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**Speaker Powerpoint Slides**

Please note that where authorised by the speaker all PowerPoint slides presented at the workshop will be made available after the meeting via the ICS website [www.ics.org/2017/programme](http://www.ics.org/2017/programme). Please do not film or photograph the slides during the workshop as this is distracting for the speakers.

**Aims of Workshop**

The workshop is largely based on the published and evidence based ICS teaching modules. The workshop is intended to educate the fundamentals of urodynamics for the beginner and includes the newly published ICS ‘Good Urodynamic Practices and Terms’.

**Learning Objectives**

- To learn the terms used for objective lower urinary tract dysfunction.
- To learn the basic principles of objective testing of lower urinary tract function.
- To learn to systematically analyse and evaluate test results and to apply standard terms in the reporting.

**Learning Outcomes**

Understand that a variety of symptoms can lead to a variety of dysfunctions when function is objectively tested. The student will also understand that although the tests give objective results, the tests have a certain biological inherent variability and are also influenced by the circumstances during the test. The student will furthermore be able to improve testing quality evaluation skills.

**Target Audience**

Everyone involved in indication performing and evaluating urodynamics

**Advanced/Basic**

Basic

**Conditions for Learning**

There is no restriction on delagates for this course with the intention to be very interactive, nevertheless.

**Suggested Learning before Workshop Attendance**

Reading of the ICS good urodynamic practices and the teaching modules publications will help interaction and raise the level of the discussion.

**Suggested Reading**


Other Supporting Documents, Teaching Tools, Patient Education etc

ICS teaching module: Cystometry (basic module)
D’Ancona CA(1), Gomes MJ(2), Rosier PF(3).

(1)Division of Urology, University of Campinas School of Medicine, Campinas, Sao Paulo, Brazil. (2)In remembrance: Hospital Santo Antonio, Porto, Portugal. (3)Department of Urology, University Medical Center Utrecht, The Netherlands.

AIMS: To summarize the evidence background for education of good urodynamic practice, especially cystometry.

METHODS: A search was done in PubMed for the last 5 years of publications selecting only clinical studies, utilizing the following keywords: cystometry 133 articles and filling cystometry 53 articles.

RESULTS: The evidence with regard to clinical setting and cystometry technique, as well as for catheters and transducers type, infused solution and patient position is presented with recommendations. Also the practice of determining bladder filling sensation and capacity and the basis of detrusor storage function diagnosis is educated.

CONCLUSIONS: This module provides the evidence background for the practice of cystometry.

Pad weight testing in the evaluation of urinary incontinence
Krhut J(1), Zachoval R(2), Smith PP(3), Rosier PF(4), Valanský L(5), Martan A(6), Zvara P(7).

1 Department of Urology, Ostrava University, University Hospital,, Ostrava, Czech Republic
2 Department of Urology, Thomayer Hospital Prague, Czech Republic
3 Department of Surgery, University of Connecticut Health Center, Farmington, CT
4 Department of Urology, University Medical Centre Utrecht, Utrecht, The Netherlands
5 Department of Urology, PJS University, Košice, Slovak Republic
6 Department of Gynecology, Charles University, Prague, Czech Republic
7Division of Urology, Department of Surgery, University of Vermont, Burlington, VT

AIM: To present the teaching module "Pad Weight Testing in the Evaluation of Urinary Incontinence." This teaching module embodies a presentation, in combination with this manuscript. This manuscript serves as a scientific background review; the evidence base made available on ICS website to summarize current knowledge and recommendations.

METHODS: This review has been prepared by a Working Group of The ICS Urodynamics Committee. The methodology used included comprehensive literature review, consensus formation by the members of the Working Group, and review by members of the ICS Urodynamics Committee core panel.

RESULTS: The pad test is a non-invasive diagnostic tool for urinary incontinence. It is an easy to perform, inexpensive test with utilization in both the daily patient care and clinical research. Despite it is clear value in initial diagnosis, selection of treatment, and follow-up evaluation, only less than 10% of urologists perform the test routinely. A number of testing protocols with varying lengths of recording time exist, however, only a 1-hr pad test has been standardized. One-hour pad tests are most suitable in establishing initial diagnosis, the 24-hr test serves most often for evaluation of treatment outcomes, and longer pad tests are
used in clinical studies.

CONCLUSIONS: The pad test is clearly underutilized. Well-designed studies providing level one evidence are lacking. Numerous variations in how the test is performed by individual urologists make the evaluation of published literature difficult. Future research goals should include randomized studies leading to establishment of optimal protocols of testing for clinical research and daily care.

**ICS teaching module: Analysis of voiding, pressure flow analysis (basic module)**
Rosier PF(1), Kirschner-Hermanns R(2), Svhra J(3), Homma Y(4), Wein AJ(5).

(1)University Medical Centre Utrecht - Urology, The Netherlands. (2)University Clinic, Rheinisch Friedrich-Wilhelms University - Clinic of Urology/Neuro-Urology Bonn, Germany. (3)School of Medicine - Department of Urology, Slovakia. (4)University of Tokyo - Department of Urology, Bunkyoku, Tokyo, Japan. (5)University of Pennsylvania Health System - Division of Urology, Philadelphia, Pennsylvania.

AIMS: To present the evidence background for an ICS teaching module for the urodynamic analysis of voiding.

METHODS: Literature analysis and expert opinion are combined to collate an outline and explanation of a preferred and good urodynamic practice.

RESULT: Patient’s preparation, pathophysiology, technique and principles of pressure flow analysis are summarized in this manuscript.

CONCLUSIONS: This module serves as scientific background for teaching the basic and practical elements of pressure flow analysis.

**International Continence Society Good Urodynamic Practices and Terms 2016: Urodynamics, uroflowmetry, cystometry, and pressure-flow study**
Rosier PF(1), Schaefer W(2), Lose G(3), Goldman HB(4), Guralnick M(5), Eustice S(6), Dickinson T(7), Hashim H(8).

(1)Department of Urology, University Medical Center Utrecht, Utrecht, The Netherlands. (2)Department of Medicine (Geriatrics), University of Pittsburgh, Pittsburgh, Pennsylvania. (3)University of Copenhagen Herlev Hospital, Herlev, Denmark. (4)Glickman Urologic and Kidney Institute Cleveland Clinic, Lerner College of Medicine, Cleveland, Ohio. (5)Medical College of Wisconsin, Milwaukee, Wisconsin. (6)Peninsula Community Health, Cornwall, UK. (7)UT Southwestern Medical Center, Dallas, Texas. (8)Bristol Urological Institute, Bristol, UK.

AIMS: The working group initiated by the ICS Standardisation Steering Committee has updated the International Continence Society Standard "Good Urodynamic Practice" published in 2002.

METHODS: On the basis of the manuscript: "ICS standard to develop evidence-based standards," a new ICS Standard was developed in the period from December 2013 to December 2015. In July, a draft was posted on the ICS website for membership comments and discussed at the ICS 2015 annual meeting. The input of ICS membership was included in the final draft before ICS approval and subsequent peer review.

RESULTS: This evidence-based ICS-GUP2016 has newly or more precisely defined more than 30 terms and provides standards for the practice, quality control, interpretation, and reporting of urodynamics; cystometry and pressure-flow analysis. Furthermore, the working group has included recommendations for pre-testing information and for patient information and preparation. On the basis of earlier ICS standardisations and updating according to available evidence, the practice of uroflowmetry, cystometry, and pressure-flow studies are further detailed.

CONCLUSION: ICS-GUP2016 updates and adds on to ICS-GUP2002 to improve urodynamic testing and reporting both for individual care and scientific purposes.
Urodynamic Committee
- former School of Urodynamics of ICS (2005-2010)

Aims of Urodynamic Committee
- sequential production of teaching/educational modules on all urodynamic tests
  - by collecting as much information as possible according to the Evidence Based Medicine (indicated in the texts)
- release modules to the public
  - in English version
  - in national languages if there is a demand

Teaching/educational modules
- design:
  - to address the method in a very specific manner
  - a narrow field rather than a very extensive information
- example
  - Filling cystometry:
    - basic
    - advanced:
      - in children, in elderly, ...
      - principles, technique, equipment, ...

Process of production
- Member od Urodynamic Committee:
  = leader/manager of working group
  - formation of working group on specific topic
  - production of module
  - approval of module by Urodynamic Committee and ICS authorities (peer review standards)

Final product
- Manuscript published in Neurourology and Uroynamics
- Slide Set posted on ICS websites
Cystometry - Definition

- Transurethral or suprapubic continuous fluid filling of the bladder, and measurement of intravesical and abdominal pressures.

- Cystometry ends with 'permission to void' or with incontinence (involuntary loss) of the (total) bladder content.

Cystometry: Aim

- To diagnose lower urinary tract reservoir function and find an explanation for the patients’ complaints.

- To evaluate lower urinary tract reservoir function for research purposes.

Cystometry (clinical relevance)

- Demonstrate the reservoir function of the bladder relevant to the signs and symptoms that the patient perceives.

What should be known before starting?

- Patient’s symptoms and signs of lower urinary tract dysfunction
  - Symptoms questionnaire (preferable)
  - Voiding diary; FVC-BD (=usual volumes voided)
  - To predict - estimated - cystometric capacity
  - Fre uroflowmetry
  - Post void residual urine

ICS Standard:

- Fluid filled >
- External pressure transducers
- Reference = pressure at the level of the symphysis
- Patient in vertical position
- Fill until strong desire to void
- Continuous medium fill-rate
  - (e.g. 10% of expected capacity /minute)
- Room temperature saline
- Indicate end of cystometry on trace
  - Stopping of the pump (and/or)
  - ‘Permission to void’
Specify (when reporting)

• Fluid type
• Fluid temperature
• Filling method and rate
• Catheter sizes
• Pressure recording technique
• Patient position
• Sensations (at volumes)
• Observations during cystometry

Solution infused

• Saline solution
• Or contrast
• Temperature
• Room temperature

Infusion Pump

Urethral Catheter

Insert catheters

• Usually lithotomy position
• Sterile catheters
  • Vesical: double lumen (or separate)
  • 6-7F
  • Rectal: punctured balloon or open tube

• Fix adjacent to the meatus

• Patient in comfortably seated position
• Cover the patient e.g. with a towel

Transducer
Position of the Transducer

- External pressure measured at the level of the symphysis pubis
- Equals: Base of the bladder
- ICS standard urodynamic pressure, is the excess pressure above atmosphere at the hydrostatic level of the upper edge of the symphysis pubis.
- Intra rectal and intravesical pressures are assumed to be measured at identical levels

Filling cystometry

- Transducers zero set to atmospheric pressure
- Transducers placed at the level of upper edge of pubic symphysis
- Initial resting pressure
  - Supine: 5 - 20 cmH₂O
  - Sitting: 15 - 40 cmH₂O
  - Standing: 30 - 50 cmH₂O

Bladder sensation – ICS classification

- Normal bladder sensation
  - can be judged by three defined points noted during filling cystometry and evaluated in relation to the bladder volume at that moment and in relation to the patient’s symptomatic complaints.
  - First sensation of bladder filling
    - is the feeling the patient has, during filling cystometry, when he/she first becomes aware of the bladder filling.
    - To be separated from the sensation that the catheterisation has caused, that means off in the first minutes.
  - First desire to void
    - is defined as the feeling, during filling cystometry, that would lead the patient to pass urine at the next convenient moment, but voiding can be delayed if necessary.
  - Strong desire to void
    - is defined, during filling cystometry, as a persistent desire to void without the fear of leakage.

- Increased bladder sensation
  - is defined, during filling cystometry, as an early first sensation of bladder filling (or an early desire to void) and/or an early strong desire to void, which occurs at low bladder volume and which persists.

- Reduced bladder sensation
  - is defined, during filling cystometry, as diminished sensation throughout bladder filling.

- Absent bladder sensation
  - means that, during filling cystometry, the individual has no bladder sensation.

- Non-specific bladder sensations
  - during filling cystometry, may make the individual aware of bladder filling, for example, abdominal fullness or vegetative symptoms.

- Bladder pain
  - during filling cystometry, is a self explanatory term and is an abnormal finding.
  - Pain may increase with volume, or not, which should be reported.

- Urgency
  - during filling cystometry, is a sudden compelling desire to void.

Communicate with patient:

- The bladder is filling from now on; from the kidneys as usual, but also slowly dripping from the urodynamic machine via the catheter:
  - Tell me at the moment that you perceive that the bladder is not empty anymore:
    - First sensation of filling
    - not in the urethra; not the sensation that the catheter causes.
  - (subsequently) Tell me when you have the sensation that normally tells you to go to the toilet, without any hurry, at the next convenient moment:
    - First desire to void
  - (subsequently) Tell me at the moment that you, without any pain, will not likely postpone the voiding any more, and or will visit the nearest restroom e.g. while shopping:
    - Strong desire to void
    - May associate with the largest voided volume on FVC-BD
  - Cystometric capacity (mL)
Filling cystometry - information

- Cystometric capacity (mL)
  - Infused weight and pump-speed helpful during the test
  - And include diuresis (capacity: voided volume + PVR) after the test.
  - Measure PVR after pressure flow via the catheter
- Bladder sensations (mL)
  - Electronic buttons during cystometry do not include diuresis; correct after the test if needed

Bladder filling sensation

- Is a subjective parameter
  - Depending on interaction/communication with the patient
- Normal bladder sensation (rule of thumb) of cap.
  - First sensation ± 175-250mL ± 33%
  - First desire to void ± 272-450mL ± 66%
  - Strong desire to void ± 429-700mL ± 100%

Bladder capacity

- Cystometric capacity – bladder volume at the end of filling phase
  - Commonly there is not much reason to fill more than 800mL e.g. in the absence of sensation and or contraction and or incontinence
  - Maximum cystometric capacity – patient can no longer delay micturition
  - Overfilling hinders subsequent (representative) voiding
  - Maximum anaesthetic capacity – volume of bladder without urinary leakage

Detrusor Pressure

\[ P_{det} = P_{ves} - P_{abd} \]


Detrusor function

- Normal detrusor function – little or no changes in pressure
  - Detrusor overactivity – ANY (amplitude) detrusor pressure rise before permission to void:
    - Neurogenic; when relevant neurologic abnormalities are present
      - NDO
    - Idiopathic
    - DO
  - Cystometry patterns are not discriminating Neurogenicity: Depends on history and clinical exam

**Bladder Compliance**

- Good compliance is large volume and low pressure

\[
C = \frac{(V_1 - V_0)}{(P_1 - P_0)}
\]


**Bladder Compliance – Normal Values**

- Not well defined
- (Neurogenic) LUT dysfunction:
  - (low) values 13 – 40 mL/cmH\(_2\)O, uppertract risk
  - Normal >40 mL/cmH\(_2\)O
  - Low <30 mL/cmH\(_2\)O
- Relation with sensation, volume and leakpoint

**Filling cystometry**

- Important points:
  - All negatives values should be corrected
  - Usually self limiting after some filling
  - Use punctured –leaking rectal balloon
  - Abdominal pressure is to identify the artifacts on \(P_{\text{abd}}\)
  - Cough tests > balanced response
  - \(P_{\text{det}}\) cannot be negative (agreed limit is 10cmH\(_2\)O)
  - Fine structure pressure variations in both pressures (signal alive)
  - Talking patient: lively signal in \(P_{\text{ves}}\) and \(P_{\text{abd}}\)

Hogan S. Neurourol & Urodyn 2012, 31: 1104-1117
Teaching Module

Filling cystometry

- Cough test
- Signs of life
- Initial pressures
- End of filling phase and volume
- Sensibility

Cystometry

- Patient centred and patient friendly
- Technically adequate
- Observe the pressures ‘as an engineer’
- Perform the test as representative for the usual situation as possible
- Reproduce the dysfunction that leads to, or is an explanation for, the signs and the symptoms that the patient perceives
- Systematically report all observations

Thank You
Affiliations to disclose:

Funding for speaker to attend:

- Self-funded
- Institution (non-industry) funded
- Sponsored by:

Aim of the pad weight test

- Qualitative assessment (continent vs. incontinent)
- Quantitative assessment (how much)

Principle of the pad weight test

- weight of the pads before and after test
- weight gain in g = urine loss in mLs

Duration of the pad weight test

- Short term tests
  - 20 min. – 2 hrs
  - qualitative assessment
- Long term tests
  - 12 hrs – 72 hrs
  - quantitative assessment

ICS pad weight test

- Only 1 hr standardized pad weight test

- 0-15 min: drinking of 500 ml sodium-free liquid, resting
- 15-45 min: walking, including stairs climbing to one flight up and down
- 45-60 min: standing up from sitting (10 times)
- coughing vigorously (15 times)
- running on the spot (1 min)
- bending to pick up small object from the floor (5 times)
- washing hands in running water (1 min)
Preparation of the patient

- **Short term tests**
  - without retrograde filling
  - with retrograde filling (200-300 ml)
  - (50-75% of the bladder capacity)

- **Long term tests**

Performing of the pad weight test

- **Short term tests**
  - set of standardized activities

- **Long term tests**
  - Normal daily activity

Cut-off values

- **Short term tests**
  - weight gain > 1g

- **Long term tests**
  - weight gain > 4g/24hrs

Is leak of 1 mL significant?

- 1 mL of fluid = 25 drops

Is leak of 1 mL significant?

- 1 mL of fluid absorbed by pad
- 1 mL of fluid leaked into the clothing

Is leakage of 5 mL of fluid significant?

- 5 mL of fluid absorbed by pad
- 5 mL of fluid leaked into the clothing

---


Sensitivity and specificity

• **Short term tests**
  - sensitivity: 34-83%\(^1\)\(^2\)
  - specificity: 65-89%\(^2\)

• **Long term tests**
  - sensitivity: no sufficient data
  - specificity: no sufficient data

**Limitations I.**

• lack of standardization
• results of the long term tests may be influenced by:
  - fluid intake
  - increased voiding frequency
  - sweating
  - vaginal discharge (up to 7g/24 hrs)\(^1\)
  - patient compliance
• no value in determining incontinence etiology

**Limitations II.**

• weak correlation with the degree of patient’s bother

**Clinical conclusions**

• pad–test can provide additional information about degree of patient’s incontinence
• easy to perform, inexpensive, risk-free
• could be influenced by many factors, therefore outcomes should be interpreted in context of other diagnostic instruments

**Recommendation for clinical use of the pad weight test**

• detailed instruction and patient motivation are crucial to achieve valid results
• use short term test for qualitative evaluation of incontinence
• in case of retrograde filling, bladder should be filled to 50-75% of bladder capacity
• use long term test for quantitative evaluation of incontinence
• the test results should be always interpreted in conjunction with other relevant assessments (self-assessment, questionnaires, physical examination, etc.)
• pad weight test result does not always correlate with patient’s bother


**References:**
Normal Voiding

- Voiding is desired (and socially acceptable)
- Pelvic floor relaxes by will...
- ...subsequently and autonomically the...
- ...urethral sphincter relaxes and (antagonistic) detrusor-dome contracts;
- Detrusor pressure forces the (relaxed) bladder neck, the urethra and pelvic floor to open;
- Urine flow begins;
- Detrusor contraction ends;
- Urethral sphincter and pelvic floor contraction resume.

ICS standard urodynamic protocol

- Optimally informed patient
- Clinical history
- Systematic symptoms and scores
- Laboratory and clinical exams
- Bladder diary (3 days)
- Free flowmetry
- Post void residual urine

Pressure-flow study

- Begins immediately after permission to void
- Ends when the pressure has returned to the base line value and/or the flow rate to zero and/or the patient considers the micturation completed

**Recommendation**

- A shorter possible meatus-to-flowmeter distance, adjusted to voiding position
- Correct the delay between pressure and flow

**Update of terms**

Bladder Outflow Obstruction (BOO) a cut-off of bladder outflow resistance based on the pressure flow relation that is considered clinical relevant (not define cut-off value)

---

**Update of terms**

- Normal voiding function – flow and pressure are within normal limits
- Situational inability to void and situational inability to voids as normal – when the opinion of the patient performing the test, the attempted voiding has been not representative.

---

**Update of terms**

- Detrusor voiding contraction – any analysis of pressure and flow
- Detrusor contratility – any method that quantify detrusor muscle properties (ex. stop test, graphical analysis)
  - unsustained contraction or fading contraction

---

**Voiding: pressure flow test**

Negative influence on voiding:

- Over distended bladder
- Very unrepresentative urgency at the beginning of voiding
- Extreme inhibition of overactive detrusor contractions before the beginning of voiding
- Rectal catheter hindering pelvic muscle relaxation

---

**Voiding: pressure flow test**

Be aware of the transurethral catheter:

- Slips out – worst scenario
- Causes (some) passive effect
  - May be obstructive (ex. urethral stricture)
  - There may ‘stent’ kinking of the catheter
- Causes active effect (hinders normal behaviour)
  - alters voiding sensation
  - Anaesthetic (lidocaine) gel
  - fear of pain during voiding

---

Set Up For The Test

Already done to perform filling cystometry:
- balanced intravesical and intra abdominal pressure

Cough (position of the catheter) check before and after voiding.

Ensure correction of flow curve for the systematic delay between flow and pressure:
- depending on the meatus to flowmeter distance
- before a pressure flow analysis is done

Care For The Test

Best possible (= most comfortable for patient), position during voiding.

Flowmeter as close as possible to the meatus.
- Minimize time delay between flow at meatus and entering flowmeter

No hindering of stream between funnel and beaker or spinning disk.
- (e.g. No (long) tube between funnel and beaker or disk.)

Use thin transurethral catheter.
Use thin rectal catheter.

Tape catheters alongside meatus / anus.

Mechanics of Voiding

Detrusor pressure (cmH$_2$O) generates flow (ml/s)
- $P_{det} = P_{ves} - P_{abd}$

Urethra (normally) functions as a tube..."distensible"
- with passive distension (until $Q_{max}$)
- and passive collapse (after $Q_{max}$)

Flow ($Q_{max}$) is limited by the ‘flow controlling zone’ (FCZ)
- The FCZ is the virtual (by definition) point in the urethra that gives the highest resistance to flow
- Increased resistance drives detrusor to higher pressures to generate flow

Urethral catheter (8F) causes ± 10cm H$_2$O increase of detrusor pressure


Before the Voiding Phase – check list

The patient was already well informed
All technical procedures are observed
Appropriate environent – physical and emotional
A physician/nurse has already tranquilized the patient
The bladder is confortably full

Let’s start !!!

ICS Terms

- Is the patient adequately informed and instructed?
  Has anything changed after the indication for UDI testing was settled?

- During:
  Are sterile catheters and filling medium used?
  Are antiseptic procedures applied?
  Is the patient clothed/covered as much as possible?
  Is the patient comfortably positioned?
  (Especially if male) Preferred position for voiding?
  Has everyone, who is unnecessary, left the site of testing?

- After:
  Is the patient instructed to drink ± 0,5-1liter immediately after the test?
Quality Control (P/Q analysis)

Ask the patient:
- Was this voiding more or less as usual / as at home?
- If not: clinical urodynamic diagnosis may be irrelevant
  - E.g.: Not being able to void does frequently (but not always) not represent the real function and is therefore situable during UDI

Observe the tracings (of the entire exam)
- Are the pressures in the physiological range
- Are the intravesical and intra abdominal pressures reacting synchronous on patients' movements and coughing (balanced pressures), also after the voiding?
- Is permission to void adequately marked /indicated?

Clinical Quality

Patients unable to void because of the test situation:
- It can be unexpected ("shy voiders / shy bladder/ paruresis")
  - Allow more time; assure absolute privacy; dim the lights
  - Allow something (cold water) to drink
  - Sound of running tap – water
  - Some contraction is seen but no, or very little, voiding:
    - not acontractility, not representative, BOO impossible to 'calculate'
    - No contraction is observed and no voiding:
      - if patient is usually able to void:
        - not definitively acontractility; not representative*
  - Patients tend to start straining; usually not productive and not representative!

Formal pressure flow analysis and diagnosis (outlet or contractility) of voiding (other than 'shy') is impossible in this situation.

Clinical Quality: pressure flow analysis

For (elderly) men (with an enlarger prostate):
- Pressure flow (relation and) analysis is straightforward
- Clinically applicable limits for grading of outlet properties exist

For young men, women and children:
- Basic principles of voiding and P/Q analysis are known and applicable
- Universally agreed clinical grading of outlet properties does not exist

Neurogenic dysynergia or neurogenic dynamic outlet obstruction:
- No standard grading is available
- No urodynamic pressure flow relation criteria
- However Detrusor Leak Point Pressure is relevant

Pressure Flow Analysis: concluding

Flow relates to pressure and is determined (or limited) by outlet properties
- Representative voiding and clinically relevant pressure flow analysis depends on good urodynamic practice and properly ascertained patient cooperation
- A very unrepresentative voiding and/or significant underactive detrusor contraction limits the validity of the pressure flow analysis

Pressure flow starts: after permission to void
Bladder outlet obstruction can be graded by:
- provisional-ICS-method = \( P_{det} - Q_{\text{max}} - 2 \times Q_{\text{max}} \)

Outlet Resistance or Degree of Obstruction

- P-Q curves, are still the mainstay of obstruction assessment
- In male population the ICS nomogram or BOOI
- Schaeffer nomogram using linearized Passive Urethral Resistance Relation (LinPURR)
- The Bladder Contractility Index (BCI)

PRESSURE/ FLOW ANALYSIS-Male
ICS Nomograms

BC Index: \( P_{\text{detMax}} - 5 Q_{\text{max}} \)
- >150 strong
- 100-150 normal activity
- <100 weak

Abrams P, 1998
Interpretation of Pressure Flow

- Analysis of bladder outlet obstruction is done on the second passive phase of micturation
- After maximum flow the true passive outlet resistance is obtained
- $P_{det} \cdot Q_{\max}$ in combination with $Q_{\max}$ gives the clinically relevant grading of bladder outlet obstruction ($P_{det} \cdot Q_{\max} - 2 \cdot Q_{\max}$)

Limitations of Pressure Flow

- Very low pressure
- Inability to void
- Inability to initiate a full voiding reflex
- Shy voiders

Limits the applicability of pressure flow analysis

Conclusions

- Pressure flow study is the golden standard for the analysis of voiding
- For male – precise limits of BOO are available
- For female and children – the limits are less precise
Let's designate a day for thinking about the weekend and pretending that we're working.

Peter F.W.M. Rosier MD PhD
Senior Lecturer Functional Urology & Neurourology
Department of Urology
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Laborie/MMS/Tiboc/Andromeda
Research protocol support

Funding for speaker to attend:
- Self-Funded
- Institution (non-industry) funded: ICS

Sponsored by: Enter Company Name

Quality in Urodynamics: The ICS documents on good urodynamic practice and on urodynamic equipment performance

Good Practice (standards)

Urodynamics practice and evaluation should be as standardized as other diagnostics and medical techniques, and be equally trustworthy.


International Continence Society Guidelines on Urodynamic Equipment Performance
Commercially available equipment usually complies with these criteria:

Machine and physician, technician and or nurse.....

Urodynamics is as reliable as the person that evaluates and reports it...

'Good urodynamic practices' for your practice?

Paragraphs: GUP2016

Introduction
Definition of terms
Patient information and preparation
Urodynamic practice protocols
Pre-testing information
Practice of flowmetry
Practice of cystometry
Practice of pressure flow studies
Technical and clinical quality control
Urodynamic graphs and report
Terms:
ICS Standard Urodynamic Test (ICS-SUT):
- Uroflowmetry and PVR plus transurethral cystometry and pressure-flow study plus PVR.
- All performed in the patient's preferred or most usual position; usually comfortably seated or standing if physically possible. The patient(s) may be reported as having had an ICS standard urodynamic test.
ICS-SUT may be supplemented
- with EMG
- with imaging (VIDEO)
- with continuous urethral pressure(s)
- with urethral pressure profile measurement
- Cystometry may be done via a suprapubic catheter
- specify supplements.
ICS Standard Urodynamics Protocol (ICS-SUP) includes:
- An ICS-SUT plus clinical history (a valid symptom and bother score), relevant clinical exam and a (3 days) bladder diary.

Leaflet contents:

What the patient should do after the test
- immediately drink one portion of ½ L extra fluid to ensure prompt voiding again, thus to rapidly relieve the urge to void.
- may be handled or prevented; e.g. the fact that mild discomfort, frequency, dysuria and haematuria may be overcome with EMG

Note:
All performed in the patient's preferred or most usual position; usually comfortably seated or standing if physically possible. The patient(s) may be reported as having had an ICS standard urodynamic test.

Urodynamic practice /accreditation

Conclusions
Published evidence to support implementation of practice standards is scarce and the conclusion on the basis of simple implementation strategies towards the achievability of practice improvement is not very encouraging.

Recommendations
We recommend that departments develop urodynamic practice protocols on the basis of the best available standards and facilitate specific training in and evaluation of urodynamic practice.

Technical and clinical quality control during invasive urodynamics.

Conclusions
Expert evidence confirms that recognition, prevention and management of artefacts are important elements of urodynamic quality control.

Urodynamic quality management, including monitoring, is relevant before, during and after the test as well as while reporting the test.

Recommendations
The WG recommends that everyone performing or evaluating urodynamics is able to recognize usual pressure patterns and is able to perform continuous quality control during the test.

The WG recommends that training and a process of continuous knowledge maintenance as the base for performing (standard good) urodynamic practice should be established.

Terms related to the cystometry observations and evaluation.
Terms related to cystometry observations and evaluation

Most common features, artefacts and errors:

Initial Resting Pressure (NEW)
- To preclude resting measurements from occluded catheters in an empty bladder with the outlet hold closed and in order to standardize the bladder surface the ICS recommends (GUP2002) gentle touching or filled 20 mL, before the initial resting pressures are considered to be established.
- Initial resting pressures should be within the physiological limits specified in previous ICS documents. Otherwise, the pressures should have post and normalized.

Poor Pressure Transmission (NEW)
- Poor pressure transmission has occurred when the cough/effort pressure peak signals on urethra and not for physiological artefacts.
- Note: The ICS does not define a new limit for ‘unequal’, or for not ‘almost identical’ GUP2002.
- Note: Pressure drift and or signal are associated with poor pressure

Expelled Catheter (NEW)
- Expelled catheter is usually simply visible during the test and should provoke correction or repetition of the test however.

Catheter Flush (NEW)
- Cough pressure peak (NEW)
- The Cough pressure peak is recognizable during post urethral urine loss or stoma).
- Abdominal, Cough or Valsalva LPP: 98; Detrusor LPP: 64; Overactivity (NEW)

Cough pressure peak (NEW)
- Overactivity is reported when the onset of the DO (with or without leakage) occurs immediately following the cough pressure peak.
- No precise definition of cough associated detrusor activity is available. However, cough induced DO is sometimes reported however its pathophysiology remains speculative.
- Since the urodynamic observation is that the cough is immediately followed by DO and because the (patho-) physiology has remained unclear, the WG presents a descriptive definition.

Features and artefacts

Dead Signal (NEW)
- A signal that is not showing small-pressure fluctuations and is not adequately responding on coughing is reported as a dead signal.
- Previously (ST2002): ‘In principle, a good signal requires only that $p_{ves}$ and $p_{abd}$ show the same fine structure and quality of signals before filling, during filling, and after voiding.

Pressure Drift (NEW)
- Continuous slow fall or rise in (one of either) pressure, that is physiologically

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Position Change (NEW)
- A change in patient position, either active or passive (e.g. tilting), is visible on the cystometry graph, during a change (or net migration of $p_{ves}$ and $p_{abd}$).
- The Position Change should not affect $p_{ves}$.

Rectal Contractions (NEW)
- Rectal contractions are usually of low amplitude and may or may not be felt by the patient.

Dropped $p_{abd}$ at Void (NEW)
- Note: $p_{abd}$ should be noted in the urodynamic report.
- A drop in $p_{abd}$ is observed.

Rectal activity (NEW)
- Rectal activity, or Rectal contractions are usually of low amplitude and may or may not be felt by the patient.

After-contraction (NEW)
- Note: Cough checking of ($p_{ves}$, $p_{abd}$) during voiding may be performed for example in ST1997.
- Rectal contractions are usually of low amplitude and may or may not be felt by the patient.

Staining (NEW)
- Note: A short abdominal strain peak may be indistinguishable from a position change or a cough and vice versa.

The urodynamic graphs and the urodynamics report

Recommendations:
The WG recommends a graph against flow rate in all cases. For the ICS-SUT, the ICS stand as well as the TCS stand is reported.

The WG recommends development of an ICS standard urodynamic report template.

Accessory tests or measurements (if applicable - no further standard)
Overall judgement of the technical quality and the clinical reliability of the test as judged by the investigator:

- Filling sensation diagnosis or urodynamic condition (ST2002).
- Cystometry (detrusor) pressure pattern diagnosis.
- Pressure-flow diagnosis (compared with uroflowmetry) includes:
  - Bladder outlet function, or (grade of) outflow obstruction
  - Detrusor contraction.
- Voiding efficiency diagnosis (Void%).

The WG recommends development of an ICS standard urodynamic report template.

Straining (NEW)
- Rectal activity, or Rectal contractions are usually of low amplitude and may or may not be felt by the patient.
- Note: The WG considers that this phenomenon will affect pressure pattern from catheter slipping out or catheter tip changing its position from catheter slipping out or catheter tip changing from neutral to weight

The WG recommends furthermore to report:

Uroflowmetry: Voiding position and representativeness as reported by the patient (especially if not).

Introduction of catheters: sensation, if occurring; pain, muscular (pelvic or adductor) defence and -perceptible unusual-obstruction(s) during insertion.

Position during cystometry.

Patient's ability to report filling sensations and or urgency and or urine loss.

Method of urodynamic stress test (if applicable).

Pressure-flow: position and representativeness as reported by the patient.
Conclusion

The Working Group initiated by the ICS Standardisation Steering Committee has updated the International Continence Society Good Urodynamic Practice.

This evidence based ICS GUP2016 has defined terms and standards for the practice of urodynamics labs in general as well as for the (individual) practice of quality control during and after cystometry and pressure-flow analysis as well as for the reporting.

Furthermore the working group has included recommendations for pretesting information and for patient information and preparation.

On the basis of earlier ICS standardisations and the available evidence, the practice of uroflowmetry, cystometry and pressure-flow study are further detailed.

The WG expresses the hope that implementation of this Good Urodynamic Practices helps to increase the individual clinical, as well as the research quality of urodynamics.