ORIGINAL ARTICLE

Application of the Chinese version of the International Prostate Symptom Score for the management of lower urinary tract symptoms in a primary health care setting

Petrus S Szeto 司徒石

Objectives To determine whether the Chinese version of the International Prostate Symptom Score can differentiate surgically treatable conditions from functional disorders among patients with lower urinary tract symptoms.

Design Retrospective cross-sectional study.

Setting Community hospital, Hong Kong.

Patients A cohort of 121 adult males with lower urinary tract symptoms referred to a specialty clinic from July 2006 to February 2007.

Main outcome measures Scores were obtained following self-administration of the Chinese version of the International Prostate Symptom questionnaire. A combination of uroflowmetry and urethrocystoscopy were applied as the gold-standard diagnostic tests for surgically treatable conditions. The effectiveness of the instrument was explored in terms of sensitivity, specificity, and positive and negative predictive values.

Results A total of 121 records were reviewed, among which 58 patients with lower urinary tract symptoms had completed both the questionnaire and gone through the relevant diagnostic tests. The receiver operating characteristics curve was constructed; the area under curve was 0.68. Using the receiver operating characteristics analysis, the optimal cut-off value for the Chinese version of the International Prostate Symptom Score was 24. The respective sensitivity and specificity values were 62% and 84%. The positive predictive value was 68% and negative predictive value was 79%.

Conclusion The Chinese version of International Prostate Symptom Score is not a sensitive instrument for diagnosing surgically treatable conditions and it is not a suitable medical test to exclude patients from referrals to secondary health care services. An acceptable specificity with a score of 24 was advantageous for triaging patients to receive early specialist attention.

Introduction

The term 'lower urinary tract symptoms' (LUTS) was first introduced in 1994 by Paul Abrams[1] to describe conditions with chronic urinary symptoms including frequency, urgency, hesitance, intermittence, decrease in urinary stream, difficulty in emptying, and nocturia. Lower urinary tract symptoms in adult male patients are a common clinical problem in primary and secondary health care.[2-6] The underlying cause varies from minimal functional disorder[7,8] to organic bladder outflow obstruction. Patients with LUTS are usually referred to specialty clinics for assessment and provision of treatment. For those without organic pathology however, it is preferable that they are managed by their family physicians, who provide a familiar environment and continuity of care.

Uroflowmetry study objectively measures urine outflow. A peak flow rate of less than 10 mL per second with a void volume of 200 mL or more is generally accepted as remarkable impairment of urine outflow and predicts satisfactory surgical outcome.[9-12]

Urethrocystoscopy is the confirmatory test for organic pathology, which entails

Key words
Predictive value of tests; Prostatic hyperplasia; Questionnaire; Sensitivity and specificity; Urinary bladder neck obstruction

Hong Kong Med J 2008;14:458-64

Department of Surgery, Tseung Kwan O Hospital, Tseung Kwan O, Hong Kong
PS Szeto, FRCS (Urology) (Edin), FHKAM (Surgery)

Correspondence to: Dr PS Szeto
E-mail: szetos@ha.org.hk

國際前列腺徵狀評分表（中文版）在基層醫護環境中對於下尿路症狀治療的應用

目的 探討國際前列腺徵狀評分表（中文版）是否可以在下尿路症狀的病人中，分辨出病人只是有功能性障礙或需要接受外科治理。

設計 橫斷面回顧研究。

安排 香港一所社區醫院。

患者 2006年7月至2007年2月期間，被轉介至專科門診的121位有下尿路症狀的男性。

主要結果測量 病人自填的國際前列腺徵狀評分問卷（中文版）得出的分數。為需要外科治理的病人進行結合尿流速圖及尿道膀胱鏡的金標準診斷測試。使用敏感度、特異性、陽性及陰性預測值找出此評分表的有效性。

結果 回顧了121份紀錄，其中58位有下尿路症狀的病人完成問卷及有關測試。接收者工作特徵曲線（ROC曲線）的線下面積為0.68。ROC曲線分析顯示國際前列腺徵狀評分表（中文版）的最佳切點為24分。敏感度、特異性、陽性預測值及陰性預測值分別為62%、84%、68%及79%。

結論 對於需要外科治理的病人，國際前列腺徵狀評分表（中文版）並非一種敏感度高的工具，所以也不能用作排除轉介至二級醫護服務的病人的有效工具。評分表有可接受的特異性，得分為24分的病人可被分流，以至能盡早獲得專科診治。

detailed inspection of the lower urinary tract. Surgically treatable pathology including benign prostatic hyperplasia (BPH), urethral stricture, lower urinary tract tumour and calculi can be confirmed under direct vision.

Nevertheless, both uroflowmetry study and urethrocystoscopy are not available in primary health care. Because of the unavailability of diagnostic tools, LUTS patients are referred to specialists for assessment and this creates a burden on the secondary health care service asked to manage patients with mild functional disorder.

The International Prostate Symptom Score (IPSS) developed by the American Urological Association[13] was adopted in different communities to assess severity of urinary symptoms.[14,15] It was validated[16-19] and translated into different languages.[20] The results generated both by self-administration and with assistance by health care workers are consistent with each other (not significantly different).[21,22] The IPSS is a common tool for pre-consultation assessment and follow-up after therapy. There are seven questions on seven urinary symptoms. According to their frequency, the patient needs to rate the frequency of each symptom from 0 to 5, making up a total possible score ranging from 0 to 35. The Chinese version translated by Hong Kong Urological Association has been applied since 1995.

The IPSS is not used as a diagnostic tool for any specific disease because different pathologies of the lower urinary tract present with similar urinary symptoms. Since surgically treatable conditions produce more severe symptoms, it is possible that the IPSS can differentiate such conditions from functional disorders. The Chinese version of IPSS (C-IPSS) is commonly used in Hong Kong, but data on its effectiveness as a medical test are limited.

The primary objective of this study was to explore whether the self-administered C-IPSS is able to differentiate surgically treatable conditions from functional disorders among Chinese patients with LUTS. The secondary objective was to estimate the prevalence of surgically treatable disorder among LUTS referrals and explore the possibility of using C-IPSS assessments to empower primary health care professionals in the management of LUTS and thus reduce referrals to secondary health care facilities.

Methods

Study design

This was a retrospective cross-sectional study, involving review of available clinical data on adult male LUTS patients referred to a secondary health care service. Self-administered C-IPSS was applied as a medical test. Uroflowmetry and urethrocystoscopy were arranged as gold-standard diagnostic tests for deciding on conditions warranting surgery. The target population consisted of Chinese adult males who were 40 years or older and attending a secondary health care service for management of LUTS, after assessment by primary health care physicians. Exclusion criteria were: pre-diagnosed disease of the lower urinary tract and a history of lower urinary tract surgery. Patients referred for management of haematuria, elevated prostate-specific antigen (PSA) level, and finding of a prostate nodule were excluded, as were those referred because of a high C-IPSS score.

This retrospective study was carried out on a cohort of patients attending from July 2006 to February 2007 in a community hospital in Hong Kong. Qualified subjects were registered. The C-IPSS questionnaire was self-administered by patients and filed. Investigations including uroflowmetry and urethrocystoscopy were suggested and performed with informed consent. Electronic data on investigation results were assessed. The predictor variable was the self-administered C-IPSS which is an ordinal variable ranging from 0 to 35.

The outcome variable was dichotomous in terms of positive or negative for a surgically treatable condition. The gold-standard diagnostic process

TABLE 1. Patient referrals and numbers with completed responses according to age

Age-group (years)	Total No. in the age-group	No. of completed C-IPSS*	% of completing C-IPSS
40-49	15	15	100%
50-59	23	20	87%
60-69	45	30	67%
70-79	27	15	56%
80-89	7	3	43%
Total	**117**	**83**	**71%**

* C-IPSS denotes the Chinese version of the International Prostate Symptom Score

TABLE 2. Prevalence of conditions warranting surgery according to age

Age-group (years)	Functional disorder	Conditions warranting surgery	Total	% with conditions warranting surgery
40-49	10	1	11	9%
50-59	11	6	17	35%
60-69	15	14	29	48%
70-79	7	7	14	50%
Total	**43**	**28**	**71**	**39%**

comprised two parts: (1) uroflowmetry results with a peak flow rate of less than 10 mL/s and void volume equal to or exceeding 200 mL (classified as a positive result), and (2) urethrocystoscopy with identification of pathology including BPH, urethral stricture, lower urinary tract calculi or tumour (classified as a positive result). Absence of pathology was classified as a negative result. A positive result from either test was classified as an overall positive, indicating a condition warranting surgical treatment.

Data analysis

Different cut-off values of C-IPSS were used to diagnose conditions warranting surgery. Corresponding values for sensitivity and specificity were calculated and a receiver operating characteristics (ROC) curve was constructed. Area under curve (AUC) of the ROC curve was calculated with bench marking at 0.75. The optimal cut-off value was obtained and the implications of corresponding sensitivity and specificity values were evaluated. The percentage of C-IPSS questionnaire completions and the prevalence of surgically treatable conditions were calculated. The impact of stratification according to different age-groups was also evaluated.

Results

Patient demographics

From July 2006 to February 2007, 121 male patients (all aged >40 years) were referred by primary health care services to the specialty clinic for assessment of LUTS. Of these, four were excluded from the study—one had a prior diagnosis of prostate carcinoma, one had a history of transurethral resection of the prostate, one was referred for a high PSA level, and another because of a prostate nodule. Both of the latter were later diagnosed to have carcinoma of the prostate. The records of the remaining 117 patients (respective mean age, standard deviation, and range being 64, 11, and 42-86 years) were analysed.

Response to the Chinese version of the International Prostate Symptom Score

Of 117 patients in the five age-groups, 83 (71%) [standard error (SE): 4%; 95% confidence interval (CI), 63-79%] were able to complete the C-IPSS questionnaire on their own. The remaining 34 patients responded to parts of the questionnaire or did not respond to any question. Reasons for not responding included: illiteracy, poor eye-sight and/or cognitive impairment. There was a trend suggesting that older patients were less likely to complete the C-IPSS questionnaire (Table 1).

Prevalence of surgically treatable conditions among referrals for lower urinary tract symptoms

Regarding the 117 patients (with or without completed C-IPSS questionnaires) in the five age-groups, 71 had completed both uroflowmetry and urethrocystoscopy. Of these 71 patients, 28 were diagnosed to have a condition warranting surgery, giving a prevalence of 39%, with a SE of 6% and a 95% CI of 28-50%. Prevalence among different age-groups is shown in Table 2.

Concerning the final pathological diagnosis of the 28 patients with surgically treatable conditions, 25 had endoscopic identification of BPH. Three were diagnosed as having bladder neck obstruction impairing urine outflow without enlargement of the prostate. No other organic pathology was diagnosed in this study sample.

Sensitivity and specificity of the Chinese version of the International Prostate Symptom Score with different cut-off points

A total of 58 of the study patients had completed both the C-IPSS questionnaire and diagnostic investigations including uroflowmetry and urethrocystoscopy. Different C-IPSS values were applied as cut-off points to diagnose conditions warranting surgery. Sensitivity steadily dropped as the cut-off value is increased, whereas specificity increased to close to 90% if the value was reduced to 25.

An ROC curve is shown in Figure 1, with sensitivity plotted against 1-specificity. The AUC

was 0.68. Inspecting the curve and finding the point with change in slope, the optimal cut-off value corresponded to a sensitivity of 60% and a specificity of about 90%. With C-IPSS score of 24, the sensitivity was 62% and the specificity was 84% (Table 3). The difference was statistically significant (x^2=12.9, with 1 degree of freedom, P<0.001).

A C-IPSS of 24 therefore appeared to be the optimal cut-off value in our study population. In which case, the calculated positive predictive value (PPV) was 68% and the negative predictive value (NPV) was 79%.

TABLE 3. Stratification of conditions warranting surgery and functional disorder among patients with lower urinary tract symptoms with a C-IPSS cut-off value of 24 (x^2=12.9, with 1 degree of freedom P<0.001)*

C-IPSS	Conditions warranting surgery	Functional disorder	Total
≥24	13	6	**19**
<24	8	31	**39**
Total	**21**	**37**	**58**

* C-IPSS denotes the Chinese version of the International Prostate Symptom Score

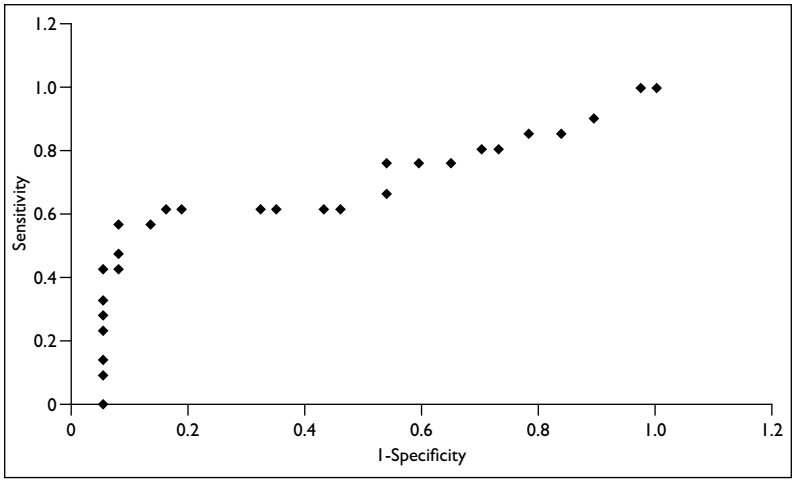

FIG 1. Receiver operating characteristics curve of the Chinese version of the International Prostate Symptom Score for detecting surgically treatable condition among patients with lower urinary tract symptoms

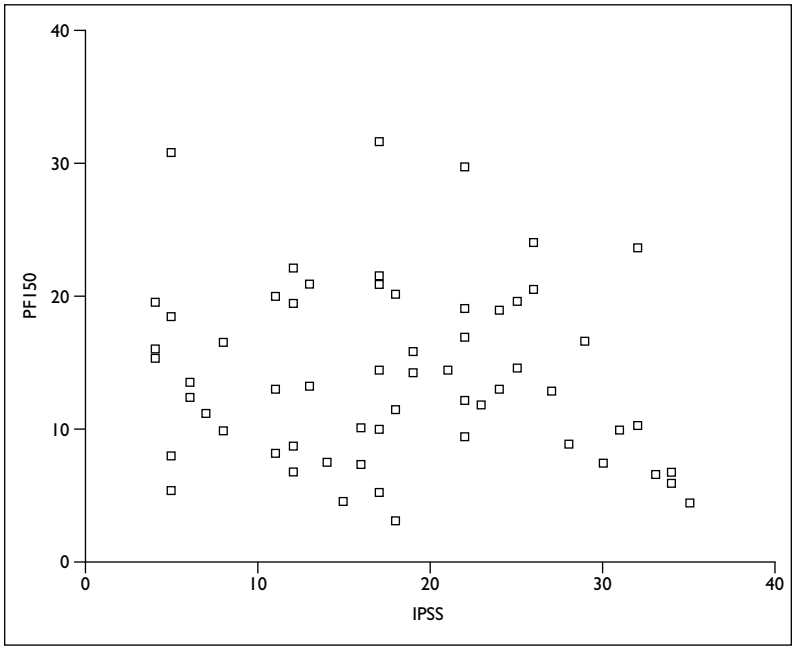

FIG 2. Scatter plot of peak flow rate (PF150) versus the Chinese version of the International Prostate Symptom Score (IPSS)

Discussion

Applicability of self-administered questionnaire

This study demonstrates that 71% of the referred patients were capable of completing the questionnaire on their own. Patients failed because of illiteracy, poor eye-sight, failure to understand the questions or the format of the questionnaire; increasing patient age was also a factor, the worst response rate (43%) being in persons aged 80 years or more.

In contrast to the results reported by MacDiarmid et al[17] (showing that 15% of respondents did not complete their symptom index), the 29% failure rate in our study is comparatively high. However, in patients younger than 70 years, the failure rate in our series decreased to 22%.

As the prevalence of LUTS increases with age, there may be a mismatch with applicability. However, the population also decreases with age. In this study, patients younger than 70 years accounted for 71% of the referrals. With increasing educational levels in the community, a self-administered assessment tool should become more applicable in the future.

Effectiveness of the questionnaire as a medical test

By running the ROC curve of the C-IPSS, it was close to a straight line and the AUC was 0.68, which is not satisfactory for the diagnosis of conditions warranting surgery. With the sensitivity of about 60% at an optimal cut-off value of 24, the C-IPSS is not a sensitive tool for this purpose among our referrals. Sensitivity gradually increases if we decrease the cut-off value from the optimal point of 24, but inevitably specificity decreases markedly.

Application of the questionnaire in primary health care

Although sensitivity was low using the C-IPSS with a cut-off value of 24 (specificity 84% and NPV 79%), it appeared helpful in selecting patients for early specialist attention. In addition, the result of this test is also relevant to the counselling of patients about having a relatively uncomfortable diagnostic surgical

procedure for a possible treatable condition.

The C-IPSS has an NPV of 79%. Thus, even with scores below 24, there is more than 20% chance that the patient could have a problem warranting surgery, which means that the result should not provide a false sense of security (for patients and attending physicians).

Using a non-invasive simple test for selecting high-risk groups for early management is important for the health care system with scarce resources for secondary care and where prioritisation is needed.

Prevalence of surgically treatable conditions

In this study, for all the subjects completing the diagnostic process with or without completing the C-IPSS questionnaire, about 39% (28/71) of the referrals had conditions warranting surgery. The prevalence of such conditions among referrals may be regarded as low. In primary health care, only symptomatic assessment is available and different physicians have different thresholds for specialist referral.

In this study group, subjects with conditions warranting surgery had C-IPSS scores as low as 5 and 6. Applying C-IPSS cannot improve the scores without delaying treatment for patients with organic pathology.

There is no other identifiable organic pathology other than BPH and bladder neck obstruction. Benign prostatic hyperplasia accounts for 89% of the pathology. Other pathology like tumour or stricture may have a different presentation (retention of urine or haematuria) and has a lower prevalence in this selected population.

Correlations between clinical parameters

Studies of BPH patients cannot establish consistent correlations between symptom measurement and objective clinical parameters. Although Girman et al[23,24] showed men with enlarged prostates (size over 40 mL) were 3 times more likely to have moderate-to-severe symptoms and twice as likely to have bothersome interference with activities relative to men with smaller prostates, Franciosi et al[25] showed a low correlation between IPSS scores and prostate gland volume.

Roehrborn and McConnell[6] in a community study showed that peak flow rate decreased with increasing symptom score. However, in their daily clinical practice there was no correlation when the study group was narrowed down to BPH patients only.

In this study, the author performed scatter plot (Fig 2) between C-IPSS and peak flow rate. Correlation between these two variables could not be demonstrated.

Correlation with dichotomous variable

Netto Júnior et al[26] performed a study to correlate IPSS and bladder outflow obstruction by performing pressure-flow studies on 258 BPH patients aged 50 to 81 years with IPSS scores from 8 to 35. They found that for patients with IPSS score of over 28, the probability (PPV) of bladder outlet obstruction was 91%, which is comparable to the cut-off point of 24 in this study. However, their NPV was just 36%. The study sample had a high proportion (154/227, 68%) of patients with bladder outlet obstruction. Similar studies by Yalla et al[27] and Sirls et al[28] did not demonstrate any correlation.

Limitation and potential bias

Study design

Although this was a retrospective cross-sectional study, the data were structurally and systematically collected and of good quality. With reliable and easily accessible electronic data, it is therefore similar to a prospective study.

Patient selection

Patients attending secondary rather than primary care service were selected. Although urethrocystoscopy is a safe procedure, it does carry minor risks.[29] It is not appropriate to perform these tests in patients with minimal symptoms who are not referred to secondary health care facilities. Concerning accessibility and risk of diagnostic procedures, only patients attending secondary health care services were recruited. This affects the applicability of the results to primary care patients in the community.

Dropout

There was a significant dropout rate in this study. Thus, after screening for exclusion criteria, only 117 patients were included for analysis, and only 83 could complete the C-IPSS questionnaire. Thus, only 58 of the recruits (approximately 50%) completed the whole diagnostic process.

With different days for investigative preliminary appointments and the 'invasiveness' of urethrocystoscopy, the subjects needed to decide whether to proceed with the investigation. Patients feeling better or not suffering from organic disease could default from the investigation process. Whether they consented for the procedure or not, may have been related to the underlying condition. Those not consenting to urethrocystoscopy or defaulting from either the preliminary appointment or the diagnostic tests, were a potential source of bias, affecting the

validity of the result.

Reviewing the C-IPSS score of the 25 patients who completed the C-IPSS questionnaire but failed to complete the diagnostic process, there were only three with scores exceeding 24.

Choice of gold-standard diagnostic tests

In this study, we tried to introduce the concept of conditions warranting surgery in LUTS, as the outcome variable to identify patients most likely to benefit from specialist referral. The cut-off point for peak flow rate in diagnosing urinary outflow obstruction remains controversial. A cut-off urinary peak flow rate of 10 cc/sec was applied as this group evidently enjoys most benefit from surgical treatment.[11] This study chose the lower limit among current recommendations to identify those most in need.

Although uroflowmetry alone cannot demonstrate obstruction[30] and pressure flow urodynamic study can give more detailed information, uroflowmetry itself is a good predictor on surgical outcome[31] and there were no available urodynamic data for subjects in this study.

Urethrocystoscopy is an optimal tool for diagnosing organic pathology in the lower urinary tract. Inspection of adenoma enlargement within the capsule[32] can produce more evidence of organic obstruction. However, there are no clear-cut criteria for the diagnosis of BPH by endoscopy. Variations in judgement among endoscopists affect the outcome, viz positive or negative with respect to conditions warranting surgery. It was assumed that all endoscopists in this study shared the same visual judgement regarding the diagnosis.

Application

The suggested cut-off values can only be applied to those LUTS patients clinically assessed by primary health care physicians already selected for specialist referral. It was not designed for screening, which entails different objectives.[33] For patients already planned for specialist care, they can fill in the C-IPSS questionnaire in the primary care clinic before making a specialist appointment. High-score patients can then be selected for early specialist attention.

The result of this study cannot be generalised to the community or all primary health service patients. To have more information on this issue, the target population needs to be changed accordingly, and the cut-off value may be different.

Conclusion

The applicability of the self-administered C-IPSS questionnaire is marginal with 70% success rate in terms of completion. It is not a sensitive instrument to diagnose conditions warranting surgery and is not a suitable medical test to exclude patient referrals to secondary health care services. However, C-IPSS of 24 can be considered an optimal cut-off value to triage patients for early attendance by specialists. With the limited feasibility and effectiveness of C-IPSS to differentiate conditions warranting surgery, the percentage of such referrals can hardly improve. In Hong Kong, public health care resources are scarce; LUTS is one of the common clinical problems in primary health care, which contributes a significant workload on the secondary health care system. Triage of those most in need of early attention may improve the efficiency of service delivery and benefit the community.

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