Evaluation of Female Bladder Complaints
Evaluation of Bladder Complaints: Objectives

- Normal bladder function
- CREOG - physiology and urodynamic eval.
- Bladder function tests - urodynamics – the basics in 25 minutes
“Normal bladder function is typified by the storage of an adequate volume of urine at low pressure without leakage and unwanted bladder sensations (urgency) interspersed with periods of efficient unimpeded expulsion of urine.”

- Chai and Gupta- 2008 Ostergard’s Urogynecology & Pelvic Floor Dysfunction
Micturition Cycle

- **Storage / Filling**
  - Detrusor relaxation and urethral contraction
  - Low detrusor pressure and high urethral pressure

- ** Voiding / Emptying**
  - Detrusor contraction and urethral relaxation
  - High detrusor pressure and low urethral pressure
What are the complaints

- Urgency
- Frequency
- Incontinence
- Incomplete or intermittent voiding
- Hesitancy
- Urinary retention
- Dysuria
Many causes of bladder complaints

- Pregnancy
- LUT disease (stones)
- Pelvic masses (all types)
- Systemic disease (diabetes, neurologic)
- UTI
- Pelvic organ prolapse
- Physiologic
- Idiopathic
Lower Urinary Tract Symptoms (LUTS)

- **Storage symptoms**
  - **Increased daytime frequency** - pt. perception she voids too often
  - **Nocturia** - waking to void one or more times
  - **Urgency** - sudden compelling desire to pass urine, difficult to defer
  - **Incontinence** - any involuntary leakage of urine
  - **Nocturnal enuresis** - loss of urine during sleep
  - **Continuous incontinence** -
  - **Other types** - giggle incontinence, coital
Lower Urinary Tract Symptoms (LUTS)

- **Voiding Symptoms**
  - **Slowed stream** - perception of reduced flow compared to previous or others
  - **Splitting / spraying**
  - **Intermittent stream** - intermittency = start and start
  - **Hesitancy** - difficulty initiating micturition, delayed stream start when ready to void
  - **Straining** - need to initiate, maintain, or improve stream
  - **Terminal dribble** - end micturition
  - **Feeling of incomplete emptying**
  - **Post micturition dribble** - after rising from toilet.
What is Normal?

- Bladder Capacity? (Storage)
- Voided Volumes? (Voiding)
- Urine output? Volume intake (Storage)
- Post voiding residual volume? (Voiding)
- Sensations for filling?
Normal Bladder Filling Sensation

- First Sensation to void (FS) = 0 - 100 ml
- Normal desire to void (ND) = 200 - 300 ml
- Strong desire to void (SD) = 300 – 400 ml
- Urge (painful, fear of leak) = 500 - 700 ml
- Maximum cystometric capacity = 400 – 600 ml
Voiding Diary

(Bladder, Frequency diary)

- High Information at low cost
  - Frequency - Normal (6-8 voids/24hr)
  - Volumes / void - Normal (150-350ml)
  - Volume / 24 hr - Fluid intake dependent
  - Fluid intake - 1,000 – 3,000ml (32-100oz)/24 hr
  - Incontinence timing
  - Functional capacity
# Voiding Diary

**CC: frequency and incontinence**

<table>
<thead>
<tr>
<th>Time</th>
<th>Voided volume (ml)</th>
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<tr>
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# Voiding Diary

**CC:** Frequency and incontinence

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<tr>
<td>1900</td>
<td>urge, leaked through clothes</td>
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<td>2120</td>
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<td>2330</td>
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Post Void Residual Volume

Emptying Study
How efficient was bladder emptying?

- Measure within 10 min after spontaneous measured void or uroflowmetry by straight cath / bladder scan
- <100 ml normal ; 100-200 ml equivocal ; > 200 ml abnormal – re-check it and correlate to patient
- Elevated PVRV indicates increased outlet resistance, decreased bladder contractility, or both
- What patients will have elevated PVRV? - post-op, elderly, severe POP, other anatomic distortion
Uroflometry

Non-invasive emptying study

- Evaluates voiding function
- Measures urine flow rate \( (Q) = \text{volume/time} \)
- Measures relationship of detrusor pressure to urethral resistance during voiding
- Invalid at low bladder volumes (<150 ml) and high (>600ml)
- \( Q_{avg} \), \( Q_{max} \), \( Q_{time} \)
Uroflowmetry

Normal Qmax > 15-20 ml/sec
Voiding Dysfunction

Causes

- Artifact-Test Anxiety
- Behavioral- chronic constipation
- Obstruction- post-op, post-partum, neurogenic
- Poor contractility – abdominal valsalva voider
Evaluation of bladder filling
Evaluation of LUTS- Simple Cystometry

- **Supplies**: straight or Foley catheter, sterile H2O or NS, 60ml syringe

- **Measurements of**: 
  - FS - first sensation of bladder filling 
  - ND - normal desire to void 
  - SD - strong desire to void 
  - Bladder capacity 
  - Detrusor contractions
Simple office cystometry
What is the difference between a simple and complex cystometry study?

- **Simple** = single-channel cystometry “eye ball”
- **Complex** = multi-channel, “subtracted”, ability to measure detrusor pressure
Multichannel cystometrogram

$P_{\text{det}} = P_{\text{ves}} - P_{\text{abd}}$
Cystometry
Sensation

- First Sensation to void (FS) = 0 - 100 ml
- Normal desire to void (ND) = 200 - 300 ml
- Strong desire to void (SD) = 300 – 400 ml
- Urge (painful, fear of leak) = 500 - 700 ml
- Maximum cystometric capacity = 400 – 600 ml
Multi-Channel Cystometry (CMG)

- Vesicle (bladder) pressure \( P_{ves} \)
- Abdominal pressure \( P_{abd} \)
- Detrusor pressure \( P_{det} = P_{ves} - P_{abd} \)
Cystometry

Filling Study

- Sensations
- Stability
- Capacity
- Compliance
- Competence (of bladder outlet)
Valsalva leak point pressure
(Abdominal leak point pressure)

- **Definition:** $P_{ves}$ at time of leakage with valsalva
- **Mark at lowest pressure that produces leak**
- **Lower pressures indicate more severe stress incontinence (<60 cm H2O)**
- **Test at SD or >300 ml**
- **Q. How competent is the bladder outlet?**
Stress incontinence- stable detrusor
Pressure-Flow Study
Voiding Assessment

- Combines uroflowmetry with real time Pdet
- Answers question: what is bladder pressure during voiding. Does the bladder contract well with voiding?
- Pdet at Qmax = most important measurement (10 cm H2O low nl)
Complex Multi-channel Urodynamic Studies

“Urodynamics is not complex, only the patients are!”

George Webster, M.B., FRCS
Duke University Medical Center
The purpose of a urodynamic study is to reproduce the patients symptoms under controlled (artificial) conditions.

“Urodynamic testing is an *adjunct* to, not a *substitute* for, a thorough history and physical examination.”

- Practical Urogynecology- Wall, Norton & DeLancey 1993
Chief Complaint:
“ I have to pee all the time”

- 30 yo
- LMP: 3 wk ago
- Contraception: Mirena IUCD
- Preg test: negative
- U.A. - Nitrites neg, leukocyte esterase neg
- HPI: Frequency, urgency gradually worsening over past few months.
UDS

Which tests should I use?

- It depends on the patient........
  - History: What is her complaint?
  - Will the test help me better understand her problem?
  - Use the simplest, least expensive tests first.
  - Use tests you are comfortable with and understand.
  - Use more complex tests if it will affect patient management
Which patients should have complex urodynamic studies?

- **Stress Incontinence**
  - Surgical planning – if UDS results can guide surgical option
  - Failed previous surgery for incontinence
  - Suspicion of ISD (fixed urethra, +EBST)

- **Urge incontinence-refractory to conservation Rx**
  - For confirmation before Botox or sacral neuromodulation

- **Mixed incontinence**
  - Diagnosis confirmation
  - Assess severity of each component

- **Incontinence post pelvic surgery or trauma**

- **Continuous incontinence/Severe incontinence**

- **Neurologic disorders**
  - Spinal cord injury, MS, Parkinson, radiation

- **Nocturnal enuresis refractory to therapy**
Who should not have complex urodynamic studies?

- **Uncomplicated stress urinary incontinence**
CASE REVIEW
Chief Complaint:
“I have to pee all the time”

- 30 yo
- LMP: 3 wk ago
- Contraception: Mirena IUCD
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## Voiding Diary

**CC:** Frequency and incontinence  
Is this a storage or voiding problem?

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- 0630 urge, almost didn’t make it
- 1900 urge, leaked through clothes
What other tests?

- Post-void residual volume = 10ml (she is emptying well)
- Cough stress test = negative with no urethral hypermobility
- Does she have a storage or voiding problem?
Terminal detrusor contraction
ONE MORE CASE
## Voiding Diary

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- Post void residual volumes - 800ml
- Sensations to fill are reduced
- Does she have a voiding or storage problem?
The End
Clinicians who are making the diagnosis of urodynamic stress incontinence should assess urethral function. *(Recommendation; Evidence Strength: Grade C)*

Surgeons considering invasive therapy in patients with SUI should assess post-void residual (PVR) urine volume. *(Expert Opinion)*

Clinicians may perform multi-channel urodynamic testing in patients with both symptoms and physical findings of stress incontinence who are considering invasive, potentially morbid or irreversible treatments. *(Option; Evidence Strength: Grade C)*

Clinicians should perform repeat stress testing with the urethral catheter removed in patients suspected of having SUI who do not demonstrate this finding with the catheter in place during urodynamic testing. *(Recommendation; Evidence Strength: Grade C)*

Clinicians should perform stress testing with reduction of the prolapse in women with high grade pelvic organ prolapse (POP) but without the symptom of SUI. Multi-channel urodynamic testing with prolapse reduction may be used to assess for occult stress incontinence and detrusor dysfunction in these women with associated LUTS. *(Option; Evidence Strength: Grade C)*
Clinicians may perform multi-channel filling cystometry when it is important to determine if altered compliance, detrusor overactivity or other urodynamic abnormalities are present (or not) in patients with urgency incontinence in whom invasive, potentially morbid or irreversible treatments are considered. (*Option; Evidence Strength: Grade C*)

Clinicians may perform pressure flow studies (PFS) in patients with urgency incontinence after bladder outlet procedures to evaluate for bladder outlet obstruction. (*Expert Opinion*)

Clinicians should counsel patients with urgency incontinence and mixed incontinence that the absence of detrusor overactivity (DO) on a single urodynamic study does not exclude it as a causative agent for their symptoms. (*Clinical Principle*)
Clinicians may perform PVR in patients with LUTS as a safety measure to rule out significant urinary retention both initially and during follow up. *(Clinical Principle)*

Clinicians may perform multi-channel filling cystometry when it is important to determine if DO or other abnormalities of bladder filling/urine storage are present in patients with LUTS, particularly when invasive, potentially morbid or irreversible treatments are considered. *(Expert Opinion)*

Clinicians may perform PFS in women when it is important to determine if obstruction is present. *(Option; Evidence Quality: Grade C)*

Clinicians may perform videourodynamic in properly selected patients to localize the level of obstruction, particularly for the diagnosis of primary bladder neck obstruction. *(Expert Opinion)*
**BACKGROUND:**

Urodynamic studies are commonly performed in women before surgery for stress urinary incontinence, but there is no good evidence that they improve outcomes.

**METHODS:**

We performed a multicenter, randomized, noninferiority trial involving women with uncomplicated, demonstrable stress urinary incontinence to compare outcomes after preoperative office evaluation and urodynamic tests or evaluation only. The primary outcome was treatment success at 12 months, defined as a reduction in the score on the Urogenital Distress Inventory of 70% or more and a response of "much better" or "very much better" on the Patient Global Impression of Improvement. The predetermined noninferiority margin was 11 percentage points.

**RESULTS:**

A total of 630 women were randomly assigned to undergo office evaluation with urodynamic tests or evaluation only (315 per group); the proportion in whom treatment was successful was 76.9% in the urodynamic-testing group versus 77.2% in the evaluation-only group (difference, -0.3 percentage points; 95% confidence interval, -7.5 to 6.9), which was consistent with noninferiority. There were no significant between-group differences in secondary measures of incontinence severity, quality of life, patient satisfaction, rates of positive provocative stress tests, voiding dysfunction, or adverse events. Women who underwent urodynamic tests were significantly less likely to receive a diagnosis of overactive bladder and more likely to receive a diagnosis of voiding-phase dysfunction, but these changes did not lead to significant between-group differences in treatment selection or outcomes.

**CONCLUSIONS:**

For women with uncomplicated, demonstrable stress urinary incontinence, preoperative office evaluation alone was not inferior to evaluation with urodynamic testing for outcomes at 1 year. (Funded by the National Institute of Diabetes and Digestive and Kidney Diseases and the Eunice Kennedy Shriver National Institute of Child Health and Human Development; ClinicalTrials.gov number, NCT00803959).
Pre-operative urodynamics in women with stress urinary incontinence increases physician confidence, but does not improve outcomes.

Urinary Incontinence Treatment Network

- **AIMS:**
  To determine if pre-operative urodynamic testing (UDS) affects physicians' diagnostic confidence and if physician confidence affects treatment outcomes at 1 year.

- **METHODS:**
  The Value of Urodynamic Evaluation (ValUE) trial randomized 630 women with predominant stress urinary incontinence (SUI) to office evaluation (OE) or OE plus UDS prior to surgery. After OE, physicians completed a checklist of five clinical diagnoses: SUI, overactive bladder (OAB) wet and dry, voiding dysfunction (VD), and intrinsic sphincter deficiency (ISD), and reported their confidence in each. Responses ranged from 1 to 5 with; 1 = "not very confident (<50%)", 5 = "extremely confident (95 + %)." After UDS, investigators again rated their confidence in these five clinical diagnoses. Logistic regression analysis correlated physician confidence in diagnosis with treatment success.

- **RESULTS:**
  Of 315 women who received OE plus UDS, 294 had complete data. Confidence improved after UDS in patients with baseline SUI (4.52-4.63, P < 0.005), OAB-wet (3.55-3.75, P < 0.001), OAB-dry (3.55-3.68 P < 0.005), VD (3.81-3.95, P < 0.005), and suspected ISD (3.63-3.92, P < 0.001). Increased confidence after UDS was not associated with higher odds of treatment success although mean changes in confidence were slightly higher for those who achieved treatment success. Physician diagnoses shifted more from not confident to confident for ISD and OAB-wet after UDS (McNemar's P-value <0.001 for both).

- **CONCLUSIONS:**
  In women undergoing UDS for predominant SUI, UDS increased physicians' confidence in their clinical diagnoses; however, this did not correlate with treatment success.
AIMS:

Urodynamic studies (UDS) are generally recommended prior to surgical treatment for stress urinary incontinence (SUI), despite insufficient evidence that it impacts treatment plans or outcomes in patients with uncomplicated SUI. This analysis aimed to calculate the cost incurred when UDS was performed as a supplement to a basic office evaluation and to extrapolate the potential savings of not doing UDS in this patient population on a national basis.

METHODS:

This is a secondary analysis from the Value of Urodynamic Evaluation (ValUE) trial, a multicenter non-inferiority randomized trial to determine whether a basic office evaluation (OE) is non-inferior in terms of SUI surgery outcomes to office evaluation with addition of urodynamic studies (UDS). All participants underwent an OE; those patients who randomized to supplementary UDS underwent non-instrumented uroflowmetry, filling cystometry, and a pressure flow study. Costs associated with UDS were calculated using 2014 U.S. Medicare allowable fees. Models using various patient populations and payor mixes were created to obtain a range of potential costs of performing UDS in patients undergoing SUI surgery annually in the United States.

RESULTS:

Six hundred thirty women were randomized to OE or OE plus UDS. There was no difference in surgical outcomes between the two groups. The per patient cost of UDS varied from site to site, and included complex cystometrogram $314-$343 (CPT codes 51728-51729) plus complex uroflowmetry $16 (CPT code 51741). Extrapolating these costs for US women similar to our study population, 13-33 million US dollars could be saved annually by not performing preoperative urodynamics.

CONCLUSION:

For women with uncomplicated SUI and a confirmatory preoperative basic office evaluation, tens of millions of dollars US could be saved annually by not performing urodynamic testing. In the management of such women, eliminating this preoperative test has a major economic benefit. Neurourol. Urodynam. 9999:1-4, 2014. © 2014 Wiley Periodicals, Inc.
Normal preoperative urodynamic testing does not predict voiding dysfunction after Burch colposuspension versus pubovaginal sling.


- **RESULTS:**

  - Of the 655 women in whom data were analyzed voiding dysfunction developed in 57 including 8 in the Burch colposuspension and 49 in the pubovaginal sling groups. There were 9 patients who could not be categorized and, thus, were excluded from the remainder of the analysis (646). A total of 38 women used a catheter beyond week 6, 3 had a surgical takedown and 16 had both. All 19 women who had surgical takedown were in the pubovaginal sling group. The statistical analysis of urodynamic predictors is based on subsets of the entire cohort, including 579 women with preoperative uroflowmetry, 378 with change in vesical pressure, and 377 with change in abdominal and detrusor pressure values. No preoperative urodynamic study findings were associated with an increased risk of voiding dysfunction in any group. Mean maximum flow during noninvasive flowmetry values were similar among women with voiding dysfunction compared to those without voiding dysfunction in the entire group (23.4 vs 25.7 ml per second, p = 0.16), in the Burch colposuspension group (25.8 vs 25.7 ml per second, p = 0.98) and in the pubovaginal sling group (23.1 vs 25.7 ml per second, p = 0.17). Voiding pressures and degree of abdominal straining were not associated with postoperative voiding dysfunction.

- **CONCLUSIONS:**

  - In this carefully selected group preoperative urodynamic studies did not predict postoperative voiding dysfunction or the risk of surgical revision in the pubovaginal sling group. Our findings may be limited by the stringent exclusion criteria and studying a group believed to be at greater risk for voiding dysfunction could alter these findings. Additional analysis using subjective measures to define voiding dysfunction is warranted to further determine the ability of urodynamic studies to stratify the risk of postoperative voiding dysfunction, which appears to be limited in the current study.