

Commentary

Adding a Bedside Hiatal Sign to POP-Q: A Hypothesis-Generating Anatomical-Support Phenotyping Framework for Female Pelvic Floor Disorders

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Female pelvic floor disorders are commonly classified according to the predominant symptom or the compartment involved in prolapse; however, stress urinary incontinence, pelvic organ prolapse, and vaginal laxity frequently coexist in the same patient. The POP-Q system provides a standardized anatomical description of prolapse, but by itself it has limited ability to explain variations in symptoms, disease progression, and postoperative functional outcomes. Recent imaging studies suggest that the morphology of the levator hiatus and pelvic floor support structures contains clinically relevant information beyond organ position alone. On this basis, this Perspective proposes a two-layer anatomical-support phenotyping framework. The anatomical layer adopts the S-POP-Q compartmental notation without modification, recording anterior, apical, and posterior compartment prolapse in an A/C/P format. The hiatal layer introduces the W value as the sole novel element, assessing the accommodated transverse caliber of the levator hiatus at rest by transvaginal palpation. The W value is intended to explore whether clinically meaningful hiatal information can be captured through a simple bedside method; the cutoff is prespecified for research, not a validated clinical threshold. Using three clinical scenarios defined by combinations of W values and anterior compartment prolapse, this Perspective further proposes testable hypotheses about symptoms, disease progression, and treatment response, and outlines a three-stage research pathway: Stage 1, measurement reliability (interobserver agreement and construct validity against imaging); Stage 2, the incremental prognostic value of W for symptoms, progression, and recurrence beyond A/C/P staging, GH, and imaging-derived LHA; and Stage 3, multicenter external validation and treatment-

response stratification. This framework is intended to complement POP-Q staging by adding information on support status beyond standardized anatomical documentation, thereby providing a research basis for functional stratification in pelvic floor disorders. This article presents a hypothesis-generating conceptual framework and does not propose an established clinical classification system or treatment recommendation.

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Introduction: From Anatomical Description to Functional Classification

Female pelvic floor disorders are typically named and managed according to the predominant symptom or the most evident anatomical manifestation, including stress urinary incontinence (SUI), pelvic organ prolapse (POP), vaginal laxity, and voiding dysfunction. This approach is consistent with routine clinical workflows and facilitates subspecialty organization, but it may also divide different functional abnormalities of the same pelvic floor system into separate disease labels. In clinical practice, urinary leakage, vaginal wall bulging, and vaginal laxity often coexist in the same patient, and their manifestations may change with childbirth-related injury, aging, tissue degeneration, and therapeutic intervention. Therefore, classification based solely on the chief complaint or the most apparent prolapse compartment may not fully capture the state of pelvic floor dysfunction.

The POP-Q system provides a standardized and reproducible method for the anatomical description of POP and serves as an important foundation for clinical communication and research comparison^{[1][2]}. By recording the positions of the anterior vaginal wall, apex, and posterior vaginal wall relative to the hymenal ring, POP-Q enables different clinical centers to describe prolapse severity in a relatively consistent manner. However, the primary purpose of POP-Q is to document anatomical position; it is not intended to determine etiology or provide functional phenotyping. Patients with identical or similar anatomical stages may have different symptom burdens, continence status, and postoperative outcomes. Reduction of prolapse may also leave pre-existing symptoms unchanged or unmask occult SUI. Studies of the genital hiatus, levator hiatus, and pelvic floor imaging parameters further suggest that structural information related to support status exists beyond organ position alone^{[3][4]}.

These observations do not diminish the value of POP-Q. Rather, they point to an unresolved clinical question: beyond standardized anatomical description, should the functional state of the pelvic floor support system under dynamic load also be recorded? If such information can be measured reliably and provides independent explanatory value for symptoms, recurrence risk, or treatment outcomes, it may serve as a complementary layer linking anatomical phenotype to clinical decision-making.

Previous studies on the integrated pelvic floor, the definition of pelvic floor stress dysfunction (PFSD; a proposed term not currently included in IUGA/ICS terminology), biomechanical anatomy, and dynamic mechanical equilibrium provide theoretical clues for this question^{[5][6]}. On this basis, this Perspective proposes a two-layer anatomical-support phenotyping framework. The anatomical layer uses the Ba, Bp, C, and D points of S-POP-Q and presents anterior, apical, and posterior compartment prolapse in an A/C/P format. The hiatal layer records a bedside palpation sign of hiatal support using the W value. The aim of this Perspective is not to declare an established classification standard, but to address three areas that remain insufficiently developed: to record anatomical descent and support status as parallel dimensions; to propose an operational approach for translating hiatal information into bedside assessment; and, on this basis, to formulate a set of falsifiable predictions about symptoms, disease progression, and treatment response.

Clinical and Biomechanical Rationale for Functional Classification

The first rationale for proposing functional classification is that the relationship between anatomical findings and clinical outcomes is not simply linear. In a study of 477 women undergoing routine gynecologic examination, Swift et al. demonstrated that the hymenal ring (POP-Q 0 cm) was the symptom inflection point: the average number of prolapse-related symptoms per subject increased from fewer than one to more than one when the leading edge of the prolapse extended beyond the hymenal remnants, and this trend was statistically significant^[7]. However, POP-Q points still do not fully explain interindividual differences in symptom burden. Similarly, postoperative “success” should incorporate symptom improvement, retreatment, and patient-reported outcomes in addition to anatomical correction^[8]. This indicates that anatomical staging describes the prolapse phenotype but may not capture all determinants of clinical outcomes.

The second rationale comes from studies of hiatal morphology and levator ani integrity. Levator ani injury, enlargement of the levator hiatus, and widening of the genital hiatus have been associated with the occurrence, severity, or postoperative recurrence of POP^{[9][10][11][12]}. Three-dimensional or four-

dimensional transperineal ultrasonography can quantify levator hiatal distension during maximal Valsalva, known as hiatal ballooning^[13]. Longitudinal studies have also shown that a larger genital hiatus is associated with the development or early progression of POP^{[14][15]}. These studies establish two premises relevant to the present Perspective: hiatal morphology can be objectively quantified, and hiatal enlargement is clinically associated with the occurrence, progression, or recurrence of POP. Whether this hiatal information can be converted into a simple bedside sign remains to be determined.

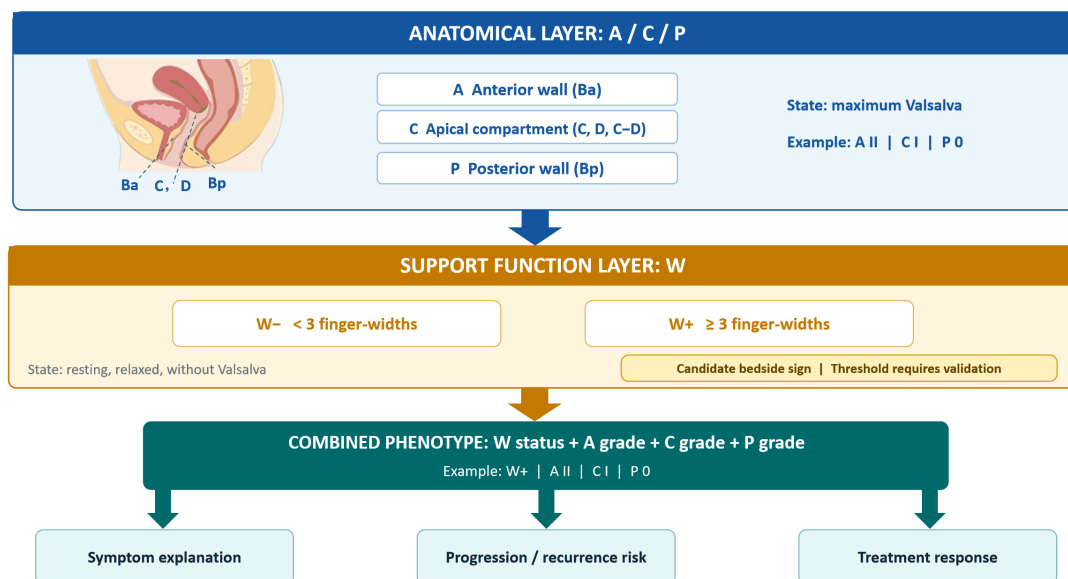
The third rationale arises from the interaction between POP and urinary continence. In some patients, SUI may be masked by prolapse and become apparent after anatomical reduction. Prophylactic treatment of occult SUI at the time of prolapse repair may reduce the risk of postoperative urinary incontinence, but may also increase certain adverse events^{[16][17]}. Systematic reviews and long-term follow-up studies of midurethral sling procedures likewise show that, although these procedures are generally effective, some patients experience persistent or recurrent urinary incontinence, complications, and repeat interventions^{[18][19][20][21]}. These findings suggest that continence outcomes depend on the overall state of pelvic floor support and its postoperative changes as well as on local urethral factors. However, current evidence is not sufficient to conclude that imaging-derived hiatal measures can predict sling efficacy or directly determine the choice of surgical procedure.

On the basis of these clinical data, our team's studies on the "holistic pelvic floor," the definition of pelvic floor stress dysfunction, biomechanical anatomy, dynamic continence mechanisms, dynamic equilibrium in POP, and finite element modeling provide mechanistic explanations for the relationships among different pelvic floor phenotypes^{[3][5][6][22][23][24]}. These studies conceptualize the pelvic floor as a dynamic mechanical system in which muscles, fascia, the vagina, the urethra, and related support structures work together, with emphasis on changes in hiatal constraint, support axes, and load transfer.

Taken together, existing evidence supports hiatal morphology as a clinically meaningful source of information in the assessment of pelvic floor support and demonstrates that it can be quantified by ultrasonography or MRI. Building on this foundation, the two-layer framework further introduces the W value, aiming to obtain corresponding bedside information through transvaginal palpation. Thus, the core innovation of this Perspective is not to re-establish the importance of the hiatus, but to propose and test a method for extending hiatal assessment to the bedside.

Proposed Framework: Anatomical Phenotype and Support Status

The proposed framework consists of two layers: an anatomical layer and a hiatal layer. The anatomical layer records the pelvic support phenotype using A/C/P anatomical staging, whereas the hiatal layer uses the W value to assess hiatal constraint. Combining these two layers is intended to identify different hiatal support states underlying similar anatomical phenotypes. Each patient is recorded using a combination of W status and A/C/P anatomical staging. The basic format is “W status + A stage + C stage + P stage” (e.g., “W+ / A II, C I, P 0”). In patients with a retained uterus, the C domain also retains the C point, D point, and C-D distance. A, C, and P are parallel anatomical dimensions used to evaluate anterior, apical, and posterior compartment prolapse, respectively. A schematic diagram of the classification framework is shown in Figure 1.



Arrows to outcomes represent associations to be tested, not established clinical rules.

Figure 1. Two-Layer Anatomical–Support Phenotyping Framework The anatomical layer is fully derived from S-POP-Q; the W value is the only novel element in the framework.

W Value: A Candidate Indicator of Hiatal Constraint

The W value (W for width) is a transvaginal palpation-based assessment of the accommodated transverse caliber of the levator hiatus at rest. In addition to the target hiatal dimension, the measurement may be influenced by vaginal wall compliance, tissue elasticity, perineal scarring, pain, examiner-applied force,

and the patient's degree of relaxation. Therefore, whether the W value primarily reflects the state of the levator hiatus or also incorporates information about vaginal tissue compliance is a construct question that must be distinguished through imaging and physiological measurements.

According to the proposed operational method, the patient is placed in the dorsal lithotomy position. With the pelvic floor muscles relaxed and without Valsalva maneuver, the examiner assesses the width of approximated fingers that can be accommodated at the plane of the levator hiatus. An accommodated width of less than three fingers is recorded as W-negative, whereas accommodation of three or more fingers is recorded as W-positive. The three-finger width is a prespecified research cutoff based on bedside feasibility, rather than a physiological threshold derived from existing imaging evidence. Early studies should record the actual width, the number of fingers accommodated, and the binary W classification simultaneously. Continuous-variable analyses should then be used to evaluate whether a stable outcome inflection point exists before determining whether three fingers is appropriate as the final classification threshold.

Prior to data collection, each examiner must calibrate finger widths using a vernier caliper to measure the proximal interphalangeal joint width of the index, middle, and ring fingers of the examining hand. The summed widths for two- and three-finger combinations are recorded to the nearest 0.5 cm and serve as individual examiner conversion factors. The centimeter value is the primary continuous variable for analysis; the finger-count category (W-negative < 3 fingers; W-positive $\geq$ 3 fingers) serves as a secondary bedside shorthand only.

To minimize measurement variability, a standardized examination protocol is prespecified: (1) dorsal lithotomy with hips flexed 45–60°; (2) measurement at the plane of minimal hiatal dimensions, identified by palpating the medial borders of the puborectalis; (3) fingers introduced in the transverse plane to the depth where the puborectalis is palpable bilaterally (typically 3–4 cm); (4) passive splinting without active dilation; (5) standard examination glove with water-based lubricant; (6) comfortably empty bladder and recent bowel movement; (7) verbal relaxation cueing with visual confirmation of absent perineal elevation; and (8) if pain or scarring precludes measurement, record as “unassessable” with documented reason.

The W value first records the degree of hiatal accommodation perceived by finger palpation at rest, rather than the instantaneous contractile force of the levator ani muscle. This article further proposes that it may reflect the long-term constraining capacity of the levator ani and related support structures on the

hiatus: when this constraint gradually declines under repeated intra-abdominal pressure loading, the hiatus may undergo persistent widening and present as a higher W status.

The W value differs from the genital hiatus (GH) length in POP-Q and the imaging-based levator hiatus area (LHA). GH measures the distance from the midpoint of the external urethral meatus to the posterior hymenal ring and mainly describes the degree of opening near the vaginal introitus. LHA is obtained by three-dimensional or four-dimensional transperineal ultrasonography and can demonstrate the levator hiatal area at rest, during pelvic floor muscle contraction, or during maximal Valsalva. By contrast, the W value records the accommodated caliber of the deeper hiatus through palpation at rest. These three measures differ in measurement plane, physiological state, and dimensional unit, and therefore provide complementary information. Previous studies of LHA enlargement and hiatal ballooning provide direct imaging evidence for the association between hiatal morphology and abnormal pelvic floor support^{[9][10][11][12][13]}. The further question raised by the W value is whether palpation can capture, at lower cost, the clinically meaningful portion of this information. Imaging evidence can provide anatomical and mechanistic support for this concept, but it cannot establish in advance the accuracy of palpation measurement, the superiority of the resting state, or the rationality of the three-finger threshold. Therefore, the W value is an independent bedside measurement scheme, and its performance must be compared with LHA, GH, and clinical outcomes. Bedside measurement of the W value and its anatomical relationship with GH and LHA are shown in Figure 2.

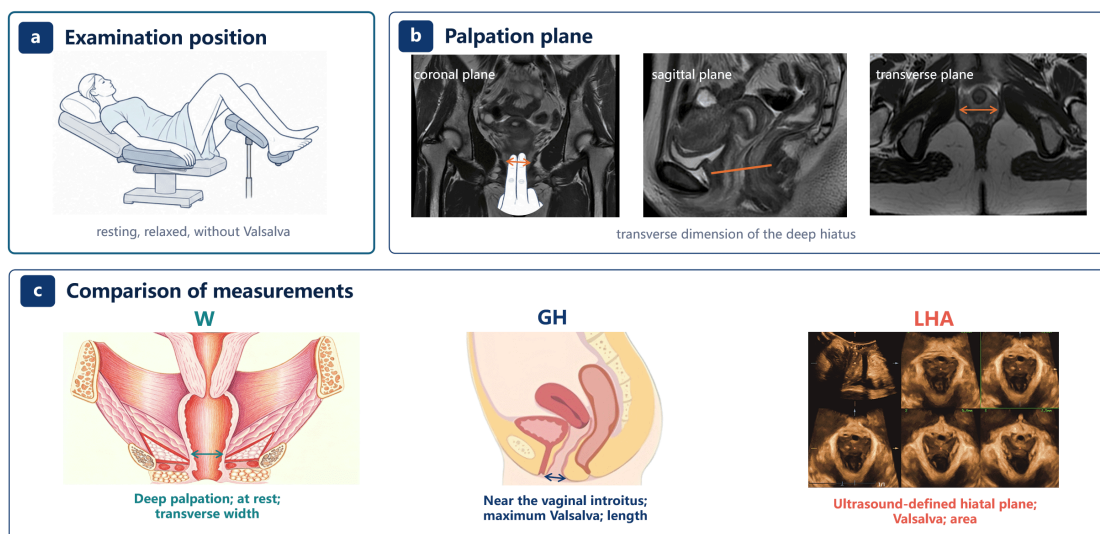


Figure 2. Bedside measurement of the W value and its anatomical relationship with GH and LHA

A/C/P Compartmental Presentation Based on S-POP-Q Measurement

The anatomical layer uses the Ba, Bp, C, and D points of S-POP-Q, whose validity for assessing prolapse has been previously demonstrated^{[25][26][27][28]}. A corresponds to the Ba point and records the most distal position of anterior vaginal wall prolapse, reflecting anterior wall support status. P corresponds to the Bp point and records the most distal position of posterior vaginal wall prolapse, reflecting the degree of posterior wall prolapse. The apical (C) region records both the C and D points. Under usual circumstances, the apical stage is determined by the C point alone, which indicates the most distal edge of the cervix or the vaginal cuff after hysterectomy. The D point indicates the posterior fornix in patients with a retained uterus and reflects the level of uterosacral ligament support; after hysterectomy, D is recorded as “NA.” The C-D distance serves as a clinical estimate of cervical length and helps distinguish descent dominated by cervical elongation from true apical support descent^{[1][2]}. When cervical elongation is pronounced (i.e., a large C-D distance with a relatively preserved D point), the apical stage should be determined by considering both the C point and the C-D distance in combination, rather than relying on C alone. The S-POP-Q measurement and A/C/P compartmental recording are shown in Table 1, and the staging criteria are shown in Table 2.

During the validation phase of the framework, the raw measurements of Ba, Bp, C, D, and TVL, the A/C/P stages, and the complete POP-Q data should all be retained. Because A/C/P does not change the S-POP-Q measurement method, the anatomical validity of each measurement point need not be re-established; validation should instead focus on whether this compartmental recording, when combined with the W value, improves symptom interpretation, risk stratification, and outcome prediction.

The framework therefore proposes a directly testable core proposition: on the basis of the anatomical phenotype recorded by A/C/P, can the addition of the W value further identify patients with different symptoms, risks of progression, and treatment responses? Whether this proposition is ultimately supported or refuted, it will clarify what bedside hiatal assessment can and cannot contribute to the diagnosis and treatment of PFSD.

Compartment	S-POP-Q parameter	Main purpose
A	Ba	Assessment of anterior compartment prolapse
C	C, D, and C-D*	Assessment of apical descent and differentiation of cervical elongation
P	Bp	Assessment of posterior compartment prolapse
Auxiliary parameter	TVL	Staging and assessment of vaginal length
Auxiliary parameter	GH	Assessment of genital hiatus (distal outlet opening)
Auxiliary parameter	PB	Assessment of perineal body surface length

Table 1. S-POP-Q Measurement and A/C/P Compartmental Recording

* after cervical amputation or hysterectomy, the D point is no longer applicable and should be recorded as “NA.”

Stage	Most distal position during maximal Valsalva
Stage 0	No prolapse demonstrated (all vaginal points at -3 cm or above; C or D at -TVL) ^{[1][2]}
Stage I	The most distal portion of the prolapse is more than 1 cm above the hymen (i.e., < -1 cm) ^{[1][2]}
Stage II	The most distal portion is ≤ 1 cm proximal or distal to the hymen (i.e., ≥ -1 cm and ≤ +1 cm) ^{[1][2]}
Stage III	The most distal portion is > 1 cm beyond the hymen but protrudes no further than (TVL - 2) cm ^{[1][2]}
Stage IV	Complete or essentially complete eversion; the most distal portion protrudes to at least (TVL - 2) cm ^{[1][2]}

Table 2. Staging Criteria for Prolapse

The recommended recording format is “W+ / A II, C I, P 0.” Note: Compartment-specific staging (A, C, and P, recording the anterior vaginal wall, apex, and posterior vaginal wall, respectively) records the most distal position of each compartment independently during maximal Valsalva. It does not equate to overall POP-Q stage, which is defined by the single most distal leading edge across all compartments^{[1][2]}. The S-

POP-Q system was originally proposed by Swift et al. [27] and validated in a multicenter inter-examiner agreement trial by Parekh et al. [28]

Relationship to Existing Bedside and Clinical Hiatal Measures

The relationship between W and existing hiatal measures can be clarified along two independent dimensions: the physiological state during measurement (rest, maximal pelvic floor contraction, Valsalva) and the measurement mode (contact, gauge-based digital examination versus non-contact or minimally disruptive imaging). Palpation during maximal contraction quantifies muscle strength and recruitment, a different construct assessed by the modified Oxford scale [29] and by digital hiatal dimension measurement during contraction as validated by Boyles et al. [30]. Imaging on maximal Valsalva quantifies distensibility (hiatal ballooning, Valsalva hiatal area) [13]. POP-Q GH quantifies the distal outlet on Valsalva [31]. The W value occupies the remaining, currently unoccupied cell of this matrix with respect to hiatal caliber assessment: a contact, gauge-based digital assessment of the hiatus at rest. Because the examining fingers splint and partially reduce prolapsing tissue, W also reflects tissue compliance and patient tolerance. It is therefore defined in this framework as a digital hiatal accommodation sign rather than a resting geometric width, and its relationship to imaging-derived resting and Valsalva dimensions is treated as an empirical question addressed in Stage 1.

Digital assessment of levator hiatus dimensions is not new. Boyles et al. measured the transverse and sagittal dimensions of the levator hiatus by digital palpation during maximal levator contraction (quantitative performance summarized in Table 3) [30]. The International Continence Society (ICS) terminology report for pelvic floor muscle assessment further describes estimating the width of the vaginal opening/levator hiatus using the number of finger-widths and converting this to centimeters for the individual assessor, with hiatal size recorded during maximal pelvic floor muscle contraction [32]. The W value should therefore not be regarded as a novel measurement; its proposed contribution is the incorporation of an existing digital hiatal-width sign into a combined two-layer phenotyping framework, measured at rest rather than during contraction. The present framework adopts this quantification approach, as detailed above.

There is also precedent for converting hiatal information into bedside signs. Khunda et al. showed that the sum of genital hiatus (GH) and perineal body (PB) measured on Valsalva predicted ultrasound-defined hiatal ballooning and objective prolapse [33]; Gerges et al. subsequently used GH+PB thresholds to

stratify abnormal hiatal distensibility^[34], and Volloyhaug et al. showed that GH+PB on Valsalva predicts levator avulsion^[35] (quantitative performance summarized in Table 3). Digital palpation of levator ani attachment to the pubic bone has also been developed and validated: van Delft et al. reported a four-grade classification with inter-rater kappa = 0.90, substantially higher than the modified Oxford scale (kappa = 0.66)^[29]. These studies demonstrate that clinically feasible hiatal assessment is achievable, but also that palpation-based pelvic floor scales carry documented reliability challenges that any new sign must meet. Notably, the predictive power of these outlet-plane measurements appears to reflect pathology of the levator hiatus itself, supporting direct measurement at the hiatal plane (discussed below).

GH itself is already a free, POP-Q-embedded bedside predictor with strong prognostic data. In a secondary analysis of the OPTIMAL trial, surgical success at 24 months decreased as preoperative GH increased, and posterior repair did not compensate for the pathophysiology producing an enlarged preoperative GH, which remained prognostic of recurrence^[31]. A related consideration concerns PB. POP-Q PB measures the surface distance from the posterior hymenal ring to the anal opening rather than the perineal body itself: it did not predict the sonographically measured perineal body or distinguish prolapse patients from controls^[36], and sonographic and endoanal ultrasound studies indicate that clinical PB values largely reflect the skin bridge rather than the fibromuscular structure^{[36][37]}. These observations imply that GH and GH+PB act as distal surrogates for hiatal distension, and that the clinically relevant pathology is located at the hiatal plane itself, a view independently formalized in the recently proposed Urogenital Hiatus Closure System (UHCS), which identifies failure of hiatal closure, acting through a self-reinforcing cycle of opening and loading, as a central driver of prolapse development and recurrence^[38]. This has two implications for the present framework. First, the incremental value of W must be tested in models that already contain GH (and PB), rather than alongside it; Stage 2 is designed accordingly. Second, if the W value functions primarily as a marker of an underlying pathological state rather than a modifiable target, W-based phenotypes may carry prognostic but not necessarily interventional value, a consideration that tempers the treatment-selection inference in Scenario 3.

The choice to measure W at rest requires explicit justification, because the imaging evidence invoked in support of hiatal morphology (hiatal ballooning, Valsalva hiatal area) is defined on maximal Valsalva^[13]^[39]. Three considerations apply. First, as a contact gauge, resting W is not directly comparable to imaging resting width: the splinting effect of the fingers makes W a measure of passive accommodated caliber that incorporates tissue compliance, information that purely geometric resting imaging does not capture.

Consistent with this distinction, Manzini et al. found resting imaging measurements uninformative for vaginal laxity while Valsalva hiatal area was predictive (AUC 0.68)^[39]; this excludes neither the accommodation construct nor its resting acquisition, but confirms that resting geometry and Valsalva distensibility are different quantities. Second, on feasibility: in women with advanced prolapse, maximal Valsalva drives the prolapsing organs against the examining fingers and tends to expel them, so a Valsalva-state digital measure would be structurally unavailable precisely in the patients most in need of assessment, creating a non-random, severity-dependent missingness. At rest, by contrast, the hiatus remains accessible at all severity stages, which is one reason the resting state is proposed as the primary acquisition condition. Third, Stage 1 will record resting and Valsalva W where feasible and pre-specify competing hypotheses about whether W correlates with resting versus Valsalva hiatal dimensions, as detailed in the evaluation design below. The relationships among W and these existing measures are summarized in Table 3.

Measure	Mode	Method / plane	Physiological state	Unit	Cost	Key existing evidence
W value (proposed)	Contact gauge (digital)	Transvaginal palpation; transverse distance between medial puborectalis borders at minimal hiatal plane	Rest (accommodation); Valsalva to be tested in Stage 1	cm (examiner-calibrated; finger count as bedside shorthand)	None	Unvalidated; proposed in this framework
GH (POP-Q)	Non-contact external	External; urethral meatus to posterior hymenal ring	Valsalva	cm	None (part of POP-Q)	Sutkin 2020 (OPTIMAL): preop GH prognostic of recurrence ^[31] ; Handa/Rosett longitudinal ^{[14][15]}
GH + PB	Non-contact external	External sum of genital hiatus and perineal body	Valsalva	cm	None	Khunda 2012: AUC 0.886, cutoff 7 cm ^[33] ; Gerges 2013: severity stratification ^[34] ; Volloyhaug 2013: predicts avulsion, cutoff 8.5 cm ^[35]
Digital LH palpation (Boyles)	Contact gauge (digital)	Transvaginal; transverse and sagittal diameters	Maximal contraction	cm	None	Boyles 2007: inter-rater $r = 0.6-0.8$, 83% within 1 cm ^[30]
Digital LAM attachment (van Delft)	Contact (digital)	Palpation of levator	Rest / contraction	4-grade ordinal	None	van Delft 2013: kappa = 0.90 vs

Measure	Mode	Method / plane	Physiological state	Unit	Cost	Key existing evidence
		attachment to pubic bone				MOS kappa = 0.66 ^[29]
Modified Oxford Scale	Contact (digital)	Palpation of contraction strength	Contraction	6-grade ordinal	None	Reliability concerns (kappa = 0.66) ^[29]
LHA (3D/4D TPUS)	Imaging (translabial; probe contact)	Imaging; plane of minimal hiatal dimensions	Rest / contraction / Valsalva	cm squared	Ultrasound equipment	Dietz 2008 ballooning ^[13] ; Manzini 2020: Valsalva LHA predictive of laxity ^[39]

Table 3. Comparison of the W value with existing bedside and imaging hiatal measures

From Combined Phenotypes to Clinical Hypotheses: Three Illustrative Scenarios

Combining the W value with A/C/P staging can generate testable predictions about disease progression, postoperative risk, and treatment response. The following three scenarios focus on W × A combinations to illustrate this approach. They do not represent all possible combinations within the two-layer framework. A is discussed preferentially here because anterior compartment support has direct clinical relevance to the bladder base, bladder neck, and urinary continence.

The predictions generated by these scenarios should be distinguished at three levels: (1) prognostic association: whether W status predicts future symptoms or progression in observational cohorts; (2) mechanistic explanation: whether W status provides a biologically plausible account of why certain phenotypes behave differently; and (3) treatment response prediction: whether W status modifies treatment outcomes. The first two levels can be addressed by observational data; treatment response prediction requires prespecified interaction analysis within randomized controlled trials or rigorously designed comparative studies.

Scenario 1: W-negative status, minimal prolapse, and SUI as the predominant manifestation. We hypothesize that this phenotype primarily reflects dysfunction of the continence mechanism, whereas hiatal constraint remains relatively preserved.

Falsifiable prediction: In a prospective cohort of women with SUI and POP-Q Stage 0–I, W-negative patients will demonstrate a greater reduction in ICIQ-UI SF score (minimum clinically important difference ≥ 3 points) at 12 months after midurethral sling placement compared with W-positive patients, and a lower cumulative incidence of de novo prolapse progression (to Stage II or beyond) at 36 months. A minimum of 50 patients per W-stratum is proposed for adequate power.

Scenario 2: W-positive status with a low A stage. This phenotype represents a state in which visible anterior vaginal wall descent is not yet prominent, but the hiatal support status has already changed. W positivity is hypothesized to identify a high-risk subgroup before anatomical descent becomes clinically evident.

Falsifiable prediction: In a prospective cohort of women with POP-Q A Stage 0–I, W-positive patients will show a higher incidence of progression to A Stage II or beyond within 24–36 months, higher baseline PFDI-20 scores, and greater vaginal laxity scores compared with W-negative patients matched for age and parity. An a priori effect size threshold of hazard ratio ≥ 1.5 for progression is proposed.

Scenario 3: W-positive status combined with a higher A stage. The coexistence of hiatal widening and anterior compartment support injury may reflect more extensive changes in pelvic floor support, with implications for recurrence risk and differential treatment response.

Falsifiable prediction: In women undergoing prolapse repair for A Stage II–IV, W-positive patients will have a higher recurrence rate (defined as POP-Q Stage II or beyond at the operated compartment) at 12–24 months postoperatively, and different PFDI-20 and PFIQ-7 response profiles when stratified by surgical approach. As noted above, treatment-response claims require prespecified interaction analysis within a trial design.

Previous observational studies from our team suggest that patients with extensive support injury may require a treatment pathway distinct from continence-directed treatment alone or isolated anterior compartment support. Reconstruction aimed at restoring the relationships among the vaginal axis, levator ani, perineal body, and urogenital hiatus has also shown preliminary improvements in anatomy

and quality of life^{[40][41]}. These studies provide clinical rationale for adjusting treatment extent according to support phenotype and make the W value a stratification variable worthy of further investigation.

From Conceptual Framework to Clinical Tool

Evaluation of the W value can be organized around three sequential questions. First, can W be measured reliably and correspond to the target hiatal structure? This stage standardizes patient position, measurement plane, and palpation method; assesses interobserver agreement (minimum $\kappa \geq 0.60$, target ≥ 0.80) across at least three examiners of varying experience with randomized examination order and a 15-minute washout; compares resting and Valsalva states; calibrates the three-finger cutoff; and clarifies its relationship with hiatal dimensions and LHA using concurrent imaging. To prevent incorporation bias, W and POP-Q measurements should be performed by different blinded examiners. Reporting should follow GRRAS (and STARD if diagnostic accuracy is assessed).

Second, does W provide clinically meaningful information? Prospective cohorts should examine its associations with symptoms, POP progression or recurrence, and de novo or persistent SUI, comparing predictive models with and without W. Incremental value should be assessed using likelihood ratio tests, change in c-statistic with 95% CI, calibration assessment, and decision curve analysis (NRI should not be used as the sole criterion). A minimum of 10 events per variable should be maintained. The prespecified covariate set includes age, parity, delivery mode, menopausal status and estrogen use, BMI, constipation, previous pelvic floor surgery, pelvic pain, and levator ani avulsion. Reporting should follow STROBE (and TRIPOD if a prediction model is developed).

Third, can the W phenotype improve risk stratification or treatment decision-making? Independent multicenter studies should validate its stability across populations and centers, and further test whether different W/A/C/P combinations correspond to distinct natural histories or treatment responses. Only after support is obtained at this level can the W value evolve from a research variable into a clinical classification tool.

Limitations and Falsifiable Boundaries of the Framework

The uncertainties of this framework mainly concern the newly added hiatal layer. The W value is a composite sign obtained by palpation. As noted above, the measurement is influenced by tissue compliance, scarring, pain, and examination conditions; additionally, hormonal status may affect tissue

elasticity. The same W value may also correspond to different pathological substrates, such as levator ani avulsion, connective tissue laxity, or perineal body injury. Therefore, the W value cannot currently localize a specific injured structure, and whether this accommodated caliber reflects the structural state of the hiatus requires validation.

As noted above, the three-finger cutoff is a prespecified research threshold, and binary classification may obscure continuous or nonlinear relationships between the W value and clinical outcomes. Factors such as age, parity, menopausal and estrogen status, body mass index, and previous pelvic floor surgery may also influence both the W value and disease outcomes. If the association of the W value is substantially attenuated after adjustment for these factors, or if W fails to provide stable information beyond A/C/P staging, GH, and LHA, its role should be revised to that of a continuous descriptive variable or a simple screening sign, rather than a core classification indicator of the two-layer framework. Additionally, Valsalva-state W measurement may be structurally unavailable in women with advanced prolapse, as prolapsing organs tend to expel the examining fingers. This severity-dependent missingness has implications for model building; sensitivity analyses under informative missingness assumptions should be prespecified.

The existing treatment evidence is mainly derived from the team proposing this framework and its collaborating centers, and previous studies were not prospectively stratified according to the W value. Furthermore, the theoretical foundation of this framework, including the concept of pelvic floor stress dysfunction, biomechanical anatomy, and dynamic mechanical equilibrium, draws substantially on the present team's prior work^{[3][5][6][22][23][24]}, which may introduce framing bias despite efforts to incorporate external evidence. Therefore, the three clinical scenarios proposed in this Perspective should be regarded as testable predictions rather than treatment rules. Only when different W/A/C/P combinations demonstrate reproducible differences in outcomes or heterogeneity of treatment effects can this framework further assume a role in risk stratification and treatment decision-making.

Conclusion

Assessment of PFSD should consider both organ descent and pelvic floor support status. This framework retains the anatomical recording of S-POP-Q and introduces, through the W value, a pathway for incorporating information on the levator hiatus into bedside assessment. Its current value is to define two parallel diagnostic dimensions and to generate reproducibly recordable combined phenotypes; it also proposes falsifiable predictions about disease progression and treatment response. Future studies need to

determine whether the W value can reliably measure the target hiatus and provide clinically incremental information. Until then, this framework should primarily be regarded as a common starting point for organizing clinical observation and comparative research.

Statements and Declarations

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Potential Competing Interests

The authors declare the following intellectual conflict of interest: references ^[40] and ^[41] describe a pelvic-floor reconstruction approach developed by the present team, and Scenario 3 of this framework could be used to identify patients who might undergo such extended reconstruction. This relationship is disclosed so that readers may judge the framing of Scenario 3; the framework itself does not constitute a treatment recommendation. The authors have no financial conflicts of interest to declare.

Ethics

This article is a conceptual Perspective based on published literature and does not report original human-subject research. Figure 2 includes pelvic-floor MRI and ultrasound images obtained from patients at the authors' institution; written informed consent for the use of these images in academic publication was obtained from the patients. No other individual patient data or identifiable clinical information are reported.

Data Availability

No new data were generated or analysed in this Perspective. All cited evidence is available from the published sources listed in the references.

Author Contributions

- L Li: Conceptualization, methodology, literature review, and writing – original draft.
- DM Tian: Literature review, conceptual analysis, and writing – original draft.
- XQ Wang: Literature review and evidence synthesis.
- XB Liu: Conceptual analysis, visualization, and figure preparation, including procurement of written patient consent for the clinical images used in Figure 2.
- TQ Yao: Writing – review and editing.
- JH Shen: Conceptualization, supervision, and critical revision of the manuscript.

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Declarations

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