Ultrasound Scanning of the Bladder:

a guideline for best practice

Record of Clinical Training

Certified complete

Supervisor _____

Date: _____

Course Leader _____

Date: _____

Appendix 2
Understanding Different Bladder Scanners

Scan Mode
Probe Frequency

Scan Mode

- A mode (amplitude)
- B mode (brightness)
- M mode (motion/movement)
- V mode (volume mode)
- 2D Real Time (sequential B mode pulses)
- Doppler modes (blood flow, colour)

Probe Frequency

The higher the frequency the greater the detail i.e. 12MHz used for eyes, 3.5MHz for abdomen.

- Real-time

  BARDSCAN® IIs Ultrasound Bladder Scanner
  Portascan+™
  MultiscanPVR

- Non real-time (V mode)

  BladderScan® BVI Range
  Cubescan BioCon Range

Two primary types of ultrasound equipment are available for bladder volume measurement:

- Real-time
- Non real-time (including hand held)

Section 1
Introduction

This guideline has been developed by leaders in ultrasound to provide nursing and other healthcare practitioners with clear guidance on the optimal use of ultrasound imaging to visualise the urinary bladder, take volume measurements and identify patients with and without urinary retention.

These guidelines are intended as a basic guide for healthcare practitioners who wish to adopt ultrasound as an additional skill to enhance their clinical judgment in the diagnosis of patients presenting with lower urinary tract symptoms (LUTS).

Ultrasound imaging should only be undertaken by a competent practitioner – someone who has completed an accredited training course. However this document summarises 'best practice' and covers the safe use of ultrasound in the examination of the urinary bladder by:

- Identifying training needs and competencies
- Providing an algorithm for bladder management
- Making informed decisions on equipment
- Assessing clinical competencies

Successful bladder scanning is all about technique and accuracy and these guidelines aim to guide healthcare practitioners in this important and sometimes overlooked diagnostic area.

Section 2
Background to Bladder Scanning with Ultrasound

Ultrasound is widely recognised as the primary imaging modality in the management of patients.

The rationale for undertaking a bladder ultrasound scan is to enable the healthcare professional to make an informed decision about the clinical management of patients presenting with urinary bladder complications.

Its primary usage in incontinence care is in measuring pre- and post-void residual urine, thus determining bladder volume and potential incomplete bladder emptying. Ultrasound has proved to be an accurate diagnostic tool in the demonstration of pre- and post-micturition volume and the measurement of residual volume.

Bladder ultrasound scanning is non-invasive, safe to use, gives high resolution diagnostic images, and the results are available almost immediately, to help clinicians make the best decisions for their patients.

Clinical Competency

Skills		
The ability to:	Section A. Sign & date	Section B. Sign & date
1. Use appropriate interpersonal skills to inform and enable the patient and/or carer to discuss any fears or anxieties about the procedure		
2. Prepare the appropriate equipment		
3. Ensure the patient is in a safe and appropriate position		
4. Carry out the scan competently and safely		
5. Safely disinfecting of equipment		
6. Record information correctly in patients records and the nursing care plan		

Attitude		
The ability to:	Section A. Sign & date	Section B. Sign & date
1. Accept accountability in support of own actions and maintain competency in relation to bladder scanning		
2. Accept own limitations and know when to seek further advice		
3. Where appropriate, adopt the role of patient advocate		
4. Acknowledge and maintain the rights and values of the individual		

Section 4
What are the Clinical Indications for Ultrasound Scanning of the Bladder?

Clinical indications	Role of ultrasound
To determine: • Urinary retention • Bladder emptying	Benefits to patients: • Non-invasive procedure capable of avoiding intermittent catheterisation
To monitor: • The onset of urinary retention following indwelling catheter removal To assist: • With bladder retraining by determining the bladder volume	Benefits to patients: • Minimises catheterisation of patients while preventing bladder distension and additional complications (e.g. infection) • Facilitates a voiding schedule

Bladder scans are undertaken to help health professionals in their clinical judgement by providing information to assist in ongoing patient management. For example, these scans help to inform decisions about treatment options recommended for use by the patient.

Real-time bladder scanning has the potential to do much more than measure pre- and post-void residual urine – but most practitioners require additional training to extend their expertise in this area.

It is important to remember that every nurse is accountable for his or her own competency and must take appropriate steps if they believe they are incompetent to undertake a specific procedure.

Competencies for Bladder Scanning

These Competencies are to be used in conjunction with:

Policy Scope of Professional Practice

Section A should be signed and dated by the practitioner.

Section B is for completion when the practitioner is assessed by an approved assessor.

Practitioner's Name: _____

Practitioner's Qualification: _____

Section 6
What are the Different Types of Ultrasound Bladder Scanners?

Type of Machine	Advantages	Disadvantages
Real-time scanners	• Dynamic imaging • Real-time images of bladder • Accurate bladder measurements • Requires basic image interpretation skills • Portable	• Initial cost can be higher, depending on model purchased
Non-real time scanners	• Relatively inexpensive • Does not require image interpretation	• Bladder volume measurements only stored here • Inconsistent volume measurements
Hand-held scanners (Non-real time)	• Very portable	

An ultrasound machine has a life of 5-7 years, after which time manufacturers recommend that replacement should be considered. Dedicated bladder volume measurement scanners (all types of machines) should have a robust Quality Assurance Programme (QAP) in place (that is regularly checked and calibrated).

Examples of different scanners include:

Real-time ultrasound scanners

These instruments facilitate dynamic study of the renal system, providing cross-sectional anatomy of the bladder, prostate and kidneys. Images can be stored for purposes of interpretation of both normal anatomy and pathology. In the case of bladder volume measurements, images of the bladder in both longitudinal and transverse section allow accurate measurements of post-micturition volume. They also allow an assessment of bladder wall thickness, prostate size and kidneys.

An example of such a scanner is shown below.

BARDSCAN® IIs Ultrasound Bladder Scanner

Section 14
Further Reading

1 M.Abdel-Fattah & J. W. Barrington (2005) Journal of Obstetrics and Gynaecology 25(2): 186 – 188.

2 Lesley Turnburg (1995) Royal college of physicians, Incontinence, RCP causes management and provision of services, section 2.67.

3 Institutions such as the University of Portsmouth are able to certify safe practice

4 Department of Health (1999) Continuing Professional Development: Quality in the New NHS: HSC – 1999 – 154

5 Nwosu, CR. Khan, KS. Chien, PF. and Honest, MR. (1998). Is Real-Time Ultrasonic Bladder Volume Estimation Reliable and Valid? A Systematic Overview Scandinavian Journal of Urology and Nephrology Volume 32, Number 5 / September 29, Pg. 325-330

6 Chan H. (1993). Noninvasive bladder volume measurement. Journal of Neuroscience Nursing; 25(5):309-12

7 Coombes GM, Millard RJ. (1994). The accuracy of portable ultrasound scanning in the measurement of residual urine volume. The Journal of Urology; 152:2083-2085.

8 Revord JP, Opitz JL, Murtaugh P, Harrison J. (1993). Determining residual urine volumes using a portable ultrasonographic device. Archives of Physical Medicine and Rehabilitation; 74:457-62.

9 Stam HJ, Rijst HVD, Bangma BD. (1991). Ultrasonic determination of bladder volume in patients with spinal cord injury. International Journal of Rehabilitation; 14:256-260.

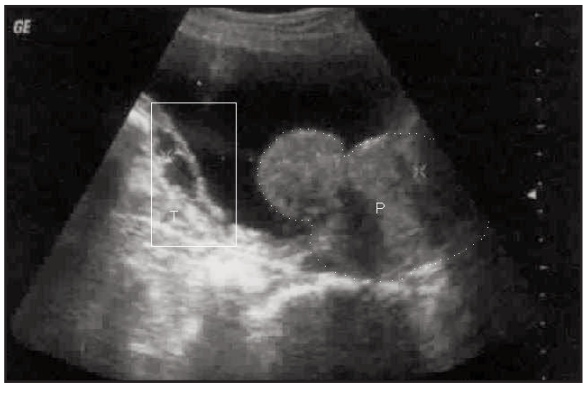
10 NICE Guideline, Urinary Incontinence: The management of urinary incontinence in women, October 2006.

Section 7
Understanding and Recognising Images

In order to obtain the optimal image and increase the accuracy of diagnosis, it is best to start off with the highest possible frequency. For those scanners that offer a choice, resolution is better with a higher frequency (e.g. 5.0 MHz) but penetration is less than that achieved with a lower frequency (e.g. 3.5 MHz).

If available, both saggital (longitudinal) and transverse scanning images should be assessed for optimal results.

Some scanners can be configured for male and female bladders; some may also feature a paediatric function for small bladders.



Typical real-time scan showing a significant prostate scan

Key:
T – Trabeculated bladder wall, P – Prostate

If using a real-time scanner, the quality of the ultrasound image will depend largely on the technique employed:

- to reduce the risk of a grainy image, try the following:
  - press down harder with the probe
  - change the angle of “attack”
  - use more gel

When to refer

Prompt referral for a second opinion is strongly recommended in the event of a suspected pregnancy (either known or unknown to the patient), or in the case of any other irregularities that may be observed on the scan.

Section 12
Financial Management

A business plan for purchasing/maintaining scanners should include the following:

- equipment costs (capital allowances)
- maintenance costs
  (planned preventative maintenance)
- gel/accessories costs
- insurance costs
- product life
  (e.g. cost of replacement scanners)

Section 13
Ultrasound Governance and Quality Assurance

a. Liability insurance

In order to practice safely, healthcare professionals should have a medical indemnity insurance cover, usually provided by their own professional body. All employers are under an obligation to provide liability insurance for all their members for practice in any clinical environment.

b. Implementation of a Quality Assurance Programme (QAP)

QAP is required to ensure safe practice in order to protect patients and staff from misdiagnosis and malpractice.

c. Maintenance programme

Day-to-day care and maintenance points to remember:

- handle with care
- avoid damage
  (e.g. don't leave in boot of car)
- ensure battery is always charged
- do not overheat scanner or probe

In addition, a maintenance programme should be in place with the manufacturers. Scanners should be regularly checked and calibrated; a record should be kept in the logbook of all tests carried out by the engineers, together with any faults and action taken.

Contingency plans must be in place in the event of a scanner that is likely to be out of commission for any length of time (e.g. servicing/recalibration/unforeseen fault).

d. Equipment insurance cover

A comprehensive insurance cover for the scanner and transducers should be in place in case of damage or theft.

Section 9
Practical Issues to Consider in Bladder Scanning

a. Assessment

Bladder distension is required for a proper assessment of the bladder structure, but for calculation of the residual volume the bladder should be empty. The patient should ideally be supine although if necessary the bladder can be viewed from the standing or sitting position.

b. Risk assessment

Healthcare professionals may need to take particular care when scanning patients who:

- are pregnant
- have a pacemaker
- have a latex allergy

c. Patient consent

Patients should be approached for consent in all cases prior to an ultrasound procedure, in line with Trust protocol. In cases where students are present in the room or participating in clinically supervised training, patients should have prior information either in writing or verbally, so that they can give informed consent.

d. Chaperone

Patients should be given an opportunity to decide whether or not they want a chaperone during an ultrasound examination. Refer to Trust protocols if appropriate.

e. Explanation of procedure

Limitations and potential advantages of the examination should be highlighted and explained to patients before undertaking the scanning. If appropriate a written explanation of the procedure can be made available to patients when they book an appointment.

f. Communication (prior, during and after the examination)

Healthcare professionals should provide a full explanation of the procedure and its implications, whenever relevant and at appropriate times. This will allow the patient to fully comply with the examination procedure, ensuring a satisfactory outcome.

g. Reporting of results

A reporting protocol should be in place, integrated with Trust protocol. Healthcare practitioners should have written information on referrals, second opinions, the reporting of results/outcomes to patients and counselling in cases where abnormalities have been detected.

h. Artefacts

Artefact or misrepresentation of the image is an important factor that may affect diagnosis and interpretation.

The following specialists have contributed to the development of this protocol:

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Continence Advisor, Bristol PCT and Nursing Lead,
Biomed HTC, Southmead Hospital

Sharon Eustice
Consultant Nurse, Continence Promotion Service,
Cornwall & Isles of Scilly

Debbie Woodcock
Chief Clinical Technologist, Clinical Measurement Department,
Royal Devon and Exeter Hospital

Appendix 3
Record of Clinical Practice

Guidelines:

- A total of 50 examinations must be submitted
- The examinations recorded should demonstrate experience in the following areas: pre and post micturition bladder volume
- A competent person should supervise all examinations

Record of Clinical Training: Bard Ultrasound Course		
Date	Clinical Details	Signature

Contents

Clinical Competency

Practitioner

I confirm that I have self assessed/been assessed (delete as appropriate) as competent to undertake bladder scanning.

Signature of Practitioner: _____

Date: _____

Approved Assessor (where appropriate)

Competence for bladders canning has been assessed and the practitioner deemed competent.

Signature of Assessor: _____

Date: _____

Acknowledged by:

Signature of Practitioner Manager/Clinical Supervisor: _____

Date: _____

Section 3
What is Ultrasound?

Ultrasound is defined as a technique where sound waves are pulsed into the body, creating a series of vibrations. The resulting echoes are measured, thereby building an image of dense and non dense tissue.

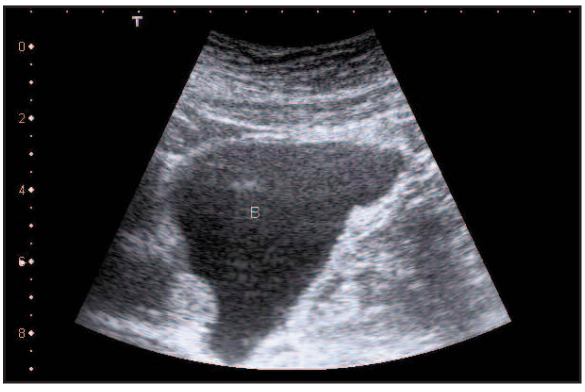
Sound waves are produced by creating a series of vibrations, or compression fronts which then travel through whatever medium they are being projected into. If we consider sound waves that are detectable by the human ear, then we know that low deep sounds travel further than high sounds and indeed sound waves that are at, or just below, the lower detection limit of the ear are actually felt as vibrations by the whole body rather than physically 'heard'.

The intensity of the echoes is translated into a grey scale:

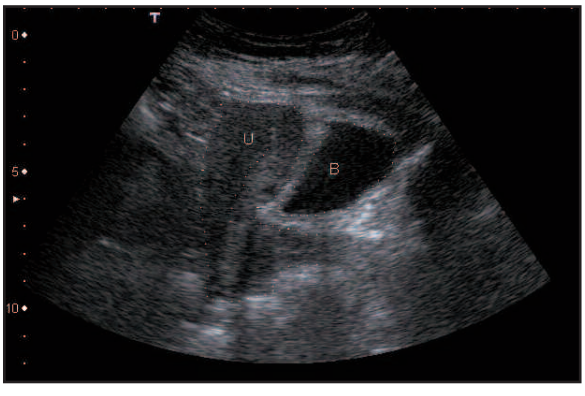
- an object or tissue returning a strong echo will be normally be visualised at the top of the grey scale, i.e. bright white
- a weak echo or region without echo will be interpreted at the bottom of the grey scale, i.e. black

Deep sounds penetrate further. For example, an ultrasound frequency of 3.5 MHz might be used for general deep tissue penetration; and 5.0 MHz for organs closer to the surface of the body, or for smaller bodies.

Typical saggital scan – male



Typical saggital scan – female



Images provided courtesy of
Debbie Woodcock, Chief Clinical Technologist,
Clinical Measurement Department,
Royal Devon and Exeter Hospital

Key:
U – Uterus, B – Bladder

Clinical Competency

The practitioner will be expected to demonstrate the following competencies when accepting and performing the nursing practice of bladder scanning

Complete either Section A or B as appropriate

Knowledge		
The ability to:	Section A. Sign & date	Section B. Sign & date
1. Identify local policies / procedures regarding bladder scanning		
2. Identify and describe own professional accountability		
3. State the conditions in which bladder scanning may be required.		
4. Describe the anatomy and physiology of the urinary system.		
5. Describe relevant equipment, infection control policy and maintenance policy.		
6. Indicate the differential diagnosis		
7. Describe the procedure for bladder scanning		
8. Discuss the implications of bladder scanning and appropriate action for:		
8.1 Residual greater than 100mLs		
8.2 Residual greater than 600mLs		
8.3 Discrepancy between result and history		
8.4 No residual		
8.5 Patient unable to void		
9. Select and apply relevant research as an aid to practice		

Section 5
What are the Advantages and Disadvantages?

Bladder ultrasound scanning offers the following advantages to the practitioner and patient. It:

- is a non-invasive procedure
- complements the finding of other investigations to provide a more complete picture
- allows early detection of bladder problems
- reduces the need to refer patients to the ultrasound department
- provides simple monitoring of bladder problems at set intervals
- eliminates the need for urinary catheterisation to measure urine volume
- enhances patient care and management
- can provide cost benefits as it enables the best use of available resources

Disadvantages may include:

- training of staff to undertake ultrasound scanning is required
- patients may still need further investigations after scanning
- maintenance of equipment must be considered
- false positive results can be shown

Appendix 1
Recommended Guidelines for Clinical Competency

Practitioners require the knowledge, skills, training and practice to ensure competency in bladder scanning.

Case Study Guidelines

Criteria:

You are asked to complete two case-studies (500 words each) in the following areas:

All case studies should be supported with relevant images and sketches of explanation of the anatomy and pathology demonstrated.

You should include two case-studies in the following areas:

- pre-micturition volume
- post-micturition volume

Format:

The following guidelines are intended to assist in the completion of the case studies. They are not exhaustive or intended to be constraining and you have the freedom to provide any information relevant to the case study produced.

- Patient identification (no patient names should be used, use numbers medical record code etc)
- Patient preparation
- Clinical indication for the examination
- Type of ultrasound machine used
- Details of examination technique used and modification applied
- Advantages and limitations of the technique
- Conclusion arrived from the technique
- Any references / further studies carried out

Non-real time ultrasound scanners

These are battery-operated ultrasound scanners which give a digital reading of bladder volume without images.

Hand held ultrasound scanners

These are battery operated, easy to use hand-held scanners allowing for quick estimation of bladder volume. The scanner is placed on the lower abdomen in the midline on top of a full bladder and by pressing a button allows the machine to measure the volume. The disadvantage is that the operator is unable to visualise the bladder and needs to adjust or angle the device to obtain a measurement. Inconsistencies in user bladder measurement are potentially possible with this type of device.

e. Education

All healthcare professionals have a duty of care to protect patients and staff members from misdiagnosis and malpractices. Continuing professional development (CPD) is key to delivering highly effective healthcare and supporting clinical governance. It is the career-long learning process that enables the needs of clients to be met and services to develop through professional and individual growth, enhancement of skills, knowledge and competence, and improved performance (DOH 1999).

f. Audit

Practitioners should conduct regular audits of their clinical practice; in ultrasound, at least 10% of the images/volume measurements should be subjected to external scrutiny every year. This can be facilitated with assistance through local continence services and further education courses.

Section 8
Algorithm for Bladder Investigation

Step 1 Assessment of clinical symptoms

- voiding difficulties
- obstructive symptoms
- common neurological problems
- recurrent UTI's

Step 2 Clinical investigations

- history
- medication
- uroflowmetry
- DRE
- ISS assessment
- PSA, U/E, PV
- urinalysis, creatinine

Step 3 Bladder ultrasound (obtain verbal consent in line with local policy)

Step 4 Post-micturition volume

- < 100mLs: clinical management
- > 100mLs: monitor/repeat
(consider referral to consultant)

Section 10
Competency in Scanning

Continuing professional development (CPD) is key to delivering highly effective healthcare and supporting clinical governance. Safe practice is facilitated by linking to a programme of training which provides basic level skills in the use of ultrasound, leading to clinical competency. Bladder scanning courses run by local specialists are recommended as a minimum training requirement.

Demonstration of clinical competency should be recognised and accredited by the Society of Radiographers and/or relevant professional bodies.

- Knowledge and skills framework
- Supervised practice
- Clinical assessment

Section 11
Infection Control and Prevention

Because of the risk of Methicillin-resistant Staphylococcus aureus (MRSA) and other potentially harmful micro-organisms, equipment must be cleaned with decontaminating wipes following each and every episode of use.

In the case of the portable, hand-held, ultrasound bladder scanner, this applies both to the probe (in contact with the patient's skin) and the scanner itself (handled by staff that have in turn touched the patient's skin).

An alcohol rub should be used to decontaminate hands immediately before each and every episode of direct patient contact, and after any activity or contact that may result in hands becoming contaminated. If hands come into contact with ultrasound gel, they should be washed thoroughly with an antiseptic scrub.

For extra protection against infection when operating in close proximity to the site of a wound, cover the ultrasound probe with a condom or latex-free glove. This will not compromise the result.

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