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**Authors:** TL Tan, YY Ding, PK Lieu

**Institution:** Tan Tock Seng Hospital

**Title:** APPLICATION OF THE UROFLOW STUDY TO INDIVIDUAL OLDER MEN: USE OF PRE-TEST PROBABILITY AND LIKELIHOOD RATIO

### Aims of study:

For the diagnosis of bladder outlet obstruction (BOO), though the sensitivity and specificity of various cut-off values of Qmax can be obtained, they are difficult to apply to individual men in clinical practice, especially when intermediate values of Qmax are encountered. In the interpretation of results of a diagnostic test, pre-test probabilities and likelihood ratios (LR) have been used to obtain post-test probabilities for other medical diagnoses (1). In this study, we use this approach for the uroflowmetry in the diagnosis of BOO for older men with lower urinary tract symptoms (LUTS).

### Methods:

The uroflowmetry and pressure-flow study data of 131 men aged 55 years and older was analysed. For the uroflow study, the Qmax was corrected for bladder volume (voided volume + residual volume) by applying the Siroky nomogram. For the pressure-flow study, BOO was defined by the provisional ICS method for definition of obstruction. The LR for BOO of the various Siroky nomogram classifications (ie, < -3SD, between -3SD and -2SD, between -2SD and -1SD, between -1SD and 0SD, >0SD) were computed.

To determine the pre-test probability for BOO, a larger group of 156 men aged 55 years and older who had pressure-flow studies done at our centre for the evaluation of LUTS was studied. The overall prevalence of BOO as well as that of sub-groups with or without voiding symptoms (any of the following: hesitancy, reduced stream, intermittent stream, sensation of incomplete emptying, straining) and lower or higher post-void residual (PVR) volumes ( $\leq 100$  ml or  $> 100$  ml) were obtained.

For various permutations of the pre-test probability of BOO based on voiding symptoms and PVR, coupled with the LR for different Siroky nomogram classifications for Qmax from the uroflow study, the post-probability of BOO were calculated in the following way:

$$\text{Pre-test odds} = \text{pre-test probability} / (1 - \text{pre-test probability})$$

$$\text{Post-test odds} = \text{pre-test odds} * \text{LR}$$

$$\text{Post-test probability} = \text{post-test odds} / (\text{post-test odds} + 1)$$

### Results:

For the uroflow study, the likelihood ratios obtained were:

SIROKY NOMOGRAM	BOO	NO BOO	LR FOR BOO
>0SD	0/27 = 0	0/104 = 0	0/0 = 0
-1 to 0SD	0/27 = 0	4/104 = 0.038	0/0.038 = 0
-2 to -1SD	4/27 = 0.148	30/104 = 0.288	0.148/0.288 = 0.51
-3 to -2SD	16/27 = 0.593	49/104 = 0.471	0.593/0.471 = 1.26
< -3SD	7/27 = 0.259	21/104 = 0.202	0.259/0.202 = 1.28

The overall prevalence of BOO in the group of 156 men was 22.4%. The prevalence for the 4 different permutations based on presence or absence of voiding symptoms and PVR were:

	<b>NO. OF PATIENTS</b>	<b>NO. OF PATIENTS WITH BOO</b>	<b>PREVALENCE OF BOO</b>
<b>No voiding symptoms + PVR <math>\leq</math> 100 ml</b>	39	7	7/39 = 17.9%
<b>Voiding symptom(s) + PVR <math>\leq</math> 100 ml</b>	85	17	17/85 = 20.0%
<b>No voiding symptoms + PVR &gt; 100 ml</b>	10	2	2/10 = 20.0%
<b>Voiding symptom(s) + PVR &gt; 100 ml</b>	22	9	9/22 = 40.9%

The computed post-test probabilities were:

<b>SIROKY NOMOGRAM</b>	<b>NO VOIDING SYMPTOMS PVR <math>\leq</math> 100 ML</b>	<b><math>\geq</math> VOIDING SYMPTOMS PVR <math>\leq</math> 100 ML</b>	<b>NO VOIDING SYMPTOMS PVR &gt; 100 ML</b>	<b><math>\geq</math> VOIDING SYMPTOMS PVR &gt;100 ML</b>
<b>&gt; 0 SD</b>	0.00	0.00	0.00	0.00
<b>-1 to 0 SD</b>	0.00	0.00	0.00	0.00
<b>-2 to -1 SD</b>	0.10	0.11	0.11	0.26
<b>-3 to -2 SD</b>	0.22	0.24	0.24	0.47
<b>&lt; -3SD</b>	0.22	0.24	0.24	0.47

### **Conclusion:**

Post-test probabilities obtained from LR provides useful information in the application of uroflowmetry for the diagnosis of BOO in individual older men, depending on the unique pre-test probabilities of BOO for the different patient subsets. In our patients, uroflowmetry has limited use in the diagnosis of BOO. For patients with voiding symptoms and PVR > 100ml, the post-test probabilities of uroflow readings classified under the lower ends of Siroky nomogram (< -3SD and -3 to -2SD) is less than 50%. However, for classification of -1 to 0 SD, we can safely rule out BOO in our men. For classification of -2 to -1 SD, men with no voiding symptoms and with PVR  $\leq$  100 ml have a post-test probability of BOO of only 10%. Depending on the “test threshold” (post-test probability below which the clinician is confident enough that BOO is absent without doing any further investigations), a decision can be made as to whether or not it is necessary to proceed on with pressure-flow studies to rule out BOO definitely. More work needs to be done to confirm the likelihood ratios obtained. Individual centres should derive their own pre-test probability for their different patient groups as this has a major influence on post-test probability.

### **References:**

1. JAMA 1994; 271(9):703-707