Lower urinary tract symptoms, traditionally labeled prostatism, are accepted by most cultures as an inevitable consequence of aging.1,2 The term prostatism implies cause and remedy, whereas in reality the condition results not only from infravesical bladder outlet obstruction caused by the enlarged prostate gland but also from motor or sensory abnormalities of detrusor and urethral function,3 or even from habit and changes in life-style that commonly occur as men grow older. Race, food, country of origin and other environmental factors are reported to be related to the prevalence of lower urinary tract symptoms but epidemiological studies are subject to many pitfalls and the data must be interpreted with great caution, particularly because a widely accepted definition of clinical benign prostatic hyperplasia (BPH) has not been established.4 The reported international differences in the prevalence of lower urinary tract symptoms may reflect true differences in the prevalence of BPH but they may also be related to cultural differences in the perception of or willingness to report symptoms. The prevalence of symptoms in the community is greater than the number of men who seek medical or surgical help, indicating that men do not always perceive that the lower urinary tract symptoms cause problems.1,6 The perception of lower urinary tract symptoms seems to be a personal matter that could be dissimilar among men in different age groups, and various environmental and socio-demographic circumstances. Recently, Abrams suggested that the terminology in this area should be redefined.7 BPH is a histological diagnosis that was shown by Berry et al to occur in 88% of men older than 80 years.8 Although prevalent, BPH may not lead to the clinical diagnosis of benign prostatic enlargement or to the urodynamic diagnosis of benign prostatic obstruction. Similarly, even though benign prostatic obstruction exists, the patient may not be bothered by lower urinary tract symptoms.9

Many questionnaires have been developed for use by patients with lower urinary tract symptoms.6,10-13 Four questionnaires have been validated in patients with the clinical diagnosis of BPH9,10,13,14 but to our knowledge none has investigated the relationships with the urodynamic diagnosis of bladder outlet obstruction. In 1991 the International Continence Society began an international multicenter study in patients with lower urinary tract symptoms suggestive of bladder outlet obstruction to validate a new questionnaire incorporating all urinary symptoms, related problems and quality of life issues that could indicate obstruction, detrusor instability, detrusor underactivity and other urinary conditions. The aims of the study were to investigate the relationship between the results of urodynamic studies and a wide range of urinary symptoms, develop and validate an International Continence Society “BPH” symptom score for use in research and clinical practice, and compare pretreatment and posttreatment symptoms with the results of advanced urodynamic pressure-flow study evaluation, used as the gold standard for quantification of the degree of obstruction in elderly men,15 to be able to define the characteristics of patients who will benefit from current therapies.

We investigated international differences in the reporting of
INTERNATIONAL DIFFERENCES IN LOWER URINARY TRACT SYMPTOMS

lower urinary tract symptoms and related bother in patients with symptoms suggestive of bladder outlet obstruction.

MATERIAL AND METHODS

In the International Continence Society "BPH" study, 1,271 patients older than 45 years with lower urinary tract symptoms suggestive of bladder outlet obstruction who were well enough to undergo prostatic surgery, if appropriate, were recruited from general urology practices in 12 countries (table 1). Patients were excluded from the study if they had an abnormal midstream urine specimen or significant other urological disease, such as prostate cancer, neurological disease or previous prostatic surgery, or if they were taking medication active on the lower urinary tract.

All patients were evaluated at baseline by medical history, including questions concerning the home location (city or town center, suburbs, village or rural), marital status (married, living as married or single), work situation (employed, retired or unemployed), and the preoperative anesthetic risk as indicated by the physician (minimal or moderate to severe). Symptoms were evaluated by the International Continence Society "BPH" study questionnaire, which allows men to report the frequency of symptoms associated with the filling, voiding and post-voiding phases, and also to assess the degree of bother that they cause. The questionnaire also contains specific questions that focus on issues concerned with sexual function and the effects of symptoms on daily life. The International Continence Society male questionnaire was developed in English and then professionally translated into 10 other languages. Each translation was then back translated and evaluated by a lay advisor or senior urologist from each country who was nominated as a national coordinator for the International Continence Society "BPH" study. Donovan et al demonstrated that with the International Continence Society male questionnaire it was possible to differentiate between men in clinical and community populations, and to detect the expected positive age gradient for most symptoms in the community group. There was reasonable agreement between relevant parts of the questionnaire, and the frequency and volume charts. Internal consistency was high, and overall the questionnaire demonstrated good test-retest reliability. Furthermore, patients underwent a physical examination, including digital rectal examination with estimation of the prostatic volume and an optional ultrasonographic examination of the prostate, free uroflowmetry studies with subsequent measurement of residual urine (the highest maximum flow rate was used for the analysis) and urodynamic pressure-flow studies.

Statistics were used to describe the patient population, and to provide an overview of the reported prevalence of each symptom and related problem for each country. Differences across the countries in medians for quantitative variables and differences in distributions for categorical variables were tested with the Kruskal-Wallis 1-way analysis of variance and chi-square tests, respectively. The impact of country of origin was studied on the reported prevalence of symptoms and related bother by using multiple logistic regression analyses.

Initially, international differences for each symptom and related bother were tested by entering country alone (represented by 10 dummy variables) into a logistic regression model. Step 2 was to determine if adjusting for confounding variables changed these results. The possible confounding variables included location of the home, marital status, patient work situation, preoperative anesthetic risk as indicated by the physician (all categorical), age, maximum flow rate and prostatic volume (quantitative). The logistic regression analysis was done for 977 patients for whom complete data were available. Odds ratios and 95% confidence intervals were calculated for each country using the United Kingdom as the reference country. Given the number of significance tests performed in each analysis, statistical significance should be interpreted with caution. Applying the Bonferroni correction for multiple testing would imply a cutoff point of approximately 0.0025 for each individual p value to retain an overall 5% significance level. Since the symptoms were strongly associated with each other, such a correction would be conservative. Therefore, for the present analyses a cutoff point of 1% was used, with a significance of 1 to 5% being regarded as marginal.

RESULTS

Patients with a wide range of objective variables, such as maximum flow rate, voided volume and residual volume, were included in the study (table 1). When comparing age, voided volume, maximum flow rate, residual volume, estimated prostatic volume, marital status, location of the home, type of house, work situation and preoperative anesthetic risk, significant differences (p < 0.02) were apparent for all variables, indicating that overall patients recruited from the various countries were different.

This finding can be illustrated by several factors. The largest group of patients from the United Kingdom were 60 to 69 years old (45%), lived in the suburbs (88%) and were retired (72%), while 24% were in active work. In Germany equal percentages of patients were 60 to 69 (40%) and less than 60 (40%) years old. German patients were more likely to live in a city (65%) and 77% were retired, while 21% were employed. The largest group of patients in Italy were older than 70 years (43%) and lived in a village (50%), and 77% of them were retired. Although the majority of Japanese patients (53%) were older than 70 years, the proportion employed was considerable (40%), while only 60% were retired.

The prevalence of each symptom and the proportion of men reporting problems among those who had the symptom for the various countries as well as in the entire study group are

Table 1. Median patient data by country separately and for the total sample with 5th and 95th percentiles

<table>
<thead>
<tr>
<th>Country</th>
<th>No. Pts. (%)</th>
<th>Age (yrs.)</th>
<th>Prostate Vol. (cc)</th>
<th>Max. Flow Rate (ml/sec.)</th>
<th>Voided Vol. (cc)</th>
<th>Residual Vol. (cc)</th>
</tr>
</thead>
<tbody>
<tr>
<td>United Kingdom</td>
<td>214 (17)</td>
<td>67</td>
<td>30</td>
<td>11.3</td>
<td>260</td>
<td>100</td>
</tr>
<tr>
<td>Canada</td>
<td>35 (3)</td>
<td>61</td>
<td>25</td>
<td>10.5</td>
<td>188</td>
<td>45</td>
</tr>
<tr>
<td>Denmark</td>
<td>121 (9)</td>
<td>70</td>
<td>40</td>
<td>10.6</td>
<td>158</td>
<td>17.0</td>
</tr>
<tr>
<td>Germany</td>
<td>120 (10)</td>
<td>68</td>
<td>35</td>
<td>10.0</td>
<td>180</td>
<td>60</td>
</tr>
<tr>
<td>Italy</td>
<td>58 (4)</td>
<td>67</td>
<td>40</td>
<td>8.6</td>
<td>240</td>
<td>75</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>391 (31)</td>
<td>66</td>
<td>35</td>
<td>12.0</td>
<td>238</td>
<td>45</td>
</tr>
<tr>
<td>Portugal</td>
<td>49 (4)</td>
<td>65</td>
<td>50</td>
<td>13.4</td>
<td>270</td>
<td>67</td>
</tr>
<tr>
<td>Sweden</td>
<td>73 (6)</td>
<td>67</td>
<td>30</td>
<td>9.9</td>
<td>202</td>
<td>50</td>
</tr>
<tr>
<td>Australia</td>
<td>47 (4)</td>
<td>65</td>
<td>30</td>
<td>17.0</td>
<td>200</td>
<td>Not given</td>
</tr>
<tr>
<td>Israel</td>
<td>10 (1)</td>
<td>66</td>
<td>40</td>
<td>9.7</td>
<td>208</td>
<td>90</td>
</tr>
<tr>
<td>Japan</td>
<td>105 (8)</td>
<td>70</td>
<td>20</td>
<td>10.0</td>
<td>170</td>
<td>38</td>
</tr>
<tr>
<td>Taiwan</td>
<td>30 (3)</td>
<td>69</td>
<td>Not given</td>
<td>16.0</td>
<td>220</td>
<td>50</td>
</tr>
</tbody>
</table>

* p < 0.01 among countries.
shown in tables 2 and 3. In the entire study group voiding symptoms tended to be reported most frequently, whereas the most bothersome were storage symptoms.16

The results of the logistic regression analysis are shown in tables 4 to 7. After controlling for possible confounding vari-
ables, the country of origin was strongly significantly associ-
ated (p <0.01) with the prevalence of 10 of the 20 symptoms, including terminal dribble, intermittency, hesitancy, ur-
gency, repeated urination, post-void dribble, urge incontinence, burning, bladder pain and sitting to urinate (table 4). In addition, 5 symptoms were marginally significant (0.01 < p <0.05), including nocturia, strain to continue, strain to start, incontinence of no apparent cause and urinary retention. Only stress incontinence was significant before but not after controlling for confounding factors. On the other hand, hesitancy became more significant after adjustment.

Table 5 presents odds ratios (95% confidence intervals) for the symptoms listed as significant in table 4. All countries were compared to the United Kingdom. Results for Canada, Portugal, Australia and Israel should be interpreted with caution given the relatively small numbers. The patterns evident are different for each country but there were some similarities. For example in the Netherlands, Denmark and

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Germany the symptoms of strain to continue, strain to start and sitting to urinate were considerably more prevalent than in the United Kingdom, whereas hesitancy was less prevalent. Urgency and repeated urination were less prevalent in Italy, Sweden, Japan, The Netherlands and Germany than in the United Kingdom. In other respects a considerably different pattern of symptoms was evident in Japan. In Japan only urinary retention was more prevalent than in the United Kingdom, while terminal dribble, intermittency, hesitancy, urgency, repeated urination, post-void dribble, urge incontinence, burning, bladder pain and incontinence of no known cause were less prevalent. Interestingly, all countries had a greater prevalence of urinary retention than the United Kingdom. Overall there were marked variations in the symptomatology across countries.

After controlling for possible confounding variables, the country of origin was strongly significantly associated (p < 0.01) with bothersomeness for only 2 of the 19 symptoms for which this parameter was assessed, that is hesitancy and strain to start (table 6). In addition, the 4 symptoms marginally significant (0.01 < p < 0.05) were terminal dribble, decreased stream, incomplete emptying and strain to continue. Three of these 4 symptoms had been highly significant before controlling for confounding factors, while strain to continue was unaffected by adjustment. Of the 13 symptoms not significant after adjustment the only 3 even marginally significant originally were intermittency, urgency and bladder pain.

Table 7 presents odds ratios (95% confidence intervals) for the symptoms listed as significant in table 6. All countries were compared to the United Kingdom. Results for Canada, Portugal, Australia and Israel should be interpreted with caution given the relatively small numbers. Again, the pattern for Japan was rather different from the other countries, with all 6 symptoms much more bothersome than in the United Kingdom. In Germany terminal dribble, decreased stream, hesitancy and incomplete emptying were also highly bothersome, whereas for the other countries only Italy and Sweden each had a suggestion of markedly greater levels of bother than the United Kingdom for the 2 symptoms of terminal dribble and strain to continue. The only instance when bothersomeness was significantly less than in the United Kingdom was strain to start in The Netherlands.

**DISCUSSION**

Although international variations in the prevalence of specific lower urinary tract symptoms were clearly demon-
International Differences in Lower Urinary Tract Symptoms

Our study indicates that international differences are relevant in the reporting of specific lower urinary tract symptoms and related bother. Inevitably, individual countries...
have different cultural backgrounds and specific health care delivery systems. Therefore, the results of studies in specific countries may not be generally applicable in other countries. In particular, it may be important to consider different patterns of reporting of symptoms and bothersomeness when interpreting the results of studies using common questionnaires. Of course, symptoms are extremely important for monitoring disease progression and outcome in individual patients. Many studies use symptom scores that consolidate individual symptom differences into 1 overall measurement, thus potentially concealing this variation. The International Continence Society male questionnaire avoids these difficulties by considering each symptom separately. For studies that use symptom scores it may be necessary to evaluate R. S. M., Oesterling, J. E., and Potter, J.: A new look at bladder neck obstruction by the Food and Drug Administration regulators: guidelines for investigation of benign prostatic hypertrophy. Trans. Amer. Ass. Genito-Urin. Surg., 68: 29, 1977.


EDITORIAL COMMENT

This well written article is a product of an important multinational study conducted by the International Continence Society to investigate, among other things, the relationship between lower urinary tract symptoms and physiological evidence of bladder outlet obstruction among men seen by urologists. The main conclusion is that prevalences of many lower urinary tract symptoms vary significantly by country, even after controlling for confounding factors. Perhaps such differences would have been expected given the variability in the demographic characteristics of the men seen in these urology practices, as well as the variability in prostatic related characteristics displayed in Table 1. The populations are different enough that unmeasured confounders may well explain some of the observed variation in symptom prevalence. To what extent any real variation in symptoms among men visiting the participating urological practices might have reflected differences in how men are referred to these practices, or actual population differences in symptom occurrence or perception, cannot be addressed with this study design.

While the prevalences of 10 symptoms were statistically significantly different among the countries studied, how impressive were the observed variations from the clinical perspective? Eliminating the 5 countries contributing fewer than 50 subjects (which yielded imprecise estimates of country specific symptom prevalences), and focusing on the 10 symptoms that showed significant variation, the data in Table 2 showed ranges of prevalence as close as 82 to 88% for terminal dribbling and as wide as 9% in spite of slight differences of these symptoms Japan appeared to be an outlier. For the 4 European countries contributing more than 100 patients the ranges of symptom prevalences appeared relatively tight. These prevalences, of course, did not reflect adjustment for potential confounders but the raw and adjusted analyses presented subsequently were not different.

Perhaps the most remarkable finding in this study was the lack of variation in symptom bother among the subjects from these urology practices in different countries, again given the differences in the populations that were enrolled. It may be that a common denominator that brought men to urologists in these different countries was the degree to which they were bothered by the symptoms. Such data complement population based studies, which can also attempt to determine whether symptom and bother differences exist at the community level.

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