically significant ($P > 0.05$). Many studies have shown that VPSS is a good option for low-educated patient populations.^{6,7} However, in another study, it was determined that there was no significant difference between VPSS and IPSS in terms of educational status.¹⁷ Nevertheless, VPSS is the only QF that can be used in the evaluation of illiterate patients.

Although IPSS is the most commonly used QF, some symptoms cannot be questioned with this scale. ICIQ-MLUTS questions the items that are not included in the other two QFs and can evaluate symptoms that are not assessed by the other questionnaires, including hesitancy incontinence, urgency incontinence, stress incontinence, unexplained incontinence, nocturnal enuresis, and post-micturition dribble. In a study using ICIQ-MLUTS, hesitancy was found in 58.1%, urgency incontinence in 32.3%, stress incontinence in 18.2%, unexplained incontinence in 20.6%, nocturnal enuresis in 12%, and post-micturition dribble in 52.3% of the patients.²¹ Similarly, in our study, the rates of patients with complaints of hesitancy (85.2%), post-micturition dribble (42.7%), and urgency incontinence (37.6%) were high. Of these patients, 25.9%

severely suffered from hesitancy, 4.7% from urgency incontinence, 1.4% from stress incontinence, 1.5% from unexplained incontinence, 2.0% from enuresis nocturna, and 9.0% from post-micturition dribble. Patients were able to state these complaints through ICIQ-MLUTS.

In the present study, we investigated the cut-off value of ICIQ-MLUTS and VPSS for moderate-to-severe symptomatic patients with LUTS. These two SFs do not have cut-off limits that are generally accepted and categorized patients as in IPSS. In a study conducted, the cut-off value of ICIQ-MLUTS for moderate-to-severe symptomatic patients was found to be 26 points.²² Studies are suggesting cut-off values of 4 and 7 points for VPSS in moderate-to-severe symptomatic patients.^{23,24} In our study, by using the ROC curve, we found the projections of the cut-off point showing 8 and above in IPSS on ICIQ-MLUTS and VPSS to predict moderate-to-severe symptomatic patients. We calculated the cut-off value, which distinguishes mild from moderate-to-severe symptoms, as 12 points for ICIQ-MLUTS and 9 points for VPSS. A score of >12 can detect moderate-to-severe patients in ICIQ-MLUTS with 90.62% specificity and 77.71% sensitivity, and a score of >9 in VPSS with 82.76% specificity and 60.56% sensitivity. We found that these cut-off values should be confirmed with larger series. In our study, the area of ICIQ-MLUTS under the ROC curve was greater than that of VPSS ($P = 0.001$). In addition, the correlation between IPSS and ICIQ-MLUTS was better. Based on this point, it was concluded that the ICIQ-MLUTS total score would be more appropriate than the VPSS total score to identify moderate-severe LUTS.

The major limitation of our study is the relatively small number of patients included. Another limitation is the lack of pressure-flow investigation. To avoid this, we did not include patient groups that would require pressure-flow examination.

5. Conclusions

QFs are one of the indispensable diagnostic tools in the evaluation of patients presenting with LUTS. All QFs have their advantages and disadvantages. The choice of QF according to the education level and the type of symptoms would be the most accurate approach in the evaluation of these patients. ICIQ-MLUTS is a good option for patients with severe complaints of continence. If an illiterate or low-educated patient group is required to express themselves, VPSS is the only option available. In our study, the highest response rate was obtained with IPSS. IPSS should be preferred to obtain as complete answers as possible. In our study, it was shown that ICIQ-MLUTS can be used as an alternative to the IPSS. Since the ratio of fully answered questions in the query forms is low, further clinical studies are needed to obtain an optimal QF.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Funding Statement

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Author contributions

Desing: Muhammet Guzelsoy. Data acquisition: Salim Zengin, Soner Coban, Ali Riza Turkoglu, Akif Koc. Data analysis and

interpretation: Muhammet Guzelsoy, Ali Riza Turkoglu, Anil Erkan. Drafting the manuscript: Muhammet Guzelsoy, Murat Ozturk, Akif Koc, Anil Erkan. Critical revision of the manuscript for scientific and factual content: Muhammet Guzelsoy, Murat Ozturk, Soner Coban. Statical analysis: Muhammet Guzelsoy, Murat Ozturk, Soner Coban. Supervision: Muhammet Guzelsoy.

Conflicts of interest

All authors have no conflict of interest to declare.

Acknowledgment

The authors appreciate Efe Onen, MD for his contribution in analysis of the statistics.

References

- Bosch J, Abrams P, Cotterill N. Canada: International Consultation on Urological Diseases Male LUTS Guideline. Etiology, patient assessment and predicting outcome from therapy. *JMlutsM* 2013;37–133.
- Kim DK, Park JJ, Yang WJ, Doo SW, Kim JH, Song YS. Changes in diagnosis rate and treatment trends of benign prostatic hyperplasia in Korea: A nationwide population-based cohort study. *Prostate Int* 2021;9:215–20.
- Gravas S, Cornu J, Gacci M, Gratzke C, Herrmann T, Mamoulakis C, et al. *Management of non-neurogenic male lower urinary tract symptoms (LUTS), incl. benign prostatic obstruction*. BPO; 2021.
- Barry MJ, Fowler Jr FJ, O'Leary MP, Bruskewitz RC, Holtgrewe HL, Mebust WK, et al. The American Urological Association symptom index for benign prostatic hyperplasia. The Measurement Committee of the American Urological Association. *J Urol* 1992;148:1549–57.
- Donovan JL, Peters TJ, Abrams P, Brookes ST, de aa Rosette JJ, Schäfer W. Scoring the short form ICSmaleSF questionnaire. *International Continence Society*. *J Urol* 2000;164:1948–55.
- van der Walt CL, Heyns CF, Groeneveld AE, Edlin RS, van Vuuren SP. Prospective comparison of a new visual prostate symptom score versus the international prostate symptom score in men with lower urinary tract symptoms. *Urology* 2011;78:17–20.
- Ceylan Y, Gunlusoy B, Degirmenci T, Kozacioglu Z, Bolat D, Minareci S. Is new visual prostate symptom score useful as International Prostate Symptom Score in the evaluation of men with lower urinary tract symptoms? A prospective comparison of 2 symptom scores in Turkish society. *Urology* 2015;85:653–7.
- Mertoglu O, Uçer O, Ceylan Y, Bozkurt O, Günlüsoy B, Albaz AC, et al. Reliability and Validity of the Turkish Language Version of the International Consultation on Incontinence Questionnaire - Male Lower Urinary Tract Symptoms. *Int Neurourol J* 2016;20:159–63.
- D'Ancona C, Haylen B, Oelke M, Abranches-Monteiro L, Arnold E, Goldman H, et al. The International Continence Society (ICS) report on the terminology for adult male lower urinary tract and pelvic floor symptoms and dysfunction. *Neurourol Urodyn* 2019;38:433–77.
- Abrams P, Chapple C, Khoury S, Roehrborn C, de la Rosette J. Evaluation and treatment of lower urinary tract symptoms in older men. *J Urol* 2013;189: S93–101.
- Klingler HC, Madersbacher S, Djavan B, Schatzl G, Marberger M, Schmidbauer CP. Morbidity of the evaluation of the lower urinary tract with transurethral multichannel pressure-flow studies. *J Urol* 1998;159:191–4.
- Lewis AL, Young GJ, Selman LE, Rice C, Clement C, Ochieng CA, et al. Urodynamics tests for the diagnosis and management of bladder outlet obstruction in men: the UPSTREAM non-inferiority RCT. *Health Technol Assess* 2020;24:1–122.
- Yap TL, Cromwell DA, Brown C, van der Meulen J, Emberton M. The relationship between objective frequency-volume chart data and the I-PSS in men with lower urinary tract symptoms. *Eur Urol* 2007;52:811–8.
- Witjes WP, de la Rosette JJ, Donovan JL, Peters TJ, Abrams P, Kay HE, et al. The International Continence Society "Benign Prostatic Hyperplasia" Study: international differences in lower urinary tract symptoms and related bother. *J Urol* 1997;157:1295–300.
- Pourmomeny A, Alebouye-Langeroudi S, Zargham M. Reliability and Validity of the Persian Language Version of the Female Lower Urinary Tract Symptoms' Long form Questionnaire. *Iran J Nurs Midwifery Res* 2018;23: 421–5.
- Netto Júnior NR, de Lima ML. The influence of patient education level on the International Prostatic Symptom Score. *J Urol* 1995;154:97–9.
- Guzelsoy M, Aydos MM, Coban S, Turkoglu AR, Acibucu K, Demirci H. Comparison of the effectiveness of IPSS and VPSS without any help in LUTS patients: a prospective study. *Aging Male* 2018;21:193–9.
- Dun R-l, Mao J-m, Yu C, Zhang Q, Hu X-h, Zhu W-j, et al. Simplified Chinese version of the international prostate symptom score and the benign prostatic hyperplasia impact index: Cross-cultural adaptation, reliability, and validity for patients with benign prostatic hyperplasia. *Prostate Int* 2022;10(3):162–8.

19. Afriansyah A, Gani YI, Nusali H. Comparison between visual prostate symptom score and international prostate symptom score in males older than 40 years in rural Indonesia. *Prostate Int* 2014;2:176–81.
20. MacDiarmid SA, Goodson TC, Holmes TM, Martin PR, Doyle RB. An assessment of the comprehension of the American Urological Association Symptom Index. *J Urol* 1998;159:873–4.
21. De Ridder D, Roumeguère T, Kaufman L. Urgency and other lower urinary tract symptoms in men aged ≥ 40 years: a Belgian epidemiological survey using the ICIQ-MLUTS questionnaire. *Int J Clin Pract* 2015;69:358–65.
22. Ito H, Young GJ, Lewis AL, Blair PS, Cotterill N, Lane JA, et al. Grading Severity and Bother Using the International Prostate Symptom Score and International Consultation on Incontinence Questionnaire Male Lower Urinary Tract Symptoms Score in Men Seeking Lower Urinary Tract Symptoms Therapy. *J Urol* 2020;204:1003–11.
23. Sanman KN, Shetty R, Adapala RR, Patil S, Prabhu GL, Venugopal P. Can new, improvised Visual Prostate Symptom Score replace the International Prostate Symptom Score? Indian perspective. *Indian J Urol* 2020;36:123–9.
24. Setthawong V, Mahawong P, Pattanachindakun N, Amnattrakul P, Dar FM, Thanavongvibul S. To investigate the correlation between the visual prostate symptom score, the international prostate symptom score, and uroflowmetry parameters in adult Thai males of different educational levels. *Prostate Int* 2018;6:115–8.