



United Kingdom Continence Society: Minimum standards for urodynamic studies, 2018

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Contents

Introduction

1 Aims of the report

2 Principal indications for urodynamic studies (UDS) in children, women, men, and neurological patients

3 Minimum standards for a urodynamic Unit

- 3.1 Director of the urodynamic unit (UDU)
- 3.2 UDU referral patterns
- 3.3 Integration in the hospital environment
- 3.4 UDU clinical environment
- 3.5 UDU staffing
- 3.6 Training and Continued Professional Development (CPD) for urodynamic (UD) staff
- 3.7 Essential technical skills
- 3.8 Essential clinical skills
- 3.9 Urodynamic equipment
- 3.10 Effective Multi Disciplinary Team (MDT) process
- 3.11 Regular audit

4 The urodynamic patient pathway

- 4.1 Patient referral
- 4.2 Patient preparation
- 4.3 Day of the urodynamic study
- 4.4 Ongoing care

5 Urodynamic techniques

- 5.1 Urine flow studies and the measurement of post-void residual urine
- 5.2 Standard UDS: filling cystometry and pressure-flow studies of voiding
- 5.3 Urethral function studies
- 5.4 Video UDS
- 5.5 Ambulatory UDS

6 Guidance for commissioners and providers of urodynamic services

7 General recommendations

8 Appendices

- 8.1 Urodynamics antibiotics policy
- 8.2 Urodynamics patient leaflets for children, women, men, neurological patients, and patients after urodynamics
- 8.3 Bladder diary and symptom questionnaires (ICIQ-BD – International Consultation on Incontinence Questionnaire Bladder Diary; ICIQ-FLUTS – International Consultation on Incontinence Questionnaire Female Lower Urinary Tract Symptom; ICIQ-MLUTS – International Consultation on Incontinence Questionnaire Male Lower Urinary Tract Symptoms)
- 8.4 The urodynamics report
- 8.5 Skills for health competencies
- 8.6 Training and CPD details for urodynamics staff
- 8.7 Working Group Members

Organizations that have reviewed and endorsed the document:

International Continence Society
Association for Continence Advice
British Association of Paediatric Urologists
British Association of Urological Nurses
British Association of Urological Surgeons (BAUS)
BAUS Section of Female, Neurological and Urodynamic Urology
British Society of Urogynaecologists
Institute of Physics and Engineering in Medicine
Royal College of Nursing, Continence Forum
Royal College of Obstetricians and Gynaecologists
Urogynaecology Nurse Specialist Committee

Introduction

This publication has been commissioned by the UK Continence Society to replace the Joint statement on minimum standards for urodynamic practice in the UK: Report of the urodynamic training and accreditation steering group, published in April 2009 by the UKCS. The 2009 document has been completely rewritten with the prime aim of providing information, advice, and guidance to help with best practice in urodynamic study services. It is intended for use, by the doctors, nurses, and scientists that provide urodynamic services, and as information to those who commission urodynamic services for their patients across the UK. The document may also help urodynamic services in other countries. However, readers are advised that practices may vary outside the UK.

There is considerable interest in both English versions of the document for use outside the UK, and for foreign version language versions. Therefore, those parts of the document that describe specific information related only to England, and/or the UK, *are shown in italics*.

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1 Aims of the report

1.1. General Aims

- 1.1.1 To guide urologists, gynaecologists, clinical scientists, nurses, and technicians in best practice of urodynamic studies (UDS)
- 1.1.2 To improve the care of patients with lower urinary tract dysfunction (LUTD) by helping to ensure that the UDS used in their assessment are of the highest possible quality
- 1.1.3 To provide clear minimum standards for UDS to those health care professionals with responsibilities for carrying out UDS
- 1.1.4 By providing a framework for best practice in the delivery of UDS, to ensure patient safety and maximize the benefits derived from these tests
- 1.1.5 To enable Commissioners to purchase a urodynamic service fit for purpose

1.2 Background

- 1.2.1 Urodynamics have developed in the UK since the early 1970s, thanks to the scientific efforts of a range of health care professionals (HCPs). These have included urologists, gynaecologists, clinical scientists, nurses, and technicians. Today in 2018, UDS are still performed by a range of HCPs, some of whom have received no formal UDS training, largely because they started urodynamic practice before there was any formal urodynamic training. However, today it is expected that all those starting to perform UDS should have received formal training and assessment
- 1.2.2 There are uncomfortable deficiencies in the regulation of UD services that undoubtedly

harm patients. Indeed, there are currently no statutory requirements for the performance of urodynamic testing and little or no quality assurance, when compared to the essential regulations for treatment modalities from medicinal products to surgical procedures. The UK Continence Society (UKCS) believes that it is unacceptable that UDS, an invasive test and an important part of the patient pathway for many men, women and children, will, if inexpertly performed, lead to some patients being denied necessary treatment, and others being subjected to treatments they cannot, or are unlikely to, benefit from. The UKCS is the major multidisciplinary group of Health Care Professionals (HCsPs), in the UK, dedicated to helping those suffering from LUTD such as urinary incontinence, and is determined to improve the care of patients. *However, even the NHS Improvements document does not outline a method by which UDS will be guaranteed to become part of a fully audited, quality controlled, clinical pathway (<https://improvement.nhs.uk/> accessed 19.10.2018).*

1.2.3 *The climate is changing, and the situation should be improved by the Improving Quality in Physiological Services (IQIPS) accreditation scheme, which will lead to increased audit activity. The GIRFT (Getting It Right First Time) initiative from the UK Department of Health, coupled with Central Commissioning offers some hope of better integration in regional networks, ensuring that patients are assessed and managed in those with appropriate expertise in those patients with complex problems.*

1.3 More detailed aims

1.3.1 The principal aims are to ensure that the patient who is referred for UDS:

- 1.3.1.1** Is appropriately referred, with adequate clinical information, and a statement as to how urodynamic testing would benefit the patient: “these are the question(s) I want the UDS to answer”
- 1.3.1.2** Receives clear and unambiguous information about the investigation, to allow fully informed consent
- 1.3.1.3** Has a test that is safe and of high technical quality
- 1.3.1.4** Has a test that is interpreted to a high clinical standard
- 1.3.1.5** Benefits from the information from the test which can be used by the multidis-

ciplinary team to optimize the patient's management

1.3.2 Secondary aims are to:

- 1.3.2.1** Provide guidance on the training and CPD requirements for all UD staff, in order to achieve technical and clinical excellence in the performance and interpretation of urodynamic testing
- 1.3.2.2** Provide recommended minimum standards for the performance of UDS
- 1.3.2.3** Provide audit standards for urodynamic units
- 1.3.2.4** Provide example documentation for all parts of the patient pathway
- 1.3.2.5** Provide the information on UDS that will guide providers by detailing the minimum standards for the UDS that they seek to provide, and commissioners to know what standards to expect when purchasing a urodynamic service.

1.3.3 Methodology

- 1.3.3.1** The document was developed through a consensus approach predominantly via membership of the UKCS Working Group. Any conflicts of interests were managed and agreement reached via discussion.

2 Principal indications for UDS in children, women, men and neurological patients

2.1 Background

- 2.1.1** The section does not seek to provide an exhaustive list that includes every possible indication, but to list those indications that include perhaps 90% of those having UDS. If the patient does not fit into these categories, then there should be a discussion between the referring clinician and the consultant urologist, consultant urogynaecologist, consultant nurse, or clinical scientist (*Band 8*) (*with skills and responsibilities as defined in 2018*) who is the Director of the Urodynamic Unit (UDU), and responsible for urodynamic services, before requesting UDS.
- 2.1.2 In general, urodynamics are only used if:**
 - 2.1.2.1** Lifestyle changes and drug therapy have not provided adequate improvement in the individual's quality of life, and further therapy such as surgery is being contemplated after discussion with the patient, and/or carer
 - 2.1.2.2** There are factors that might lead to deterioration in lower urinary tract

(LUT) function with possible consequences for the upper urinary tract, particularly in children and some patients with neurogenic LUT dysfunction

2.1.3 Therefore it follows that UDS are not indicated when:

- 2.1.3.1 The patient has not been treated using lifestyle changes and drug therapy, when appropriate
- 2.1.3.2 The patient does not wish to consider surgical management after failed conservative treatment
- 2.1.3.3 UDS is not likely to provide information that will change the management of that patient

2.2. The most frequent indications for UDS are:

2.2.1 Children

- 2.2.1.1 Congenital neurological conditions, including spina bifida, and sacral agenesis
- 2.2.1.2 Congenital structural conditions, including posterior urethral valves, anorectal malformations, and bladder exstrophy
- 2.2.1.3 Dysfunctional voiding
- 2.2.1.4 Failed overactive bladder (OAB) treatment prior to Botulinum toxin type A (BTXA) or sacral nerve stimulation

2.2.2 Women

- 2.2.2.1 Prior to surgery for bothersome stress incontinence
- 2.2.2.2 Women with pelvic organ prolapse (POP) and urinary symptoms considering surgery and women with new onset lower urinary tract symptoms (LUTS) post pelvic floor surgery
- 2.2.2.3 Idiopathic voiding dysfunction/urinary retention
- 2.2.2.4 Failed OAB treatment prior to BTXA or sacral nerve stimulation

2.2.3 Men

- 2.2.3.1 Prior to possible surgery for suspected prostatic obstruction
- 2.2.3.2 Post-prostatectomy stress incontinence
- 2.2.3.3 In the younger man (eg, <45 years) with voiding symptoms/history of retention
- 2.2.3.4 Failed OAB treatment prior to BTXA or sacral nerve stimulation

2.2.4 Neurological patients

- 2.2.4.1 Congenital or acquired neurological conditions with a risk of upper tract deterioration (eg, spinal cord injured patient and spina bifida)

- 2.2.4.2 Significant LUTS, including incontinence, that have not responded to conservative management

3 Minimum standards for a urodynamic unit

The key features of a urodynamic unit (UDU) include:

3.1 Director of the UDU: A director should be appointed who is usually a consultant urologist specializing in functional urology or a consultant urogynaecologist. However, the Director may be a consultant nurse or clinical scientist (*Band 8*). He or she will be responsible for:

- 3.1.1 Determining the Scope of the UDU defined by whether the UDU has a secondary, tertiary, or specialist referral pattern
- 3.1.2 Integrating the UDU into the Hospital Environment
- 3.1.3 The UDU environment
- 3.1.4 Appointment of UDU staff
- 3.1.5 Ensuring that the necessary skill sets exist to ensure high quality UDS
- 3.1.6 Ensuring that urodynamic equipment is fit for purpose and maintained
- 3.1.7 Ensuring that Education, Training and CPD needs are met
- 3.1.8 Urodynamic MDT process
- 3.1.9 Regular UDU audits

3.2 UDU referral patterns: the patients to be investigated will depend on the type of Unit. There should not be a “drift expansion” of the type of patients seen, or the service, without transparent discussion *with the clinical and urodynamic networks and the Commissioners of clinical services*

- 3.2.1 Secondary care units offer a local service with basic UDS for men and/or women, without complex problems
- 3.2.2 Tertiary care unit offer a service that also includes video UDS, urethral function studies and ambulatory UDS for men and/or women with complex problems, from a wider geographical area
- 3.2.3 Specialist regional units offer the full range of UD tests to a well-defined population, such as children, or spinal cord injury patients.

3.3. Integration in the Hospital Environment:

- 3.3.1 Ensure that the UDU has support from the organization's Radiology, Information Technology (IT), and Medical Physics departments
- 3.3.2 Ensure that the UDU develops any business case development to secure funding, and purchases equipment and consumables in line with local policies

- 3.3.3** Ensure the security of patient sensitive data and system security in the UDU according to local policies

3.4 UDU clinical environment

- 3.4.1** The clinical space required will be determined by the type of UDU, the UD tests to be offered and, to some extent, by the numbers of patients to be seen. However the following need to be ensured:

- 3.4.1.1** Space for equipment/consumable storage, and consultation, as well as accessibility for wheelchairs/hoists etc.
 - 3.4.1.2** Patient changing area
 - 3.4.1.3** Toileting facilities
 - 3.4.1.4** Waiting area with access to water for patients
 - 3.4.1.5** Appropriate disposal facility for body fluids
 - 3.4.1.6** Appropriate UD couch or UD chair
 - 3.4.1.7** Maintenance of privacy and dignity
 - 3.4.1.8** Emergency planning
- 3.4.2** Risk assessments should be carried out for infection control, radiation, lone worker and manual handling
- 3.4.3** Administrative requirements for service provision:
- 3.4.3.1** Patient information leaflets, ensuring the supply of up to date material
 - 3.4.3.2** Booking of UD appointments of appropriate length
 - 3.4.3.3** Ensuring that the number of sessions per week/month meet the service demands/workload
 - 3.4.3.4** Adequate staffing to include contingency planning/continuity of service
 - 3.4.3.5** Availability of chaperones
 - 3.4.3.6** The local policy for safeguarding children should be followed
 - 3.4.3.7** Administration, including processing of clinical notes and dictation on patients, and establishment and maintenance of a UD database
 - 3.4.3.8** Monitoring adherence to quality control criteria such as diagnostic targets, for example, waiting times, and management of “long waiters” and those who did not attend (DNAs)
 - 3.4.3.9** *Patients placed on an active waiting list for urodynamics should not have to wait longer than 6 weeks from referral in the UK (2018). UDS may be planned in children and neurological patients in which case*

referral to treatment (RTT) targets do not apply

- 3.4.3.10** Supporting the MDT pathway

- 3.4.3.11** Clinic coding

- 3.4.3.12** Management of materials/consumables

- 3.4.3.13** Facilitation of audit/service evaluation

3.5 UDU staffing

UDS in the UK are delivered in a variety of models, but all have the same common principles:

- 3.5.1** Patient safety and well-being necessitates there being two HCPs at each UDS. In general, this allows one to concentrate on the technical aspects of the test whilst the second person talks with the patient and interprets symptoms with urodynamic findings, during the test. In addition, if there is an unexpected event, such as a syncopal attack (fainting) then the patient can be properly cared for
- 3.5.2** All staff need to be aware of local policies including infection control, manual handling, intimate examination, and chaperoning
- 3.5.3** The technical aspects, can be provided by a nurse, technologist or other HCP *with a minimum grade of Band 5*, or a suitably trained doctor
- 3.5.4** The clinical aspects of UDS can also be provided by a nurse, clinical scientist or other HCP *with a minimum grade of Band 6 (with skills and responsibilities as defined in 2018)*, or a suitably trained doctor
- 3.5.5** During video UDS it may also be necessary to have radiology staff present
- 3.5.6** *The UD unit and staff should be certified by UKCS.*

3.6 Training and CPD for UD staff

- 3.6.1** The UKCS takes the view that those who have been formally trained best serve patients. Training should be based on indicative minimum numbers of UDS performed, combined with structured competence assessments which document the trainee's progress until he/she has acquired the competence needed to work independently. Assessment of competence varies with specialty *but will include a log of cases, objective structured assessments of training (OSATs), direct observations of procedure (DOPs), mini clinical examination (mini-CEX), and case-based discussions (CBDs), including analyses of traces. In addition, trainees will be expected to perform a relevant audit. Ensuring that proper training occurs is the*

responsibility of the Director of the UDU who will be UKCS certified as a preceptor/mentor

3.6.2 *The UKCS wish to see a process by which the Directors of UDUs are assessed and recognized by NHS England, perhaps in collaboration with UKCS*

3.6.3 Practice levels for consultant staff, or equivalent, working in UDUs is seen as an essential part of CPD and regular sessions in the UDU are essential and a minimum of 12 sessions per year, once fully trained, is essential to maintaining standards

3.6.4 *UKCS Certification, and re-certification of all Units and staff, should become mandatory*

3.6.5 Details of training requirements are given in Appendix 8.6 for each specialty: clinical scientists, nurses, paediatric urologists, adult urologists and urogynaecologists

3.6.6 UD staff will comply with their relevant regulators' standards of practice where appropriate.

3.6.7 Urodynamic papers and books: There are a number of important papers that should be read by all those undertaking UDS, and responsible for either the technical, clinical, or both aspects of UDS. In addition, HCPs intending performing UDS should read one of the published books on UDS. These papers and books provide the principal information sources for all UDS.

3.6.7.1 ICS Terminology 2002: The standardization of terminology of lower urinary tract function: report from the Standardization Sub-committee of the International Continence Society. Abrams P, Cardozo L, Fall M, Griffiths D, Rosier P, Ulmsten U, van Kerrebroeck P, Victor A, Wein A; Standardization Sub-committee of the International Continence Society. *Neurourol Urodyn* 2002; 21:167-78

3.6.7.2 Urodynamic features and artefacts 2012: (Urodynamic features and artefacts. Hogan S, Gammie A, Abrams P.) *Neurourol Urodyn* 2012; 31:1104-17

3.6.7.3 ICS Equipment Performance 2014: (International Continence Society guidelines on urodynamic equipment performance. Gammie A, Clarkson B, Constantinou C, Damaser M, Drinnan M, Geleijnse G, Griffiths D, Rosier P, Schaefer W, von Mastrigt R.) *Neurourol Urodyn* 2014; 33:370-379

3.6.7.4 ICS Good Urodynamic Practices and Terms 2016: (Rosier P, Schaefer W, Lose G, Goldman H, 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; 36:1243–1260.

3.6.7.5 Urodynamics Made Easy. Chapple C, Hillary C, Patel A, MacDiarmid S. Elsevier, Amsterdam 2018.

3.6.7.6 Urodynamics. Abrams P. Springer-Verlag, London 2006.

3.6.7.7 International Children's Continence Society Standardization Report on Urodynamic Studies of the Lower Urinary Tract in Children. Bauer S, Nijman R, Drzewiecki B, Sillen U, Hoebeke P. *Neurourol Urodyn* 2015; 34:640-647

3.6.7.8 The standardization of terminology of Lower Urinary Tract Function in Children and Adolescents: Update report from the standardization committee of the International Children's Continence Society. Austin P, Bauer S, Bower B, Chase J, Franco I, Hoebeke P, Rittig S, van de Walle J, von Gontard A, Wright A, Yang S, Nevéus T. *Neurourol Urodyn* 2016; 35:471-481

3.6.7.9 Clinical Urodynamics in Childhood and Adolescence (Urodynamics, Neurourology and Pelvic Floor Dysfunctions) edited by Mosiello G, Del Popolo G, Wen J, De Gennaro M. Springer-Verlag, London 2018.

3.6.8 Urodynamic Courses: *The first urodynamic course, the Basic Urodynamic Course, was started in Bristol in 1978, which was held initially every 2 years and is now annual. To fulfill urodynamic accreditation the applicant should have attended one of the following courses:*

3.6.8.1 *Bristol Urological Institute 3-day certificate course, with venues in Birmingham, Bristol, London, Manchester, and Newcastle*

3.6.8.2 *An equivalent ICS accredited course (depending on the training program, evidence of the course content may need to be submitted)*

3.6.8.3 BSUG/RCOG female UDS course

3.6.8.4 *Evelina Children's Hospital paediatric urodynamics course* (www.emede-vents.com/c/medical-conferences-2018/paediatric-urodynamics-course)

3.7 Essential technical skills

Essential technical skills refer to the skills needed to run the technical aspects of a UDS. This skill set is used to deliver technical excellence in UDS by a technologist, nurse, clinical scientist, or doctor who has been trained *according to UKCS 2018 Standards*. The skill set includes:

- 3.7.1 A relationship with the Medical Physics or Clinical Engineering department/manufacturers with both an annual planned preventative maintenance arrangement, and to arrange ad hoc visits if necessary, in the event of equipment problems
- 3.7.2 Maintain the urodynamic equipment (pressure transducers, flow meters, weight transducers, and infusion devices) on a day to day basis
- 3.7.3 Be able to carry out daily/weekly calibration checks of the UD equipment
- 3.7.4 Have a sound knowledge of the physiological range for all the main UD measurements: urine flow, and abdominal, urethral, and vesical pressures, as this information is the basis from which high quality traces result
- 3.7.5 Produce a high quality trace from the technical point of view, with proper quality control according to ICS 2016 (see below)
- 3.7.6 Recognize and correct artefacts that occur during UDS: some of which will be physiological, and others mechanical/electrical coming from the equipment, described in a comprehensive paper by Hogan et al (2012) (see 3.6.7.2)
- 3.7.7 Be able to annotate traces correctly, so that others who were not present at the UDS can properly understand the recordings

3.8 Essential Clinical Skills

A range of skills and ability is necessary to deliver the clinical aspects of a UDS and to perform an excellent clinical study to each patient. They may be possessed by a nurse, clinical scientist, or doctor who has been trained *according to UKCS 2018 standards*. They include:

- 3.8.1 Sound knowledge of the anatomy and physiology of the lower urinary tract, and the principle conditions affecting the bladder and urethra (lower urinary tract dysfunction, LUTD)

3.8.2 Clinically assess the patient on the day of the UDS, and in particular, confirm the urodynamic questions to be answered

3.8.3 Insert the urodynamic catheters using aseptic non-touch technique (bladder) and a clean technique (bowel or vagina)

3.8.4 When inserting the rectal catheter the HCP must ensure, by digital examination, that the patient does not have a loaded rectum as this is likely to influence the UD findings

3.8.5 Have a continuous dialogue with the patient, in order to assess whether the patient's symptoms are reproduced during the UDS

3.8.6 Assure quality control during the UDS

3.8.7 Altering technique, if need be, during the investigation

3.8.8 Able to deal with patient problems such as the patient fainting: this is an example of a situation that demands that two HCPs are present during all UDS

3.8.9 To interpret the UD tracing and reach one or more urodynamic diagnoses, in the light of the urodynamic questions asked

3.8.10 State whether or not the patient's symptoms have been reproduced during UDS

3.8.11 Have an outline discussion with the patient at the end of UDS, covering both the diagnosis and a description of possible treatment options (setting a management plan in the light of the question(s) asked)

3.8.12 If the HCP at UDS is the clinician responsible for delivering the treatment this, discussion will be detailed. If not, the detailed discussion will occur at a later date with the responsible Consultant *who would be expected to be trained in urodynamics as well as be a member of BSUG, or the BAUS section, or UKCS certified*, and a member of the local urodynamic MDT.

3.8.13 NOTE: the UKCS considers that the UD diagnosis should be made at the time of the UDS and does not think it appropriate for the diagnosis to be made at a remote location, by a clinician without access to the patient, perhaps delayed by a considerable period of time

3.8.14 Be part of, and attend the MDT (NICE (2013) Urinary incontinence: the management of urinary incontinence in women Clinical Guidance 171. The National Institute for Health and Care Excellence)

3.9 Urodynamic equipment

3.9.1 Recommended equipment: Urodynamics is very dependent upon the appropriate use of

good quality equipment. Table 1 lists the equipment recommended for different levels of urodynamic service. A guide to the specifications for this equipment can be found in the ICS guidelines for urodynamic equipment performance.

3.9.2 Maintenance routines and regular checks: maintenance of urodynamic equipment and checks of its proper calibration are essential, not just for patient safety but also for reliable urodynamic measurement. Responsibility for this is equally that of the UD HCPs, as well as the technical support. These checks should be planned and recorded and include:

3.9.2.1 regular check of calibration of the flowmeter (checking the accuracy of a known volume)

3.9.2.2 regular check of calibration of pressure transducers (checking eg, 0-50 cmH₂O is registered correctly)

3.9.2.3 computer software and hardware updates and maintenance

3.9.2.4 electrical safety tests, normally every year or two

3.9.2.5 additional technical support from Medical Physics or Clinical Engineering department, or from manufacturer, under contract if necessary

3.9.3 Procurement: a specification should clearly state what function is required, including the environment of use, numbers of pressure channels, accessories and software features required, the physical layout needed, electrical supply requirements, documentation and:

3.9.3.1 User training needed and the details of maintenance and service contracts necessary should be specified

3.9.3.2 Adequate data security, data backup and compatibility with IT networks are essential

3.9.3.3 Thought should also be made towards provision of replacement equipment in case of machine failure

3.9.3.4 Detailed technical and operational considerations are outlined in the "Buyers' guide for urodynamic equipment," published by the Department of Health (www.nhscep.useconnect.co.uk)

3.10 Effective Multi Disciplinary Team (MDT) process

3.10.1 Patients who have had UDS should be discussed in the MDT prior to invasive treatment. At present NICE has only considered MDTs in women with incontinence. The MDT should include nurses and clinical scientists performing UDS (NICE Urinary incontinence in women: management Clinical guideline [CG171] Published date: September 2013 Last updated: November 2015, Section 1.8.4). A paediatric MDT is not mandated but is generally regarded as best practice.

3.10.2 NICE stipulates that the MDT for urinary incontinence should include the following staff:

3.10.2.1 urogynaecologist

3.10.2.2 urologist with a sub-specialist interest in female urology

3.10.2.3 specialist nurse or clinical scientist

3.10.2.4 specialist physiotherapist

3.10.2.5 colorectal surgeon with a sub-specialist interest in functional bowel problems, for women with coexisting bowel problems

3.10.2.6 member of the care of the elderly team and/or occupational therapist,

TABLE 1 Recommended equipment for different urodynamic investigations

Type of service	Equipment required
Urine flow recording	Uroflowmeter Commode (female)/stand (male) Ultrasound machine for measurement of post-void residual volume
Standard UDS: Filling Cystometry and Pressure-Flow Study of Voiding	Uroflowmeter Commode (female)/stand (male) Pressure transducer mounting stand Urodynamic equipment with two pressure transducers and infusion pump, and, if required, Electromyography (EMG) recording channel
Video UDS (Additional requirements to above)	Imaging apparatus (image intensifier, fixed X-ray unit or ultrasound machine) Urodynamic equipment with video capture included.
Urethral Function Studies	Motorized withdrawal unit and pump for urethral pressure profilometry Three pressure channels required if urethral pressure is also measured while filling/voiding.
Ambulatory UDS	Ambulatory urodynamic equipment (two pressure channels, data logger, linked flowmeter, computer for data download and analysis)

for women with functional impairment

3.11 Regular audit

3.11.1 *Departments can be accredited under the Department of Health IQIPS scheme, which assesses quality in every aspect of service delivery. IQIPS accreditation is used as a mark of assurance, for instance, by the Care Quality Commission. IQIPS includes references to audit in the areas of: patient referrals, reporting to referrers, adherence to local protocol, and good practice, access to patient data, and safety.*

3.11.2 The UKCS Working Group therefore recommends regular audits on:

3.11.2.1 The appropriateness of UD referrals (*IQIPS patient referrals*)

3.11.2.2 Post UDS urinary tract infection (UTIs) (*IQIPS safety*)

3.11.2.3 Quality Control of UD traces (*IQIPS good practice*): see Table 2, Section 5

3.11.2.4 Outcome of UDS in terms of whether the patient's symptoms were reproduced, and the defined

urodynamic questions answered (*IQIPS good practice*)

3.11.2.5 Effect of UDS on clinical outcome (*IQIPS reporting to referrers and good practice*)

3.11.2.6 Patient experience/satisfaction (*IQIPS reporting to referrers and good practice*)

4 The urodynamic patient pathway

There are a number of important aspects that help to ensure that the patient has a satisfactory experience:

4.1 Patient referral: each referral must include:

4.1.1 The “Urodynamic Questions“ that the referring clinician wants answered, for example, “this man has a reduced urine flow rate and has persistent bothersome LUTS and wishes to be considered for trans-urethral resection of prostate (TURP), can you confirm the presence of obstruction?” or “This woman has bothersome stress incontinence despite weight loss and a course of pelvic floor exercises and wishes to consider a surgical solution, can you confirm urodynamic stress incontinence, and no negative factors with respect to likely outcome?”

TABLE 2 Checklist for assessing quality in UD recordings

Display	Are intravesical pressure (p_{ves}), abdominal pressure (p_{abd}) and detrusor pressure (p_{det}) and flow traces all present, scaled and labeled?
	Are infused and voided volume figures or graph displayed?
	Do the printing scales permit clear display of all trace features?
Quality Control	Are p_{ves} and p_{abd} zeroed to atmosphere (both >0 cmH ₂ O after zeroing & connection to patient)?
	Are resting p_{ves} and p_{abd} in the range 5-20 cmH ₂ O (supine), 15-40 cmH ₂ O (seated), and 30-50 cmH ₂ O (standing)?
	Is the resting p_{det} between -5 and $+5$ cmH ₂ O?
	Are live signals visible throughout the test (or after any correction) on p_{abd} and p_{ves} , but not visible on p_{det} ?
	Are cough tests done: before filling, regularly during filling, before and after voiding?
	Are the smaller cough test peaks $\geq 70\%$ of the larger peaks in both p_{ves} and p_{abd} traces, or corrected if not?
	Is poor compliance seen, and if so, was the pump stopped until pressure stabilised?
	Is there abnormal steady pressure descent and was it corrected?
Flows (both pressure-flows and free flows)	Is the point of maximum flow (Q_{max}) marked or reported on all traces where flow occurs?
	Is the Q_{max} marker moved away from artefacts?
	Are voided volume, post-void residual, flow time and voiding time recorded, being corrected for any involuntary leakage during filling?
Markers	Are any involuntary detrusor contractions (DO), leaks, position changes, VLPP or stress tests marked as such?
	Is “permission to void” marked?
	Are all values at markers clear, either from the trace or the table of events?
	Are all values used in diagnosis free from artefact?

4.1.2 A summary of other important factors, including:

4.1.2.1 Current medication for LUTD with drug dosage and length of treatment. Opinions vary as to whether patients should stop LUTD drugs before UDS, and there is no clear evidence to guide this decision. This emphasizes the importance of knowing which drugs a patient is taking at the time of UDS

4.1.2.2 Relevant physical findings: in women, the results of a vaginal examination to exclude pelvic abnormalities, including details of any pelvic organ prolapse and oestrogenization of the vagina should be noted. However, the urodynamic HCP may be a clinical scientist who would not be expected to do a pelvic examination where appropriate: this issue needs to be resolved locally.

4.1.2.3 Results of screening urine flow studies (UFS), with post void residual (PVR) measurement, which should be done prior to UDS in all men, and in women with voiding symptoms. Furthermore, the data from UFS are important for comparison with the flow measurements during the UD pressure-flow study (PFS)

4.1.2.4 A statement as to whether the patient is one at high risk of getting a urinary tract infection (UTI) from the UDS. If so, then the local urodynamic antibiotic policy should be followed: see Appendix 8.1 for examples

4.1.2.5 Indicate if an interpreter is required as it is essential that the interpreter is present at the UDS: experience shows that a telephone service is inadequate and compromises the UDS

4.1.3 Triaging referrals: referrals which fall outside the scope of the UDU should be referred elsewhere in the network, as appropriate, so that all patients are investigated by those with the necessary training and expertise. In broad terms, patients with complex problems need to be investigated in tertiary care centres with specialist consultant input. *This process is likely to become mandatory with Central Commissioning for complex cases*

4.2 Patient preparation

4.2.1 Written patient Information: it has been shown that good patient information about what he/she

can expect during UDS maximizes patient satisfaction with the process. Patient information leaflets that include all the important elements can be found in Appendix 8.2

4.2.2 Bladder diary: the patient should be asked to complete a three-day diary and bring it to the UD appointment, unless a diary was recently completed. This is vital when interpreting the patient's LUTS and forms the basis for management of many patients' symptoms. It is also important in determining how full to fill the bladder during UDS. The ICIQ-Bladder Diary is the only fully validated diary that exists and is shown in Appendix 8.3

4.2.3 Symptom questionnaires: it is useful to ask the patient to complete a validated symptom questionnaire and bring this to the UD appointment. The ICIQ-FLUTS for women and the ICIQ-MLUTS for men are recommended, and are shown in Appendix 8.3. The Electronic Personal Assessment Questionnaire (EPAQ) is a commercially available package but only validated for use in women

4.2.4 Antibiotic prophylaxis should be arranged, if needed, according to the local urodynamic antibiotic policy (Appendix 8.1). Furthermore, the Working Group support the findings and recommendations of a Cochrane Systematic Review, which does not recommend the routine use of prophylactic antibiotics as there is no evidence that routine antibiotic prophylaxis reduces the incidence of UTIs or fever following UDS (Prophylactic antibiotics to reduce the risk of urinary tract infections after UDS. Foon R, Toozs-Hobson P, Latthe P. Cochrane Database of Systematic Reviews 2012, Issue 10. Art. No.: CD008224). They also recommended regular audit in every UDU to determine their incidence of UTI.

4.3 Day of the urodynamic study

4.3.1 Safeguarding the Patient

4.3.1.1 Staff introduce themselves wearing a clear ID, and welcome the patient (or child and their parent or responsible adult), and make sure she/he is not desperate to pass urine

4.3.1.2 Review the referral letter with the patient/parent: confirm that the patient has received the appropriate conservative treatment/drug therapy according to guidelines and remains bothered by symptoms and wishes to have further treatment. Should there be no valid

indication for UDS this should be discussed with the patient/parent and if necessary the UDS cancelled and/or the referring clinician contacted by phone

- 4.3.1.3 Receive and review the bladder diary, and patient completed questionnaires. Use the bladder diary and questionnaires to determine the patient's most bothersome symptoms
- 4.3.1.4 After review, the urodynamic clinician will decide which urodynamic tests are required to answer the urodynamic questions
- 4.3.1.5 Check that the patient knows what to expect during UDS
- 4.3.1.6 Ensure that any necessary antibiotic prophylaxis has been taken appropriately
- 4.3.1.7 Record verbal consent or take written consent (according to local policy) and document any risk factors
- 4.3.1.8 Provide an appropriate chaperone, and for a child, ensure that the local policy for safeguarding children is followed
- 4.3.1.9 Ensure that the clinical environment maintains the maximum possible privacy and dignity, with screens for changing, and availability of single sex changing areas/toilets in line with local policy.

4.3.2 Initial testing and physical examination

- 4.3.2.1 Ask the patient to empty their bladder and do a flow study, recording maximum urine flow rate (Q_{max}), volume voided (VV) and post-void residual urine volume (PVR)
- 4.3.2.2 Perform dipstick test on voided urine to exclude infection, and if positive follow the local Urodynamic Antibiotics Policy (Appendix 8.1)
- 4.3.2.3 Examine the patient: **Abdominal**, to exclude a palpable bladder after voiding and obvious masses; **Perineal** inspection for sensation, skin condition, and visible pelvic floor contraction; **Rectal** examination to assess anal tone, pelvic floor contraction and to exclude faecal loading; **In women**, if not previously examined and if trained to do so, perform vaginal examination for pelvic abnormalities and record details of any pelvic organ prolapse (POP) and oes-

trogenization of the vagina; Simple **neurological** testing of lower limbs to assess sensation, muscle strength, and reflexes, may be indicated

4.3.3 Urodynamic Studies

- 4.3.3.1 UDS vary in their complexity and their frequency of use. "Standard UDS" include filling cystometry and a pressure-flow study of voiding, and are applicable for the large majority of men and women coming to a UDU. The largest patient group in whom UDS is indicated are women with urinary symptoms. Men with urinary symptoms comprise the second largest group of patients referred for UDS, with significantly smaller numbers of patients with neurological disease and children undergoing this test. Video and Ambulatory UDS are indicated in much smaller sub-groups of patients
- 4.3.3.2 As a general rule, UDS are indicated in patients when lifestyle interventions and drug therapy have failed to alleviate bothersome symptoms, and invasive surgical treatment is being considered. In an important minority of patients, UDS are indicated if there is the possibility of the bladder being "unsafe" and there is a risk of deterioration in kidney function
- 4.3.3.3 UDS should be performed according to ICS Good Urodynamic Practice 2016 (see section 3.6.6.4 above), with constant communication with the patient to determine whether his/her everyday LUTS are reproduced and to correlate sensation with urodynamic findings and using the event marker on the urodynamic machine
- 4.3.3.4 An established methodology should be used. Currently this involves the use of water-filled catheters during pressure recording. The Working Group members have looked at the evidence for the clinical effectiveness of air-filled catheters, and do not recommend their use until there is an adequate evidence base of validation of the recordings obtained by this methodology
- 4.3.3.5 Perform those tests needed according to the individual patient and the clinical questions that have been asked. Tests

may include urine flow study and measurement of PVR; filling cystometry; pressure-flow studies of voiding; urethral function studies; video UDS; and ambulatory UDS

4.3.4 Urodynamic report: the trace should be analyzed and the main urodynamic pressure and flow findings documented. Appendix 8.4 contains a specimen UD report. Any report should include the following:

- 4.3.4.1** Name of referring clinician
- 4.3.4.2** Patient history, including last menstrual period, pregnancy status, and allergies
- 4.3.4.3** UDS urinalysis result
- 4.3.4.4** Name and title of person performing the test
- 4.3.4.5** Findings on physical examination
- 4.3.4.6** Free flow data and any initial PVR
- 4.3.4.7** Catheters used including size, and the filling rate and position of patient during filling and voiding
- 4.3.4.8** Details of pressures recorded during both filling and voiding
- 4.3.4.9** LUT sensation, cystometric capacity, detrusor, and urethral function during filling
- 4.3.4.10** Type of any leakage seen during filling
- 4.3.4.11** Detrusor and urethral function during voiding
- 4.3.4.12** Urine flow as part of the pressure-flow study of voiding, voided volume, and PVR
- 4.3.4.13** The urodynamic diagnoses during filling and voiding, whether normal or abnormal
- 4.3.4.14** In every patient, it should be documented whether their everyday symptoms were reproduced, either fully or partly, or were not reproduced, and if the UD questions were answered

4.4 Ongoing care after UDS includes:

- 4.4.1** Advice to drink 500 mL – 1 litre of fluid as soon as he/she gets home, and to maintain a high fluid intake for 24 h, with aim of minimizing the chance of a UTI. It is useful to give written advice for the patient to take home: an example is given in Appendix 8.2
- 4.4.2** A statement as to the next step in their management
- 4.4.3** Patients appreciate a copy of both the urodynamic report and the letter to the referring consultant and their GP

4.4.4 Seek service users' (patients') experience where possible after UDS.

5 Urodynamic Techniques

This section sets out the skills that are required to deliver safe and effective UDS that benefit the patient by providing information, not otherwise available, to guide their future effective management. These skills are both **technical** (see section 3.7) and **clinical** (see section 3.8) and are needed to deliver an individualized test whilst assuring quality standards are met leading to the accurate, clinically relevant, interpretation of the test.

Quality of urodynamic recordings is of fundamental importance, because a poor quality study is of no use and at worst, might be interpreted wrongly and the patient's treatment misdirected. The table below gives the key measures by which quality can be assessed.

5.1 Urine flow studies and the measurement of post-void residual urine

5.1.1 Introduction: Introduction: Urine flow studies (UFS) are the simplest studies of voiding function, and it is considered mandatory to include the measurement of PVR. Patients presenting to the out-patient clinic with bothersome LUTS are usually asked to provide a urine sample for dipstick testing as a first-line basic screening assessment. This can mean that it is difficult for the patient to have an adequately filled bladder for UFS at the same clinic appointment. For this reason, many urological departments run a dedicated flow clinic. The largest group of patients undergoing UFS is men with LUTS presumed secondary to Benign Prostatic Obstruction (BPO), however this study is also an important initial investigation in females with voiding symptoms.

UFS are screening studies, without high diagnostic specificity. Their limitations are due to urine flow being a product of the propulsive forces generated by the bladder and the resistance to flow from the bladder outlet. Hence, low flow may be due to bladder outlet obstruction, or to detrusor muscle underactivity, or to a combination of the two.

5.1.2 Indications:

- 5.1.2.1** To screen for dysfunctional voiding in children
- 5.1.2.2** To screen for low flow prior to SUI surgery in women with voiding symptoms
- 5.1.2.3** To screen for voiding difficulties in women, including women with

possible obstruction due to pelvic organ prolapse

- 5.1.2.4** To screen for low flow in men with LUTS possibly due to Bladder Outlet Obstruction (BOO)

5.1.3 Technical skill requirements:

- 5.1.3.1** To understand the principles by which uroflowmeters and ultrasound (US) scanners work
- 5.1.3.2** To be able to clean and maintain uroflowmeters and ultrasound machines
- 5.1.3.3** To be able to carry out calibration checks on the uroflowmeter
- 5.1.3.4** To recognize uroflowmetry trace artefacts
- 5.1.3.5** To understand the relevant measurements which must be made and documented to ensure complete information is acquired

5.1.4 Clinical skill requirements:

- 5.1.4.1** To know the indications for uroflowmetry and PVR measurement
- 5.1.4.2** To be able to provide clear instructions to the patient regarding the performance of the test
- 5.1.4.3** To understand how the uroflowmeter and ultrasound (US) machine function, and the principles of calibration
- 5.1.4.4** To understand the cause of, and prevent where possible, uroflowmetry trace artefacts
- 5.1.4.5** To try to ensure that an adequate voided volume is passed during uroflowmetry
- 5.1.4.6** To understand the importance of bladder diary data in interpreting the UFS
- 5.1.4.7** To establish whether the UFS was typical for the patient
- 5.1.4.8** To broadly categorize flow studies into normal, characteristic of urethral stricture, suggestive of bladder outlet obstruction or detrusor underactivity, or other abnormal pattern
- 5.1.4.9** To be able to issue a report detailing relevant history, any relevant physical findings, the measurements from the UFS, and the interpretation of the investigation together with any shortcomings of the individual's test, such as low voided volumes when there is no significant PVR

5.1.5 Special considerations in:

- 5.1.5.1 Children:** often attend flow clinics with incompletely filled bladders, and pre-

scanning with the handheld bladder scanner is useful to document the bladder size before asking the child to void. If the bladder is under-filled, some degree of flexibility is then required to allow the child to drink and then undertake the study quickly if/when the child has a strong desire to void. ICCS guidelines are followed. Voided volumes should be greater than 50% of functional bladder capacity. As a general rule, the square of the maximum flow rate (Q_{\max}^2) should be greater than the voided volume.

- 5.1.5.2 Women:** in women with POP, consider reducing the prolapse to assess voiding

- 5.1.5.3 Men:** clear instructions should be given to men prior to uroflowmetry in order to avoid potential artefacts arising from excessive movement of the urinary stream across the collecting funnel

- 5.1.5.4 Neurological:** many neurological patients are unable to void voluntarily and therefore are unable to do UFS

5.2 Standard UDS: filling cystometry and pressure-flow studies of voiding

5.2.1 Introduction:

- 5.2.1.1** Standard UDS are the most frequently indicated type of UDS performed and assess both the filling and the voiding phases of the micturition cycle
- 5.2.1.2** The principal aims are to define detrusor and urethral function during both filling and voiding phases
- 5.2.1.3** The bladder is almost always filled through a urethral catheter, whilst the pressures in both the bladder and the rectum (or vagina) are measured
- 5.2.1.4** Standard UDS are used when simultaneous imaging of anatomy is unlikely to be relevant

5.2.2 Common indications:

- 5.2.2.1** In women prior to stress urinary incontinence (SUI) surgery, to confirm the diagnosis and to establish whether there are any factors that may mitigate against an optimal outcome
- 5.2.2.2** In women with bothersome voiding symptoms, in order to establish, if possible, the cause
- 5.2.2.3** In men with bothersome voiding symptoms, in order to establish the potential diagnosis of bladder outlet obstruction,

particularly if LUTS persist despite non-surgical therapies, and when surgical treatment for BPO is being considered

5.2.2.4 In both men and women with persistent storage LUTS despite non-surgical therapies, most commonly for OAB when surgical treatment is being considered, such as sacral nerve stimulation or injection of botulinum toxin

5.2.2.5 Patients refractory to conservative and medical therapies but remain bothered by symptoms and who are willing to consider invasive therapy

5.2.2.6 In general, videourodynamics are the preferred UD test in children and neurological patients

5.2.3 Technical skill requirements:

5.2.3.1 To understand the principles of how the uroflowmeter, and urodynamic equipment functions, and their vulnerabilities, for example excess pressure on a pressure transducer

5.2.3.2 To be able to clean and maintain the uroflowmeter and urodynamic equipment

5.2.3.3 To be able to perform calibration checks on the uroflowmeter, the pressure transducers and the bladder filling pump

5.2.3.4 To assess the quality of the urodynamic recording during the test and to improve the quality if necessary

5.2.3.5 To recognise and know the cause of, and prevent where possible, artefacts on the UD trace

5.2.3.6 To be able to read the tracing, and analyse and record the urodynamic measurements of flow pressure and bladder capacity, in the UD report (see Appendix 8.4)

5.2.4 Clinical skill requirements:

5.2.4.1 To know the indications for standard UDS

5.2.4.2 To be able to take a detailed history from the patient

5.2.4.3 To confirm and document that the relevant physical examinations have taken place, and if competent, to carry out any examination that has not been previously recorded. If not competent to do this, to clearly state to the referring clinician, in the UD report, the examination that is still required

5.2.4.4 To be able to provide clear instructions to the patient regarding the performance of the test

5.2.4.5 To be able to pass the urodynamic catheters

5.2.4.6 To understand how the uroflowmeter, urodynamic machine, and the bladder filling pump function, and the principles of calibration for each

5.2.4.7 To recognise and know the cause of urodynamic trace artefacts

5.2.4.8 To know when and how to change the UD technique during the test, if indicated, for example, provocation testing or altering filling rate

5.2.4.9 To understand the importance of bladder diary data in interpreting the UDS

5.2.4.10 To establish whether the patient's experience of both the filling and voiding phases of their UDS was typical for them

5.2.4.11 To be able to interpret, and validate the urodynamic data from the UDS, and issue a report detailing relevant history, any relevant physical findings, and the measurements and diagnoses from the UDS, for example using the Bladder Outlet Obstruction Index and the Bladder Contractility Index in men

5.2.4.12 Interpretation of the investigation in the light of the patient's symptoms, mentioning any shortcomings or quality issues of the individual's test.

5.2.4.13 To manage any adverse reactions during the test and in the post procedure period for example, vasovagal attack

5.2.4.14 Compliance with local infection control best practice

5.2.5 Special considerations in:

5.2.5.1 Children: standard UDS are rarely performed in children. The majority undergo video UDS to allow maximum information to be obtained from the study

5.2.5.2 Women: if there is POP prolapse, reduction during urodynamics may be needed

5.2.5.3 Men: the voiding phase of the urodynamic study should be carried out with the man in his usual voiding position. For most men this is in the standing

position, but this may not always be the case and the preferred voiding position should be established before the study

- 5.2.5.4** Neurological: standard UDS may be used when anatomical abnormalities and upper tract deterioration is unlikely, for example in multiple sclerosis, however, many do require video UDS

5.3 Urethral Function Studies

5.3.1 Introduction

- 5.3.1.1** Urethral function studies are not widely used. The most frequently used tests are urethral pressure profilometry (UPP) and abdominal/valsalva leak point pressure (ALPP/VLPP) measurement in patients with stress incontinence. There is no clear evidence as to which test is most useful: the principal aim is to assess urethral function during storage

- 5.3.1.2** Detrusor leak point pressures (DLPP) are also occasionally measured

5.3.2 Common indications:

- 5.3.2.1** In women, prior to surgery for recurrent or persistent bothersome stress incontinence

- 5.3.2.2** In women with bothersome voiding symptoms and or idiopathic urinary retention, to assess possible urethral sphincter overactivity

- 5.3.2.3** In women with suspected urethral relaxation incontinence

- 5.3.2.4** In younger men with voiding symptoms and low flow rates, who are unlikely to have prostatic obstruction, in order to identify the site of any obstruction and to assess possible urethral sphincter overactivity

- 5.3.2.5** In men with post-prostatectomy stress incontinence to assess the degree of urethral sphincter weakness prior to possible incontinence surgery

- 5.3.2.6** In men with possible BOO to assess possible BPO

- 5.3.2.7** In patients with poorly functioning artificial sphincters, to assess their function

- 5.3.2.8** In patients with neurological disease or those with poor bladder compliance whose upper urinary tracts may be at risk from high-pressure bladder filling (“unsafe bladders”). Detrusor leak point pressure (DLPP) measurement may be required

5.3.3 Technical skill requirements:

- 5.3.3.1** To understand the principles of urethral function studies and equipment

- 5.3.3.2** To be able to clean and maintain perfusion pump and withdrawal machine (profilometer)

- 5.3.3.3** To be able to check the calibration of the equipment

- 5.3.3.4** To understand different types of pressure measurement (solid state or water perfused) and their differences if more than one method is used

- 5.3.3.5** To be able to undertake static and dynamic UPP

- 5.3.3.6** To recognize and know the cause of, and prevent where possible, urethral function study artefacts

- 5.3.3.7** To know the standard measurements to make and to document for example, functional profile length and maximum urethral closure pressure

- 5.3.3.8** For fluid filled catheter UPP, to understand the relationship between withdrawal rate, infusion rate, system compliance, and the concomitant constraints

5.3.4 Clinical skill requirements:

- 5.3.4.1** To know the indications for urethral function studies

- 5.3.4.1** To understand the principles of urethral function studies

- 5.3.4.1** To know how the profilometer functions

- 5.3.4.1** To have a knowledge of the characteristic normal traces obtained in men and women

- 5.3.4.1** To recognize and know the cause of, and prevent where possible, urethral function study artefacts

5.3.5 Special considerations in:

- 5.3.5.1** Children: urethral function studies are not performed in children

- 5.3.5.2** Men: it is important to know the previous medical history for the male patient undergoing UPP. If radical prostate surgery has previously been undertaken then this will affect the shape of the UPP trace obtained

5.4 Video UDS (VUDS)

5.4.1 Introduction

- 5.4.1.1** Video UDS are performed when there is a likely patient benefit in having anatomical information during the UD

test, as that information may make a difference to the decisions made for future management

5.4.1.2 The benefits of video UDS must be judged to be greater than the risks of irradiation to patients and staff, and the additional cost involved

5.4.1.3 Video UDS usually use X-ray fluoroscopic imaging although ultrasound can be used

5.4.1.4 *Units should perform in line with Ionising Radiation Medical Exposure Regulations (IRMER) regulations on safety, and follow "As Low As Reasonably Achievable" (ALARA) principles, with an appropriate audit trail*

5.4.2 Common indications:

5.4.2.1 In children with congenital neurological conditions (eg, spina bifida and sacral agenesis), congenital structural conditions (eg, posterior urethral valves, bladder exstrophy), dysfunctional voiding, and for failed OAB treatment prior to sacral nerve stimulation or BTXA

5.4.2.2 In women, prior to possible repeat surgery for recurrent or persistent bothersome stress incontinence

5.4.2.3 In women with urinary retention/incomplete emptying to provide information regarding the site of obstruction at bladder neck/mid-urethra/pelvic floor

5.4.2.4 In younger men with voiding symptoms and low flow rates, who are less likely to have prostatic obstruction, in order to identify the site of any obstruction

5.4.2.5 In men with post-prostatectomy stress incontinence prior to possible incontinence surgery

5.4.2.6 In neurological patients where the upper tract is potentially at risk, due to an "unsafe bladder," for example, in spinal cord injury and spina bifida

5.4.3 Technical skill requirements: Video UDS requires the same technical skill set needed for standard UDS (see 5.3.3 above), and in addition, staff should:

5.4.3.1 Have had the radiological training in order to use the X-ray equipment, unless this is a responsibility of radiology staff

5.4.3.2 Have an understanding of the safety issues arising from video UDS using X-ray imaging

5.4.3.3 Know when and how to obtain the necessary images

5.4.3.4 Be able to reset the UD software to allow for the increased fluid density of contrast medium

5.4.4 Clinical skill requirements: Video UDS requires the same clinical skill set needed for standard UDS (see 5.3.4 above), and in addition, staff should:

5.4.4.1 Have an understanding of the safety issues arising from video UDS using X-ray imaging

5.4.4.2 Ensure that all women under 55 have an assessment of pregnancy/breast feeding status

5.4.4.3 Know when and how to obtain the necessary images

5.4.4.4 Have a detailed knowledge of the anatomy of the pelvic region

5.4.4.5 Know how to manage a reaction to contrast media

5.4.5 Special considerations in children:

5.4.5.1 The child must be prepared for the process of urethral (and rectal) catheterisation prior to the study. If the child has neurogenic LUTD, intermittent self-catheterisation (ISC) is likely to have been established already, and the urodynamics is generally well tolerated. If the child has idiopathic LUTD, then it is likely that they will need to undertake ISC in the future. In that situation, the urology nurse specialist will need to be closely involved with the family and home/hospital visits organized to try to establish ISC. If this proves impossible, then suprapubic urodynamic lines may need to be placed under general anaesthetic 24h prior to the study.

5.4.5.2 Most children prefer to sit for the study

5.4.5.3 Distracting the child with cartoons/videos/games on iPad/tablet/phone may be useful

5.4.5.4 Bladder capacity must be considered prior to starting the study (either functional from a bladder diary, or expected using standard formulae for example, capacity (mL) = (age in years × 30) + 30)

5.4.5.5 Fill rates should be low, generally 5-10 mL/min with an absolute maximum of 10% of bladder capacity per minute

- 5.4.5.6** Video images should be taken regularly during the study
- 5.4.5.7** The voiding phase may provide limited information in children, as children with neurogenic LUTD are generally unable to empty, and children with idiopathic LUTD may be unhappy to void with the urethral catheter in situ
- 5.4.6 Special considerations in women:** the benefits of video must be clearly established in women of reproductive age. Local policy will likely require a pregnancy test, and if positive, will prevent X-ray from being used
- 5.4.7 Special considerations in men:**
- 5.4.7.1** When anatomical detail of the bladder neck and urethra are required, it may be necessary to position the male patient in the 30 degrees oblique position in order to avoid any potential artefact from the bony pelvis
- 5.4.7.2** During provocation for suspected stress urinary incontinence in males it is often necessary to carry out a second fill, following which the urodynamic catheters should be removed and the provocation repeated: the increase in outlet resistance, due to the presence of urodynamic catheters, can sometimes prevent the demonstration of mild urodynamic stress incontinence
- 5.4.8 Special considerations in neurological patients:**
- 5.4.8.1** Health-care professionals should only undertake urodynamics on neurological patients if they understand the patient's condition, including hand function, and mobility and cognition, and the potential effects these will have on the management of the patient's bladder and bowel function. They also need to understand the potential for progression and change to make the urodynamics meaningful. Neurological patients need an individualized study according to the urodynamic questions that need to be answered
- 5.4.8.2** Spinal injury patients with a level of T6 or above are at risk of autonomic dysreflexia and should only undergo urodynamics in a unit that is familiar with recognising and managing this condition
- 5.4.8.3** Safety issues that are most important in spinal cord injured patients: higher risk of latex allergy – the UDU should have a latex free policy; attention needs to be paid to skin areas, particularly if the patient has a lack of sensation or skin breakage; assess the risk of autonomic dysreflexia – staff should know when to use prophylaxis and how to treat if it occurs
- 5.4.8.4** Practical issues include: mobility is often reduced and therefore the patient may need hoisting onto the UD table and positioning on the table may be difficult; recording flow in the voiding phase may not be possible, although, in men, a drainpipe may need to be used to measure leakage and collect voided urine; although most VUDS are done supine, some patients can stand
- 5.4.8.5** Urodynamic technique adaptations include: the bladder should be emptied if that patient would normally do so; those with a suprapubic catheter (SPC) should be filled, and pressure recorded, through the SPC; bladder filling should be done slowly, usually commencing at a rate of 20 mL/min; the rectum should be emptied if found to be loaded, as this can affect the recording of rectal (abdominal) pressure and detrusor function during voiding; and DLPP may need to be measured, and the effect that VUR may have on DLPP appreciated
- 5.4.8.6** If incontinence surgery is being considered, the bladder needs to be filled to the appropriate volume for that patient, and it may be necessary to obstruct the urethra to achieve this: in men this can be performed by a penile clamp, and in women urethral compression may be needed
- 5.5 Ambulatory UDS (AUDS)**
- 5.5.1 Introduction**
- 5.5.1.1** The aim of AUDS is to reproduce the patient's symptoms by allowing the patient to do those activities that cause the symptoms. During AUDS the patient can move freely and leave the UDU returning to void
- 5.5.1.2** Instead of artificial bladder filling, the bladder is filled naturally (physiologically) by the patient's own urine.

Therefore, the average bladder filling rate is 60-120 mL per hour (1–2 mL/min). As with other UD techniques, both bladder and rectal or vaginal pressure are recorded throughout filling and voiding phases

5.5.1.3 AUDES are performed in regional centres in a highly selected group of patients and require considerable additional time, resources, and equipment which is specifically designed for this purpose

5.5.2 Common indications:

5.5.2.1 Those patients with bothersome LUTS who have failed non-surgical treatments, but whose standard or video UDS have failed to reproduce the patient's symptoms, and therefore further treatment is being delayed whilst a clear cause for the LUTS is established

5.5.3 Technical skill requirements: Ambulatory UDS requires the same technical skill set needed for standard UDS (see 5.3.3 above), and in addition, staff should:

5.5.3.1 Understand how the AUDES equipment functions, including use of solid state, air filled or water filled catheters, including any sterilization issues

5.5.3.2 Be able to clean and maintain the AUDES equipment

5.5.3.3 Be able to check calibration of the transducers and the AUDES machine

5.5.3.4 Recognize and know the cause of, and prevent where possible, AUDES artefacts

5.5.4 Clinical skill requirements: Ambulatory UDS requires the same clinical skill set needed for standard UDS (see 5.3.4 above), and in addition, staff should:

5.5.4.1 Know the indications for ambulatory UDS.

5.5.4.2 Be able to adapt the test and the clinical environment to ensure the patient's symptoms/exacerbating conditions are recreated

5.5.4.3 Be able to download and to analyse the AUDES recording

5.5.4.4 Be able to use the urodynamic data from the AUDES, and issue a report detailing relevant history, any relevant physical findings, the measurements from the UDS, and the interpretation of the investigation together with any shortcomings of the individual's test

5.5.5 Special considerations in:

5.5.5.1 Children: although ambulatory UDS and natural bladder filling offer potential benefit in children, the equipment and expertise is only available in a very limited number of tertiary centres and as a result the technique has not been widely adopted.

6 Guidance for commissioners and providers of urodynamic services

6.1. Guidance for Providers: Section 3 provides detail in "Minimum Standards for a Urodynamic Unit" of the issues that are important and give the details which providers of UD services should include when describing the UD Services they wish to offer to patients. In the UK NHS the provider is usually a hospital.

6.2 Guidance for Commissioners: *In England, the NHS commissioners are known as the Clinical Commissioning Group, and "purchase" urodynamic services from a hospital which is the provider. Section 3 in "Minimum Standards for a Urodynamic Unit" provides the details of the urodynamic services that the commissioners can expect from the providers of UD services.*

7 General recommendations

7.1 Urodynamic studies (UDS) have become widely accepted as an essential investigation into lower urinary tract dysfunction over the last 40 years. However, there is no regulation with respect to the training of staff or assessment of quality in the performance of UDS. Hence patients are at risk from sub-standard UD assessment, and are not aware of this regrettable omission.

7.2 The UKCS considers that all UD staff should undergo formal training, and fulfill set CPD requirements in order to maintain their skills.

7.3 *The UKCS considers that all UDUs should be accredited to UKCS standards and would hope to work with NHS England to achieve this through IQIPS*

7.4 It is hoped that Central Commissioning will allow this system to be developed so that patients are investigated at the most appropriate UDU

7.5 All UDUs should have a designated suitably qualified director responsible for UD quality assurance including UD audit, staff appointment and training, and the MDT process

7.6 High quality UDS demand that the UD HCPs possess two essential skill sets, technical and clinical and these are defined for the first time.

- 7.7 The patient's UD pathway is defined, and integral to this is an appropriate UD referral and the systematic provision of full information to all patients
- 7.8 The requirements for the range of UD tests is defined, and the skill sets required to deliver a high quality UDS are listed
- 7.9 This report provides the details required to ensure that the Commissioners know the necessary specification of the UD services that they are purchasing, and that the providers know the criteria they must meet when offering to provide a urodynamic service.

8 Appendix

This appendix includes examples of practice and documents required in every UDU. Individual organizations may wish to develop their own versions according to the needs of their patients in general and specific patient groups, in particular, and local factors.

The documents listed can be accessed through the UKCS website www.ukcs.uk.net

8.1 Urodynamics antibiotic policies:

- 8.1.1 Adult UDU Bristol Urological Institute
- 8.1.2 Paediatric, Bristol Children's Hospital

8.2 Urodynamic Patient Leaflets

- 8.2.1 Adults, Bristol Urological Institute
- 8.2.2 Children, Bristol Children's Hospital
- 8.2.3 Neurological patients, Sheffield Spinal Cord Injury Unit
- 8.2.4 Women, Leaflets from Birmingham Women's Hospital, and St Mary's Hospital Manchester
- 8.2.5 "After your test", Queen Elizabeth Hospital, Glasgow

8.3 Bladder Diary and Male and Female Symptom Questionnaires

- 8.3.1 International Consultation on Incontinence Questionnaire – bladder diary (ICIQ-BD)
- 8.3.2 International Consultation on Incontinence Questionnaire – male lower urinary tract symptoms (ICIQ-MLUTS)
- 8.3.3 International Consultation on Incontinence Questionnaire – female lower urinary tract symptoms (ICIQ-FLUTS)

8.4 Urodynamic reports for men and women, Bristol Urological Institute

8.5 Skills for health competencies: www.tools.skillsforhealth.org.uk

8.6 Training and CPD details for Urodynamic Staff

- 8.6.1 Adult Urology
- 8.6.2 Paediatric Urology
- 8.6.3 Urogynaecology
- 8.6.4 Nurses
- 8.6.5 Clinical scientists
- 8.6.6 Clinical technologists

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