

Start	End	Topic	Speakers
		Introduction	Tufan Tarcan
		First Case	Enrico Finazzi Agrò
		Second Case	Peter Rosier
		Questions	All
		Evaluation and reporting cases in small groups	Peter Rosier Enrico Finazzi Agrò
		Plenary reporting by the group members	Tufan Tarcan
		Break	None
		Evaluation and reporting cases in small groups	Peter Rosier Enrico Finazzi Agrò
		Plenary reporting by the group members	Tufan Tarcan
		Questions	All

### **Aims of Workshop**

Invasive urodynamic studies (UDI) are the gold standard of LUTD diagnosis. UDI is done by the treating physician her or himself or by a designated and dedicated other person. A report and a diagnosis is the ultimate aim of UDI. The report includes information about all relevant events and technical quality and reliability. The report includes also all elements of LUT function measured in relation with limits of normal. Grading and staging of dysfunction and UDI-patterns are reported in standard terms in combination with the patient's reporting of representativeness and combined with the patient's symptoms and perceived signs of dysfunction. Finally a urodynamic test report concludes with a urodynamic diagnosis in standard terms.

### **Learning Objectives**

The workshop's grand clinical round will learn how to systematically evaluate an invasive urodynamic test.

### **Target Audience**

Urology, Urogynaecology and Female & Functional Urology

### **Advanced/Basic**


Intermediate

### **Suggested Learning before Workshop Attendance**

Abrams P, Cardozo L, Fall M, Griffiths D, Rosier P, Ulmsten U, Van Kerrebroeck P, Victor A, Wein A; Standardisation Sub-Committee of the International Continence Society. The standardisation of terminology in lower urinary tract function: report from the standardisation sub-committee of the International Continence Society. *Urology*. 2003 Jan;61(1):37-49. Review. PubMed PMID: 12559262. Rosier PFWM, Schaefer W, Lose G, Goldman HB, Guralnick M, Eustice S, Dickinson T, Hashim H. International Continence Society Good Urodynamic Practices and Terms 2016: Urodynamics, uroflowmetry, cystometry, and pressure-flow study. *Neurourol Urodyn*. 2017 Jun;36(5):1243-1260. doi: 10.1002/nau.23124. Epub 2016 Dec 5. Review. PubMed PMID: 27917521. Hogan S, Gammie A, Abrams P. Urodynamic features and artefacts. *Neurourol Urodyn*. 2012 Sep;31(7):1104-17. doi: 10.1002/nau.22209. Epub 2012 Mar 30. PubMed PMID: 22473568.

**ICS Workshop:**  
**Evaluating and Reporting a urodynamic test**  
On the basis of ICS-GUP (2002 &) 2016

Tufan Tarcan, E. Finazzi Agrò, Peter F.W.M. Rosier  
The ICS school of Urodynamics & ICS Urodynamics Committee.

 **International Continence Society**  
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**Introduction**

- Urodynamics shows lower urinary tract physiology
  - Shows the function (or dysfunction(s)) of the LUT ...
- Urodynamic studies allow to see where and how the physiology of the patients is different from normal physiology.
- Evaluation of urodynamics is based on the knowledge of normal physiology.
  - But should include also what you know about technical artefacts and errors...
- Urodynamics is as reliable as the person evaluating the test

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**Introduction:**

- *Program: Discussion of cases*
- *But first: Some words about physiology and urodynamics*

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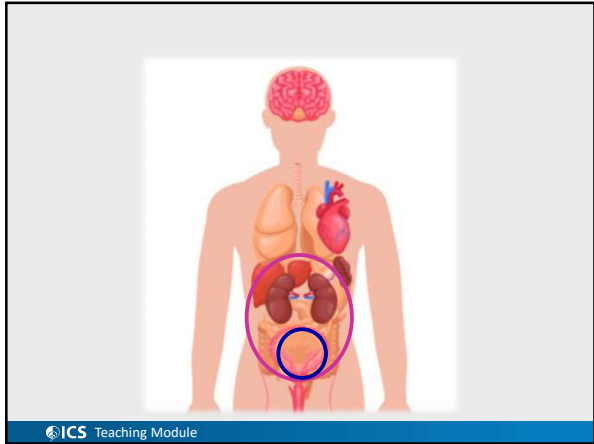
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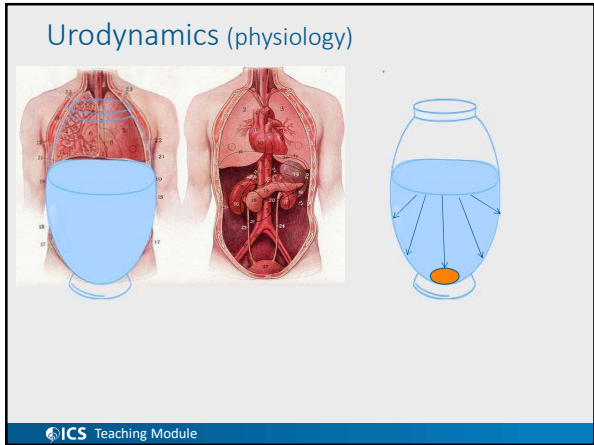
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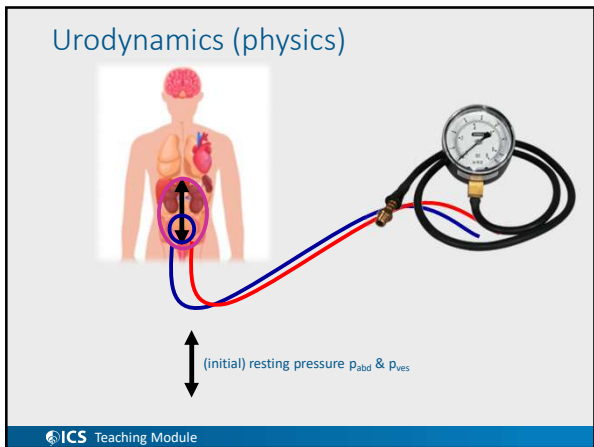
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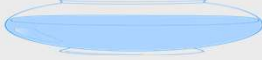
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### Initial resting pressure (urodynam)

- Depends on position
  - Lower in supine position
- Everything inside the abdomen has an average weight approximately equal to water
- Resting pressure: (abdominal mass (cmH<sub>2</sub>O) on pelvic floor)
  - What about high BMI (overweight persons)?
    - predominance of the extra mass =outside the abdominal cavity
    - (not resting on the pelvic floor)
- Abdominal muscle contraction and diaphragm contraction elevate the pressure around and inside the bladder



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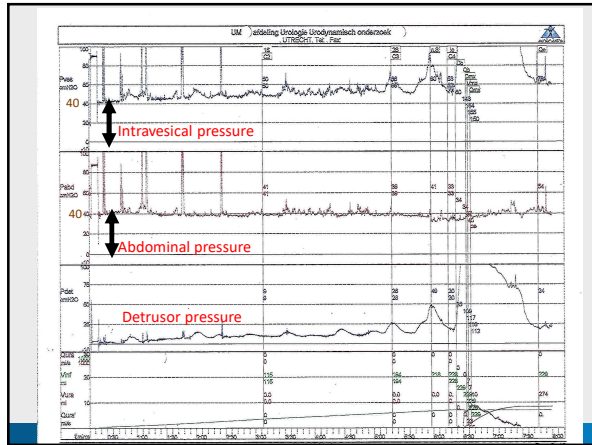
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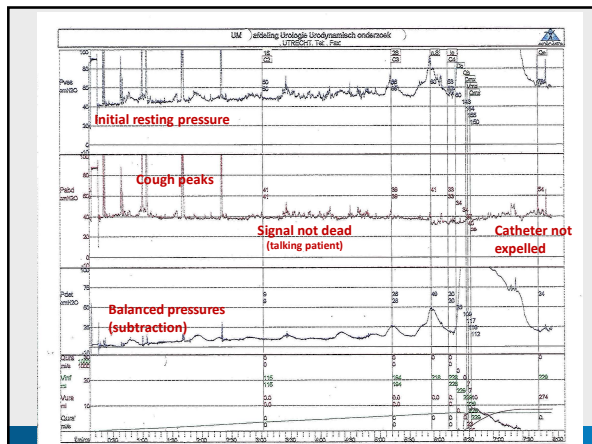
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### Lower urinary tract function

- Storage function
  - (detrusor muscle)
    - Adapts to volume increment
    - Low pressure
    - Signals stretch
      - = 'sensation of filling'
      - Contraction is suppressed
  - Outlet closed (continent)
- Voiding function
  - At a convenient moment
    - Controllable
      - Pelvic muscle relaxation
      - Detrusor contraction is activated
  - Outlet relaxes
    - Pelvic muscle > internal sphincter
  - Efficient and effective voiding



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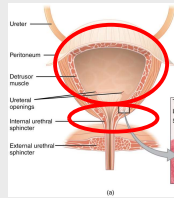
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### Storage: normal physiology

- Bladder fills and voiding is inhibited
- Pelvic floor is in 'normal activity' state
  - pelvic floor is set of muscles
  - 'reactive' to physical activity, movements, coughing
  - sub (-sub) maximal contracted
- Detrusor dome contraction is inhibited
- Detrusor base (bladderneck) is contracted
- Volume increment distends the bladder (dome)
  - (muscle) -stretch is perceived (sensation of filling)
    - Starting from a certain volume ( $\pm 30\%$  of usual capacity)
    - Muscle stretch = proprioception



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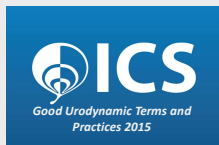
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### UDS: Quality Control / plausibility check

- Initial Resting Pressure
- Dead Signal
- Poor pressure transmission
- Pressure drift
- Expelled Catheter
- Catheter Flush
- Tube Knock
- Pump Vibrations
- Cough pressure peak



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Technical (post test quality) evaluation of the tests

- Uroflowmetry: (& p/Q test)
  - Artefacts:
    - Hitting the device (funnel, beaker, weighing disk)
    - Not voiding in the funnel
    - (Situational) straining (ask patient)
- Not representative inability to void.
- Not representative voiding
- Or inability to void as usual:  
pauresis; bashful bladder; shy voider
- Volume (compare diary and or need or urgency) in mL

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Technical (quality) evaluation of the tests  
Cystometry

- Report from graphs and results
- (Time-based) graphs fully displayed
  - Standard layout
  - Standard scales
- Initial zero recorded, pressures in expected range, responding in a balanced manner
- Standard ICS sensations marked? And other events?
- Recognize features, events and artefacts:

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Technical (quality) evaluation of the tests  
Cystometry

- Report from graphs and results
- (Time-based) graphs fully displayed
  - Standard layout
  - Standard scales
- Initial zero recorded, pressures in expected range, responding in a balanced manner
- Standard ICS sensations marked? And other events?
- Cystometry: volumes at sensation (within expected range?)
- sensations normal (incremental)/ atypical/ none?
- Check: end of cystometry (permission to void) (&pump fill stop)
- Recognize features, events and artefacts:

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Recognize features and events:

- Initial resting pressure
  - Within limits of normality
- **Observe  $p_{abd}$ ,  $p_{ves}$  and  $p_{det}$  if not as expected: report**
- Dead signal:
  - No dead signal (after initial filling)
- **If present, determine the relevance of the test**
- Pressure drift:
  - No pressure drift
- **If present, determine the relevance of the test**
  - Check / repair/ calibrate equipment

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Recognize features and events:

- Poor pressure transmission:
  - Cough pressure transmission; 'balance' within limits of normal
- **If poor transmission is observed, determine the relevance of the test**
- Expelled catheter:
  - Catheters not expelled during the test
- **If catheter loss is observed, determine the relevance of the test**

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Recognize features and events

- Catheter flush:
  - Catheter flushes –not confused with vesical or rectal activity.
- **Recognize flushes**
- Tube knock:
  - Tube knock(s) recognized, not confused with vesical or rectal activity
- **Recognize tube knocks**

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Recognize features and events

- Pump vibrations:
  - Pump vibrations recognized, not confused with vesical or rectal activity
- **Recognize pump vibrations**
- Cough pressure peak:
  - Coughs, strains and position changes recognized
  - Peaks associated with incontinence?
- **Recognize coughs (talking) and abdominal muscle strains**

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Recognize features and events:

- Leak point pressure:
  - Pressures (ves, det and or abd) at leakage: note delay meatus to registration (flowmeter or marker)
- **Report leak point pressure (specified and with subscripts (ICS-format))**
- Urodynamic stress test:
  - Stress test not confused with DO, unless
    - (see below) cough associated detrusor overactivity: CADO
- **Recognise and report stress test (pressure, volume)**
- Cough associated detrusor overactivity:
  - (CADO:) Detrusor activity following cough or position change (standing-up)
- **Recognise stress (or position change sitting > standing) CADO**

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Recognize features and events:

- Position change:
  - Not confused with detrusor activity
- **Recognise stress (or position change sitting > standing) CADO or UI**
- Rectal contractions:
  - Not confused with DO
- **Recognise rectal contractions (observe  $p_{abd}$  and  $p_{ves}$ )**

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### Recognize features and events:

- Dropped pabd at Void:
  - Recognized to influence detrusor subtracted pressure
- **Recognise dropped pressures**
- Straining:
  - Not confused with detrusor activity
- **Recognize and report straining**
- After-contraction:
  - Not confused with expelled (vesical) catheter
  - Cough checked (pressure transmission) following the after-contraction?
- **Diagnose after contraction, only when cough check was done**

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### Urodynamics Report:

- Patient ((Identity and) relevant clinical) information
- Technical Quality
- Equipment (standard –per laboratory)
- Sensations (inserting cath's, filling and post filling)
- Representativeness
- Cystometry -incontinence
- Pressure flow study
  - Contraction
  - Bladder outflow
  - Voiding efficiency

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### Report: UDS quality

- Check patient's (& test's) identity
- **If not documented earlier or recently:**
- Report the indication for the test
  - And whether the patient has neurological or anatomical abnormalities
- Summarize bladder diary
- Summarize results of earlier (urodynamic) tests
  - or other relevant tests

Summarise clinical exam, also (but not limited to):

- If patient is male, document prostate size
- If the patient is female, document prolapse
- Neurologic evaluation saddle region

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What should be known during the test & reported immediately after the test...

Report in file

- ✓ Patient took all medication, as usual
  - no.....
    - If not: decide relevance for LUT function and or test results
- ✓ Patient's fluid intake was as usual
  - no.....
    - If much more than usual: anticipate (more) diuresis adding to cystometry fill volumes
- ✓ Patient has no recent (new) symptoms (or signs of active UTI)
  - no.....
    - If UTI > (if test was not cancelled) Results may not be representative

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Technical (quality) evaluation of the tests  
Pressure flow graph (time base) and plot (x/y)

- Check scaling and axes
  - Check clinical representativeness and PVR
- ICS standard plot axes are (as from 2022) PFS= x/y
  - Pressure =horizontal axis
- Recognize detrusor opening pressure
- Start of flowrate: not relevant to grade BOO
- And minimum detrusor opening pressure
  - And evaluate (determine) distension and collapse
- Relevant to grade BOO
- Detrusor pressure at Q<sub>max</sub>, observe / correct (not physiological) peaks

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Equipment

- These items will not differ –between tests- if you are evaluating tests from your own clinic, but should be checked, certainly when evaluating tests from elsewhere.

Report if this deviates from your routine:

- Flowmeter type
- Technique of PVR –measurement
- Catheters and pressure sensors type (and fixation to patient)
- Fill fluid and temperature
- Pressures, volumes, and flow scales on display (graphs)
- Timescale on graphs
- Orientation and scaling of the pressure flow graph

- ✓ Test is ICS-SUT ✓ Test is (part of) ICS-SUP See: ICS- GUP2016

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Before making a urodynamic diagnosis

- Use always the same scales on the graphs
- Get used to typical patterns (in your time and pressure scales)
- Be aware if changed
- Use a standardized test routine (whenever possible) and a systematic evaluation routine
- Establish clinical quality
- Valid indication for the test, clinically well done, appropriate communication and cooperation with patient
- Establish technical quality
- Technically well done, no artifacts that make interpretation impossible, no lack of test-information

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What should be known during the test & reported immediately after the test...

- The patient had normal to strong need to void (or urgency) before initial uroflowmetry
  - no.....
- Report grade of fill sensation (not, normal, -very- strong, or urgency)
- (or) Uroflowmetry was not done (because):
- The patient's position while voiding was:
  - Sitting, Standing, Recumbent, Supine...
  - not as preferred by the patient
- The micturition has been almost as usual
  - no.....
- Much more difficult to start (situational / representative), needed unusual straining, more painful, position was found to be suboptimal.....

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Test report cont'd: uroflowmetry

- Report initial, not catheterized, (free) uroflowmetry
- Maximum of flowrate (correct if necessary)
- Volume voided (mL)
- PVR (mL)
- Add: Pattern description (no ICS –standard)
- Note: Was the test considered representative?

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Test report cont'd: catheterisation

- ✓ Insertion of catheters went uneventful, without active muscle defence or anatomical resistance
- Report(ed) lot of adductor and or PFM defence, pain, emotions
  - ✓ Patient's mobility is normal. ✓ Insertion sensations were as can be expected. ✓ Neurological normal saddle region.
  - no.....
  - Report(ed) neurological abnormalities (specify), specify muscle recruitment abnormalities
- ✓ Pressures are in expected range and balanced
- ✓ The fill speed has been continuous (& adapted to expected end fill volume)
  - no.....
- If not: report deviation from standard practice
- (also check for -need of- diuresis volume correction)

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Test report cont'd: Sens of filling

- ✓ The sensation(s) of filling (ICS-GUP2016) could be reliably assessed
  - no.....
- Patients emotions did affect (her/his) reporting
- Sensation is blurred, difficult to report or atypical (but as usual)
- Sensation is reported (very) unfamiliar /different
- Sensation is reported in urethra (more than in bladder)
- Pain occurred -in association with filling, (@mL?). Location?
- Pain was present -not in association with filling. Location?
- ✓ The bladder filling capacity has been around the expected volume
  - no.....
- Note: over-filling (may lead to difficult to initiate voiding or unusual PVR)

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Test report cont'd: Filling

- ✓ Bladder provocations were done
  - before strong desire to void
  - no.....
- Consider that provocations after NDV or with SDV may (negatively) affect voiding and p/Q results
- ✓ The patient's diuresis volume is included in the volume results
  - no.....
- Capacity and also sensation volumes can be adapted after the test
- ✓ Urinary incontinence was observed
  - no.....
- Note: if incontinence has occurred, sometimes not visible on the flowrate channel

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Test report cont'd: Pressure flow

- ✓ The patient's (p/Q) voiding position was...
  - not as preferred by the patient
- As for (free) uroflowmetry
- Report parameters (and pattern)
- ✓ The micturition has been almost as usual
  - Includes straining as usual
  - no.....
- Same as for uroflowmetry
- Compare p/Q with not catheterized uroflowmetry
- Inability to void during p/Q test (=not acontractile detrusor!)

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Test report cont'd

- ✓ The bladder was emptied after the test
  - no.....
- Report PVR after p/q (in mL) (report comparison with free flow)
- ✓ There was no haematuria or other sign of lesion
  - no.....
- Report (and manage) if necessary. (follow -up in post test reporting)
- ✓ The observations were explained to the patient
  - no.....
- Be aware that patient is informed about test results
- ✓ The patient has received post-test instructions
  - no.....
- Check for late(r) complications

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Pressure flow graph and analysis

- Define genuine  $Q_{max}$  and related pressure
  - Calculate BOOI and BCI
- BOOI quantifies and grades BOO ( $P_{det.Qmax} - 2Q_{max}$ )
- BCI to grade contraction ( $P_{det.Qmax} + 5Q_{max}$ )
- Recognize pressure and flowrate variations
- Report waxing and waning contraction
- Report dynamics of outflow and interruptions of micturition
- Report dysfunctional pattern (not related to neurologic abnormalities), clumsy voiding (if representative)

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### Make a diagnosis

- Integrate results of flowrate, cystometry, p/Q and PVR's
  - Recognize all features on the traces
  - Diagnose **sensation(s)** (and or pain)
  - Diagnose **volume adaptation**
  - Diagnose **(in)continence**
  - Diagnose ability to **initiate micturition**
  - Diagnose **outflow (dys-)function** (dynamics or grade of BOO)
  - Diagnose **contraction (dys-)function**: difficult to initiate; underactive; in normal range; fading, voiding efficacy (void%)
  - Report in ICS parameters and terms
- Integrate what you observe from the urodynamic tests with what you know about your patient

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### Thank You



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