

Buyers' guide

Urodynamic systems

CEP09037

December 2009



Introduction 3

Technical considerations..... 6

Operational considerations..... 8

Economic considerations 12

Purchasing..... 14

Acknowledgements 16

Glossary..... 17

References..... 18

Author and report information..... 20

CEP buyers' guides are intended to provide prospective purchasers of healthcare products on the UK market with general guidance on the technical, operational, and economic considerations to be taken into account in selecting the most appropriate product where a range of similar products exists. They do not include product-specific information, which is published separately via market reviews (which contain product specifications and expert commentary) or evaluation reports (which contain additional technical and / or user evaluation data). Readers are encouraged to check CEP's web site for updates.

Scope

Urodynamics is the term used to describe the investigation of bladder and urethral function by means of pressure and flow measurements. In the UK, urodynamic investigations are performed widely and several companies produce urodynamic equipment. There have been reviews of urodynamic equipment in the UK in the past [1], but none recently, except CEP Guide 08045 of which this is an update.

This buyers' guide offers a comprehensive overview of urodynamic equipment available in the UK. It discusses the technical, operational, economic and purchasing considerations which might influence purchasing decisions, and provides comparative product specifications. Urine flow testing (uroflowmetry) is an integral part of urodynamic assessment, but 'stand-alone' flow meters, sold separately from urodynamic equipment, are beyond the scope of this guide. Ambulatory urodynamic systems and non-invasive urodynamic systems are also beyond the scope of this guide.

Urodynamic investigations

A number of different tests are included under the umbrella term of urodynamics:

- uroflowmetry (urine free flow tests)
- filling and voiding cystometry (bladder pressure and urine flow measurement, with or without X-ray imaging)
- urethral pressure measurements (by withdrawing a catheter slowly through the urethra)
- ambulatory monitoring (cystometry studies using portable equipment)

The range of urodynamic tests offered by any centre will vary according to referral patterns. A district general hospital will generally only offer flow studies and filling and voiding cystometry, whereas a regional centre receiving tertiary referrals may offer videocystometry and perhaps ambulatory monitoring in addition to the more routine tests.

Clinical background

Lower urinary tract symptoms (LUTS) is the collective term for symptoms suggestive of bladder or urethral dysfunction. Symptoms include frequent urination, incontinence and difficulties in bladder emptying.

Men

In men, difficulty in voiding is the most common symptom investigated using urodynamics. The first urodynamic test performed is usually a flow study (uroflowmetry). Flow studies are commonly used in isolation to investigate voiding problems. In addition voiding cystometry (pressure/flow study) is performed to differentiate between obstruction and detrusor underactivity as a cause for voiding difficulties [2;3]. The International Continence Society (ICS) uses pressure/flow study measurements to define whether urinary flow is obstructed [4].

Women

In women, incontinence is more common than voiding difficulties. Filling and voiding cystometry, and sometimes urethral pressure monitoring, are the main urodynamic investigations.

Children and patients with complex conditions

It is often difficult to predict the underlying bladder pathology from knowledge of the disease alone, and symptoms are not always helpful when sensation may be impaired [5]. Urodynamic testing, usually by means of videocystometry, is recognised as having an important role in the management of children and adults with complex urological and neurological problems.

Development of urodynamics

Historically, the diagnosis and management of women with LUTS has been based on careful history taking and physical examination. These methods are useful but not entirely accurate; studies have demonstrated an improvement in diagnostic accuracy when urodynamic testing is used in addition to history and examination [6;7].

Developments in electronics, allowing more accurate measurement of bladder pressure, and a greater awareness of the clinical and economic benefits of a reliable diagnosis prior to surgical intervention have led to the widespread uptake of urodynamics as a clinical investigation.

The need for standardisation was recognised early, and the International Continence Society (ICS) was founded in 1971 to encourage a uniform approach to urodynamic testing.

National guidance

A Cochrane review has considered whether treatment based on urodynamic diagnosis was more likely to be successful than treatment based on presumptive diagnosis. This review recommended that a larger definitive trial was needed, as the numbers in published randomised controlled trials were too small to draw a conclusion [8].

The National Institute for Health and Clinical Excellence (NICE) recently published guidelines on the role of urodynamics in women with incontinence [9]. Cystometry is recommended before surgery to treat incontinence if:

- there is a suspicion of bladder muscle over-activity (spontaneous bladder contractions associated with urgency),
- there has been previous surgery for stress incontinence or prolapse, or
- there are voiding difficulties.

The guidelines recommend that cystometry is not necessary before starting conservative treatment (such as pelvic floor exercises) or before surgery for the “small group of women with a clearly defined clinical diagnosis of pure stress urinary incontinence” [9].

There have been no published Cochrane reviews or NICE guidelines concerning the role of urodynamic investigations in men.

Urodynamic investigations

Uroflowmetry

Urodynamic equipment includes a flow meter so that pressure/flow studies can be performed. For urine free flow study (uroflowmetry) the patient voids into a machine that measures the rate and pattern of urinary flow. There are two types of urine flow meters: spinning disc and weight transducer. In addition, the perineal electromyographic (EMG) signal within muscles is sometimes measured during voiding.

The parameters for the uroflowmetry equipment are specified by the ICS and are recommended to be in the following range: flow rate 0 to 50 ml/s, volume up to 1000 ml, maximum time constant 0.75 s, and accuracy of $\pm 5\%$ full scale [10].

Filling and voiding cystometry

During filling cystometry, vesical (bladder) pressure (p_{ves}) and abdominal pressure (p_{abd}) are measured. The detrusor is the muscle that is present in the bladder wall and detrusor pressure (p_{det}) is calculated by subtracting the abdominal pressure from the vesical pressure ($p_{ves} - p_{abd} = p_{det}$). Abdominal pressure is recorded to allow for any changes, such as straining or talking, which might influence bladder pressure but not detrusor pressure. The calculated p_{det} thus reflects true changes in vesical / detrusor pressures caused by detrusor muscle activity

To conduct filling and voiding cystometry the bladder must first be filled actively by an infusion of normal saline or X-ray contrast medium. During filling cystometry, bladder and abdominal pressures are measured constantly using inserted catheters. After filling, voiding cystometry - also known as a pressure/flow study - is performed as the patient urinates, recording bladder and abdominal pressures together with urine flow rate. Data are analysed and pressure/flow graphs are generated to determine whether or not a patient has an obstructed (high pressure/low flow) or underactive (low pressure/low flow) void. Videocystometry will require additional computer hardware to capture X-ray images from an image intensifier. EMG recording is also an option usually available, although the requirement for it varies between departments.

The ICS recommends the use of water-filled catheters, although air-filled and microtip catheters are also acceptable, provided precaution is taken with initial setting of zero pressure levels. The recommended accuracies are: $\pm 1\text{cmH}_2\text{O}$ for pressure and $\pm 5\%$ full scale for flow and volume. The recommended ranges for operational measurements are: 0 - 250 cmH_2O , 0 - 25 ml/s (with 50 ml/s option), and 1000 ml for pressure, urine flow rate and volume respectively. The rate of data acquisition should be at least 10 Hz [10].

Urethral pressure profile (UPP) measurement

A special catheter is withdrawn slowly through the urethra while fluid is slowly infused through it, and urethral pressure at the catheter tip is recorded continuously. The resulting graph can give information on sphincter strength and prostate length and pressure. Machines normally use a small motorised arm (also called profilometer) to withdraw the catheter at a fixed rate. Many UK departments do not use UPPs on a regular basis.

Ambulatory monitoring

During ambulatory monitoring bladder and abdominal pressures are recorded as for cystometry, but the bladder is allowed to fill naturally and a portable recording device is used. It is particularly useful if the patient's symptoms were not reproduced (for whatever reason) during a standard urodynamic test. Ambulatory monitoring is normally carried out at specialist urodynamics centres using microtip rather than water-filled pressure measurement catheters.

Types of urodynamic systems

Portable or pole-mounted systems

These systems are designed for mobile clinic use or for easy portability within a department. They tend to use laptop computers and wireless links and occupy only a small floor area. They tend to have limited functionality as a result but are generally adequate for routine urodynamic testing.

Trolley mounted systems

The majority of equipment sold in the UK is mounted on a dedicated trolley, which often holds the pump and pressure transducers as well as the desktop computer. They can be moved around a hospital fairly easily but occupy a little more floor space than a portable system and are best kept on the trolley once assembled.

Specifications

Transducers

Bladder and abdominal pressure can be measured with several types of pressure sensor. The ICS recommends water-filled catheters connected to an external pressure sensor, but solid state (microtip) or air-filled catheters may also be used. Water-filled systems give more reliable resting pressures but are more susceptible to movement artefacts when for instance the tube is knocked. The reverse is true for other sensor types. In all cases, it is vital for good quality urodynamic traces that appropriate calibration and measurement protocols are followed [10]. It is possible to use different types of sensor for different pressure channels. The department should be clear before purchase which method is preferred as all manufacturers offer a choice of pressure transducers.

Other types of transducers will also need to be considered. Fluid infused is usually measured by a weight transducer holding the saline bag, although in practice a carefully calibrated pump will give a measure of infused fluid accurate enough for clinical purposes. Urine flow is measured by either a weight sensor measuring rate of change of urine weight, or a spinning disc flowmeter that calculates volume from direct measures of flow. There is no clinically significant difference in the accuracy of the flowmeter types [11], so considerations may only rest on, for example, compatibility with existing equipment or cleaning requirements.

Ergonomics and physical arrangements

One of the most important considerations for the department will be the physical layout of the machine. A department that has a dedicated room will not need to move the equipment much, but one that shares space will need to consider issues such as how easy the unit is to take in and out of store, the presence of trailing wires, and whether the unit will restrict patient or staff access. A department that is either mobile or is very constrained for space will need to consider the smaller, portable models, all of which connect to laptop computers. In addition, if videocystometry is intended, it will be vital to check the range of movement of the fluoroscopy unit and how this matches the layout of the urodynamic machine and height of commode.

Another important parameter to consider is the location of the pump and volume transducer. Some machines have these rather low which hampers inspection of the drop chamber and increases difficulty of bag loading. During evaluation, staff should check the comfort of the access and ease of setting up the infusion set in the pump. The range of movement of keyboard and screen should also be noted during assessment, to ensure suitable ergonomics. If UPPs are used regularly, checks should also be made of the method used to deliver slow infusion. Roller pumps have the disadvantage of giving large pressure waves on the UPP trace, whereas machines that use compression bags wrapped around the saline have steady pressure but require careful attention to maintain the bag's inflation.

Consumables

The supply of consumables should also be investigated during purchase. In addition to a standard cost comparison, the number of supply sources available should also be considered. A greater choice will give better backup if one supplier fails. The configuration of consumables can also boost efficiency. For instance, the use of combined tube, tap and pressure dome set would result in lowering stock requirements and increasing clinic speed.

Infection control

During equipment evaluations, the ease of cleaning according to department protocol between tests should be considered. Equipment that has cloth-covered or inaccessible surfaces should be shielded or modified. The MHRA recommends that water filled domes are disposed between tests to reduce the risk of cross infection [12], a practice that should be factored into the costing of consumables.

Software

While the complexity of urodynamic equipment varies between systems, it does not always correlate with clinical usefulness. There may be a tendency for the operator to rely overly on automated results [13]. Since the acceptability of many software features is essentially subjective, purchasers should assess software suitability as part of their evaluations. Listed below are particular features that should be scrutinised before purchase:

Area	Considerations
Urine flow	<ul style="list-style-type: none"> Is the signal filtered, smoothed or analysed excessively before display?
UPPs	<ul style="list-style-type: none"> What automatic features are available? Are they necessary and helpful to us?
Cystometry	<ul style="list-style-type: none"> What automatic analysis occurs at the end of the test? Do we need it? What points are taken for compliance measurements? Are flow and pressure signals excessively processed before display? Do volume calculations allow the user to incorporate leakage and residuals?
Calibration	<ul style="list-style-type: none"> Does the department prefer calibration by their own personnel or by the supplier?
On-screen prompts and information	<ul style="list-style-type: none"> Are these helpful or do they reduce clarity? Do they improve clinic operation?
Connectivity	<ul style="list-style-type: none"> Is a network connection required and if so will it affect system reliability?
Reporting	<ul style="list-style-type: none"> What formats are required for patient records? Is recalling and printing a report straightforward? Can reports and data analyses be manually edited?
Data archiving	<ul style="list-style-type: none"> Are the data storage and transfer methods compatible with IT policies and hardware?

Other considerations

The specifying department should consider carefully which tests are essential for their clinical use and which tests are merely desirable, as each option will add not just cost but also complexity to the machine. The following issues were highlighted as key to the acceptability and usability of a given device:

- size and layout of the machine
- level of complexity relative to required functionality
- training programme during the early days of use
- availability of disposables (standard type or single source)
- ease of printing and post-test analysis
- personal, subjective acceptability of software interface, therefore trialling equipment prior to purchase is essential

Staff requirements and training

In order to operate a urodynamic clinic, it is necessary to have adequately trained staff. At present in the UK, there are no specific training or certification requirements for operators of urodynamic equipment. A joint statement on minimum standards for urodynamic practice in the UK was published in April 2009 by the UK Continence Society in discussion with the Royal College of Obstetricians and Gynaecologists, Royal College of Surgeons, Royal College of Nursing, British Association of Paediatric Urologists and the Chartered Society of Physiotherapy. Certificate courses are available under the auspices of the ICS and it is probable that these will be incorporated into the training requirements. All manufacturers give user training upon purchase of the equipment. The department will find additional training of value once some experience on the equipment has been gained.

Levels of staffing for a particular clinic will vary depending on the range and type of tests that are offered. For example, a centre that sees mainly patients from one specialty for standard cystometry may be nurse led, whereas a centre that offers a wide range of tests will need levels of staffing that reflect that. The use of fluoroscopy in video urodynamics will necessitate input from medical physics and radiology.

Servicing and maintenance

Service contracts, proximity for repair calls and technical staff support levels will also need to be considered. In-house biomedical or clinical engineering departments will be able to offer safety testing, regular maintenance and calibration checks. Specific training on particular equipment is not generally offered by suppliers as they have their own maintenance services available under contract, but such training is not essential for routine preventative maintenance. Detailed repair work and the purchase of parts will, of course, require supplier services. Monthly equipment calibration checks should be part of the in-house clinical routine.

Setting up clinics

Clinics are most commonly run from a fixed location, such as a hospital. Not all urodynamic clinics have dedicated facilities, but this might be justified for those dealing with large numbers of patients. Mobile clinics providing more basic investigations are feasible.

Range of tests

The range of tests offered will vary depending upon local requirements and clinical expertise. For example, a particular gynaecologist or urologist might run a clinic performing standard cystometry on their own patients prior to intervention. In contrast, regional centres, where referrals are often tertiary, might choose to offer a more comprehensive range of tests, including urethral pressure profilometry and videocystometry in addition to standard cystometry.

Choice of equipment

The choice of equipment for any centre will be determined by the planned clinic location, as well as by the range of investigations that will be offered. For example, a mobile unit will require a more portable piece of equipment, even if that means giving up some functionality. A tertiary referral centre will need a piece of equipment with software capable of performing videocystometry.

All manufacturers offer a variety of options for each device, such as increased computer memory (RAM) for faster performance, extra software modules for automatic processing or reporting, backup hardware options for data storage, larger screen if required, etc. The purchasing department should consider carefully what performance features are clinical requirements in compiling the specification for potential suppliers. It should be noted that all machines currently available on the market have the option of network operation, include training packages with the supplier, and have acceptable parameter ranges for normal clinical use.

Whole-life costing

The purchaser should bear in mind that the capital cost of a device is only a fraction of the total cost of running a urodynamic machine. Other costs include equipment maintenance costs, staff time costs, consumables, laundry, room cleaning and facility depreciation. For a practical comparison, some of these costs are used below to demonstrate the use of the whole-life costing method in determining the total cost of a purchase. For simplicity, inflation affecting both costs and cash value has been ignored.

If we consider the consumables used over the average seven year lifetime of a machine, assume a two-year warranty followed by a five-year service contract, but ignore facility and staff costs as these are the same for each device, the following equation can be suggested to calculate the whole life cycle cost of a urodynamic machine:

$$\text{Whole-life cost} = P + (C \times N \times 7) + (M \times 5)$$

where:

- P = initial purchase cost
- C = consumable cost per test
- N = number of tests carried out per year
- M = maintenance contract annual fee

The initial purchasing cost is based on the list price provided by a supplier, which is often given as a range of list prices. This range reflects the various hardware and software options available on a machine.

The typical cost for consumables per test is roughly the same for water-filled catheters on any machine, and is £30 (or £73 for video urodynamics). This includes the cost of a pump tube set, syringes and taps, 500ml bag of normal saline, sterile water, bladder and rectal catheters, disposable transducer domes, lignocaine and a catheter pack. For video urodynamics a more expensive contrast medium instead of saline fluid would be required. Many urodynamic systems use standard consumables available from multiple sources. As prices can vary significantly between suppliers, future price differences may be exploited. If a single supplier or proprietary consumable is used, the department should ensure there are clear benefits from choosing that route.

The average department might carry out 250 tests per year with typical duration of a test being 60 minutes with the cost per person per hour being £40 (North Bristol NHS Trust funding office).

Maintenance cost is often based on a percentage of the machine capital cost and there is scope for variations. Typical maintenance arrangement may cover call-out charges, general support, annual service and calibration. Provision of spare parts can be offered at extra cost. Discounts for maintenance can be offered if the local hospital engineers or medical physics department can provide first line support, assuming appropriate training is provided by the supplier.

Purchasing procedures

Business case

A business case should be drafted and approved before conducting any procurement exercise. Further guidance on preparing business cases is available from the Office of Government Commerce [14], and an illustrative example is provided in the NHS PASA Operational Purchasing Procedures Manual, Procedure 1-01 [15].

The procurement panel

A multidisciplinary team should be selected to guide the purchase. Representatives from clinical, operator, technical, estates and financial sections should be included.

Identifying potential suppliers

Criteria for supplier selection must be established. A supplier pre-qualification questionnaire which asks for details such as skills and experience of the service engineers may be used as an initial screen to exclude unsuitable suppliers.

Evaluation criteria

Performance specifications should be derived from local operational requirements and agreed by the procurement panel. The performance specifications will form the basis for assessing the adequacy of suppliers' technical specifications, provided in response to the technical specification questionnaire. Requests for features which are supplier-specific are not permitted under standard purchasing procedures. Very specific features, for instance colour schemes, which are not supported by operational requirements, are also not allowed as they may unfairly favour particular manufacturers.

Operational procedures

The Trust Operational Purchasing Procedures Manual provides details of the procurement process [16]. European Union procurement rules apply to public bodies, including the NHS. The purpose of these rules is to open up the public procurement market and ensure the free movement of goods and services within the EU. In the majority of cases, a competition is required and decisions should be based on best value. The EU procurement rules apply to contracts worth more than £90,319 (from January 1st 2008) [17], an amount that is well in excess of the cost of a single urodynamic machine.

NHS Supply Chain (www.supplychain.nhs.uk), a ten year contract operated by DHL on behalf of the NHS Business Services Authority, offers OJEU compliant national contracts or framework agreements for a range of products, goods and services. Use of these agreements is not compulsory and NHS organisations may opt to follow local procedures.

Purchasing options

Equipment may be purchased outright or leased. Local procurement departments should be consulted on the cost-effectiveness of lease arrangements, as the deals will be linked to consumable supply and maintenance contracts. Combinations of purchase and lease are also available, with a reduced price being payable after some lease time has elapsed.

Sustainable procurement

The UK Government launched its current strategy for sustainable development, *Securing the Future* [18], in March 2005. The strategy describes four priorities in progressing sustainable development:

- sustainable production and consumption – working towards achieving more with less
- natural resource protection and environmental enhancement – protecting the natural resources and habitats upon which we depend
- sustainable communities – creating places where people want to live and work, now and in the future
- climate change and energy – confronting a significant global threat.

The strategy highlights the key role of public procurement in delivering sustainability.

For urodynamic equipment, the same consideration should be given as for general computing equipment, i.e. ensuring full use of equipment lifetime, avoidance of unnecessary features, energy efficient displays etc. Another consideration may be the amount of paper printed per test, as some systems have defaults for printing unused patient details and analysis figures. Reduction of the disposal of consumables, including administration sets, catheters and sterile equipment is also an issue for comparison between systems or transducer types.

End of life disposal

Consideration should be given to the likely financial and environmental costs of disposal at the end of the product's life. Where appropriate, suppliers of equipment placed on the market after the 13th August 2005 should be able to demonstrate compliance with the UK Waste Electrical and Electronic Equipment (WEEE) regulations (2006) [19]. The WEEE regulations place responsibility for financing the cost of collection and disposal on the producer. Electrical and electronic equipment is exempt from the WEEE regulations where it is deemed to be contaminated at the point at which the equipment is scheduled for disposal by the final user. However, if it is subsequently decontaminated such that it no longer poses an infection risk, it is again covered by the WEEE regulations, and there may be potential to dispose of the unit through the normal WEEE recovery channels.

We should like to thank the following for their contribution to this buyers' guide:

Samih Al-Hayek, Specialty Registrar, Royal United Hospital, Bath.

Fadi Al-Housami, Specialty Registrar, Musgrove Park Hospital, Taunton

Howard Brobin, Urodynamics Specialist, Mediwatch UK Ltd

Connie Chew, Urodynamics Nurse, Southmead Hospital, Bristol.

Nick Darker, Product Manager, Mediwatch UK Ltd

Debbie Delgado, Urodynamics Nurse, Southmead Hospital, Bristol.

Julie Ellis-Jones, Urodynamics Nurse, Southmead Hospital, Bristol.

Aled Evans, Medical Physics Department, Southern General Hospital, Glasgow.

Roger Lewis, Managing Director, Lewis Medical Ltd

Carl Loveluck, Clinical Applications Specialist, Dantec Dynamics Ltd

Jon McFarlane, Consultant Urologist, Royal United Hospital, Bath.

Paul Scarborough, Sales Manager, Digitimer Ltd

Doug Small, Medical Physics Department, Southern General Hospital, Glasgow.

Adrian Smart, Customer Support, Laborie Medical Technologies Europe Ltd

Donald Smith, Medical Physics Department, Southern General Hospital, Glasgow.

Stuart Taylor, Product Manager, Albyn Medical Ltd

James Urie, Sales & Marketing Director, Mediplus Ltd

Tim Ward, Operations Manager, Mediplus Ltd

Jo Wilkinson, Product Specialist, Genesis Medical Ltd

BUI	Bristol Urological Institute (www.bui.ac.uk)
BIME	Bath Institute of Medical Engineering (www.bime.org.uk)
Cystometry	the study of bladder pressure and volume
Detrusor	the muscle found in the bladder wall
EMG	electromyographic signal, the electrical signal within muscles
ICS	International Continence Society (www.icsoffice.org)
LUTS	lower urinary tract symptoms
MHRA	Medicines and Healthcare products Regulatory Agency
NICE	National Institute for Health and Clinical Excellence
N/A	Not Available - the data not provided by the supplier
p_{abd}	abdominal pressure, measured usually rectally or vaginally
p_{det}	detrusor pressure (= p _{ves} - p _{abd})
p_{ves}	vesical pressure, the pressure inside the bladder lumen
Pressure/flow	or voiding cystometry, the study of bladder pressure and urine flow
UPP	urethral pressure profile
Vesical	within the bladder

-
- [1] Barnes DG, Ralph D, Hill PD, et al. A consumer's guide to commercially available urodynamic equipment. *British Journal of Urology* 1991 Aug;68(2):138-43.
 - [2] Abrams PH, Farrar DJ, Turner-Warwick RT, et al. The results of prostatectomy: a symptomatic and urodynamic analysis of 152 patients. *Journal of Urology* 1979;121(5):640-2.
 - [3] Abrams P. Objective evaluation of bladder outlet obstruction. *British Journal of Urology* 1995;76(Suppl 1):11-5.
 - [4] Abrams P. Bladder outlet obstruction index, bladder contractility index and bladder voiding efficiency: three simple indices to define bladder voiding function. *BJU International* 1999 Jul;84(1):14-5.
 - [5] McGuire EJ, Woodside JR, Borden TA, et al. Prognostic value of urodynamic testing in myelodysplastic patients. *Journal of Urology* 1981;126(2):205-9.
 - [6] Clarke B. The role of urodynamic assessment in the diagnosis of lower urinary tract disorders. *Int Urogynecol J Pelvic Floor Dysfunct* 1997;8(4):196-9.
 - [7] Fitzgerald MP, Brubaker L. Urinary incontinence symptom scores and urodynamic diagnoses. *Neurourology and Urodynamics* 2002;21(1):30-5.
 - [8] Glazener CMA, Lapitan MC. Urodynamic investigations for management of urinary incontinence in children and adults. 2002. Report No.: Issue 3. Art. No: CD003195.
 - [9] National Institute for Health and Clinical Excellence. Urinary incontinence: the management of urinary incontinence in women. 2006 Oct.
 - [10] Schäfer W, Abrams P, Liao LM, et al. Good Urodynamic Practices: Uroflowmetry, Filling Cystometry and Pressure-Flow Studies. *Neurourology and Urodynamics* 2002;21(3):261-74.
 - [11] Gammie et al. UKCS ASM 2007, Birmingham. 2007.
 - [12] Medical Devices Agency. MDA Safety notice: SN 2000(09) Pressure transducer cover (SensoNor Pressure Dome) for urodynamic system of bladder pressure measurement. 11-5-2000.
Ref Type: Generic
 - [13] Lewis P, Howell S, Shepherd A, et al. Computerised urodynamics: help or hindrance? *Neurourology and Urodynamics* 1997;16(5):508-9.

-
- [14] website 2008 Available from: URL:
http://www.ogc.gov.uk/stdtoolkit/reference/documentation/p13_buscase.html
- [15] website 2008 Available from: URL:
<http://home.pasa.nhs.uk/PASAWeb/Guidance/OPPM/LandingPage.htm>
- [16] website 2008 Available from: URL:
<http://home.pasa.nhs.uk/PASAWeb/Guidance/TOPPM/LandingPage.htm>
- [17] website 2008 Available from: URL:
http://www.ogc.gov.uk/procurement_policy_and_application_of_eu_rules_eu_procurement_thresholds.asp
- [18] UK Government Strategy for Sustainable Development; Securing the Future. website 2008 Available from: URL: <http://www.sustainable-development.gov.uk/publications/uk-strategy/index.htm>
- [19] EC Directive on Waste Electrical and Electronic Equipment. website 2008 Available from: URL: <http://www.berr.gov.uk/files/file35992.pdf>

Buyers' guide: Urodynamic systems

**Lucy Swithinbank, Andrew Gammie,
Elena Skryabina*, Jennifer Chan*,
Steven Wilson*, Craig Davey***

Bristol Urological Institute,
Southmead Hospital,
Bristol BS10 5NB

Tel: 0117 959 5690
Email: admin@bui.ac.uk
www.bui.ac.uk

*Bath Institute of Medical Engineering,
Wolfson Centre,
Royal United Hospital,
Bath BA1 3NG

Tel: 01225 824103
Email: evaluation@bime.org.uk
www.bime.org.uk

About CEP

The Centre for Evidence-based Purchasing (CEP) is part of the Policy and Innovation Directorate of the NHS Purchasing and Supply Agency. We underpin purchasing decisions by providing objective evidence to support the uptake of useful, safe and innovative products and related procedures in health and social care. We are here to help you make informed purchasing decisions by gathering evidence globally to support the use of innovative technologies, assess value and cost effectiveness of products, and develop nationally agreed protocols.

Sign up to our email alert service

All our publications since 2002 are available in full colour to download from our website. To sign up to our email alert service and receive new publications straight to your mailbox contact:

Centre for Evidence-based Purchasing
Room 152C
Skipton House
80 London Road
SE1 6HL

Tel: 020 7972 6080
Fax: 020 7975 5795
Email: cep@pasa.nhs.uk
www.pasa.nhs.uk/cep

© Crown Copyright 2009