

Fluid for infusion

- Normal saline
- Urografin/alternative contrast



Appointments

- Invite patient to phone in for appointment
 - Referral forms
 - Email referral letters
- Complete ICIQ-BD and ICIQ-LUTS before attendance
 - ?check urine in those with recurrent UTIs



Staffing

- Interest in urodynamics
- Sensitivity
- Sense of humour!
- Appropriate number for type of test
 - Video UDS
 - Amb UDS



Staff Training

- All staff should be adequately trained
- Accreditation through UKCS and national organisations
- Joint statement on minimum standards for urodynamic practice in the UK
- Working party represented Royal Colleges
 - Published April 2009 and launched at UKCS conference Swansea 2009



Neurology and Urodynamics 29:1365-1372 (2010)

— CONTROVERSIAL TOPIC —

Minimum Standards for Urodynamic Practice in the UK

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- Initial training should be delivered by a trained senior preceptor.
- Minimum of 6 months supervised participation in a urodynamic clinic and attendance at an accredited theoretical course.
- Formal supervision of a minimum 30 cases by the preceptor before independent unsupervised practice.
- ≥ 200 studies per annum should be performed within the department to maintain expertise for routine UDS.
- >30 cases workload per independent urodynamicist to maintain expertise in any particular patient group (women, men, children, and neuropaths)
- UDS dept must operate within the context of an MDT and have audits







Terminology

- Familiar with ICS terminology
 - Standardisation reports
 - www.ics.org




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REVIEW ARTICLE

WILEY    

International Continence Society Good Urodynamic Practices and Terms 2016: Urodynamics, uroflowmetry, cystometry, and pressure-flow study

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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 (for this journal).

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.

KEY WORDS
clinical practice standard and quality, cystometry, incontinence, lower urinary tract dysfunction, pressure-flow study, urodynamic, uroflowmetry




Sections:

- Definitions of terms for Urodynamic Tests
- Patient information and preparation of the patient for invasive
- Urodynamic practice protocols
- Clinical practice pre-testing information
- Practice of uroflowmetry




Definitions of Terms for Urodynamic Tests

- All ICS-SUT data as a minimum, and preferably complete ICS-SUP data should be specifically reported or summarized for the total cohort of patients in all research reports that contain (invasive) urodynamic results
- Referring to the current manuscript when research is reported as “. . . According to ICS Standard Good Urodynamic Practices (ICSGUP2016),” when complete ICS-SUT or SUP data are reported.




ICS standard urodynamics protocol:

- A patient undergoing collection of a
 - clinical history (should include(a) valid symptom and bother score(s) and medication list),
 - relevant clinical examination,
 - (3 days) bladder diary,
 - representative uroflowmetry with post-void residual (PVR)
 - complete ICS standard urodynamic test
- is referred to as having had the “ICS standard urodynamics protocol (ICS-SUP).”



ICS standard urodynamic test (NEW):

- Uroflowmetry and PVR
- Transurethral cystometry and pressure-flow study
- All tests are performed in the patient's preferred or most usual position: comfortably seated and/or standing, if physically possible.
- The patient(s) is reported as having had an ICS standard urodynamic test (ICS-SUT).




Patient Information and Preparation of the patient for Invasive Urodynamics


Overview of the content of an ICS Standard Information Leaflet for Urodynamics.

- What is a urodynamic investigation
- That the test involves insertion of catheters into the bladder and rectum, and relevant technical issues
- What is the usefulness of urodynamics, why is the testing done
- What are the different steps of urodynamic investigation and how they are performed (e.g. uroflowmetry, cystometry, urethral pressure measurement and pressure-flow)
- How dignity, communication and comfort during the investigation are maximized (What you do or offer in this regard)
- The symptoms that may occur following the investigation, what they indicate and how can they be handled or prevented, e.g. the fact that mild discomfort, frequency, dysuria and haematuria may be experienced, and a urinary tract infection may occasionally develop*
- Additional information including length of the investigation, sterility of relevant parts of equipment, lack of 'injection'
- That the test is done interactively and that communication with the patient is a necessary part of the test.
- What the patient should do before the test (e.g. arrive if possible with a full bladder for uroflow, and also with an empty bowel if possible).
- Whether the patient should continue medication before the test, or whether there are specific medications that the patient should not take in (a defined period) before the test. Note: This should be individualized, e.g. with a tick box or a written instruction of the requester.
- What the patient should do after the test
 - e.g. immediately drink one portion of 15-20L extra fluid to ensure prompt voiding again, in order to relieve urethral irritation rapidly.
 - All usual activities are permitted after the test.
 - Symptoms and signs of urinary tract infection and what steps to take if these arise.


* Consider risks depending on local situation and regulations for fire adverse events (and incidence) that a reasonable patient might be expected to be informed as a standard.




Urodynamic Practice Protocols


- Departments develop urodynamic practice protocols on the basis of the ICS-GUP standards and facilitate specific training in, and evaluation of, urodynamic practice.
 - Centers should—ideally coordinate and together on a nationwide level—decide on individual accreditation and recertification (eg, required minimum number of tests) as well as the level of authority and autonomy to perform urodynamic tests.
- 

Clinical Practice Pre-testing Information


- Apart from the clinical information (history, medication, and clinical examination), the information from the (3-day) FVC or BD, and the uroflowmetry and PVR are utilized while performing invasive urodynamics.
 - Give specific instructions to the patient with regard to the continuation of usual LUT management (eg, medication) if the patient is on treatment, and — persisting or new onset— symptoms require urodynamic analysis.
- 

Practice of Uroflowmetry

- Permitting patients to undergo uroflowmetry in their preferred position and to strive for minimum physical discomfort and anxiety for the patient, as well as ensuring personal dignity.
 - Checking if the voiding is representative, based on the patient's report and also on the association with the patient's FVC or BD volumes.
- 

- The position of the patient during voiding studies should be reported.
 - Consider repetition of the uroflowmetry if the result has not been representative for the patient or if the result indicates abnormality. Particularly, if the voided volume and/or flow rate are unexpectedly low or the PVR is (much) larger than expected or explainable in both women and in men.
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Practice of Cystometry

1. What determines filling rate?
 2. How is the patient instructed to report sensations?
 3. Fluid-filled external transducers and catheter system
 4. Abdominal pressure catheter placement: rectal versus vaginal
 5. Patient positioning for cystometry and pressure-flow
 6. Reliability and need for repeat cystometry for confirmation
- 

1. What determines filling rate

- Person doing the cystometry knows the FVC-BD results as well as the results of uroflowmetry and PVR, prior to performing invasive urodynamics.
- ICS maximum physiological filling rate is standard and suggests that “non - physiological filling rate” is standardized on the basis of the individual patient’s typical voided volumes (including estimation of the PVR volume) to prevent too fast filling and/or too large volumes.
 - In mL/min of roughly 10% of the largest voided volume



- Use maximum physiological rate when comparability is relevant (eg, this may be required in prospective research cohorts, before and after intervention).
- Parameters during cystometry depending on bladder volumes should be corrected for diuresis if relevant for clinical management or for scientific purposes.
- “Permission to void” should always be marked on the urodynamic graph to indicate the beginning of the pressure-flow study.
- Stopping the fill pump is a more or less automatic marker, but when there is a delay between stopping the filling and this permission, a specific marker should be used to allow correct interpretation of the graphs after the test.



2. How is the patient instructed to report sensations?

- Marking FSF, FDV, and SDV, during cystometry as recommended by ST2002, on the basis of explicit verbal instructions and communication before and during the test specified in this GUP, and reporting the results.



3. Fluid-filled external transducers and catheter system

- ICS standard cystometry is performed with a **fluid-filled** system with **external transducers** at the reference level of the **upper edge of the symphysis pubis**.
- Urodynamic laboratories should ensure that the equipment, including the catheters and transducers, meet the requirements as explained in the ICS guideline on equipment performance.
- Urodynamic laboratories should check the performance of their system at regular intervals and calibrate according to manufacturer recommendation, and as advised in the ICS guideline on equipment performance.



- Comparisons of micro-tip catheter systems (multicenter group averages) or air-filled catheters in vitro or in vivo (pairwise averages of two measurements) with ICS standard fluid-filled systems demonstrated that both systems give different results.
- The reports of these studies have concluded that systems are not interchangeable.



4. Transurethral catheter

- Done with the thinnest possible double lumen catheter (6Fr). However, on the basis of the lack of evidence for inferiority of two catheter techniques, this alternative is considered acceptable.
- Fixation of the catheters as adjacent as possible to the anus and the urethral meatus with tape, without blocking the urinary meatus.



5. Abdominal pressure catheter placement: rectal versus vaginal

- Rectal placement of a fully fluid-filled open, or punctured balloon catheter, to measure abdominal pressure should be considered the ICS standard.
- Vaginal or stoma placement of the abdominal pressure catheter is used alternatively only if rectal catheter placement is impossible.



6. Patient positioning for cystometry and pressure-flow

- Filling cystometry is done in the **vertical** position (standing or normally seated) whenever physically possible.
- A pressure-flow study is done comfortably seated (women, some men) or standing if that is preferred position (men).



7. Reliability and need for repeat cystometry for confirmation

- Does not recommend routine immediate repetition of invasive urodynamics “for confirmation” if the test was technically adequate, has been considered representative, and has answered the clinical question.
- Immediate repetition of the test when doubt exists as to whether the test has answered the clinical question.
- Repetition of a urodynamic test when technical errors and artefacts have been observed at immediate post-test analysis.



Practice of pressure-flow studies and an update of terms

- Only validated for voluntarily initiated micturitions and not for incontinence.
- Have shortest possible meatus-to-flowmeter distance, adjusted to the voiding position, but recommends correcting for delay between pressure and flow.
- Important: relevance of instruction, position and privacy for the patient while performing PFS



Technical and clinical quality control during invasive urodynamics

- Everyone performing or evaluating urodynamics should be able to recognize usual pressure patterns and be able to perform continuous quality control during the test.
- Training and a process of continuous knowledge maintenance as the basis for performing urodynamic tests should be established.



The urodynamic graphs and the urodynamics report

- Standard urodynamic graph: “plot of detrusor pressure against flow rate during voiding” should be provided, according to the example in this ICS standard (ST1997).
- “ICS standard urodynamic (time-based) graph” as well as an “ICS standard pressure-flow plot” to be required elements in the ICS standard urodynamics report development of an ICS standard urodynamics report template.



- Furthermore, the WG recommends reporting as follows:
- Overall judgement of the **technical quality** and the **clinical reliability** of the test to represent the lower urinary tract function 'as usual', to be evaluated by the person who performed the tests.
 - Uroflowmetry: **Voiding position**, **urge** (before the test) and **representativeness**, as reported by the patient.
 - Introduction of catheters: **sensation**; (if occurring; pain), **muscular** (pelvic or adductor) **defence** and **perceptibly unusual-obstruction(s) during insertion**.
 - **Position(s)** during cystometry and pressure flow study.
 - **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.
 - Accessory tests or measurements (if applicable -no further standard).
 - Representativeness of the tests to reflect the 'usual LUT behaviour' as reported by the patient.
 - Filling **sensation -diagnosis**.
 - Cystometry (detrusor) pressure **pattern -diagnosis**.
 - Pressure-flow **-diagnosis** (compared with uroflowmetry) includes:
 - Bladder **outflow** function, or obstruction (and the method for assessment)
 - Detrusor **contraction**, (and the method for assessment)



Urodynamic stress test

- Used for any physical effort of the person tested, to elevate abdominal pressure during cystometry, with the aim of examining (urodynamic) stress urinary incontinence.
- Evidence is lacking (or conflicting) with regard to the preferred technique of urodynamic stress testing.
- The provocation method, the pressure measuring catheter(size) and method, the leak detection method as well as the absolute or relative (percentage of cystometric capacity) intravesical volume(s) while testing should be reported.



Leak point pressure

- Pressure (spontaneous or provoked) that has caused fluid to be expelled from the bladder at the moment that it is visible outside the urethra (may also be used for extra-urethral urine loss or stoma).
- May refer to Abdominal, Cough or Valsalva LPP or Detrusor LPP.
- Provocation and pressure recording site ("type of LPP") should be reported.




Newly Introduced Definitions

- **Normal Voiding Function**
Flow rate (and pressure-rise) are within normal limits, begin more or less directly after permission to void and ends with an empty bladder.
- **Bladder Outflow Obstruction (BOO)**
("outflow" to recognize what is measured) with the definition: a (specified) cut-off of bladder outflow resistance based on the pressure flow relation (ratio) that is considered clinically relevant



Urodynamic practice protocols

The WG recommends that departments develop urodynamic practice protocols on the basis of the ICS – GUP standards and facilitate specific training in, and evaluation of, urodynamic practice.



Neurourology and Uroynamics 29:280-287 (2008)
CONTROVERSIAL TOPIC

Minimum Standards for Urodynamic Practice in the UK
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Abstract This paper reports on the recent publication and wide distribution of a 'best standard' on minimum standards for urodynamic practice in the UK. Methods: A multidisciplinary working group were invited with a remit to develop a 'best standard' for urodynamic practice in the UK. Results: The standard is a concise document, written in plain language, and includes recommendations on urodynamic practice in the UK. It is available on the ICS website. Conclusion: This is the first attempt to standardize urodynamic practice nationally. The document is available on the ICS website. www.ics.ucl.ac.uk. Neurourol Urodyn. 2008;29:280-287. doi:10.1016/j.neuro.2008.05.001

Key words: IUTS, standardization, urodynamic

INTRODUCTION
Urodynamic practice is a group of physiological tests used to assess the function of the lower urinary tract. It is a controversial topic, and the standards for its practice are not uniform. The purpose of this paper is to provide a 'best standard' for urodynamic practice in the UK. This standard is a concise document, written in plain language, and includes recommendations on urodynamic practice in the UK. It is available on the ICS website. www.ics.ucl.ac.uk. Neurourol Urodyn. 2008;29:280-287. doi:10.1016/j.neuro.2008.05.001

METHODS
The aim of developing an international minimum standard for urodynamic practice in the UK was to provide a 'best standard' for urodynamic practice in the UK. The standard is a concise document, written in plain language, and includes recommendations on urodynamic practice in the UK. It is available on the ICS website. www.ics.ucl.ac.uk. Neurourol Urodyn. 2008;29:280-287. doi:10.1016/j.neuro.2008.05.001

CONCLUSION
This is the first attempt to standardize urodynamic practice nationally. The document is available on the ICS website. www.ics.ucl.ac.uk. Neurourol Urodyn. 2008;29:280-287. doi:10.1016/j.neuro.2008.05.001

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Urodynamics '@Bristol'

- ICIQ-bladder diary and ICIQ-LUTS
- Flow and residual
- Urethral pressure profile
- Filling cystometry +/- Video
- Voiding cystometry +/- Video



BLADDER DIARY

Please complete this 3 day bladder diary. Enter the following in each column against the time. You can change the specified times if you need to.

1. Details
Write the amount you had to drink and the type of drink you had.

2. Urine output
Enter the amount of urine you passed in millilitres (ml) in the urine output column. Use a weight for measuring (eg. 10g = 10ml). If you passed urine but couldn't measure it, put a tick in the urine output column.

3. Bladder sensation
Write a description of how your bladder felt when you went to the toilet using the codes listed at the bottom of the page.

4. Woke BSD when you went to bed and **Woke** when you woke up in the morning.

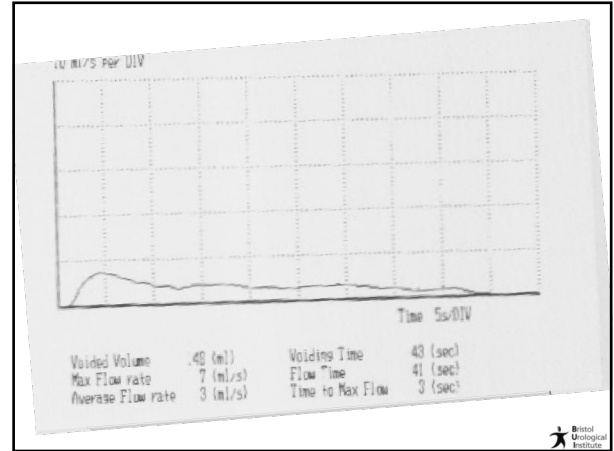
Here is an example of how to complete the diary:

Time	Drinks	Urine Output	Bladder Sensation
Amount	Type		
8am			2
9am	Tea		
10am	300ml Water	Leak	
11am		Leak	3

Bladder sensation codes

0 - No need to go, just in case
1 - Urgent desire to pass urine
2 - Urgent desire to pass urine and no urgency
3 - Urgent desire to pass urine and in the toilet
4 - Urgent desire to pass urine and in the toilet, but you need to pass urine and you don't yet have an urge
5 - Urgent desire to pass urine and in the toilet, but you need to pass urine and you don't yet have an urge, but you have an urge
6 - Urgent desire to pass urine and in the toilet, but you need to pass urine and you don't yet have an urge, but you have an urge, but you have an urge
7 - Urgent desire to pass urine and in the toilet, but you need to pass urine and you don't yet have an urge, but you have an urge, but you have an urge
8 - Urgent desire to pass urine and in the toilet, but you need to pass urine and you don't yet have an urge, but you have an urge, but you have an urge
9 - Urgent desire to pass urine and in the toilet, but you need to pass urine and you don't yet have an urge, but you have an urge, but you have an urge

0 - did not need to go, just in case
1 - urgent desire to pass urine
2 - urgent desire to pass urine and no urgency
3 - urgent desire to pass urine and in the toilet
4 - urgent desire to pass urine and in the toilet, but you need to pass urine
5 - urgent desire to pass urine and in the toilet, but you need to pass urine and you don't yet have an urge
6 - urgent desire to pass urine and in the toilet, but you need to pass urine and you don't yet have an urge, but you have an urge
7 - urgent desire to pass urine and in the toilet, but you need to pass urine and you don't yet have an urge, but you have an urge, but you have an urge
8 - urgent desire to pass urine and in the toilet, but you need to pass urine and you don't yet have an urge, but you have an urge, but you have an urge
9 - urgent desire to pass urine and in the toilet, but you need to pass urine and you don't yet have an urge, but you have an urge, but you have an urge



Urodynamic test

- Choose test
- Formulate urodynamic question
– Based on history and examination

Urodynamic Studies

- Simple
 - uroflowmetry
 - ultrasound assessment of residual urine
- Basic
 - filling cystometry
 - voiding cystometry
- Complex
 - video urodynamics
 - urethral function studies
- Advanced
 - ambulatory urodynamics
 - neurophysiological testing

GUP: Three main principles

- Clear indication for UDS
- Precise measurement and quality control
- Accurate analysis and critical reporting

Clear indication for UDS?

- Formulate urodynamic question
 - ?voiding difficulties
 - ?incontinence
 - ?unsafe bladder

Will test alter management?

Test adaptations

- Adapt test to provide answer
 - Running taps
 - ?antimuscarinics
 - Screening for post-void residual
- Adaptation for complex patients
 - ?drain residual/part residual
 - ? “sting” for gross VUR



Precise measurement and quality control Filling cystometry

- Equipment
 - 3 measurement channels
 - Produce adequate data, ie infused volume (?weight transducer), event markers
 - Signals displayed in real time
 - Online recording of events
 - UDS performed in dialogue with patient



Precise measurement and quality control Filling cystometry

- Indications
 - Clear indications
 - Interactive with patient
 - FVC to judge max cc
 - Careful and continuous observation of signals
 - Have symptoms been reproduced?



Precise measurement and quality control Filling cystometry

- Technique
 - Quality control
 - Resting values
 - “fine definition”/“live test”
 - Cough checks



Quality control

- Regular coughs during test
- Troubleshooting
 - Flush line
 - Reposition
 - ?Faecal loading
- Cough after voiding



Detrusor pressure (pdet)

- pdet is the most relevant parameter to understand bladder function
- Defined as $pdet = pves - pabd$
- We can only subtract pressures recorded to the same zero and reference level
- Initial pdet is between -5 and +5 cmH₂O



Criteria for Quality Control of Pressure Recordings

- Resting values for pves and pabd are in a typical range:
 - supine 5-20 cmH₂O
 - sitting 15-40 cmH₂O
 - standing 30-50 cmH₂O
- Coughs are used at regular intervals
 - every 1 min. or 50 ml filled volume
 - ensure that the pabd and pves signals respond equally
 - immediately before voiding and immediately after voiding



PQS : Influence of technique in findings

- patient position
 - men stand
 - women sit
 - disabled may have to lie
- test environment
- technical aspects
 - size of catheters
 - speed and degree of bladder filling
 - catheter movement



Bladder Outlet Obstruction Index (BOOI) (previously Abrams - Griffiths number)

$$\text{BOOI} = \text{pdetQmax} - 2\text{Qmax}$$

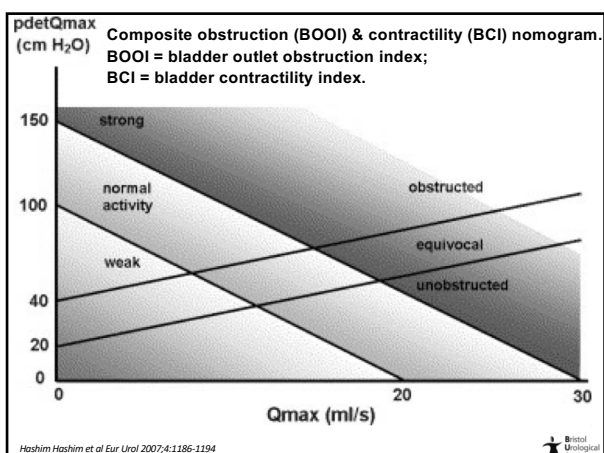
- BOOI >40 Obstructed
- BOOI 20 - 40 Slightly Obstructed (Equivocal)
- BOOI <20 Unobstructed



Bladder Contractility Index (BCI)

$$\text{BCI} = \text{pdetQmax} + 5 \text{Qmax}$$

- BCI >150 Strong Contractility
- BCI 100-150 Normal Contractility
- BCI <100 Weak Contractility
- Note: Schäfer (1995) described DECO (unpublished abstract)



Precise measurement and quality control Pressure/flows

- Cough test post void
- ?Adjust height transducers
- Relationship to volume
 - 150-250 mls
 - >400 mls
- Exclude artefacts
- Was voiding typical?



Accurate analysis

- Assessment of data and plausibility
- Correct artefacts
 - Report “smoothed” figs (electronically/manually) for flows
- ICS standards
 - Zero
 - Reference level



Critical reporting

- Relevant history
 - Urodynamic question
- Description of UDS findings
- Were the symptoms reproduced?
- Was the voiding typical for them?
- State position/fill speed
- Urodynamic diagnosis
- Suggestions for management

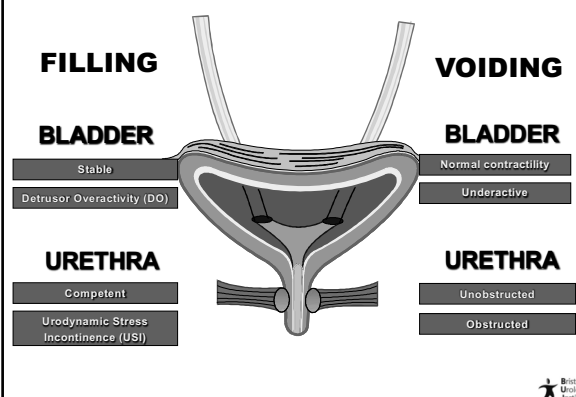


Critical reporting

- Reports done promptly
- Details of FVC
- Copies of trace/equivalent attached



URODYNAMIC DIAGNOSES



Conclusions

- Basic urodynamics – key to advanced
- Quality is important in all cases
- Attention to details are important to ensure an effective efficient service

