Selecting diagnostic strategies in primary pelvic organ prolapse

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Interobserver agreement and intersystem comparison of the halfway system of Baden and Walker versus the Pelvic Organ Prolapse-Quantitation Prolapse Classification System in assessing the severity of pelvic organ prolapse

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Sjoerd de Blok
Erwin Birnie
Gouke J. Bonsel

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**ABSTRACT**

**Objective**
The objective of this study was to assess the interobserver and intersystem agreement of the Baden and Walker (B&W) and the Pelvic Organ Prolapse-Quantitation (POP-Q) systems.

**Methods**
Fifty patients with primo pelvic organ prolapse were consecutively examined by two gynecologists according to the two systems.

**Results**
The inter-observer agreement (weighted kappa \(K_w\)) of the Baden and Walker system was 0.76 for cystocele, 0.71 for prolapse of the uterus, 0.50 for rectocele and 0.37 for enterocele. Overall, the interobserver agreement of the POP-Q centimeter scores, analyzed by the Spearman’s rank correlation coefficient, were good for the anterior and middle compartment and poor for the posterior compartment. The inter-observer agreement of the overall stage of the POP-Q system based on the leading edge of the prolapse was \(K_w\) 0.33.

The intersystem agreement between B&W and POP-Q systems was moderate for the middle compartment (\(K_w\) 0.64 and 0.44), fair for the anterior compartment (\(K_w\) 0.23 and 0.35) and poor for the posterior compartment (\(K_w\) 0.11 and 0.12).

**Conclusion**
The interobserver variation of the Baden Walker and POP-Q systems proved to be similar and the intersystem variation between the two systems moderately strong. The systems are not completely interchangeable.

**Keywords**
Prolapse classification system • Prostate grading • Interobserver variation of prolapse classification systems • Intersystem correlation
INTRODUCTION

In The Netherlands, about 20% of the average clinical workload among gynecologists is related to pelvic organ prolapse (POP) and its functional complaints. In spite of the high prevalence of this disorder (the life-time risk of undergoing at least one surgical treatment for POP or urinary incontinence in the US is 11%), much is unclear regarding the optimal set of diagnostic tests, the staging of prolapse severity and, consequently, the selection of therapy. Even the definition of prolapse shows high variability as accepted criteria are absent.

POP is primarily assessed on the basis of patient history taking and gynecological examination, usually performed in an unstandardized way. Consequently, the severity of prolapse and related complaints are measured and described differently. To obtain a standardized, accurate, and unequivocal grading of prolapse severity as the basis for treatment decisions, several grading/staging systems have been developed, eg, the systems of Beecham, Baden and Walker, Shull et al, and Porges. Of these, the halfway system of Baden and Walker is very well-known. In 1996, the Standardization of Terminology Committee of the International Continence Society (ICS), the American Urogynecologic Society (AUGS) and the Society for Gynecologic Surgeons (SGS) introduced the Pelvic Organ Prolapse-Quantitation (POP-Q) system to evaluate therapeutic measures in a uniform, standardized way.

Although several studies have examined the interobserver agreement of the POP-Q system, much remains unclear about the reproducibility of the systems and how these systems compare relative to each other.

The first objective of the study was to compare the interobserver agreement of the halfway system of Baden and Walker (B&W) with the Pelvic Organ Prolapse-Quantitation (POP-Q) system. Our secondary objective was to assess to what extent the prolapse severity stages obtained with these systems agree with each other to assess if these two systems are interchangeable.

MATERIAL AND METHODS

Patients

Invited for study participation were women with suspected POP who were referred to the gynecology outpatients clinic of the Onze Lieve Vrouwe Hospital. Included were women who experienced a sagging sensation and/or miction and defecation problems at least once a week, and in whom one of the compartments was at least grade I prolapse according to B&W. Excluded were
patients less than 6 months post partum, patients with congenital defects of the tractus urogenitalis and/or the tractus digestivus, patients with gynecological pathology additional to the prolapse or with previous prolapse surgery and/or hysterectomy, patients in poor general condition precluding surgical therapy, patients with insufficient command of the Dutch language, patients who did not consent to dual examinations or follow-up visits.

The study was approved by the Medical Ethical Board of the hospital.

Examinations
We conducted a prospective, observational cohort study. When patients met inclusion criteria, and after assignment of informed consent, a second appointment was made. During this second visit severity of POP was assessed first in terms of B&W and followed by POP-Q. The pelvic examinations were carried out by two gynecologists independently (AGG, SdB) between 2 and 4 PM. The second gynecologist (SdB), blinded to the results of the first gynecologist (AGG), repeated the examination immediately afterwards. Data were recorded by a nurse on a standard form. POP was assessed with the patient sitting 45° upright in a gynecological examination chair while she was instructed to strain forcefully. Prolapse according to B&W was measured using a Seyffert speculum and described as one of five grades (0, I-IV) assigned to the following parameters: cystocele, rectocele, descensus uteri and enterocele. POP-Q describes pelvic organ support in terms of six defined anatomical landmarks on the vaginal wall relative to the hymen: points Aa and Ba on the anterior vaginal wall, points C and D in the superior vagina and points Ap and Bp on the posterior vaginal wall. Additionally genital hiatus (gh), perineal body (pb) and the total vaginal length (TVL) were recorded. TVL, representing the greatest depth of the vagina, was measured without using a speculum after digital reposition of the uterus and vagina to its normal anatomic position. Each POP-Q parameter was expressed in centimeters. For this purpose a Sim’s speculum and a polype forceps with marks on 1, 2, 3, 5, 7.5 and 10 cm were used as originally described by the ICS. A classification is available to translate the POP-Q centimeter scores into one of five POP-Q stages (0, I-IV) according to the leading edge of the prolapse¹⁰.

Analysis
Interobserver agreement of the B&W system and the interobserver agreement of the overall stage of the POP-Q system were measured by the weighted kappa (Kw) statistic. The weights to the disagreement were assigned according to the method of the equally spaced and quadratic difference. The interobserver
agreement of the POP-Q scores in centimeters was analyzed by Spearman’s rank correlation coefficient.

For both systems the percentages of complete interobserver agreement and the percentages of interobserver discrepancies of one and two stages, respectively, were added. Intersystem agreement was assessed for those parameters common to both measurement systems, viz. cystocele/point Ba, descensus uteri/point C, and rectocele/point Bp. Although the systems differ, the B&W and POP-Q systems can be made comparable using a simple conversion rule without much loss of information. As figure 1 shows, the B&W grades (0, I-IV) and the POP-Q centimeter scores can be translated into a 3-level intermediary system, used as common benchmark for our purpose. Level 1 represents descensus of the compartment to the midplane of the vagina but absence of vaginal prolapse. Level 2 is descensus of the compartment to the hymenal ring, which represents a first or second degree of vaginal prolapse. Level 3 is descensus of the compartment through the hymenal ring and indicates a third or complete vaginal prolapse. The conversion of the original B&W and POP-Q scores into the 3-level intermediary system was blinded for other data.

### Prolapse classification systems

![Figure 1 Comparison of the B&W grading system versus the POP-Q classification system with the 3-level intermediary system.](image)

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Intersystem agreement, ie, agreement between the B&W and POP-Q scores, converted to the 3-level intermediary system, was evaluated with the weighted kappa $K_w$ statistic. A $p$ value < 0.05 was considered statistically significant.

**RESULTS**

**Patients**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td></td>
<td>55.2 (10.4)</td>
</tr>
<tr>
<td>Educational level</td>
<td></td>
</tr>
<tr>
<td>Primary/lower vocational</td>
<td>16 (32%)</td>
</tr>
<tr>
<td>Secondary/high school</td>
<td>16 (32%)</td>
</tr>
<tr>
<td>Academic/university</td>
<td>18 (36%)</td>
</tr>
<tr>
<td>Body Mass Index (BMI)&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Mean (SD) [range]</td>
<td>25.1 (3.5)</td>
</tr>
<tr>
<td>Parity</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0 (-)</td>
</tr>
<tr>
<td>1</td>
<td>10 (20%)</td>
</tr>
<tr>
<td>2</td>
<td>16 (32%)</td>
</tr>
<tr>
<td>3</td>
<td>15 (30%)</td>
</tr>
<tr>
<td>$\geq$4</td>
<td>9 (18%)</td>
</tr>
<tr>
<td>Type of delivery&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Spontaneous</td>
<td>48 (124) births</td>
</tr>
<tr>
<td>Forceps/vacuum</td>
<td>4 (4) births</td>
</tr>
<tr>
<td>Caesarian section</td>
<td>4 (6) births</td>
</tr>
<tr>
<td>Birth weight of largest infant (g)</td>
<td></td>
</tr>
<tr>
<td>Mean (SD) [range]</td>
<td>3766 (617)</td>
</tr>
<tr>
<td>Perineal trauma</td>
<td></td>
</tr>
<tr>
<td>Mediolateral episiotomy</td>
<td>21 (42%)</td>
</tr>
<tr>
<td>No or incomplete perineal rupture</td>
<td>24 (48%)</td>
</tr>
<tr>
<td>Total perineal rupture</td>
<td>2 (4%)</td>
</tr>
<tr>
<td>Unknown</td>
<td>3 (6%)</td>
</tr>
</tbody>
</table>

<sup>a</sup> BMI of women in the normal population is 18-24 (body mass index = kg/m<sup>2</sup>).

<sup>b</sup> Fifty women delivered 134 times. All women delivered at least once vaginally

SD = standard deviation.

**Table 1** Characteristics of 50 women with pelvic organ prolapse

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Table 1 shows the characteristics of the women included in our study. None of the fifty patients were nullipara. No patients experienced multiple births and all patients delivered at least once vaginally.

**Interobserver agreement of the Baden & Walker System**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Cystocele</th>
<th>Rectocele</th>
<th>Descensus uteri</th>
<th>Enterocele</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>0</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>I</td>
<td>7</td>
<td>10</td>
<td>22</td>
<td>21</td>
</tr>
<tr>
<td>II</td>
<td>18</td>
<td>13</td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td>III</td>
<td>18</td>
<td>16</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>IV</td>
<td>4</td>
<td>8</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 2 The grading of prolapse according to the Baden and Walker system by gynecologists A and B in 50 patients

Table 2 presents the grading of prolapse according to B&W, as assigned by gynecologists A and B. For the anterior compartment, the interobserver agreement was complete in 58%; the discrepancy was one stage in 38% and two stages in 4% of the patients. For the middle compartment, the interobserver agreement was complete in 54%; the discrepancy was one stage in 40% and two stages in 6%. For the posterior compartment these percentages were 40%, 52% and 8%, respectively. For enterocele, the interobserver agreement was complete in 88%; the discrepancy was one stage in 8% and two stages in 4%.

The interobserver agreement ($K_w$) was 0.76 (95% CI: [0.65-0.88] for cystocele, 0.71 (95% CI: [0.55-0.88] for descensus uteri, 0.50 (95% CI: [0.29-0.71]) for rectocele and 0.37 (95% CI: [-0.14-0.89] for enterocele. The 95% confidence interval for enterocele was wide and included the value 0, ie, one cannot exclude that there is no agreement better than chance. Interobserver agreement was good for cystocele and for prolapse of the uterus, moderate for rectocele and poor for enterocele.

**Interobserver agreement of the POP-Q System**

The interobserver variation of the POP-Q centimeter scores assessed by gynecologists A and B varied for the site specific-site points. The correlation coefficients for the specific points ranged from rs 0.54 for Aa, rs 0.62 for point Ba, rs 0.85 for point C, rs 0.28 for Ap, rs 0.36 for point Bp, rs 0.53 for gh, rs
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Table 4 shows the POP-Q stages according to the leading edge of the prolapse assigned by gynecologist A and B. Agreement was complete in 60% of the cases. A discrepancy of one stage and two stages was found in respectively 36% and 4% of the cases. The disagreement between gynecologists was particularly large in stages II and III, where 30% of the patients were staged differently. The interobserver agreement (Kw) for the overall POP-Q stage was fair with 0.33 (95% CI: [0.08-0.59]).

Table 4 Interobserver agreement of the overall pelvic organ prolapse-quantification stage based on the leading edge of the prolapse obtained from gynecologists A and B (n=50)\textsuperscript{a}

\begin{tabular}{|l|l|l|l|l|}
\hline
Site & Gynecologist A & Gynecologist B & Spearman’s rank correlation coefficient \\
& (mean ± SD) & (mean ± SD) & \\
\hline
Aa & 0.02±1.19 & 0.47±1.63 & 0.54 \\
Ba & 2.33±2.09 & 1.38±2.15 & 0.62 \\
C & 0.01±3.92 & 0.56±3.15 & 0.85 \\
gh & 4.51±1.14 & 4.56±1.16 & 0.53 \\
Pb & 2.71±0.77 & 2.44±0.96 & 0.50 \\
Ap & 0.20±1.42 & -0.71±1.79 & 0.28 \\
Bp & 0.30±1.54 & -1.01±2.21 & 0.36 \\
TVL & 8.03±1.51 & 8.08±1.02 & 0.32 \\
\hline
\end{tabular}

\textsuperscript{a} Point D was not measured in all cases and was excluded from the interobserver study.

SD = standard deviation.
Baden and Walker system versus POP-Q classification system

Figure 2 Comparison of the B&W grading system versus the POP-Q scores (in centimeters) for the anterior compartment, as obtained from gynecologists A and B ($n=50$)
Y axis: spread in centimeters for POP-Q points Ba.
X axis: distribution of B&W cystocele grades.

Figure 3 Comparison of the B&W grading system versus the POP-Q scores (in centimeters) for the middle compartment, as obtained from gynecologists A and B ($n=50$)
Y axis: spread in centimeters for POP-Q points C.
X axis: distribution of B&W descensus uteri grades.

Figure 4 Comparison of the B&W grading system versus the POP-Q scores (in centimeters) for the posterior compartment, as obtained from gynecologists A and B ($n=50$)
Y axis: spread in centimeters for POP-Q points Bp.
X axis: distribution of B&W rectocele grades.
Intersystem agreement between Baden & Walker and POP-Q

Figures 2 - 4 show the association between the B&W grades and the POP-Q scores (in centimeters) for both gynecologist A and gynecologist B. A paired increase in severity of the prolapse for the two systems is demonstrated graphically for both gynecologists, respectively. Gynecologist B generally estimated the prolapse to be a slightly smaller (Figs. 2-4).

Table 5 shows the intersystem agreement (K_w) after conversion of the original B&W grades and POP-Q scores (in centimeters) into a 3-level system (Fig. 1). For the anterior compartment, agreement between B&W and POP-Q was only fair, and the gynecologists did not differ in this respect. For the middle compartment, agreement was moderate to good. Agreement for the posterior compartment appeared to be poor, and this was the case for both gynecologists.

<table>
<thead>
<tr>
<th>Compartment</th>
<th>Gynecologist A</th>
<th>Gynecologist B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior compartment</td>
<td>( K_w 0.23 )</td>
<td>( K_w 0.35 )</td>
</tr>
<tr>
<td>(= cystocele/point Ba)</td>
<td>95% CI, 0.10-0.37</td>
<td>95% CI, 0.17-0.54</td>
</tr>
<tr>
<td>1-level: 24/50</td>
<td>1-level: 13/50</td>
<td></td>
</tr>
<tr>
<td>2-level: 2/50</td>
<td>2-level: 6/50</td>
<td></td>
</tr>
<tr>
<td>Middle compartment</td>
<td>( K_w 0.64 )</td>
<td>( K_w 0.44 )</td>
</tr>
<tr>
<td>(= descensus uteri/point C)</td>
<td>95% CI, 0.48-0.80</td>
<td>95% CI, 0.27-0.60</td>
</tr>
<tr>
<td>1-level: 13/50</td>
<td>1-level: 21/50</td>
<td></td>
</tr>
<tr>
<td>2-level: 1/50</td>
<td>2-level: 2/50</td>
<td></td>
</tr>
<tr>
<td>Posterior compartment</td>
<td>( K_w 0.11 )</td>
<td>( K_w 0.12 )</td>
</tr>
<tr>
<td>(= rectocele/point Bp)</td>
<td>95% CI, 0.02-0.20</td>
<td>95% CI, -0.00-0.25</td>
</tr>
<tr>
<td>1-level: 33/50</td>
<td>1-level: 34/50</td>
<td></td>
</tr>
<tr>
<td>2-level: 6/50</td>
<td>2-level: 4/50</td>
<td></td>
</tr>
</tbody>
</table>

\( K_w = \) weighted kappa; CI = confidence interval.

Table 5 Intersystem agreement of the 3-level intermediary-system for gynecologists A and B separately.

Table 5 shows the intersystem agreement (\( K_w \)) after conversion of the original B&W grades and POP-Q scores (in centimeters) into a 3-level system (Fig. 1). For the anterior compartment, agreement between B&W and POP-Q was only fair, and the gynecologists did not differ in this respect. For the middle compartment, agreement was moderate to good. Agreement for the posterior compartment appeared to be poor, and this was the case for both gynecologists.

DISCUSSION

We evaluated the agreement in staging the degree of the prolapse between two experienced gynecologists and between two systems. The interobserver agreement of the B&W system was good for cystocele and for prolapse of the uterus, moderate for rectocele and poor for enterocele. The interobserver agreement for the various POP-Q points expressed in centimeters showed also
a good agreement for the anterior and the middle compartment but a poor agreement for the posterior compartment. The interobserver agreement for the overall POP-Q stage was only fair. The agreement between the B&W stages and the POP-Q stages was fair for the anterior compartment, moderate to good for the middle compartment, and poor for the posterior compartment.

The study is subject to some limitations regarding measurement and generalizability. Firstly, standardized B&W and POP-Q measurements in principle require that the prolapse is measured during the Valsalva maneuver and that the patient confirms that the prolapse is at its maximum. Although we performed the examination in the afternoon and we instructed the patient to strain forcefully, the maximum prolapse was not always reached according to the patient, or according to an examination carried out at another occasion. Moreover, the gynecologists inevitable were not blinded for their own first classification, as the assessment of the prolapse according to B&W was directly followed by the POP-Q classification. As gynecologist B always examined the patient as second examiner, the sequence of examinations may have biased measurements and therefore decreased interobserver and intersystem agreement. Contrary to our expectation, second measurements on average pointed towards a slightly smaller prolapse. Generalizability can be challenged as only primo pelvic organ prolapse were included. This could explain the higher prevalence of disorders in the anterior and middle compartments rather than in the posterior compartments, and the relative small number of severe prolapses of the posterior compartment. In patients with recurrent pelvic organ prolapse, severe posterior wall prolapse appears more prevalent\textsuperscript{14-16}. However we do not expect agreement to be affected by the patient mix in our study.

Several studies have examined the interobserver and intraobserver variation for the POP-Q system. Hall demonstrated a substantial interobserver and intraobserver correlation independent of observers’ experience (Spearman’s correlation coefficients of 0.895 for point Ba, 0.522 for point C and 0.746 for point Bp)\textsuperscript{11}. Kobak determined the interobserver agreement for both B&W and POP-Q\textsuperscript{12}. The (unweighted) kappa for B&W by area of the greatest prolapse was 0.68 and the kappa for ICS stage based on the leading edge of the prolapse was 0.79, indicating good interobserver agreement for both systems. The correlation coefficient between B&W and POP-Q system in the study of Bland was 0.75 for point Ba and cystocele and 0.68 for point Bp and rectocele; the correlation coefficient for the middle compartment was not mentioned\textsuperscript{13}. Brubaker found a significant interaction effect between the examination technique and the examiner on the POP-Q results in most of the analyses\textsuperscript{17}. 
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Compared to these studies, our results for the interobserver agreement appear less favorable, particularly for the posterior compartment. Our study was a standard practice study; without specific preparation, we established the degree of agreement between two experienced gynecologists in a nonresearch setting. The suboptimal results for the posterior compartment may be in part due to the difficult measurement procedure of that compartment; a rectocele shows as a bulge instead of a downward eversion of the vaginal wall. A rectocele is probably underestimated without digital rectal examination. Scotti expressed the same critics in his contribution of characterizing and reporting pelvic floor defects\textsuperscript{18}. In general, the accuracy of clinical examination is poor compared with surgical evaluation. Burrows shows that the predictive value of clinical evaluation for posterior wall defects was less than 40\%\textsuperscript{19}. Low correlation may also be caused by lack of variation in data. In our case, e.g., enterocele was rare, and this might explain the low correlation for enterocele. A head-to-head comparison of the B&W and POP-Q systems is difficult in view of the conceptual differences underlying these systems. The B&W system is a classification based on a visually orientated nonquantitative judgment of the physician, whereas the POP-Q system is based on detailed quantitative measurements. However, the robustness of meticulous measurements expressed in centimeters is impaired by subjective factors; expression of the prolapse depends on the forcefulness of the patient’s straining, her activities that day, and her capacity to duplicate efforts. Furthermore, the reading must be done quickly during straining, and this may add to imprecision. The B&W system is also applied during Valsalva maneuver but that system does not pretend such precision. A full comparison between the B&W and POP-Q systems is hampered by the fact that not all anatomical landmarks are included in both systems, implying that substitution of one system by another cannot easily envisaged, e.g., in the POP-Q system, enterocele is added with a remark (pulsion) to point Bp and not separately measured in centimeters, whereas the hiatus genitalis and perineal body, important aspects of genital prolapse, are not measured in the B&W system. More generally, POP-Q measurements are one-dimensional, B&W measurements essentially are 2-dimensional, while a prolapse is essentially a 3-dimensional condition. Therefore, both systems are designed to deliver in a part of different information on the degree of prolapse. Because none of the grading systems is 3-dimensional, no grading system is able to reproduce the degree of the prolapse in all its aspects. As the choice of therapy is also guided by non-anatomical aspects as functional disorders, presence of enterocele, previous surgery and co-morbidity\textsuperscript{20}, perfection of anatomical measurements – even if these would be 3-dimensional – will never
allow for clear-cut therapeutic decision on the basis of clinical examinations results alone. From therapeutic point of view, precise calibration of the measurement systems can be deceptive as small differences in grading usually have no therapeutic consequences. The ICS designed the POP-Q system because of concern about the reliability and validity of the staging of prolapse according to the B&W system, with consequent suboptimal clinical and international communication, and hampered comparison of therapeutic interventions and longitudinal evaluations of individual patients. Steele regarded the POP-Q easy to teach and to learn\textsuperscript{21}, but in our experience the learning time for the POP-Q system is longer than for the B&W system. A survey of practice patterns among ICS and IUGA members regarding the management of urinary incontinence and pelvic organ prolapse showed that only around 40\% of the members routinely use the POP-Q system in clinical practice. For research two third of the members used the POPQ system. The main criticism is that the POP-Q system is too complex\textsuperscript{22-24}.

We conclude that both the B&W system and the POP-Q system are sensitive to the gynecologist who performs the examinations, particularly when the posterior compartment is assessed. Considering the moderate inter-and intra-agreement of the posterior wall prolapse, assessment of this compartment requires revision of the classification systems or additional diagnostics. Training, feedback and multiobserver measurements will be necessary to improve the precision of clinical examination systems; however, subjective factors as describes before, will inevitably reduce the accuracy and reproducibility. Because the systems are not fully interchangeable, particularly regarding the anterior and posterior compartments, we think at this stage there is a place for both systems. In clinical practice B&W seems sufficient as functional classification system. The POP-Q system is particularly useful in research setting which might benefit from detailed quantitative measurements of the prolapse.
REFERENCES

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