

# Non-invasive assessment of lower urinary tract function

David E. Rapp, MD, Mikel Gray, PhD

Department of Urology, University of Virginia School of Medicine, Charlottesville, Virginia, USA

Referring to the article published on pp. 9829-9834 in this issue

---

RAPP DE, GRAY M. Non-invasive assessment of lower urinary tract function. *Can J Urol* 2019;26(4):9835.

While urodynamic testing (UDT) remains the standard for assessing lower urinary tract function, its utility in clinical practice is limited by its invasive nature, and vulnerability to artifact. Common artifacts in traditional UDT are associated with use of a urethral catheter for measurement of intravesical pressure, and abdominal pressure tube placed in the rectal or posterior vaginal vault. Assessment typically relies on one or two filling/voiding studies; and filling occurs at supraphysiologic rates with variable impact on sensations of bladder filling. Combined with the potential risks of infection and trauma, these limitations drive the desire to develop non-invasive testing as adjuncts to formal UDT.

Further underscoring the value of novel, non-invasive technologies are contemporary practice patterns and currents within the field of medicine. The last decade has seen a widespread movement towards models of care and reimbursement that focus on cost and quality. These efforts are seen within the urologic community and AUA/SUFU care guidelines that promote judicious use of UDT. Accordingly, the AUA/SUFU guideline for OAB recommends initiation of first-line therapies for overactive bladder based on history and physical exam alone, reserving UDT when considering invasive and potentially irreversible treatments.<sup>1</sup> Similarly, UDT is not recommended for the index stress urinary incontinence patient prior to surgical therapy.<sup>2</sup>

These guidelines highlight the avoidance of invasive and costly testing in uncomplicated patients. However, the development of affordable non-invasive tests may allow physicians to obtain some basic information about bladder function while avoiding the cost and invasiveness of traditional UDT.

Finally, the development of novel, non-invasive technologies to assess the lower urinary tract may also allow for additional insight into bladder function. As the authors describe, recent investigation has explored assessments of bladder shape, wall thickness, and vibrometry as measures of bladder function and pathology.<sup>3</sup> Additional research has focused on developing technologies to more specifically assess bladder afferent activity given the significant limitations to verbal indicators of sensation used in UDT (e.g. first sensation).<sup>4</sup>

As noted in this, the accuracy of ultrasound in assessing real-time bladder volume measurement is less than ideal. Nevertheless, the study serves as an initial step in the potential use of ultrasonography for measuring voided volume and ultimately, its use throughout lower urinary tract filling/storage and evacuation phases. Additional development is needed, but this study provides valuable insights into the evolution of noninvasive techniques for UDT. □

---

## References

1. Gormley EA, Lightner DJ, Burgio KL et al. Diagnosis and treatment of overactive bladder (non-neurogenic in adults: AUA/SUFU guideline. Retrieved from: [www.auanet.org/guidelines/overactive-bladder-\(oab\)-guideline](http://www.auanet.org/guidelines/overactive-bladder-(oab)-guideline). Accessed: July 1, 2019.
2. Kobashi KK, Albo ME, Dmochowski RR et al. Surgical treatment of female stress urinary incontinence: AUA/SUFU guideline. Retrieved from: [www.auanet.org/guidelines/stress-urinary-incontinence-\(sui\)-guideline](http://www.auanet.org/guidelines/stress-urinary-incontinence-(sui)-guideline). Accessed: July 1, 2019.
3. Vinod NN, Nagle AS, Naimi HA et al. Bladder volume correction factors measured with 3D ultrasound and BladderScan. *Can J Urol* 2019;26(4):9829-9834.
4. Lowenstein L, FitzGerald MP, Kenton K et al. Validation of real-time urodynamic measure of urinary sensation. *Am J Obstet Gynecol* 2008;198(6):661.e1-e4.

---

Address correspondence to Dr. David E. Rapp, Department of Urology, University of Virginia School of Medicine, 200 Jeanette Lancaster Way, Charlottesville, VA 22903 USA