
# Guidelines For Professional Working Standards

# Ultrasound Practice

**United Kingdom Association of Sonographers**
**October 2008**

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# INTRODUCTION

This document is the result of four earlier documents, the Guidelines for Professional Working Practice, published in December 1993, the Guidelines for Professional Working Practice - Reporting, in April 1995, the Guidelines for Professional Working Standards, August 1996 and the first Guidelines for Professional Working Standards - Ultrasound published in October 2001.

Consultations were held with sonographers in centres throughout the UK during the revision process in order to collect a range of current ultrasound practice evidence to inform the changes. Contributions were obtained from other ultrasound bodies in support of the document.

These professional working standards, which are not prescriptive, are made available to sonographers to be used as guidelines for good practice. Since the publication of the Guidelines for Professional Working Standards in 1996, service provision, technology and patient expectations in medical ultrasound have been transformed. For this reason, the examination specific section has been changed to present generic statements in order to provide a basis on which departments can generate their own procedures and protocols. In response to considerable queries from sonographers related to practice issues, a new section has been introduced to offer guidance. In addition, sonographers are advised to access additional documents such as occupational standards for medical ultrasound[1] and *skills-for-health* statements[2] in order to inform local departmental procedures.

It is becoming increasingly common practice to identify and write standards in an outcome-based format rather than to provide prescriptive statements of 'how to do' or 'what to measure'.
An example might be:

*...on completion of the general ultrasound examination, the sonographer must be able to demonstrate that a competent assessment of the patient has been undertaken to match the clinical request by the acquisition of appropriate images and a conclusive written report...*

After consideration and reviewing the work undertaken with sonographers during this review process, it has been decided, that whilst acknowledging this development places individual accountability on each practitioner for the examinations that they undertake, to retain the original style for the standard statements would be more appropriate at this time.

Reporting examples have been preserved at the request of sonographers. However it is recommended that they are used for guidance purposes only as many departments have introduced their own reporting procedures that reflect local practice.

The terms *patient* and *client* in some sections are interchangeable. For ease of reading, the term *patient* has been used throughout this document. Several titles are used by health care professionals who practise ultrasound. The title *sonographer* has been utilised to represent any practitioner carrying out an ultrasound examination.

The use of texts, peer-reviewed material and web-sites has been kept to a minimum as currency of such material is likely to be limited by continual changes in the practice area. This aligns with current opinion. It is the responsibility of the reader and user to ensure that they research and apply the most up to date evidence in association with the contents of this document. At the time of publication all references stated are accurate.

The Trustees would like to acknowledge the contributions made by Gillian Allinson, Jean Carter, Liz Chapman, Jeanette Clewes, Katy Cook, Anne-Marie Dixon, Theresa Fail, Andrew Fairhead, Kath Gration, Alison Hall, Crispian Oates, Steve Savage, Simon Thoroughgood and the sonographers who attended the workshops.

***Trish Chudleigh, Rosemary Lee, Wendy Williams, Jean Wilson - UKAS Committee, October 2008***

References

1. The University of Hertfordshire and Prime Research and Development Ltd. (1998). *Occupational Standards for Diagnostic Ultrasound.* London: The College of Radiographers and South and West Regional Office of the NHSE.
2. http://www.skillsforhealth.org.uk/page/competences/competences-projects-in-development/list

# SECTION 1
## GENERAL GUIDELINES

The minimum qualification for non-medical sonographers to practise in the UK is a Postgraduate Certificate in Medical Ultrasound or equivalent as recommended by the Consortium for the Accreditation of Sonographic Education (CASE).[1] Individuals without a recognised qualification, including student sonographers, should always be supervised by qualified staff.

The sonographer should:

- recognise his/her scope of practice and work within its boundaries
- ensure that a locally agreed written scheme of work is in place
- accept properly delegated responsibility, in accordance with local practice and guidelines

An ultrasound examination should not be carried out unless a valid request has been received. The request should include such clinical details as are relevant to the examination, clear identification of the person requesting the examination and to whom the report should be directed.

Sonographers are strongly advised to register on the National Voluntary Register for Ultrasound Practitioners in support of practice regulation.[2,3]

References
1. Consortium for the Accreditation of Sonographic Education. (2000) *CASE Accreditation Handbook.* London: CASE.
2. http://www.ukasonographers.org
3. http://www.sor.org

## 1.1 SAFETY OF MEDICAL ULTRASOUND

"...Diagnostic ultrasound has been widely used in clinical medicine for many years with no proven deleterious effects. However, if used imprudently diagnostic ultrasound could be capable of producing harmful effects. The range of clinical applications is becoming wider, the number of patients undergoing ultrasound examinations is increasing and new techniques with higher acoustic output levels are being introduced. It is therefore essential to maintain vigilance to ensure the continued safe use of ultrasound..."[1]

A broad range of ultrasound exposure is used in the different diagnostic modalities currently available. Doppler imaging and measurement techniques may require higher exposures that those used in B- and M-modes, with pulsed Doppler techniques having the potential for the highest levels.

Modern equipment is subject to output regulation. Recommendations related to ultrasound safety included in this publication assume that the equipment being used is designed to international or national safety requirements and that it is operated by competent and trained personnel.

It is the responsibility of the sonographer to be aware of and apply the current safety standards and regulations[2] and to undertake a risk/benefit assessment for each examination.

The sonographer should be responsive to:

- potential bio-effects of ultrasound and the need to minimise dose at all times
- potential hazards arising from the particular ultrasound equipment
- relative risks for each application[3,4]
- conditions where current recommendations contra-indicate the use of certain types of ultrasound equipment
- current guidelines regarding replacement of ultrasound equipment[5]

References

1. http://www.efsumb.org/ → Committees → Safety Committee (ECMUS) → Clinical Safety Statements
2. http://www.bmus.org/ → Ultrasound Safety → Ultrasound Safety & Guidelines → BMUS Safety Guidelines
3. Barnett, S. B. and ter Haar, G., (2000). *Guidelines and recommendations in The Safe Use of Ultrasound in Medical Diagnosis,* ter Haar and Duck FA (ed). London: British Institute of Radiology
4. ISUOG Safety statement 2003 (access for [temporary] members only) http://www.isuog.org/EducationAndTraining/StatementsandGuidelines/Statements/
5. Routine Ultrasound Screening in Pregnancy; Protocol, Standards and Training. Supplement to Ultrasound Screening for Fetal Abnormalities; Report of the RCOG Working Party. July 2000. RCOG Press

## 1.2 ULTRASOUND EQUIPMENT AND QUALITY ASSURANCE TESTING

The sonographer is expected to:

- have detailed knowledge of ultrasound equipment in order to ensure that it is appropriate for purpose
- manipulate the equipment correctly so that patient diagnosis and management are not compromised
- ensure that an agreed quality assurance programme is in place that incorporates the regular inspection of ultrasound machines and auxiliary equipment

The stated aim of quality assurance procedures applied to ultrasound equipment is to ensure consistent and acceptable levels of performance of the imaging system and image recording facilities. Most quality assurance protocols focus on the consistency of specific features of image quality over time. The acceptability of image quality may not be apparent from measurable changes in the parameters tested. The issue of what constitutes unacceptable equipment performance is still very difficult to assess objectively. In the absence of nationally accepted performance standards for ultrasound equipment, local and subjective evaluation is required.

This programme should include a policy on:

- electrical safety tests carried out at least once a year by qualified personnel[1]
- baseline/acceptance testing of all new or upgraded equipment, and following major repair
- user tests including weekly inspection of cables, transducers, monitor and image recording facilities

A quality assurance programme should be developed in discussion with medical physics or service engineers, for each individual machine. This should be based on its clinical uses, the modes and functions utilised, the transducer types and frequencies and the auxiliary equipment attached. The programme should indicate clearly the limits of acceptability for each test, what and by whom action should be taken when these are exceeded.

The sonographer's responsibilities in relation to the ultrasound equipment should include:

- appropriate selection for the examination and awareness of its limitations within that clinical context
- manipulation of the controls to maximise the clinical information observed
- awareness of system artefacts and how to interpret their appearances
- ensuring that the equipment is suitably maintained to provide optimal images
- ensuring that all transducers are appropriately prepared and cleaned according to the manufacturers' guidelines, with especial reference to intra-cavitary probes
- awareness of and adherence to local infection control procedures
- ensuring that the recorded image is an accurate record of the displayed real-time information
- following the proper shut-down procedure for the equipment, so that stored data and settings are not corrupted or lost
- inspection for electrical and mechanical safety, ensuring that apparently unsafe equipment is not used until it has been checked and repaired
- agreement of equipment performance criteria for each type of examination undertaken. (This should be updated regularly, in line with new developments in equipment carry performance)
- reporting any concerns in relation to the performance of specific equipment
- awareness of current guidelines regarding the replacement of ultrasound equipment

References

1. MHRA Device Bulletin DB2006(05) "Managing Medical Devices: Guidance for healthcare and social services organisations", Nov. 2006. Available at www.mhra.gov.uk/Home → Publications → Safety guidance → Device Bulletins

## 1.3 ULTRASOUND EXAMINATION PROCEDURES

Relating to all ultrasound examinations, the sonographer should be aware of locally agreed standards of practice and current guidelines of other professional bodies and organisations.

The following points should be considered for all ultrasound examinations:

- the clinical details provided are sufficient to carry out the examination requested and the correct examination has been requested
- relevant information is available from the case notes, previous investigations and other sources
- the role of the ultrasound examination is understood in the clinical context for the patient
- informed consent is obtained before proceeding with the examination
- the necessity for the presence of a chaperone and/or an interpreter
- a systematic scanning approach that can be modified according to the individual patient
- the implications should the examination be incomplete
- the need to extend the ultrasound examination, and/or proceed to additional imaging techniques where necessary in accordance with locally agreed protocol
- the after care of the patient
- the potential risks involved in the procedure to the patient
- appropriate national and local Health and Safety regulations including infection control

## 1.4 COMMUNICATION

Whilst undertaking any ultrasound examination and working in accordance with locally agreed practice, the sonographer should:

- obtain sufficient verbal and/or written information from the referring clinician to undertake correctly the examination requested
- be mindful of the need to use interpreters as and when necessary to communicate adequately with the patient
- greet the patient using his or her full name and status
- be able to discuss the relative risks and benefits of the examination with the patient
- explain the scanning procedure appropriately to the patient
- obtain informed consent* from the patient or their representative being mindful of his/her capacity to understand[1,2]
- be aware of the individual patient's special needs including chaperoning and privacy during the examination+
- be professional and understanding throughout the examination; manage the interaction between the patient and any accompanying adults and children in a way that enables the examination to be carried out to a competent standard
- explain and discuss the findings with the patient
- interpret and communicate the findings appropriately and in a timely fashion to the referring clinician[3]
- ensure appropriate arrangements have been made for further care before the conclusion of the examination.

* *Refer to Section 1.5*
\+ *Refer to Section 1.6*

References
1. The Royal College of Radiologists (2005) *Standards for Patient Consent Particular to Radiology*. London: The Royal College of Radiologists.
2. Mental Capacity Act 2005.
3. National Patient Safety Agency, February 2007: Early identification of failure to act on radiological imaging reports.

Additional Reading
- http://www.npsa.nhs.uk
- http://www.dh.gov.uk
- http://www.rcr.ac.uk

## 1.5 INFORMED CONSENT FOR ULTRASOUND EXAMINATION

Valid consent must be obtained before starting any ultrasound examination or procedure. Healthcare professionals who do not respect the right of a patient to determine what happens to their own body in this way may be liable to legal or disciplinary action.

The consent process is a continuum beginning with the referring health care professional who requests the ultrasound examination and ending with the sonographer who carries it out. It is the responsibility of the referring professional to provide sufficient information to the patient to enable the latter to consent to the ultrasound examination being requested. It is the responsibility of the sonographer to ensure that the patient understands the scope of the ultrasound examination prior to giving his or her consent.

Verbal consent must be obtained for all examinations. Additional verbal consent should be obtained where a student sonographer undertakes part or all of the ultrasound examination under supervision.

Consent for those of an intimate or invasive nature should be recorded in the ultrasound report. (Refer to Section 4.4).

Local schemes of work should clearly state which examinations require written consent.

Literature which explains the scope of the examination clearly and accurately should be made available to patients prior to the ultrasound examination.

Additional Reading


- BMA (2006) Consent and capacity London, British Medical Association
- http://www.bma.org.uk/ap.nsf/Content/Hubethicsconsentandcapacity
- DH (2007) Consent London, Department of Health http://www.dh.gov.uk/en/Policyandguidance/Healthandsocialcaretopics/Consent/index.htm
- NSC (2007) Informed Consent
- http://nscfa.web.its.manchester.ac.uk/images/Fetal/Publications/Consent%20Standards%20Booklet_final.pdf
- http://nscfa.web.its.manchester.ac.uk/images/Fetal/Publications/antenatal_working_standards.pdf
- RCOG (2004) Obtaining valid consent. Clinical Governance Advice No 6. London, Royal College of Obstetricians & Gynaecologists.
- http://www.rcog.org.uk/resources/Public/pdf/CGA_No6.pdf
- RCR (1998) Intimate examinations. BFCR (98) 5. London, Royal College of Radiologists.
- http://www.rcr.ac.uk/index.asp?PageID=310&PublicationID=73

## 1.6 INTIMATE EXAMINATIONS

The definition of an intimate examination may differ between individual patients for ethnic, religious or cultural reasons. In addition, some patients may have a clear preference for a health carer of specific gender due to their ethnic, religious or cultural background, because of previous experiences or in view of their age. Where possible such individual needs and preferences should be taken into consideration.

When conducting an intimate and/or invasive examination, the sonographer should:

- act with propriety and in a courteous and professional manner
- communicate sensitively and politely using professional terminology
- use a chaperone when appropriate
- respect the patient's rights to dignity and privacy
- comply with departmental schemes of work and guidance

Patients should not be asked to remove clothing unnecessarily - when required private, warm, comfortable and secure facilities for undressing and dressing should be provided. Care should be taken to ensure privacy in waiting areas used by patients not fully dressed in their own clothes. During the ultrasound examination only those body parts under investigation should be exposed.

Care must be taken to maintain confidentiality when non-health care personnel are nearby.

Patients should be offered the opportunity to have a chaperone, irrespective of sonographer gender and examination being undertaken.

A record should be made in patient records when chaperones are offered and used, and when they are declined. The record should include the name and designation of the chaperone. Chaperones should normally be members of the clinical team who are sufficiently familiar with the ultrasound examination being carried out to be able to reliably judge whether the sonographer's actions are professionally appropriate and justifiable.

For professional integrity and personal safety the sonographer should give equal consideration to their own need for a chaperone irrespective of the examination being undertaken or the gender of the patient.

The patient's privacy and dignity should be maintained throughout the examination which should be conducted without interruption. Only personnel necessary for carrying out the ultrasound examination should be in the room during intimate examinations.

It is good practice to ensure that both hand washing and equipment cleaning are carried out in full view of the patient at the beginning and at the end of the intimate examination to reassure him or her that effective infection control procedures are being applied.[1]

References
1. http://www.dh.gov.uk/en/AdvanceSearchResult/index.htm?searchTerms=hand+washing+intimate+exams

Additional Reading
- RCR (1998) Intimate examinations. BFCR (98) 5. London, Royal College of Radiologists.
- http://www.rcr.ac.uk/index.asp?PageID=310&PublicationID=73

## 1.7 ERGONOMIC PRACTICE

### Prevention and Management of Work Related Musculoskeletal Disorders

Work related musculoskeletal disorders (WRMSD) are becoming increasingly associated with ultrasound practice. This is due to two major factors - escalating patient referrals and the increasing body mass index of the population. It is important that sonographers take care of their posture and working environment whilst scanning.

Employers have a duty of care to their employees and should be guided in ways to avoid potential work related injuries, i.e. by supplying equipment fit for purpose and being realistic about time management[1]. Departmental guidelines should include strategies to minimise the risk of WRMSD, including appropriate management of workload. (Refer to Section 1.8).

The risk of WRMSD can be reduced by:

- exercising and stretching before starting to scan, and in between examinations
- using a height-adjustable couch
- using a height-adjustable chair
- using separate viewing monitors for the sonographer and the patient
- placing feet flat on the ground i.e. not balanced on the machine base
- abducting the scanning arm to the least degree of angle possible by positioning the patient appropriately on the couch
- using a ‘power grip’ to hold the transducer rather than a ‘finger (pinch) grip’
- changing scanning position between examinations (sitting/standing)
- avoiding repeatedly carrying out the same type of examination
- positioning scanning sundries within easy reach
- positioning the scanning monitor to be viewed at a 15° downward angle
- setting the room temperature, including air conditioning, to a comfortable level
- adjusting the ambient light to suitable levels for both examination and report writing[2]
- taking short but frequent breaks from scanning
- taking responsibility for addressing personal workload issues

### Managing the Obese Patient

In order to reduce the likelihood of the sonographer developing WRMSD and/or exacerbate the condition when present, multiple repeat examinations of obese patients/patients should be avoided. Clinical obesity is defined as a body mass index (BMI) >35. Where inadequate visualisation is due to clinical obesity of the patient, one repeat examination only should be offered.

Should the examination remain incomplete at the second attempt, the sonographer should record in the report that the examination could not be completed, due to increased patient BMI and that no further appointment has been given. (Refer to Section 2.5).

The sonographer should be aware of the recommended weight limits for various examination couches and ensure appropriate equipment is available or make suitable arrangements when necessary.

References
1. Health & Safety at Work Act (1974)
2. http://nscfa.web.its.manchester.ac.uk/cms.php?folder=94#fileid367

Additional Reading
- Dodgeon, J., Bernard, F., Wilde, J. and Newton-Hughes, A (2002) *Avoidance of musculo-skeletal disorders during ultrasound scanning.*
- The Causes of Musculoskeletal Injury Amongst Sonographers in the UK Ransom 2002 (SCoR). http://www.asum.com.au/open/home.htm
- http://www.soundergonomics.com

## 1.8 GUIDANCE ON ULTRASOUND EXAMINATION TIMINGS

In the context of this section, the examination is defined as the following:

Assessing the ultrasound request, introductions, explanation and consent, the ultrasound procedure, discussing the findings with the patient, writing the report, archiving the images and attending to the after-care of the patient including arrangements for further appointments and/or investigations.

The sonographer has a professional responsibility to ensure that the time allocated for an examination is sufficient to enable it to be carried out competently. It is critical to patient management that no ultrasound examination is compromised by departmental and/or government targets.

The allocated appointment time for specific ultrasound examinations will vary depending on their type and complexity. It may also be influenced by the expertise of the sonographer and/or training commitments within the department. In addition the duration of the examination will be further influenced by the scan findings and/or the condition of the patient.

It is recommended that the minimum time allocated for an ultrasound appointment is no less than 15 minutes. In order to provide adequate practical training without compromising the examination, it is recommended that the allocated time where training is being undertaken should be doubled.

The following recommendations in Table 1 have arisen from a series of consultation workshops with UKAS members. They are offered for guidance purposes and represent minimum allocated appointment times. They are illustrative only, and not exhaustive.

Additional Reading
- Bates, J., Deane, C., and Lindsell, D. (2003). Extending the provision of ultrasound services in the UK. London: *BMUS Journal*
- South West London Workforce Development Confederation (2003). *Modernising the Clinical Ultrasound Service.* London: South Bank University
- Royal College of Obstetricians and Gynaecologists (2000). Routine Ultrasound Screening in Pregnancy. Protocol, Standards and Training
- Fetal Anomaly Screening Programme - http://www.screening.nhs.uk/fetalanomaly/home

**TABLE 1 Recommended Examination Timings**

| ALLOCATED APPOINTMENT TIME | ULTRASOUND EXAMINATION EXAMPLE |
|---|---|
| | |
| **15 minutes** | Follow up of screening for abdominal aortic aneurysm |
| | Follow up of screening for endometrial hyperplasia |
| | |
| **20 minutes** | Pregnancy dating |
| | 3rd trimester review |
| | Referral for gall bladder disease |
| | Referral for urinary tract pathology |
| | Referral for testicular lump |
| | Referral for thyroid mass |
| | Follow up of known liver disease (eg: cirrhosis / hepatitis) |
| | Follicular tracking for assisted reproductive techniques |
| | Referral for gynaecological indications |
| | Peripheral vascular referrals (eg: DVT / carotid stenosis) |
| | |
| **30 minutes** | 1st trimester pregnancy screening (nuchal translucency) |
| | 2nd trimester routine anomaly screening |
| | Paediatric / neonatal referrals |
| | Investigation for diffuse liver disease |
| | Investigation for portal hypertension |
| | Breast Referrals |
| | Cardiac Referrals |
| | |
| **45 minutes** | Interventional procedures - biopsies, contrast, fetal therapy |
| | Known twin pregnancy including 1st trimester screening |
| | |
| **60 minutes** | Bedside examinations (total time away from department) |
| | Intra-operative procedures |

## 1.9 MEDICO-LEGAL ISSUES

The place of work should have a written set of guidelines that accurately describes the range of ultrasound examinations undertaken. Their content should address the ultrasound examinations, their reporting and the appropriate referral pathways for patients with normal and abnormal ultrasound findings. The details in the guidelines should be such that a new staff member, having read the guidelines, could carry out and report these examinations and appropriately refer the patient after the examination to the expected standard. Guidelines should be updated regularly and their review date should be included in their content. Superseded guidelines should be kept on file permanently.

Records are currently required by law to be kept for a number of years as specified by individual institutions.

The following guidance should be considered:

- Sonographers should be aware that they are legally accountable for their professional actions, including the reporting of ultrasound examinations, in all circumstances
- The report is a public document and part of the hospital medical records, together with any hard copy images, computer stored images and/or video recordings which may accompany it (Refer to Section 4.2)
- The patient consents to an ultrasound examination that he or she has the right to expect will be delivered and reported by a competent sonographer (Refer to Section 1.5)
- A competent sonographer is one who works to the standards defined by the guidelines of his or her place of work, the code of conduct of his or her professional body, the guidelines of that and other relevant bodies and of the regulatory body where appropriate
- The standard of care provided by a competent sonographer is that which the majority of similar individuals would provide and/or which a significant body of similar individuals would provide in similar and contemporaneous circumstances
- Images that accompany an ultrasound examination carried out by a competent sonographer evidence the assumption that the necessary standard of care has been delivered (Refer to Section 4.2)
- All images must be capable of being attributed to the correct examination and should include the correct patient identifier(s), examination date and time
- As the majority of medico-legal issues currently relate to obstetric ultrasound examinations it is recommended that:
    - for dating examinations the images displaying the measured embryonic or fetal sections referred to in the written report should be taken and stored
    - for 1st trimester nuchal translucency Down's screening examinations a minimum of two images should be taken namely:
        - the measured crown rump length
        - the measured nuchal translucency
    - for 2nd trimester anomaly examinations a minimum of four images should be taken namely:
        - the measured head circumference section demonstrating the cavum septum pellucidum and lateral ventricles
        - the measured transcerebellar diameter section
        - the measured abdominal circumference
        - the measured femur length

- for growth examinations the images displaying the measured fetal sections referred to in the written report should be taken and stored
- any additional fetal anatomy that is measured and referred to in the written report, such as a dilated renal pelvis, should also be imaged and stored
- representative images of any abnormal or unusual findings referred to in the written report should be imaged and stored

## 1.10 ULTRASOUND SCREENING PROCEDURES

It should be noted that ultrasound screening programmes may differ across the four countries of the UK and sonographers should contact the relevant Health Departments for current advice.

Screening programmes should follow the principles laid down by the World Health Organisation[1]. There are several ultrasound screening programmes based on local practice, research evidence or national guidance currently offered in the UK. These include:

- Antenatal ultrasound screening for Down's syndrome[2,3]
- Fetal anomaly screening[4]
- Aortic aneurysm screening in the elderly male population[2]

Provision of an ultrasound screening programme requires the same level of competence, understanding, consent and patient care as any other ultrasound examination.

### Pregnant Women Declining Antenatal Ultrasound Screening

At the current time, all women should be offered antenatal ultrasound screening for Down's syndrome and fetal anomalies as part of their maternity care.[2,3,4]

Prior to attendance at the ultrasound department, all women should be provided with appropriate information, based on national and local guidelines, about the screening test in order to make an informed choice on their care.[1,2] (Refer to Section 1.5).

Some women may choose to decline screening and/or any ultrasound examination during pregnancy.

In cases where a woman declines ultrasound screening, the sonographer is advised to:

- confirm that the woman has understood the reason for the ultrasound examination and if necessary, in accordance with local procedure, request the services of a designated interpreter
- comply with the woman's wishes to decline screening
- document the woman's decision to decline ultrasound screening in the report
- adhere to local protocols to manage any subsequent ultrasound examinations e.g. dating scan when a possible abnormality might be detected.

If the sonographer has any reason to query either the clinical request for screening, the woman's knowledge of the procedure and risks involved or a request from a woman for part-screening (chromosomal or structural), the sonographer should contact the referring health care professional for clarification.

Depending on local protocols related to giving patients relevant and appropriate information, women who are undecided about ultrasound screening could be given the following:

*"…In order to confirm your pregnancy, to take measurements to provide you with an expected date of delivery, confirm that your baby's heartbeat is present and establish the site of the afterbirth, various views of your baby must be obtained. The sonographer will need to take a detailed look at your baby and obtain various ultrasound images whenever you attend for your scan(s).*

*If we identify any unusual findings in any of these images - which might include for example a twin pregnancy, the fact that your baby has died, or that an abnormality is present - we are professionally obliged to inform you. We are also obliged to inform your midwife or medical practitioner of these findings in a written report.*

*By consenting to any ultrasound scan 'to check your baby or provide details of your dates', you should accept the above statement related to the sonographer's professional practice code. If you find this unacceptable then you may wish to consider declining your scan appointment…"*

You are advised to refer to the relevant sections in this publication for additional guidance on specific ultrasound examinations and techniques applied in health care screening.

References

1. Wilson, J.M.G. and Junger, G. (1968) Principles and Practice of Screening for Disease: WHO available at http://whqlibdoc.who.int/php/WHO_PHP_34pdf
2. http://www.nsc.nhs.uk
3. http://www.screening.nhs.uk/downs/home
4. http://www.screening.nhs.uk/fetalanomaly/home

# SECTION 2
# EXAMINATION SPECIFIC GUIDELINES

## 2.1 GUIDELINES RELEVANT TO BREAST EXAMINATIONS

All breast ultrasound examinations should be carried out systematically using a combination of longitudinal, transverse, radial, anti-radial and coronal scan planes in order to demonstrate the contours, architecture and ultrasound characteristics of the following:

- skin, nipple and areola
- subcutaneous fat
- superficial and deep layers of the superficial fascia
- lactiferous ducts and sinuses
- fibro-glandular breast and interspersed fatty tissues
- Cooper's ligaments
- retro-mammary space
- pectoralis major, pectoralis minor and serratus anterior muscles
- axilla:

  lymph nodes

  axillary vessels

  muscles and fatty tissues.

The sonographer should be able to:

- communicate the relevant information sensitively, recognising the patient's fears and anxieties
- ensure privacy and modesty
- position the patient in a standardised way to ensure reproducibility of technique and lesion localisation
- carry out a comprehensive extended ultrasound examination of the whole breast(s) +/- axilla(e) or a localised examination targeted to a specific area of the breast according to the individual clinical presentation
- demonstrate the normal anatomy of the breast, axilla and chest wall and associated vascular supply and perfusion using a combination of B-mode and Doppler techniques
- recognise the spectrum of normal ultrasound appearances of breast tissue resulting from physiological variations due to aging or pregnancy
- carry out a simple clinical examination in order to correlate the underlying sonographic appearances of a palpable abnormality
- locate the sonographic position of a mammographically detected abnormality
- recognise and demonstrate abnormal ultrasound appearances resulting from disease
- assess the need to extend the examination to include additional areas of the ipsi-lateral breast and/or the contra-lateral breast in view of sonographic and/or mammographic findings

## Observations

Examination of focal lesions or pathological findings should involve the assessment of:

- size (maximum diameter)
- shape (depth:width ratio)
- outline including margin definition and regularity
- internal echo-texture
- posterior and edge through transmission
- mobility and compressibility
- adjacent tissues

In the case of the use of Doppler, examinations should include the assessment of:

- number, alignment and configuration of vessels
- orientation and relationship of vessels to any lesion
- velocity and resistance of arterial blood flow

Care must be taken to use minimal transducer pressure and to use high frequency (>5MHz), low PRF (~1000Hz), minimal wall filter (50-100Hz) and a colour gain level just above noise level to demonstrate low amplitude low velocity signals.

Where malignancy is suspected the examination should be extended to include the axilla and internal mammary lymph node areas.

Additional Reading

- AIUM. (2002) Standard for the Carry outance of Breast Ultrasound Examination (online) Maryland USA, American Institute of Ultrasound in Medicine. Available at: http://www.aium.org/publications/clinical/breast.pdf
- Dixon AM (2007) Breast Ultrasound: How, Why & When? Edinburgh, Elsevier
- Hagen-Ansert S. (2007) Sonographic evaluation of the breast (online) General Medical Systems, Ultrasound Online CME Courses. Available at http://www.gehealthcare.com/usen/education/proff_leadership/products/msucmebr.html
- RCR. (2003) Guidance on Screening and Symptomatic Breast Imaging. BFCR(03)2, London, Royal College of Radiologists.

## 2.2 GUIDELINES RELEVANT TO GENERAL MEDICAL EXAMINATIONS

During an abdominal ultrasound examination, the anatomical structures which the sonographer should normally examine must be in accordance with the clinical information given and are shown in Table 2.

The sonographer should demonstrate:

- normal anatomy/variants of abdominal organs and structures including age related appearances of the each organ in at least two planes. (This should include assessment of size, outline and ultrasound characteristics)
- pathological findings including focal and diffuse processes and associated haemodynamic findings (pre- and post-operative assessments)
- the presence of any abnormal intra-abdominal fluid collections or masses
- when clinically relevant: vascular anatomy including position, course and lumen of relevant vessels (Haemodynamic observations including the presence/absence of flow, its direction, velocity and variance)
- The emphasis of the examination of the above structures will be altered according to clinical presentation

**TABLE 2 Structures for Abdominal Ultrasound Examination**

| STRUCTURES | EVALUATION |
|---|---|
| **Liver** | size, shape, contour and ultrasound characteristics of all segments appearance of intrahepatic vessels and ducts porta hepatis and adjacent area portal venous, hepatic venous and arterial systems |
| **Diaphragm** | contour, movement, presence of adjacent fluid, masses, lobulations |
| **Ligaments** | appearance of falciform, ligamentum teres and venosum |
| **Gallbladder** | size, shape, contour and surrounding area ultrasound characteristics of the wall and the nature of any contents |
| **Common Duct** | maximum diameter and contents; optimally it should be visualised to the head of pancreas |
| **Pancreas** | size, shape, contour and ultrasound characteristics of head, body, tail and uncinate process; diameter of main duct |
| **Spleen** | size, shape, contour and ultrasound characteristics including the hilum assessment of splenic vein blood flow and presence/absence of collaterals |
| **Aorta** | diameter, course and branches including the bifurcation appearance of its walls, lumen and para-aortic regions |
| **IVC** | patency, diameter, appearance of its lumen and para-caval regions |
| **Adrenals** | not routinely viewed but any apparent abnormality of size and ultrasound characteristics should be noted |
| **Kidneys** | size, shape, position and orientation, outline and ultrasound characteristics of cortex, medulla, collecting system, main and intra-renal arteries and veins |
| **Ureters** | assessment of the presence/absence of dilatation/reflux |
| **Urinary Bladder** | appearance of wall and contents assessment of volume pre- and post-micturition |
| **Prostate** | size and shape |
| **Gastro-Intestinal Tract** | wall thickness, contents, diameter of lumen, motility, presence/absence of masses |
| **Other Structures** | where relevant include: omentum, muscles, abdominal wall, possible hernias, lymph nodes sites for potential fluid collection (including upper/ lower abdomen and the thorax) |
| **Proceed to examination of the pelvis where necessary (Refer to Section 2.3)** | |

## Contrast Enhanced Ultrasound (CEUS)

A contrast enhanced ultrasound (CEUS) examination is the utilisation of a specialised microbubble ultrasound contrast agent combined with dedicated contrast hardware of the ultrasound system in order to evaluate suspected pathologies in specific organs of the body. This is done by observing the enhancement pattern of the lesion during the arterial, portal and late vascular phases (see below). It is increasingly in clinical use for diagnostic imaging and post-interventional procedures e.g. radiofrequency ablation (RFA) for several organs.

CEUS Imaging Post Injection:

- Arterial Phase — starts at 10-20 seconds, ends at 25-35 seconds
- Portal Phase — starts at 30-45 seconds, ends at 120 seconds
- Late Phase — > 120 seconds
- Bubble Disappearance — 240-360 seconds[1]

Individual cases should always be managed on the basis of the clinical information available for that particular patient.

It is preferable that the examination is carried out by two sonographers, one to complete the ultrasound examination and the other to administer the contrast agent.

Refer to Section 2.2 in addition to the following:

The sonographer should:

- review previous images/reports prior to the procedure to confirm the region(s) of interest
- review the clinical history for factors, which might contraindicate the procedure (e.g. allergy to sulphur hexaflouride, uncontrolled systemic hypertension and adult respiratory distress syndrome)
- prepare the contrast agent according to the manufacturer's directions and 5mls of saline prepared in a separate syringe to be used as a flush post injection
- insert venflon according to local protocols, ensuring a strict aseptic technique is used in preparing and giving the I.V. injection
- ensure the appropriate contrast preset is set on the ultrasound system
- inject 2.4mls of contrast agent (using a needle diameter not less than 20G to avoid loss of bubbles due to mechanical impact during injection), to be given initially as a bolus followed by a 5ml saline flush
- ensure that if characterisation of the lesion is unsuccessful or additional lesions are found in the late phase a further 1ml of contrast agent is given focusing on the lesion of interest
- ensure that the examination time is continuous for a period of 5 minutes, but longer if necessary, timed by a stop-clock from the beginning of the examination
- remove the venflon and ensure bleeding has stopped before the patient leaves the department.

In relation to associated knowledge, the sonographer should be aware of:

- local guidelines for acceptance of requests
- the behaviour of benign and malignant lesions
- limitations of CEUS and of the sonographer's own limits of experience and understanding
- the range of diagnostic options available following CEUS and the importance of other imaging techniques
- contra-indications

In relation to departmental procedures, the sonographer should:

- ensure that a protocol is in place for the delegation and injection of the ultrasound contrast agent
- ensure that a protocol is in place for carrying out and reporting of CEUS
- ensure that a programme of annual basic life support training is in place for all staff

References

1. Guidelines for Good Clinical Practice Recommendations for Contrast Enhanced Ultrasound (CEUS) - Update 2008. EFSUMB study group et al. Ultraschall in Med 2008: 29:28-44.

Additional Reading

- Albrecht, T., Blomley, MJK., Bolondi, L., et al. (2004). Guidelines for the use of contrast agents in ultrasound. *Ultraschall Med 25: 249-256.*

## 2.3 GUIDELINES RELEVANT TO GYNAECOLOGICAL EXAMINATIONS

The type of examination carried out, i.e. using vaginal (EV) and/or trans-abdominal (TA) techniques should be directed by the clinical presentation of the patient. As discussed in Section 1.5 a full explanation of the techniques should be given to the patient and appropriate consent sought. The need for a chaperone should also be considered. (Refer to Section 1.6).

The sonographer should consider the following:

- obtaining information regarding the patient's previous medical and menstrual history including stage and cycle
- establishing information relating to any medication e.g. oral contraceptive pill, hormone replacement therapy, Tamoxifen
- that EV ultrasound is the recommended technique for detailed assessment of the endometrium (e.g. referral for post menopausal bleeding) and ovaries (e.g. referral for polycystic ovaries)
- using colour flow mapping and/or power Doppler in appropriate clinical presentations e.g. the assessment of myometrial vascularity, ovarian angiogenesis, endometrial vascularity
- using 3D ultrasound in the assessment of pathology and congenital malformations of the uterus and ovaries

### Observations

The anatomical structures which the sonographer should normally examine during a gynaecological examination should be in accordance with the clinical information given and are shown in Table 3. This should include assessment of size, outline and ultrasound characteristics.

**TABLE 3 Structures for Gynaecological Ultrasound Examination**

| STRUCTURE | EVALUATION |
|---|---|
| **Uterus** | position, size, shape<br>appearance of the myometrium |
| **Endometrium** | appearance and thickness |
| **Ovaries** | position, size, shape, appearance number, size and internal echo pattern of follicles when present |
| **Adnexae** | presence or absence of mass(es). appearance and size when present |
| **Fallopian Tubes** | assessment where visible |
| **Pouch Of Douglas** | presence or absence of fluid and/or masses |

The sonographer should:

- demonstrate the normal anatomy/variants of the female pelvic organs and structures including age related appearances of each organ in at least two planes
- relate the ultrasound appearances to the relevant menstrual or menopausal status with particular attention to any patient drug regime
- demonstrate pathological findings and associated haemodynamic findings
- demonstrate the presence of any abnormal intra-abdominal fluid collections or masses
- review the urinary tract when a pelvic mass is identified

## Assisted Reproductive Techniques

The sonographer should be competent to carry out the following:

- serial examinations to monitor the effect of hormone therapy
- serial examinations to assess timing of ovulation in spontaneous and stimulated cycles
- monitoring for evidence of ovarian hyper-stimulation and ovarian hyper-stimulation syndrome
- serial examinations for monitoring endometrial receptivity in embryo replacement cycles
- confirmation of conception in successful treatment cycles
- confirmation of the presence and site of single/multiple gestation(s)
- assessment for ectopic pregnancy

The sonographer should understand the role of hystero-contrast-sonography (HyCoSy) in the diagnosis of tubal patency and saline installation sono-hysterography (SIS) for the diagnosis of intra-uterine pathology affecting the endometrium.

The sonographer should be aware of:

- the role of the Human Fertilisation + Embryology Agency (HFEA) in assisted conception techniques
- current advice on the requirement for pre-examination analgesia, to include non-steroidal inflammatory drugs (NSAIDs)
- the recommendations of prophylactic antibiotic prescription in accordance with local protocols or guidelines.
- This guidance should be read in conjunction with Section 2.5

## Hystero-Contrast-Sonography (HyCoSy)

The sonographer should refer to Section 1.6 for guidelines on intimate examinations.

The following recommendations are for guidelines to practise and local variations may apply.

The examination should be booked up to Day 14 last menstrual period (LMP). If the patient has a longer cycle than 28 days this can be extended. The patient must be informed of the procedural risk to an early pregnancy.

Before the procedure the sonographer should:

- check LMP, recording the day of cycle and whether regular or irregular
- record any history of infections
- check that the patient's cervical smear checks are current
- give a full explanation of the procedure and gain informed consent before continuing

For a baseline scan the sonographer should:

- image the uterus in the midline longitudinal section and record the endometrial measurement
- image the uterus in transverse section recording the endometrial measurement
- note the position of the cornua
- image and measure both ovaries in 3 planes
- note and record any pathology present, stating its position
- if there are uterine fibroids present state their relationship to the endometrial cavity
- once the catheter is in situ, image its position in the cavity

During the procedure:

- 1 to 2 mls of contrast agent is injected into the cavity
- do not over fill the cavity; not only will this cause unnecessary discomfort, it could induce spasm in the fallopian tubes leading to a false negative result (tubes appear blocked)
- further contrast is introduced only as required
- both tubes should be imaged from the cornua to the ovary and spill demonstrated
- if the contrast is not seen to flow immediately both tubes should be observed for a minimum of 5 minutes to exclude spasm
- ideally the procedure should be video recorded where possible

## Safety

Any procedure that involves the cervix may lead to shock. Prior to the procedure, it is the responsibility of the sonographer undertaking the examination to ensure that a medical practitioner is available to attend to the patient at immediate notice when contacted.

## Prevention of Shock

The risk of cervical shock is reduced if the following are observed:

- inform and reassure the patient throughout the procedure
- avoid the use of tenaculum forceps
- avoid unnecessary manipulation of the cervix
- do not over inflate the catheter balloon, approximately 0.5 - 1.0 ml is sufficient; it should not be inflated in the cervical canal
- contrast agent should be used sparingly
- if carry outing a S.I.S., ensure saline can flow out of the cavity; do not use excessive pressure
- ensure that the patient is aware of the signs and symptoms of infection and the necessary action to take

## 2.4 GUIDELINES RELEVANT TO MUSCULO-SKELETAL EXAMINATIONS

As the field of musculo-skeletal (MSK) ultrasound imaging is extensive, the following section covers the most widely used applications in sonographic practice.

The anatomical structures which the sonographer should normally examine during a musculo-skeletal ultrasound examination will be variable and dependent on the signs and symptoms with which the patient is presenting (see Tables 4 + 5 as examples). A clinical history should be taken prior to any examination.

**TABLE 4 Structures for the Achilles Tendon Examination**

| STRUCTURES | EVALUATION |
|---|---|
| **The Achilles Tendon (Inflammation)** | assessed in both transverse and longitudinal planes from its insertion point into the posterior aspect of the calcanium to the myotendenous junction<br>special attention should be given to evidence of inflammatory changes as<br>• focal spindle thickening<br>• hypoechoic regions within the tendon<br>• detectable blood flow within the tendon when using power Doppler<br>• thickening of the paratendon<br>• bursitis |
| **The Achilles Tendon (Rupture)** | assessed with the patient sitting with the foot in a neutral position to allow accurate assessment of width of any tear |

**TABLE 5 Structures for the Shoulder Examination**

| STRUCTURES | EVALUATION |
|---|---|
| **General** | evidence of free fluid/bursitis within the shoulder region should be excluded |
| **Long Head Of Biceps (LHB) Tendon** | examined in longitudinal and transverse sections from its insertion point within the shoulder to the myotendonous junction<br>assessment should be made of the following: -<br>• the LHB AP diameter<br>• evidence of calcification within the tendon<br>• evidence of complete or partial tear of the bicep tendon<br>• its position within the bicipital groove<br>• evidence of subluxation out of the bicipital groove<br>• increased fluid within the tendon sheath |
| **Subscapularis Tendon** | assessed in both longitudinal and transverse planes from its insertion point into the shoulder to the myotendinous junction<br>• tendon should be evaluated for<br>• thickening associated with inflammation<br>• calcification<br>• partial or complete tears<br>• fluid collections |
| **Infraspinatous Tendon** | assessed in both longitudinal and transverse planes from its insertion point into the shoulder to the myotendinous junction<br>• tendon should be evaluated for<br>• thickening associated with inflammation<br>• calcification<br>• partial or complete tears<br>• fluid collections |
| **Superspinatous Tendon** | in both longitudinal and transverse planes from its insertion point into the shoulder to the myotendinous junction<br>• tendon should be evaluated for<br>• thickening associated with inflammation<br>• calcification<br>• partial or complete tears<br>• fluid collections<br>also be evaluated for impingement by dynamic assessment |
| **Acromio-Clavicular Joint** | assessed for any evidence of inflammation that may instigate impingement |

Table 6 provides a list of examples of pathologies with which the sonographer should be aware when carrying out a musculoskeletal ultrasound examination.

**TABLE 6 Pathologies**

| EXAMINATION | PATHOLOGIES |
|---|---|
| **Elbow** | • tendinosis of common flexor/extensor origins<br>• tendinosis and rupture of triceps and distal biceps tendons<br>• effusion<br>• loose bodies<br>• bursae |
| **Wrist/Hand** | • tendon tears and tenosynovitis<br>• carpal tunnel syndrome<br>• space occupying lesions<br>• pulley injuries<br>• arthropathy |
| **Knee** | • effusion<br>• bursae (including ruptured Baker's cyst)<br>• meniscal cysts<br>• collateral ligament sprains<br>• patellar tendon tendinosis and rupture |
| **Hip** | • developmental dysplasia of the hip (DDH)<br>• effusion (children, adults, prosthetic joints)<br>• bursae<br>• tendinosis and tendon tears |
| **Lower Limb** | • muscle contusion and tears<br>• tendinosis and tendon tears |
| **Soft Tissue** | • lipomas<br>• sarcomas |

## 2.5 GUIDELINES RELEVANT TO OBSTETRIC EXAMINATIONS

The nature of examination carried out, i.e. using vaginal (EV) and/or transabdominal (TA) techniques should be directed by the gestational age of the pregnancy and/or the clinical presentation of the woman. As discussed in Section 1.5 a full explanation of the relevant technique(s) should be given to the woman and appropriate consent sought. The need for a chaperone should also be considered. (Refer to Section 1.6).

The sonographer should consider the following:

- using the most appropriate scanning technique(s) for the gestational age of the pregnancy
- awareness of the safety issues relevant to the type of examination required and the gestational age of the pregnancy examined
- confirmation (or otherwise) of the presence of embryonic/fetal heart pulsations at the start of the examination
- taking correctly the measurements which date the pregnancy or assess fetal growth most accurately, in accordance with national guidelines
- assessing the gestational age or growth velocity of the fetus using such measurements and appropriate, referenced biometry charts
- evaluating whether the embryonic/fetal, placental and other uterine appearances are normal for the gestational age of the pregnancy in accordance with current best clinical practice
- discussing the findings with the woman in accordance with locally agreed practice
- reporting the findings to the referring health care professional in accordance with locally agreed practice
- assessing the relevance and completeness of the ultrasound findings obtained and their association with various clinical conditions amenable to detection by ultrasound

### Image Acquisition

It is recommended that a set of standard images is taken and stored for every obstetric examination carried out. For dating examinations the images displaying the measured embryonic or fetal sections referred to in the written report should be taken and stored. Representative images of any abnormal or unusual findings referred to in the written report should be imaged and stored. (Refer to Sections 1.9 and 4.2).

### Terminology

The correct terminology should always be used, for example:

- ‘embryo’ describes a conceptus of <10 weeks (menstrual age) while ‘fetus’ describes a conceptus of >10 weeks (menstrual age)
- ‘live’ should be used to describe an embryo or fetus in which fetal heart pulsations can be seen. As ‘viable’ means capable of sustaining independent life, it should be used with caution before 24 weeks of gestation
- potentially ambiguous phraseology such as ‘the fetus appears normal’ should be avoided
- where the routine anomaly examination demonstrates normal findings the following phrases are recommended:

  ‘The ultrasound appearances are normal’
  or
  ‘No abnormalities were detected’

- ‘cannot be excluded’ is not clinically helpful and therefore should not be used. The following is recommended:

  ’Ultrasound findings do not indicate an ectopic pregnancy’

## Maternal Obesity

In order to reduce the likelihood of a sonographer developing work-related musculo-skeletal disorders (WRMSD) and/or exacerbate the condition when present, multiple repeat examinations of clinically obese women should be avoided. Clinical obesity is defined as a body mass index (BMI) >35. (Refer to Section 1.7)

Where inadequate visualisation within the allocated appointment time at the routine anomaly scan undertaken between $18^0$ and $20^6$ weeks is due to clinical obesity of the mother, one repeat examination only should be offered, at a gestational age of 22-23 weeks. Should the anomaly scan remain incomplete at the second examination, the sonographer should record in the report that the routine anomaly scan could not be completed, due to increased maternal BMI and that no further appointment has been given.

Similarly serial scans to assess fetal growth in the well but obese mother should be refused. A scan at 36 weeks only, to assess presentation and growth in the multiparous mother, preceded by a growth scan at 32 weeks in the nulliparous mother, is recommended.

Ultrasound examinations should not normally be extended beyond the allocated appointment time.

## Establishing Gestational Age (GA)

Gestational age should be assessed and established in accordance with NICE guidelines[1] and using nationally recommended dating charts[2]

| | |
|---|---|
| 10 weeks - $13^6$ weeks | CRL[1] |
| CRL >84mm | HC[1] |

Prior to visualisation of a live embryo, the gestational age may be assessed from the measurement of the mean gestation sac diameter (MSD). This should be calculated using the two maximum diameters of the sac from the longitudinal, sagittal view using the vaginal route[3]. Where a vaginal examination is declined, the full bladder technique should be used and the gestation sac volume calculated[4].

It is recommended that the expected date of delivery (EDD) is only assigned once a live embryo or fetus has been identified.

## Assigning Gestational Age after 12 Weeks 6 Days

As the accuracy of GA assessment declines with increasing crown rump length (CRL), it is recommended that assigning an expected date of delivery between $13^0$ and $14^0$ weeks is undertaken with caution. Similarly assigning the EDD using head circumference (HC) measurements between 80mm and 120mm (equivalent to $12^4$-$15^6$ weeks) should also be undertaken with caution. Ultrasound biometry carried out between $16^0$-$26^0$ weeks should be used. After this gestation biometry should only be used to evaluate fetal growth velocity.

## Examinations in the First Trimester

### • First trimester confirmation of pregnancy, dating or growth

It is recommended that requests for early pregnancy ultrasound examinations are only carried out on women with a recent positive pregnancy test, and after 5 weeks and 3 days of gestation i.e. after the yolk sac is normally identified.[5] The conclusion from examinations carried out before this gestation will frequently be of a pregnancy of unknown location.[3] This diagnosis is of limited clinical value and will merely necessitate a repeat ultrasound examination in 7-10 days.

The optimal gestational age range over which to assess gestational age by ultrasound biometry is $7^0$-$12^6$ weeks. It is recommended that ultrasound assignment of the EDD is best carried out within this gestational range.

- **Nuchal translucency screening**

The nuchal translucency screening examination, either as part of a programme combined with serum screening, or as a stand-alone screening option for Down's screening of twins or higher multiple pregnancies, should follow nationally agreed guidelines.[1,6]

The structures which the sonographer should normally examine, and measure correctly according to referenced charts where appropriate, during a first trimester examination are shown in Table 7.

**TABLE 7 Structures Examined in a First Trimester Ultrasound Examination**

| STRUCTURE | EVALUATION | MEASUREMENTS |
|---|---|---|
| **Uterus** | position, appearance | |
| **Gestation Sac** | position, appearance, contents | Mean gestation sac diameter |
| **Embryo** | heart pulsations present/absent | Crown rump length |
| **Fetus** | heart pulsations, present/absent<br>anatomical assessment | Crown rump length<br>Nuchal Translucency |
| **Placenta** | position, appearance | |
| **Multiple Pregnancy** | the above + chorionicity | |
| **Both Adnexae** | appearance | |

## Examinations in the Second Trimester

The structures which the sonographer should normally examine appropriately and measure correctly according to referenced charts during a second trimester dating examination are shown in Table 8.

**TABLE 8 Structures Examined in a Second Trimester Ultrasound Dating Examination**

| STRUCTURE | EVALUATION | MEASUREMENTS |
|---|---|---|
| **Skull And Intracranial Anatomy At Level Of Lateral Ventricles** | appearance | Head Circumference<br>(Biparietal diameter) |
| **Intracranial Anatomy At The Sub-Occipito-Bregmatic Level** | appearance | Transcerebellar diameter |
| **Abdomen At Level Of Stomach And Umbilical Vein** | appearance | Abdominal circumference |
| **Femur** | appearance | Femur length |
| **Fetal Movements** | observed | |
| **Placenta** | position relative to the cervical os | |
| **Amniotic Fluid** | volume | |

## • Fetal Anomaly Screening

In keeping with nationally agreed guidelines, it is recommended that the optimal gestational age range over which routine fetal anomaly screening is carried out is $18^{0}$-$20^{6}$ weeks.[1,6] (Refer to Section 1.10)

The structures which the sonographer should be able to examine during a routine fetal anomaly screening examination are shown in Table 9. Similarly the measurements that the sonographer should be able to make correctly according to referenced charts during the same examination are also shown in Table 9. It is anticipated that the majority of these measurements will only be taken in cases where abnormal findings are identified or suspected. The range of structures and measurements included in such an examination will normally be determined by local guidelines.

In addition to the assessment of the fetal anatomy as indicated in Table 9, the sonographer should also be able to take the fetal measurements according to referenced charts and make the assessments shown in Table 10.

### Examinations in the Third Trimester

## • Fetal Growth, Fetal Well Being or Placental Localisation

These examinations may be requested and undertaken in the Second Trimester where appropriate.

Fetal growth should be assessed and represented using nationally recommended size charts.[2]

The structures which the sonographer should normally be able to examine appropriately and to measure correctly according to referenced charts during an examination to assess fetal growth, fetal well being or placental position are shown in Table 11.

**TABLE 9 Structures Examined in Fetal Anomaly Ultrasound Screening**

| STRUCTURE | EVALUATION | MEASUREMENT |
|---|---|---|
| **Skull** | bones, shape | |
| **Brain** | cavum septum pellucidum | |
| | both lateral ventricles, including choroid plexus | atrial width |
| | cerebellum | transcerebellar diameter |
| | cerebellar vermis | |
| | cisterna magna | cisterna magna width |
| **Face** | mid-sagittal profile<br>coronal view of lips<br>alveolar ridge<br>both orbits and lenses | <br><br><br>inter-orbital diameters |
| **Neck** | nuchal skin | nuchal skin fold thickness |
| **Chest** | size | |
| **Heart** | position, size, appearance, 4 chamber view, left and right ventricular outflow tracts | |
| **Lungs** | appearance | |
| **Diaphragm** | appearance | |
| **Stomach** | position, appearance | |
| **Bowel** | appearance | |
| **Kidney Left And Right** | | AP, transverse and longitudinal diameters |
| **Renal Pelvis Left And Right** | | AP diameter |
| **Bladder** | size, appearance | AP, transverse and longitudinal diameters |
| **Abdominal Wall** | appearance, cord insertion | |
| **Umbilical Cord** | number of vessels | |
| **Spine And Skin Covering** | appearance in longitudinal, transverse and coronal planes | |
| **Twelve Long Bones** | appearance | |
| **Hand Left And Right** | carrying angle, fingers | |
| **Foot Left And Right** | carrying angle, toes | |
| **Genitalia (Where Clinically Relevant)** | | |

**TABLE 10 Additional Structures Examined in Fetal Anomaly Ultrasound Screening**

| STRUCTURE | EVALUATION | MEASUREMENTS |
|---|---|---|
| **Skull And Intracranial Anatomy At Level Of Lateral Ventricles** | | Head circumference (Biparietal diameter) |
| **Intracranial Anatomy At The Sub-Occipito-Bregmatic Level** | | Transcerebellar diameter |
| **Abdomen At Level Of Stomach And Umbilical Vein** | | Abdominal circumference |
| **Femur** | | Femur length |
| **Fetal Movements** | observed | |
| **Placenta**<br>**a) Low Lying**<br>**b) IVF Pregnancy**<br>**c) Succenturate/Multilobate**<br>**d) Velamentous Insertion**<br>**e) Multifetal** | position relative to the cervical os<br><br>If a),b),c) d) and/or e) apply, trans-abdominal scan of cervix with colour Doppler to exclude vasa praevia[7] | Heart rate |
| **Amniotic Fluid** | volume | |

**TABLE 11 Structural Evaluation in a Third Trimester Ultrasound Examination**

| STRUCTURE | EVALUATION | MEASUREMENTS |
|---|---|---|
| **Fetal Lie** | presentation | |
| **Skull And Intracranial Anatomy At Level Of Lateral Ventricles** | | Head circumference (HC) (Biparietal diameter) (BPD) |
| **Abdomen At Level Of Stomach And Umbilical Vein** | | Abdominal circumference (AC) |
| **Femur** | | Femur length (FL) |
| **From The Above Information** | estimation of fetal weight | (BPD), HC, AC, FL |
| **Umbilical Artery** | end diastolic flow | pulsatility index |
| **Middle Cerebral Artery** | | pulsatility index, velocity |
| **Ductus Venosus** | forward flow | pulsatility index |
| **Fetal Movements** | assessed for frequency during examination | |
| **Amniotic Fluid** | | |
| **- Singleton Pregnancy** | volume | amniotic fluid index |
| **- Multiple Pregnancy** | volume | deepest pool |
| **Placenta** | position relative to the cervical os | |
| **a) At Risk Of Vasa Praevia**[7] | colour Doppler across cervix | heart rate |
| **b) Low Lying** | assess vaginally | distance of placental leading |
| **c) Placenta Praevia** | assess vaginally | edge to internal os |


References

1. http://www.bmus.org (Charts recommended for clinical obstetric practice - February 2007)
2. http://nice.org.uk (Antenatal care - routine care for the healthy pregnant women- March 2008)
3. Royal College of Obstetricians and Gynaecologists. *The Management of Early Pregnancy Loss* Guideline No.25. London RCOG 2006.
4. Robinson HP & Fleming JEE (1975). *'Gestation Sac' Volumes as Determined by Sonar in the First Trimester of Pregnancy.* BJOG 82: 100-107
5. Grisolia G, Milano V, Pilu G et al (1993). *Biometry of early pregnancy with vaginal sonography.* Ultrasound Obstet Gynecol 3:403-411
6. http://www.screening.nhs.uk/downs (Antenatal Screening - Working Standards for Down's Syndrome Screening 2007 - April 2007)
7. Daly-Jones E, John A, Leahy A, McKenna C & Sepulveda W (2008). *Vasa Praevia; a Preventable Tragedy.* Ultrasound 16(1): 8-14.

Additional Reading

- http://www.vasapraevia.co.uk

## 2.6 GUIDELINES RELEVANT TO PAEDIATRIC AND NEONATAL ULTRASOUND EXAMINATIONS

Before undertaking any paediatric ultrasound examination the sonographer should:

- be aware of the content and implications of The Children's Act[1]
- be aware of the issues surrounding consent by patients to examinations, with particular reference to consent by, or on behalf of, children[2]
- be aware of the implications and issues surrounding 'Gillick competence'[3]

During the examination the sonographer should:

- consider the special needs and care of the patient, including the presence of the parent/guardian/ accompanying person during the examination where appropriate
- use appropriate communication*
- make use of immobilisation and other techniques where relevant; sedation should only be used in extenuating circumstances such as when complex pathology is evident
- demonstrate normal anatomy/variants, including age related appearances of the whole organs and structures examined in at least two planes including size, shape, outline and ultrasound characteristics+
- make the relevant measurements and relate to the normal range for age
- understand the role of ultrasound in prenatally diagnosed conditions and its role in the management of the neonate

** Refer to Section 1.4*

*+ Refer to Section 2.2*

The paediatric anatomical structures which the sonographer would normally examine will depend upon the request and should be in accordance with the clinical information but may include any of the following identified in Table 12.

**TABLE 12 Structures for Paediatric and Neonatal Ultrasound Examinations**

| STRUCTURE(S) | EVALUATION |
|---|---|
| **Abdomen Pelvis** | be aware of the paediatric ultrasound characteristics and potential conditions of organs and structures that differ from those of an adult+ |
| **Organs + Systems That Might Require Special Attention In The Paediatric Patient** | |
| **Gastro-Intestinal Tract** | particular attention to the pylorus and appendix; assess wall thickness, contents, diameter of lumen, motility, presence/absence of masses; in cases of suspected malrotation assess the relative positions of the SMA and SMV |
| **Neonatal Spine** | normal anatomy, congenital defects |
| **Neonatal Hips** | normal anatomy, clicking hips, |
| **Neonatal Cranium** | ultrasound characteristics of the internal cranial architecture<br>ventricles and choroid plexi — subependymal regions<br>head of caudate nucleus — thalamus<br>corpus callosum — cavum septum pellucidum<br>brain stem — posterior fossa contents<br>cerebral gyri and sulci — vascular structures |

References
1. Children's Act 1989 & 2004
2. The Society of Radiographers. (2005). *The Child and the Law: The Roles and Responsibilities of the Radiographer*. London: The Society of Radiographers.
3. Gillick v West Norfolk and Wisbech Area Health Authority (1985)

Additional Reading
- Royal College of Radiologists' Guidance on Consent [BFCR (05) 8]
- http://www.bspr.org.uk
- http://www.everychildmatters.gov.uk

## 2.7 GUIDELINES RELEVANT TO THE ULTRASOUND EXAMINATION OF SUPERFICIAL STRUCTURES

When undertaking ultrasound examinations of superficial structures, the sonographer should:

- consider the nature of the examination with regard to patient privacy and ascertain the necessity for the presence of a chaperone
- be familiar with the guidelines on intimate examinations*

** Refer to Section 1.6*

The anatomical structures which the sonographer should be able to examine correctly are listed in Table 13.

**TABLE 13 Structures for Superficial Ultrasound Examinations**

| STRUCTURE(S) | EVALUATION |
|---|---|
| **Neck** | thyroid gland, parathyroid glands, salivary glands, lymph nodes, trachea, oesophagus, vasculature and muscles |
| **Testes** | normal anatomy and vascular supply of the scrotum/penis (proceed to renal assessment when appropriate |
| **Anus** | continuity of the internal and external sphincters |
| **Eyes** | chambers, lens, retina, retro-orbital structures including the vessels; orbital biometry |
| **Other** | the nature of other superficial, palpable masses e.g. lipoma |

**For each examination the sonographer should:**

- assess the size, shape, contour, ultrasound characteristics of the organ and the relevant vascular structures
- identify normal anatomy/variants and abnormal appearances due to disease processes or trauma

## 2.8 GUIDELINES RELEVANT TO VASCULAR ULTRASOUND EXAMINATIONS

The vascular structures which the sonographer should be able to examine are listed below in Table 14.

**TABLE 14 Structures for Vascular Ultrasound Examinations**

| STRUCTURE(S) | EVALUATION |
|---|---|
| **Head And Neck** | common internal and external carotid arteries; vertebral and subclavian arteries; jugular and subclavian veins; cerebral arteries by transcranial examination |
| **Abdomen** | abdominal aorta and main branches; inferior vena cava (IVC) and branches; other visceral arteries and veins as included in general abdominal and gynaecological examinations* |
| **Upper Limb** | arteries and veins (deep and superficial) of the upper limb; subclavian, axillary, brachial, radial and ulnar arteries; subclavian, axillary, brachial, radial, ulnar, basilic and cephalic veins |
| **Lower Limb** | arteries, veins (deep and superficial) and infra-inguinal grafts of the lower limb aorta, Iliac, femoral, popliteal, peroneal, anterior and posterior tibial arteries; IVC, iliac, femoral, popliteal, gastrocnemius, peroneal, anterior and posterior tibial veins; posterior calf, gastrocnemius and soleal venous sinuses; long and short saphenous veins and their variants |
| **Grafts** | inflow vessels, proximal anastomosis, body of graft, distal anastomosis and run-off |

** Refer to Sections 2.2 and 2.3*

The sonographer should be able to:

- demonstrate the vessels relevant to specific clinical criteria in terms of:
    - position and course
    - congenital variations
    - ultrasound characteristics of the lumen and walls including venous compressibility
    - presence/absence of collaterals and/or fistulae
    - ultrasound characteristics of surrounding tissues
- assess by use of pulsed, colour and/or power Doppler the haemodynamics of vessels, including their presence or absence, interruption to flow, flow direction, velocity and resistance measurements. (The angle caliper should be set correctly, with an angle =/<60°, before any velocity measurements are made. The focal zone should include the target of interest when diameter or area measurements are being taken)
- demonstrate and estimate the location and extent of pathological vascular diseases and assess the efficacy of any surgical or other interventional treatment
- demonstrate other pathological processes adjacent to, or involved with, vascular structures and assess their effects on these structures
- assess the relevance of such pathology to the clinical picture

# SECTION 3
# REPORTING

## 3.1 GUIDELINES FOR REPORT WRITING

An ultrasound report may be defined as the recording and interpretation of observations from an ultrasound examination.

### General Comments

- The ultrasound report should be written and issued by the sonographer undertaking the ultrasound examination and viewed as an integral part of the whole examination
- The report should be written as soon as possible after the examination has been completed
- The name and status of the sonographer issuing the report should be recorded on the report
- The sonographer should take responsibility for the accuracy of the report and ensure that the report is communicated to the appropriate personnel
- The sonographer should be aware of his/her limitations and consequently seek clinical advice when necessary.

### Report Style

- The style of the report should be concise, clear and easily understood
- Standard reports which are understood and accepted by staff within a hospital may need to be modified for outside referrals
- Potentially ambiguous phraseology should not be used
- Short paragraphs should be used and the burying of important comments avoided
- Abnormal and related findings should be grouped
- Irrelevant information should be avoided
- Technical findings should be described

  For example:

  - *There is a simple right adnexal cyst present measuring 7.6cm maximum diameter, arising from the right ovary*
  - *A well defined mass with mixed echoes is present in the left rectus sheath. The lesion is exquisitely tender The mass measures 5.2 x 4.6 x 3.*6cm

- Acoustic or technical language should be used when it significantly assists in the diagnosis. 'Echogenic' is, for example, frequently used inappropriately to indicate increased reflectivity. It should be avoided unless qualified by a comparative such as 'increased echogenicity'
- Abbreviations should only be used when the user is confident that they will be clearly interpreted
- The content of the examination and the technique(s) used should be documented

  For example:

  - *A large left sided varicocoele is present and, in view of this, the kidneys were examined*
  - *The placental edge could not be identified trans-abdominally and a vaginal scan was undertaken*

- Action taken should be reported

  For example:

  - *I have informed the patient that she has an ovarian cyst and that a follow up scan is arranged in six weeks time*
  - *In view of the findings I have personally discussed these results with Dr ***** by telephone*

- A succinct conclusion should be included at the beginning or the end of the report

## Clinical Content

- The report should address the clinical question and generally pertain to the reason for referral

  For example:

  - *The gallbladder is very tender and cholecystitis is the likely cause of the right upper quadrant pain*
  - *The scan confirms the clinical impression of oligohydramnios. There is significant fetal bladder dilatation and bilateral hydronephrosis in keeping with bladder outflow obstruction*

- The report should be conclusive where possible, indicating when the appearances are consistent with a specific diagnosis. Where no conclusion is possible alternative explanations for the ultrasound appearances may be offered
- The report should guide the referring clinician in further management

  For example:

  - *Although a distal bile duct calculus has not been demonstrated the appearances are in keeping with a distal biliary obstruction and further investigation is advised to evaluate the cause of the jaundice*
  - *There is evidence of a significant ventricular septal defect and a detailed assessment of the cardiac anatomy is advised*

- Any limitations should be stated and, if a relevant organ has not been fully examined, the reason(s) should be indicated

  For example:

  - *pancreas obscured by bowel gas*
  - *gall bladder is contracted, patient not fasted*

- The presence/absence of ascites, lymphadenopathy or distant metastases should be noted in cases of known primary carcinomas
- It may be appropriate, depending on local practice, to suggest further investigations which may clarify the diagnosis. These include other imaging modalities such as a plain X-ray, CT, MRI or invasive procedures

  For example:

  *“There is a poorly defined 7 cm, mainly solid mass adjacent to, and separate from, the left kidney.*

  *This may be bowel or a lymph node mass. Suggest CT or MRI to clarify”*

- The exclusion value and significance of the ultrasound appearances should be stated where relevant
- The sonographer should be aware at all times of the implications for the patient of the contents of the report and act in accordance with local guidelines

## Report Proforma/Worksheet

- Where a report proforma is used e.g. in obstetric reporting, it should include a clear definition of what a positive, negative or missing response means. It is essential to ensure that the precise meaning of statements made on the proforma is clearly understood. It is recommended that a free-text facility is available on the report form and is used when appropriate
- The use of worksheets, when used in conjunction with departmental schemes of work, is useful as an aide memoir for training purposes
  *(Examples of obstetric ultrasound worksheets can be found in the Appendix)*

## Guidance for Completing Patient Notes / Hospital Records

- A provisional report written in the patient notes should always be written in black ink. If handwriting is illegible, the report should be printed. The report must be written in an appropriate part of the notes, dated, signed and the reporter's name and status printed
- Abbreviations should be avoided and words always written in full for example DVT should be written as deep vein thrombosis or SFV, superficial femoral vein, as it cannot be assumed that the person reading the report will be familiar with the writer's abbreviations
- Correction fluid or sticky labels should not be used to cover errors. Any error that is made should have a single horizontal line through the words or sentence and initialed. If the wrong patient's report is entered in the notes then the whole report should be removed by a single horizontal line scored through for each line of text and signed with a note of explanation e.g. written in error
- If additional details are to be included, it is advised that a case note continuation sheet is used and a patient label put on the addressograph area. If a patient label is not available the patient's hospital number, full name, address and date of birth should be entered clearly
- The provisional report should be followed up by a printed verified report as soon as possible. If a second opinion has been sought for the examination or report, the person giving the opinion should also be noted in the report and their status given

## EXAMPLES OF EXAMINATION SPECIFIC REPORTING

Listed in this section are common examples of suitable report formats for use with various specific referrals. These are not intended to be comprehensive or prescriptive.

## 3.2 BREAST ULTRASOUND

The report should include the following information:

- clinical indication for examination
- breast under examination
- location within breast of area(s) examined
- differential diagnoses in order of likelihood
- recommendations for further imaging and/or investigations

The report should describe any pathology in terms of:

- clinical and/or mammographic correlation
- radial location using standard ‘clock face’ annotation and distance from nipple
- lesion size and extent including the greatest diameter and/or tumour volume
- margin definition
- internal echo-texture
- posterior through-transmission characteristics
- vascularity
- appearances of adjacent structures

It must be remembered that breast ultrasound is not appropriate as a screening investigation for cancer and has a limited ability to demonstrate morphological changes associated with in-situ disease. The terms *‘no abnormality detected’* and *‘no anatomical disturbance’* are therefore recommended when no pathology has been demonstrated.

## Abnormal Ultrasound Appearances

### *Referral for Palpable Mass Left Breast*

*The palpable lump at the 12 o'clock 30mm position is a 24mm well-defined anechoic mass showing posterior acoustic enhancement/increased through transmission.*
*Appearances are those of a simple cyst.*

### *Referral for Examination of Right Breast and Axilla:*

*The palpable lump at the 4 o'clock 30mm position is a 14mm irregular ill-defined solid mass showing posterior acoustic shadowing. The internal arterial vessels show high resistance high velocity flow.The axillary lymph nodes are enlarged, round and uniformly hypoechoic.*
*Appearances are those of malignancy with LN involvement.*
*Needle core biopsy required for confirmation*

### *Referral for Examination of Left Breast:*

*The mammographically detected lesion in the UOQ is a 12mm well defined solid mass with posterior acoustic enhancement and edge shadowing.*
*Internal arterial vessels show low resistance low velocity flow.*
*Appearances are those of a fibroadenoma.*
*Histological confirmation is suggested.*

(There is a wide spectrum of diffuse proliferative benign disease which may be described variously as benign breast change (BBC), benign breast disease (BBD), fibrocystic change (FCC) or fibrocystic disease (FCD).)

## 3.3 GENERAL MEDICAL ULTRASOUND

It may be useful to have a standardised reporting format for normal abdominal scans which includes all the organs routinely examined and which is acceptable to the imaging department and referring clinicians. Several formats may be required according to the reason for referral in order to answer the relevant clinical question(s).

An example of a simple to read 'factual' abdominal ultrasound report is given below:

*Technique:* Patient fasted. Transabdominal.
*Findings:* Liver: Nodular appearance consistent with cirrhosis. No focal lesion. Portal vein patent with forward flow. Spleen: Enlarged - 17cm (Normal <12cm). Gallbladder: Normal. Common Bile Duct: Normal - 5mm. Kidneys: 5cm simple cyst upper pole right kidney. Otherwise normal. Right 11.2cm. Left: 10.5cm. Aorta: Normal.
Other Findings: Abdominal wall varices.
*Comment:* Findings are consistent with cirrhosis and portal hypertension with a patent portal vein and abdominal wall varices.

### *Referral for suspected biliary disease*

*Normal ultrasound appearances of the liver. The gallbladder is clear. No evidence of biliary duct dilatation. The pancreas, spleen, both kidneys and aorta are normal.*

### *Referral for urological symptoms*

*Normal ultrasound appearances of both kidneys, bladder and prostate. No ultrasound evidence of renal calculi, mass or obstruction.*
*Normal ultrasound appearances of both kidneys and bladder. Pre-micturition volume ... mls.*
*Post micturition volume ... mls.*

### *Referral for known primary carcinoma*

*Normal ultrasound appearances of liver, gallbladder, CBD, pancreas, spleen, both kidneys and adrenal glands. No evidence of abdominal lymphadenopathy or ascites.*

### *Referral for palpable RUQ mass*

*Normal ultrasound appearances of liver, gall bladder, CBD, pancreas, spleen and both kidneys. Prominent Reidel's lobe noted. No RUQ mass identified.*

### *Referral for fatty intolerance*

*The gall bladder contains several calculi. Normal common duct with no intra-hepatic duct dilatation. The ultrasound appearances of the liver, pancreas, spleen, both kidneys and aorta are normal.*

### *Referral for RUQ pain*

*The liver has increased echogenicity with reduced prominence of portal tracts an appearance consistent with fatty change.*
*There is a 3 cm highly reflective focal lesion in segment 6 of the liver. The appearances are typical of an haemangioma but if there is clinical suspicion of malignancy then metastasis cannot be excluded. Normal appearances of the gall bladder, pancreas, spleen, both kidneys and aorta.*

### *Referral for bleeding varices*

*Shrunken nodular liver. Enlarged spleen (16 cm) with varices around the hilum.*
*Reverse flow is present in the portal vein and there is increased intra hepatic arterial flow. Patent right and middle hepatic veins - left technically difficult to demonstrate.*
*Patent paraumbilical vein is noted. Gross ascites is present.*
*Conclusion: ultrasound appearances are compatible with advanced liver disease with portal hypertension.*

### *Referral for Contrast Enhanced Ultrasound*

The sonographer should ensure that the report describes: **-**

- the behaviour of the lesion(s) in the arterial, portal and late phases
- if the behaviour is benign or malignant and if possible conclude with the nature of the lesion e.g. haemangioma
- cases where characterisation of small lesions (<1cm) are difficult or larger lesions which are atypical are referred for other imaging investigations
- technically sub-optimal examinations when a referral for further imaging is desirable

## 3.4 GYNAECOLOGICAL ULTRASOUND

The report should contain the following information:

- examination method, i.e. vaginal and/or abdominal
- named person as chaperone if present
- date of the last menstrual period (LMP)
- length of menstrual cycle

Several standard report formats may be required according to the reason for referral in order to answer the relevant clinical question(s):

- pathological findings
- organ of origin
- location
- size
- internal reflectivity - cystic, solid, complex, septated, solid foci
- posterior through transmission
- borders - definition
- other associated appearances e.g. ascites

### *Referral for pelvic pain*

*Vaginal scan with patient consent.*
*Day 23 of 29-31 regular cycle.*
*Anteverted uterus - normal in size and echo pattern with a 5mm cystic structure in the cervical canal.*
*Ultrasound appearances are consistent with a Nabothian cyst.*
*Endometrial thickness Xmm with some fluid noted in endometrial cavity.*
*Ultrasound appearances of both ovaries are normal for luteal phase of cycle.*
*No pelvic mass or fluid demonstrated.*

### *Referral for subfertility investigation*

*Vaginal scan with patient consent.*
*Day 18 of 28 day cycle. Clomid 50mg days 2-6.*
*Retroverted uterus with thickened (Xmm) endometrium.*
*Ultrasound appearances of both ovaries are normal. 25mm corpus luteal cyst in the right ovary.*
*No other adnexal masses seen. No fluid in the Pouch of Douglas.*
*Ultrasound appearances are compatible with the luteal phase.*

### *Referral for post menopausal bleeding*

*Transabdominal scan.*
*Approx. 3 years post menopause.*
*Ultrasound appearances are of a normal anteverted uterus with thin (Xmm) endometrium and right ovarian volume of Yml s.*
*Left ovary was obscured by bowel gas.*
*No adnexal masses evident although left side difficult to visualise. No fluid in the Pouch of Douglas.*

### *Referral for menorrhagia*

*Vaginal scan with patient consent.*
*25 days post LMP. Irregular cycle 4-6 weeks.*
*Retroverted uterus containing several submucosal fibroids on the anterior wall, the largest of which is Xmm in diameter. Ultrasound appearances of both ovaries are normal with a corpus luteum in the left ovary.*

### *Referral for deep dyspareunia*

*Patient declined a vaginal scan.*
*LMP - unsure ?six weeks ago. Irregular cycle.*
*Anteverted uterus with endometrial thickness Xmm.*
*Ultrasound appearances of the left adnexa are normal but left ovary not demonstrated - ?absent (patient unsure of this when questioned.)*
*The right ovary demonstrates normal ultrasound appearances. Adjacent to this ovary is a complex structure measuring YxYxYmm containing low level echoes.*
*Small amount of fluid noted in the Pouch of Douglas.*
*These ultrasound appearances are consistent with pyosalpinx, tubo-ovarian abscess or ectopic pregnancy.*

### *Referral for suspected pelvic mass*

*Transabdominal scan.*
*Patient says she has had a partial abdominal hysterectomy in December, 1986.*
*There is an irregular complex mass arising out of the pelvis measuring 15 cm in diameter.*
*It contains several solid highly vascular areas. Ovaries not demonstrated.*
*The ultrasound appearances of the liver are normal but there is bilateral hydronephrosis and ascites is present. These ultrasound appearances are consistent with ovarian malignancy. In view of these findings a CT examination may be helpful for staging purposes.*

### *Referral for Hy-Co-Sy examination:*

*Examination carried out according to departmental guidelines.*
*Day 6 of 30 day cycle.*
*Transabdominal and vaginal scans carried out prior to the procedure.*
*Anteverted uterus with a thin endometrium consistent with early proliferative phase of the cycle.*
*Both ovaries demonstrated.*
*No abnormal pelvic ultrasound appearances.*
*Ultrasound contrast media introduced into uterine cavity. Ultrasound appearances of the cavity are normal. Both Fallopian tubes patent. No filling defect demonstrated.*
*Normal ultrasound appearances.*
*Examination carried out according to departmental guidelines.*
*Day 14 of 28 day irregular cycle.*
*Transabdominal and vaginal scans carried out prior to the procedure.*
*Uterus is normal in size, shape and texture.*
*Endometrium measures ….mms, preliminary in appearance. Endometrial measurements where A …mm; C…..mm: E…..mm.*
*Rt ovary (state the 3 dimensions); Lt ovary (state 3 dimensions) it contains a dominant follicle of …cm in diameter.*
*Hycosy - Xmls of contrast agent used. Spontaneous flow demonstrated, with spill over both ovaries. Bilateral tubal patency.*

## 3.5 MUSCULO-SKELETAL ULTRASOUND

### *Shoulder*

*Clinical History: Left shoulder pain ?cuff tendonitis.*
*There is a minor focus of tendonitis in the supraspinatus tendon but no tear. No significant bursal thickening. Normal long head of biceps, subscapularis and infraspinatus tendons. Normal AC joint.*

### *Achilles Tendon*

*Clinical History: Pain right Achilles tendon.*
*The right Achilles tendon was mildly thickened and hypoechoic approximately 5 cms from its calcaneal insertion which may represent a focal tendinosis. Normal calcaneal insertion. No evidence of tear.*

## 3.6 OBSTETRIC ULTRASOUND

### First Trimester - Early Pregnancy

- ***Pregnancy of unknown location 1***

*Transabdominal scan, EVS declined.*
*Single gestation sac present within the uterus.*
*Gestation sac volume 0.4mls, equivalent to 5+ weeks.*
*No embryo or yolk sac seen.*
*Normal appearances with measurements in agreement with recent positive pregnancy test.*
*Appointment made to rescan in 10 days to assess presence of embryo, heart pulsations and therefore an ongoing pregnancy.*

- ***Pregnancy of unknown location 2***

*Vaginal scan carried out with consent. Chaperone present.*
*Pregnancy test positive 8 days ago.*
*Anteverted uterus with thickened endometrium. No gestation sac identified.*
*Normal ovaries. Corpus luteum noted on left ovary.*
*No adnexal mass see. No free fluid present.*
*The ultrasound findings in isolation do not indicate an ectopic pregnancy. However, in view of the clinical symptoms of mild right sided pain and vaginal spotting, further management is recommended e.g. serum hCG monitoring.*

- ***Pregnancy of uncertain outcome***

*Vaginal scan carried out with consent. Chaperone present as requested.*
*Ms X reports a positive pregnancy test 6 weeks ago with some recent vaginal spotting.*
*Mean gestation sac diameter 12mm = 5+ weeks. No embryo or heart pulsations seen as yet.*
*Ms X is aware of the discrepancy between her menstrual history and today's ultrasound findings.*
*We have arranged to rescan one week to review the findings and exclude a missed miscarriage.*

- ***Missed miscarriage 1***

*Vaginal scan carried out with consent. Chaperone present.*
*Mean gestation sac diameter 40mm, equivalent to 9+ week size.*
*The gestation sac was empty, with no evidence of an embryo or yolk sac seen.*
*The findings of an ongoing pregnancy of this gestational age would include a live embryo, 22-30mm in length and yolk sac. These were not present.*
*Conclusion: appearances indicate a missed miscarriage.*

- ***Missed miscarriage 2***

*Vaginal scan carried out with consent. Chaperone declined.*
*Irregularly shaped gestation sac present within the uterus.*
*10mm embryo seen (equivalent to 7+ weeks) but no heart pulsations were demonstrated.*
*I have discussed these findings with Ms X and referred her to the gynae on-call team.*
*Conclusion: appearances indicate a missed miscarriage.*

- ***Ectopic pregnancy***

*Vaginal scan carried out with consent. Chaperone present.*
*6 weeks since LMP.*
*Anteverted uterus with thickened (25mm) endometrium.*
*There is a complex mass in the right adnexae, mean diameter 30mm.*
*Normal left ovary and adnexa. Fluid in the Pouch of Douglas.*
*Conclusion: these appearances are highly suggestive of an ectopic pregnancy.*
*Gynaecology team on-call contacted - to return to Casualty for review by Dr X.*

## First Trimester - Dating

- ***Singleton pregnancy, 1st trimester dating***

*Vaginal scan carried out with consent. Chaperone declined.*
*Intrauterine pregnancy*
*Single live embryo. CRL = 18mm*
*Gestational age = 8 weeks + 3 days. USEDD = XX.YY.ZZZZ*
*Combined 1st trimester serum and nuchal translucency screening for Down's syndrome has already been discussed at booking and Ms X wishes to have this carried out. She is aware that the optimal time for her PAPP-A blood test to be taken is at 10 weeks and we have made this appointment for her. We have also made her nuchal translucency screening appointment for 4 weeks time.*

- ***Singleton pregnancy, 1st trimester dating, Down's screening declined***

*Transabdominal scan carried out*
*Single live fetus. CRL = 60mm*
*Gestational age = 12 weeks + 4 days. USEDD = XX.YY.ZZZZ*
*Ms X has declined Down's screening therefore nuchal translucency assessment was not carried out.*
*She wishes to have a routine anomaly scan and this appointment has been made for her.*

- ***DCDA twin pregnancy, 1st trimester dating***

*Vaginal scan carried out with consent. Chaperone declined.*
*A single posterior placenta together with the 'lambda sign' appearance of the intertwin membrane at the placental interface indicates a dichorionic diamniotic (DCDA) twin pregnancy.*
*Heart pulsations noted in both embryos.*
*Twin 1, the lower twin, is on the maternal left. Twin 2, the upper twin, is on the maternal right.*
*Twin 1 CRL = 16mm; Twin 2 CRL = 18mm*
*Gestational age, based on the measurement of the larger embryo = 8 weeks + 3 days*
*USEDD = XX.YY.ZZZZ*
*Down's screening has already discussed at booking visit and Ms X wishes to have this carried out. An appointment for nuchal translucency screening at 12 weeks has therefore been given. She is aware that we are unable to offer nuchal translucency combined with serum screening in a twin pregnancy.*

## First Trimester - Nuchal Translucency Screening

- **DCDA twin pregnancy, nuchal translucency - reduced risk**

*Transabdominal scan carried out.*
*Maternal age 37 years.*
*A single posterior placenta together with the 'lambda sign' appearance of the intertwin membrane at the placental interface confirm a dichorionic diamniotic (DCDA) twin pregnancy.*
*Twin 1, the lower twin, is on the maternal left. Twin 2, the upper twin, is on the maternal right.*
*Gestational age = 12 weeks and 5 days*
*Twin 1 CRL 60mm NT 1.7mm, Twin 2 CRL 64mm NT 1.5mm*
*Risk of Trisomy 21 based on maternal age = 1:242*
*Adjusted risk of Trisomy 21 for Twin 1 = 1:1066*
*Adjusted risk of Trisomy 21 for Twin 2 = 1:1298*
*Ms X is aware that the nuchal translucency measurements have resulted in a reduced risk for Down's syndrome for both fetuses. The routine anomaly scan appointment has been arranged. We have also arranged for 4 weekly (monthly) scans from 24 weeks, to assess fetal growth as per our protocol.*

- ***MCDA twin pregnancy, nuchal translucency - increased risk***

*Transabdominal scan carried out.*
*Maternal age 37 years.*
*A single posterior placenta together with the 'T sign' appearance of the intertwin membrane at the placental interface confirm a monochorionic diamniotic (MCDA) twin pregnancy.*
*Twin 1, the lower twin, is on the maternal left. Twin 2, the upper twin, is on the maternal right.*
*Gestational age = 12 weeks and 0 days.*
*Twin 1 CRL 56mm NT 1.5mm, Twin 2 CRL 56mm NT 3.5mm*
*Risk of Trisomy 21 based on maternal age = 1:100*
*Adjusted risk of Trisomy 21 for the pregnancy = 1:7*
*Ms X is aware that the nuchal translucency measurements have resulted in an increased risk for Down's syndrome for the pregnancy. She is also aware that increased nuchal translucency has been reported as an early sign of TTTS. We have discussed briefly diagnostic testing and 2nd trimester ultrasound screening including detailed fetal cardiac assessment. Ms X understands that there is a miscarriage risk, in singleton pregnancies, of approximately 1%, associated with both CVS and amniocentesis. We have made an appointment for Ms X and her partner with our screening midwife later on today to discuss the scan findings and her management options.*

## Second Trimester

- ***Singleton pregnancy, 2nd trimester dating***

*Single live pregnancy.*
*HC = 130mm*
*AC = 105mm*
*FL = 22mm*
*Anterior placenta, not low.*
*Gestational age, based on dating parameters of HC and FL = 16 weeks and 4 days.*
*USEDD = XX.YY.ZZZZ*
*Ms X has already discussed screening for Down's syndrome and wishes to have this done. She understands that the pregnancy is too advanced for combined serum and nuchal translucency screening. We have completed her triple test serum screening form and sent her to have her blood taken today. Routine anomaly scan booked for 4 weeks time.*

- ***Routine anomaly screening, low placenta***

*The appearance of the fetal anatomy is normal.*
*The fetal growth velocity is normal.*
*Normal amniotic fluid volume.*
*The anterior placenta is low lying at present but does not extend across the internal os. No evidence of vasa praevia as assessed with colour Doppler. We have arranged to review placental site at 32 weeks as per protocol. Ms X is aware that vaginal imaging may be necessary at this examination.*

- ***Completion of anomaly scan 1***

*Repeat examination at 22 weeks + 4 days due to initial poor visualisation at routine anomaly scan at 20 weeks + 4 days.*
*Normal situs.*
*Normal appearance of the four chamber view of the heart.*
*Outflow tracts and fetal face could not be adequately seen.*
*Ms X is aware that we have been unable to carry out a complete fetal anatomy survey and that this has been due to poor visualisation because of a BMI of 36.*
*In keeping with our guidelines we have not arranged any further scans to review the fetal anatomy but, as this is Ms X' first pregnancy, we have arranged to rescan for growth at 32 and 36 weeks.*

- ***Suspected spina bifida***

*Abnormal, 'banana shaped' cerebellum. Trans-cerebellar diameter 15mm.*
*Dilated ventricles noted, both atria 11mm.*
*Lower lumbar and upper sacral vertebrae and skin covering abnormal in appearance.*
*Conclusion: appearances indicate spina bifida (L3-S2) with meningocoele and hydrocephalus.*
*I have discussed these findings with Mr X who will see the parents later this morning. I have explained my findings to the parents.*

- ***Mild renal pelvic dilatation***

*Mild dilation of both renal pelves noted.*
*AP diameter of left pelvis 6mm, right pelvis AP 7mm.*
*No other markers of abnormal karyotype were seen. I note the low risk Down's screening result.*
*I have discussed these findings with Ms X.*
*Re-scan arranged at 32 weeks to monitor renal pelves.*

## Third Trimester

### Fetal Growth

- ***Growth velocity within normal limits, singleton pregnancy.***

BPD = 84mm HC = 310mm
AC = 260mm FL = 65mm
*The fetal growth velocity is within normal limits, with the head and femur measurements on the 50th centile and the abdominal circumference on the 10th centile.*
*Estimated fetal weight = Xgm.*
*Normal amniotic fluid volume, AFI 15.5 cm.*
*Ms X reports good fetal movements which were also observed during the examination.*
*We have arranged a further appointment in 2 weeks to assess fetal growth.*

- ***Asymmetrical growth restriction, singleton pregnancy***

*BPD = 84mm HC = 310mm*
*AC = 260mm FL = 65mm*
*The head circumference lies on the 40th centile while that of the abdomen has fallen to below the 5th centile.*
*Estimated fetal weight = Xgm.*
*Normal umbilical artery Doppler trace with positive end diastolic flow. Middle cerebral artery PI below the 5th centile*
*Reduced amniotic fluid volume, AFI 8.5cm.*
*Ms X reports a decrease in fetal movements over the last few days. Fetal movements were seen today during the examination but the fetus was quiescent for the majority of the examination*
*These findings suggest asymmetrical intra-uterine growth restriction with redistribution. The obstetric team has been contacted - for review in ANC today. We will review the fetal growth in 2 weeks if undelivered.*

- ***Placental Localisation, 36 Weeks***

*Cephalic presentation.*
*BPD = 89mm HC = 325mm*
*AC = 300mm FL = 69mm*
*Normal growth velocity. Estimated fetal weight = Xgm*
*Normal amniotic fluid volume, AFI = 15.0cm*
*Ms X reports good fetal movements that were also observed during the examination.*
*Vaginal scan carried out with Ms X's consent. A chaperone was declined.*
*The leading edge of anterior placenta is 15mm from the internal os as assessed vaginally. There was no evidence of vasa praevia - no vessels were seen near to or crossing the internal os as assessed with colour Doppler.*
*We have made Ms X an ANC appointment with her consultant to discuss her further management.*

## 3.7 PAEDIATRIC AND NEONATAL ULTRASOUND

### *Neonatal Cranial Ultrasound*

*Clinical history: 30 weeks premature, ?intracranial haemorrhage.*
*Normal intracranial appearances.*
*Normal ventricular size.*
*No evidence of haemorrhage demonstrated.*
*Neonatal Cranial Ultrasound.*
*Clinical history: 28 weeks premature, ?intracranial haemorrhage.*
*Peri-ventricular flaring demonstrated.*
*There is midline shift of the ventricular system due to an extensive area of haemorrhage inferior to the third ventricle and extending into the temporal cortex.*
*Colour Doppler demonstrates active flow within this area suggesting continuing enlargement of this area of haemorrhage.*

### *Paediatric Hips*

*Normal ultrasonic appearance of both hips, which are in joint.*
*(Right hip angle is x degrees, Left hip angle is x degrees).*

### *Paediatric Hips*

*Both hips are immature and the left hip is in a dislocated position.*
*Right hip alpha angle is xx degrees, beta angle x degrees, Graff classification x; Left hip alpha angle is xx degrees, beta angle x degrees, Graff classification x.*

### *Renal Ultrasound*

*Referral for Recurrent Urinary Tract Infections.*
*Both kidneys are normal in size and structure. No evidence of mass or obstruction. The urinary bladder is clear and empties completely on micturition.*

### *Renal Ultrasound*

*Referral for Recurrent Recurrent Urinary Tract Infections.*
*The right kidney is markedly hydronephrotic with significant cortical loss. No apparent ureteric distension. Normal left kidney, no evidence of obstruction. The urinary bladder is clear and emptied on micturition. The appearances of the right kidney are most probably due to a PUJ obstruction. A MAG3 Renogram is advised for confirmation.*

### *Abdominal Ultrasound*

*Referral for palpable epigastric mass.*
*There is a large mass of mixed echogenicity in the epigastric region measuring 8.7 x 9.5 x 10cms. This is possibly related to the left lobe of the liver but this was difficult to differentiate. The liver texture otherwise appears normal. Pancreas, spleen and kidneys are normal. No apparent abdominal lymphadenopathy. Differential diagnoses include hepatoblastoma, neuroblastoma and lymphoma. Further investigation by CT and biopsy are required.*

## 3.8 SUPERFICIAL ULTRASOUND

### *Thyroid Ultrasound*

*Referral for ?goitre. Normal thyroid function tests.*
*The thyroid gland is normal in size and echogenicity. There are no discrete nodules evident.*
*No lower cervical lymphadenopathy.*
*Conclusion - normal examination.*

### *Thyroid Ultrasound*

*Referral for ?retrosternal goitre.*
*This confirms a large diffuse goitre which is of altered echogenicity throughout. There are no discrete nodules.*
*There is evidence of retrosternal extension bilaterally, most prominent on the left side.*
*No lower cervical lymphadenopathy.*

### *Parotid Ultrasound*

*Referral for swelling left parotid gland ?cause.*
*There is a well defined 1.5cm hypoechoic mass superficially in the tail of the left parotid gland. It contains a small central cystic area. This could represent a small pleomorphic adenoma or possibly a Warthin's tumour. Normal submandibular salivary glands. No lower cervical lymphadenopathy. Ultrasound guided FNA is advised.*

### *Testicular Ultrasound*

*Referral for palpable mass.*
*There is a well defined 2.5cm mass of mixed echogenicity in the left testis. In view of the patient's age this is most likely to be a teratoma. The right testis and epididymis are normal.*

## 3.9 VASCULAR ULTRASOUND

### Carotid Ultrasound

The report should indicate the presence of disease including location and extent.

Where significant disease is found i.e. >50% stenosis, the report must include:

- the peak systolic velocity PSV and end-diastolic velocity EDV in the distal CCA (i.e. 1-2 cm below bifurcation)
- the highest PSV and EDV obtainable around the stenosis
- From these velocities, the PSV Ratio ($ICA_{PSV}$/$CCA_{PSV}$ or St Mary's Ratio ($ICA_{PSV}$/$CCA_{EDV}$) may be calculated, but the original velocity measurements should always be quoted in the report.
- In the case of a large plaque in a large bulb measure and report the bulb diameter and the plaque thickness (residual lumen)
- Qualitatively note any calcification and irregular surface of plaque
- Record length of plaque
- Record the distance of the bifurcation below the mastoid process (cm)
- Record presence or otherwise of clear distal lumen

Note whether the distal ICA lumen is clear with colour filling and the nature of the flow i.e. pulsatile, turbulent or damped.

The presence of calcification, low echogenic plaque and any ulceration seen should be noted.

**TABLE 15 Diagnostic Criteria**

| Percentage stenosis NASCET | ICA Peak Systolic Velocity cm/sec | ICA PSV to CCA PSV ratio | ICA PSV to CCA EDV ratio |
|---|---|---|---|
| <50 | <125 | <2 | <8 |
| 50 -59 | >125 | 2-4 | 8 - 10 |
| 60 - 69 | | | 11 - 13 |
| 70 - 79 | >230 | >4 | 14 - 21 |
| 80 - 89 | | | 22 - 34 |
| >90 but less than near occlusion | >400 | >5 | >35 |
| Near occlusion | High, low or string flow | Variable | Variable |
| Occlusion | No flow | Not applicable | Not applicable |

For the vertebral arteries, the direction of flow and waveform type, when pathological, should be recorded i.e. antegrade/retrograde and transient or full subclavian steel waveform. Where abnormal vertebral waveforms are found the maximum PSV in the proximal subclavian artery should be measured (normal <1.50 m/s).

Caution should be exercised in interpreting velocities when there is severe bilateral disease (arteriosclerosis) or when there is concurrent aortic valve disease. Where there is poor visualisation due to patient habitus, calcified vessels, or a firm conclusion is otherwise difficult or ambiguous, the report should note this and indicate that further imaging is required for a definitive diagnosis.

## Lower/Upper Limb/Graft Arterial Ultrasound

Location and extent of disease should be reported including start of occlusion and point of reconstitution. Velocities at discrete stenoses should be measured when there is a greater than two fold increase in PSV at the stenosis relative to the proximal PSV, indicating a > 50% stenosis. Values measured should be quoted in the report e.g. (1.2 to 4.7 m/s).

It may be appropriate to summarise the observations, for example: Generalised narrowing throughout the SFA-popliteal segment or uneven lumen throughout or SFA was ectatic.

Indicate the quality of the distal waveform e.g. Damped flow below knee or Flow remained good and pulsatile to ankle level.

Note the quality of the distal run-off i.e. are the vessels of normal/narrowed calibre at ankle, are posterior and anterior tibial arteries patent.

## Ultrasound Investigation for Deep Vein Thrombosis (DVT)

- Note which veins have been assessed and record their compressibility and presence/absence of colour filling
- Note the presence/absence of phasic flow with respiration or Valsalva in proximal veins
- Note whether vigorous/sluggish enhanced flow is seen upon distal manual compression
- Where thrombus is identified, record its location and extent and whether there is any patency through the thrombus

## Ultrasound Investigation for Varicose Vein

- Note occurrence and location of reflux in the LSV and SSV distributions. Include anterior thigh vein and Giacomini vein when seen
- Note the presence of incompetence at SFJ and SPJ
- Note occurrence of reflux in mid-thigh and large calf perforators
- Note any incompetence in distal popliteal vein (reflux >1 second) and gastrocnemius vein (when seen, usually runs to a perforator in the calf)

In the case of recurrent varicose veins, determine and report the source of any incompetence seen with reference to landmarks:

*Example*

LSV absent, incompetent anterior thigh vein runs from SFJ to lateral border of knee, incompetent superficial vein runs from mid-thigh perforator 10 cm above knee, LSV present and incompetent from 6 cm below the SFJ with communicating vein to incompetent SFJ, large incompetent perforator 8 cm above medial malleolus.

## Vein Marking for Harvesting or Other Pre-Surgery Ultrasound

With patient standing or sitting to ensure vein filling, determine location and measure diameter of vein (should be greater than 3-4 mm for use as graft). Marking is done with a water colour pencil and then marked in with a permanent marker as the gel is removed from the skin. Report should note vein diameter and location of adequate vein e.g. Good LSV to 8 cm below knee - greater than 4 mm throughout. Vein marked.

# SECTION 4
# PRACTICE GUIDELINES

## 4.1 CLINICAL GOVERNANCE

Clinical governance is defined in the 1998 consultation document "A First Class Service: Quality in the New NHS"[1] and also in 1998 by Scally and Donaldson in the British Medical Journal[2] as:

> *"A framework through which NHS organisations are accountable for continuously improving the quality of their services and safeguarding high standards of care by creating an environment in which excellence in clinical care will flourish."*

As clinical governance is based on professional values and concern for others, the sonographer is actively involved in this process of accountability as part of his or her daily activities. By safeguarding high standards of care and seeking to continuously improve its quality, it ensures that health care provision is patient-centred which is central to the concept.

To the sonographer, clinical governance means:

| | |
|---|---|
| **Clinical Effectiveness** | Taking part in personal, departmental and wider audit programmes to evaluate clinical practice and service to patients/patients including the reporting of ultrasound examinations |
| **Communication and Consent** | Refer to Section 1.4 |
| **Patient Safety** | Refer to Section 1.1 |
| **Risk Management** | Incident reporting, infection control, prevention and control of risk |
| **Education, Training and Continuous** | Lifelong learning |
| **Professional Development** | Refer to Section 5.1 |
| **Team Working** | Being inclusive of everyone both within the service and across organisations |
| **Patient, Public and Carer** | Providing the highest quality patient care at all times through |
| **Involvement** | Carer Involvement service improvement |
| **Being Accountable for One's** | Refer to Section 5.2 |
| **Own Actions** | |
| **Common Sense** | |

References
1. Department of Health. (1998) *A First Class Service: Quality in the New NHS.* London: DH
2. Scally and Donaldson. (1998) British Medical Journal: 317,61-65 (4 July).

Additional Reading
- www.dh.gov.uk
- www.healthcarecommission.org.uk
- www.clinicalgovernance.scot.nhs.uk
- www.npsa.nhs.uk
- www.nice.org.uk

## 4.2 ACQUISITION, ARCHIVING AND USE OF ULTRASOUND DATA

Ultrasound data refers to ultrasound images, ultrasound reports and request forms. They include images captured and stored in digital, video, X-ray film or thermal paper format(s) and written reports/requests generated either in electronic format or on paper.

### Image Recording

The compilation of an appropriate number of annotated images that represent the entire ultrasound examination is good practice as it provides the following:

- support for the written report
- a second opinion to be given on those parts of the examination that have been imaged
- contribution to clinical governance through audit and quality control
- a teaching tool
- evidence that the examination was carried out to a competent standard
- evidence that the local guidelines were followed

Unless the entire examination is recorded, it must be recognised that the ultrasound image data cannot be fully representative of that examination.

All images should have the following demographic and machine information correctly recorded on them:

- Patient identification
- Date of examination
- Hospital/department identification

The sonographer should be aware that the on-screen information is not always reproduced on the recorded images. For example, the safety indices displayed during the real time examination may not be replicated on the accompanying thermal images.

The sonographer should ensure that the local departmental guidelines address the issues of:

- ultrasound data acquisition
- archiving of examination specific ultrasound data in accordance with national guidance
- current legislation including Data Protection and Freedom of Information Acts

(Refer to Section 1.9)

It is the sonographer's responsibility to ensure that an appropriate number of diagnostic and annotated images is recorded to match the dynamic examination in support of the written report.

Additional Reading

- The Royal College of Radiologists, (2006). *BFCR(06)4; Retention and Storage of Images and Radiological Patient Data.* London: RCR
- Department of Health, (2006). *Records Management: NHS Code of Practice: Parts 1 & 2.* London: DH
- British Standards Institute BSI PD 0008, (1999). Legal Admissibility and Evidential Weight of Information Stored Electronically. London: BSI
- Medical Ethics Department. (2004). Taking and using visual and audio images of patients: Guidance from the Medical Ethics Department. London: BMA.
- Committee on Publication Ethics. (2000). The Cope Report. London: BMJ Books.

## 4.3 USE OF MOBILE TELEPHONES AND OTHER ELECTRONIC DEVICES IN THE ULTRASOUND DEPARTMENT

The Department of Health (DH) guidance on all aspects of policy concerning the use/misuse of mobile phones and other electronic devices is comprehensive and transparent. The guidance[1] can be used to inform a local written policy on the use of mobile telephones and electronic devices in the ultrasound department.

The Medicines and Healthcare products Regulatory Agency (MHRA) advises that Trusts and Boards do not impose an overall ban on the use of mobile phones. Previous technological evidence may have been misinterpreted and this has led to inconsistencies in the implementation of policy based on this evidence. However, as these electronic devices become more sophisticated and may have photographic capabilities, respect for patient and staff privacy and confidentiality should be maintained at all times.

Only when there is good reason should mobile phones be switched on and used in clinical areas. Trusts and Boards are advised to establish designated areas, clearly sign-posted, where the use of mobile phones is permitted. They are also advised to carry out a risk assessment before a locally defined policy is published.

It must be noted that the DH advice is related to NHS Hospitals only. Sonographers who work in Primary Care, independent treatment centres, the private sector or other areas where medical ultrasound is practised may not be governed by this guidance. It should be the responsibility of all sonographers in these situations to seek out appropriate advice at their workplace and together with the DH recommendations include it in their departmental written guidelines.

References
1. Department of Health, 2007. *Using Mobile Phones in NHS Hospitals.* London: Department of Health.

Additional Reading
- http://dh.gov.uk
- http://healthcarecommission.org.uk
- www.mhra.gov.uk

## 4.4 USE OF PATIENT, STAFF AND HOSPITAL DATA FOR EDUCATION AND RESEARCH

Ultrasound students are required to access, compile and submit all or a part of confidential patient information and ultrasound images to another individual for the purposes of assessment[1]. This material may include demographic and personal data, clinical details, ultrasound reports and images and may be stored electronically or in paper format. Unless students and their tutors address the appropriate access procedures to use confidential material, assessments may be compromised and patient confidentiality will be breached. These issues are also relevant to sonographers involved in the gathering of ultrasound data for purposes of research.

The following guidelines should be considered:

- agree a local procedure for access and use of confidential material for education or research purposes
- all patients whose cases are to be used for assessment purposes must be asked for their consent prior to the ultrasound examination taking place
- all patients who give **prior** consent have the right to withdraw their consent at any time before the submission of the assessment
- all patient identification should be removed from documentation and ultrasound images prior to assessment submission or research publication
- a disclaimer should be included in the submission if permission has been given to identify material that could be traced to source
- all captured assessment data should be anonymous and electronically stored on equipment within the ultrasound department. This includes draft assignments, work in preparation and research protocols
- a record of data matchings between anonymous and named data sets for search and identification purposes should be retained
- all stored study data should be destroyed on successful completion of the learning episode or research programme
- ethical approval should be sought, and obtained where appropriate, for research studies
- The Data Protection Act (1998) and NHS (2006) guidance will be adhered to at all times

Additional Reading
- Ethics Committee, (2001) The BMJ's ethics committee is open for business. *British Medical Journal,* 322: 1263-1264
- Data Protection Act 1998
- Freedom of Information Act 2000
- Australian Society for Ultrasound in Medicine. (2000) *Consent to Ultrasound Scanning for Teaching Purposes.* B6: ASUM.
- Sayer, M., Bowman, D., Evans, D., Wessier, A., and Wood, D. (2002). Use of patients in professional medical examinations: current UK practice and the ethicolegal implications for medical education.
- *British Medical Journal.* 324: 404-407
- Medical Ethics Department. (2004). *Taking and using visual and audio images of patients: Guidance from the Medical Ethics Department.* London: BMA.
- http://www.asum.com.au/open/home.htm
- http://www.gmc-uk.org

## 4.5 GUIDELINES FOR THE SCANNING OF PERSONS FOR NON-CLINICAL PURPOSES

Ultrasound examinations for non-clinical purposes include the scanning of:

- patients for training of medical and non-medical sonographers in the clinical setting
- student and tutor volunteers for skill-based training in the classroom
- models at conferences and workshops in support of presentations
- subjects in research studies to test an hypothesis
- sonographers and application specialists for demonstrating equipment
- patients requesting an examination for which there is no clinical indication

The sonographer should:

- ensure that the ultrasound exposure time is kept to a minimum and does not exceed recommended safety limits
- be aware of the safety policies and procedures, including those for work-related musculo-skeletal disorders and recommendations issued by professional bodies, scientific and legislative organisations
- ensure that written local guidelines for non-clinical examinations reflect current guidance and good practice
- discourage, and personally decline, the ad-hoc scanning of local health care and hospital staff for clinical purposes who present without a formal request

(Refer to Section 1.9)

### Points of Good Practice

- Appropriate referral pathways should be in place in the event of unanticipated findings, including pregnancy, being discovered during an examination for non-clinical purposes. The patient should be made aware of this policy prior to undergoing the examination and should accept responsibility to act on the finding
- Any person must be fully aware of the nature and purpose of the procedure and the anticipated exposure conditions as they relate to those in normal clinical practice
- Written consent should be obtained from the patient after a full explanation has been given
- The examination should be supervised by a qualified and competent sonographer who is working to a recognised set of standards and who has authorisation to supervise the scanning of volunteers and other patients. It is recommended that the sonographer has professional indemnity for scanning for non-clinical referrals
- The sonographer is expected to be aware of current findings and opinions regarding the safety of all ultrasound examinations, in particular the use of Doppler examinations in pregnancy
- The sonographer must always minimise the ultrasound dose, without compromising diagnostic value, during the examination
- Children under 16 years of age should not participate in non-clinical ultrasound examinations
- Ethical permission must be sought from the local ethics committee for the purposes of research

Additional Reading

- http://www.aium.org/publications/statements/_statementsSelected.asp?statement=31
- http://www.bmus.org.publications/pu-volunteers01.asp
- http://www.asum.com.au/open/home.htm
- http://www.efsumb.org/efsumb/committees/Safety_Committee/Safety_Eng/2006/souvenir/scanning/statement.pdf
- http://www.bmus.org.publications/pu-guidelines01.asp

## 4.6 GUIDELINES RELEVANT TO SETTING UP A SONOGRAPHER-LED INTERVENTIONAL ULTRASOUND SERVICE

Interventional ultrasound services are classed as an extension of the role of the sonographer and amongst others may include amniocentesis, paracentesis, hystero-contrast-sonography, sono-hysterography, fine needle aspiration of the breast or thyroid, and transrectal prostate biopsy.

When setting up any sonographer-led service, it would be appropriate to make application to extend the sonographer role to the Clinical Lead, Service Manager and Trust or Executive Health Board seeking their approval.

In order to ensure patient and sonographer safety when setting up the new interventional ultrasound service the following is an example of a best practice application.

Evidence of:

- support from a lead medical practitioner
- appropriate training
- insurance/liability cover for the sonographer
- quality assurance and audit programmes
- acceptance by all clinicians that the sonographer is the person to consent patients
- protocol for each individual procedure that the sonographer will complete

Additional Reading

*Professional Development and Role Extension*


- The College of Radiographers, (2003). *Role Development Re-visited: The Research Evidence 2003.* London: CoR.
- The College of Radiographers, (2008). *Continuing Professional Development: Professional and Regulatory Requirements.* London: CoR. http://www.sor.org
- Department of Health, (2000). *The NHS Plan 2000.* London: DoH. http://doh.gov.uk


*Training + Delegation of Tasks*


- The Royal College of Radiologists, (1999). *Skill Mix in Clinical Radiology.* London: RCR
- The Royal College of Radiologists + The College of Radiographers (1998), *Inter-professional Roles and Responsibilities in a Radiology Service.* London: RCR, CoR. http://www.rcr.ac.uk

# SECTION 5
# PROFESSIONAL GUIDELINES

## 5.1 CONTINUING PROFESSIONAL DEVELOPMENT (CPD)

Continuing professional development:

> "...is the process by which health professionals keep updated to meet the needs of patients, the health service, and their own professional development. It includes the continuous acquisition of new knowledge, skills, and attitudes to enable competent practice..."[1]

It is a process that seamlessly continues after the successful completion of a first qualification and lasts throughout a sonographer's professional life and is embedded in the NHS clinical governance strategy. (Refer to Section 4.1)

According to Bates, Deane and Lindsell in 2003[2], all staff must have access to continuing professional development.

Sonographers are obliged to maintain a record of their professional activities3 and submit it and other suitable evidence to the regulatory or professional body if requested. Activities that may be used as evidence can be defined as:

- successfully completing a postgraduate educational programme of study
- attendance at and participation in appropriate professional workshops and conferences
- defining and implementing a departmental audit programme
- implementing a change process in practice
- mentoring an ultrasound student in practice
- participation in an ultrasound or professional research project
- attendance at and participation in inter-departmental case review
- submission of a paper to a peer-reviewed journal
- critical evaluation of a peer-reviewed research paper
- lecturing to peers and students both formally and informally
- involvement with a professional ultrasound group or scientific society
- promoting the practice of ultrasound to other health care colleagues within a wider sphere

It is important that suitable records are maintained and evidence is compiled on a regular basis. Evidence should not only include attendance certificates at events but also written records of personal learning and reflection.

References
1. Peck, C., McCall , M., McLaren, B,. Rotem, T. (2000). *British Medical Journal.* 320(7232): 432-435. (http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1117549)
2. http://www.bmus.org
3. United Kingdom Association of Sonographers. (2008) *Code of Professional Conduct.* London: UKAS.

Additional Reading
- The Society of Radiographers. (2003). *A Strategy for Continuing Professional Development.* London: CoR.

## 5.2 CODE OF PROFESSIONAL CONDUCT FOR SONOGRAPHERS

### Introduction

A Code of Practice can be defined as a set of conventional principles and expectations that are considered binding on any person who is a member of a particular group. (WordNet® 3.0, © 2006 by Princeton University accessed 19 July 2007). It is designed to cover all circumstances, written in broad terms, expressing ethical principles.

The Code of Professional Practice for Sonographers issued by the United Kingdom Association of Sonographers (UKAS) has been compiled to offer guidance to all health care practitioners who participate in the practice of medical ultrasound.

This document replaces all previous publications of the Code and has been reviewed to coincide with the publication of the 2nd edition of the Guidelines for Professional Working Standards (2008). It closely reflects the statements made in March 2004 which have seen no major changes. Codes 11 and 12 have been added to reflect the expanding practice of ultrasound in all areas of health care and Institutions of Higher Education policy.

The statements, that reflect best practice, are to be a guide and offer advice to sonographers, educationalists, students of medical ultrasound and other health care practitioners. They are statements of professional conduct that reflect the individual's rights, local and national changing patterns of ultrasound service delivery and the requirement of sonographers to demonstrate continuing competency through personal and professional development.

### The Code of Practice for Sonographers

1. Sonographers have a duty of care to their patients, patients and carers and to the minimisation of ultrasound exposure consistent with diagnostic needs.
2. Sonographers are ethically and legally obliged to hold in confidence any information acquired as a result of their professional and clinical duties, except where there is a legal obligation for disclosure.
3. Sonographers must be committed to the provision of a quality ultrasound service having due regard for the legislation and established codes of practice related to health care provision in order to minimise risk to patients, patients, carers and other professionals.
4. Sonographers are legally and professionally accountable for their own practice and must not be influenced by any form of discrimination.
5. Sonographers must identify limitations in their practice and request training and support to meet their perceived needs.
6. Sonographers will take all reasonable opportunity to maintain and improve their knowledge and professional competency and that of their peers and students.
7. Sonographers must pay due regard to the way in which they are remunerated for their work.
8. Sonographers have a duty of care to work collaboratively and in co-operation with the multi-disciplinary health care team in the interests of their patients and patients.
9. Sonographers must act at all times in such a manner as to justify public trust and confidence, to uphold and enhance the reputation of sonography and serve the public interest.
10. Sonographers must ensure that unethical conduct and any circumstances where patients and others are at risk are reported to the appropriate authority.
11. Sonographers who are held accountable in another area of health care must relate this Code to others that govern their practice.
12. Student sonographers pursuing a qualification in medical ultrasound must adhere to their Universities' Codes of Conduct that relate to all elements of their ultrasound education and training.

# APPENDIX
## OBSTETRIC REPORTING PROFORMAS

### FETAL DATING EXAMINATION WORKSHEET

**Name:** **Unit No.:**

**Address:** **DOB:**

**Consultant:**

**Date Of Examination:**

**Gestational Age:** **Previous Ultrasound** ☐

**Multiple Pregnancy** **Yes** ☐ **No** ☐

**Chorionicity** **DCDA** ☐ **MCDA** ☐ **MCMA** ☐

**Fetal Heart Pulsations Observed** **Yes** ☐ **No** ☐

**Fetus** **Presentation**

**Measurements (mm):**

**Crown Rump Length:** **Head Circumference:**

**Transcerebellar Diameter:**

**Abdominal Circumference:** **Femur:**

**Placental Position Relative To Internal Os:**

**Internal Cervical Os Assessed For Evidence Of Vasa Praevia** **Yes** ☐ **No** ☐

**Amniotic Fluid** **Normal** ☐ **Increased** ☐ **Decreased** ☐

**Gestational Age By U/S:** **USEDD:**

**Comments:**

**Scanned And Reported By:** **Status:**

**Equipment:** **Anomaly Appointment Made For:**

## FETAL ANOMALY EXAMINATION WORKSHEET

**Name:** **Unit No.:**

**Address:** **DOB:**

**Consultant:**

**Date Of Examination:**

**Previous Ultrasound** **Yes** ☐ **No** ☐ **USEDD**

**Multiple Pregnancy** **Yes** ☐ **No** ☐

**Fetus** **Presentation**

**Fetal Heart Pulsations Observed** **Yes** ☐ **No** ☐

**Measurements (mm):**

**Biparietal Diameter:**

**Head Circumference:**

**Atrium Of Lateral Ventricle:**

**Abdominal Circumference:**

**Femur:**

**Placental Position Relative To Internal Os:**

**Internal Cervical Os Assessed For Evidence Of Vasa Praevia** **Yes** ☐ **No** ☐

**Amniotic Fluid** **Normal** ☐ **Increased** ☐ **Decreased** ☐

**Comments:**

√ = normal U/S appearance & position
x = abnormal U/S appearance & / or position
ns = not seen

| **ANATOMY:** | | | | | |
|---|---|---|---|---|---|
| Face (coronal view): | Profile: | | Lips: | Alveolar ridge | |
| Choroid plexus: | R: | L: | Nuchal area: | Posterior fossa: | |
| Orbit: | R: | L: | Lens: | R: | L: |
| Situs | | | Cardiac rhythm: | | |
| 4 chamber view of heart: | | | Aortic root: | Pulmonary artery | |
| Chest contents: | | | Diaphragm: | | |
| Fetal stomach: | | | Abdominal wall: | | |
| Cord insertion: | | | 3 vessel cord: | | |
| Spine: | | | Skin covering: | | |
| Kidney: | R: | L: | Renal pelvis: | R: | L: |
| Bladder: | | | Genitalia: | | |
| Femur: | R: | L: | Humerus: | R: | L: |
| Tibia: | R: | L: | Radius: | R: | L: |
| Fibula: | R: | L: | Ulna: | R: | L: |
| Foot: | R: | L: | Hand: | R: | L: |
| Toes: | R: | L: | Fingers: | R: | L: |

**Additional comments:**

**Scanned and reported by:**

**Status:** **Equipment**

## FETAL GROWTH EXAMINATION WORKSHEET

**Name:** **Unit No.:**

**Address:** **DOB:**

**Consultant:**

**Date Of Examination:** **Gestational Age:**

**Fetal Heart Pulsations Observed** **Yes** ☐ **No** ☐

**Fetus** **Presentation**

**Measurements (mm):**

**Biparietal Diameter:** **Head Circumference:**

**Abdominal Circumference:** **Femur:**

**Umbilical Artery PI** **End Diastolic Flow** **Yes** ☐ **No** ☐

**Middle Cerebral Artery PI** **End Diastolic Flow** **Yes** ☐ **No** ☐

**Ductus Venosus PI** **Forward Flow** **Yes** ☐ **No** ☐

**Placental Position Relative To Internal Os:**

**Internal Cervical Os Assessed For Evidence Of Vasa Praevia** **Yes** ☐ **No** ☐

**Amniotic Fluid**

**Normal** ☐ **Decreased** ☐ **Oligohydramnios** ☐ **Increased** ☐ **Polyhydramnios** ☐

**Left Upper Quadrant** **Right Upper Quadrant**

**Left Lower Quadrant** **Right Lower Quadrant**

**AFI** **Deepest Vertical Pool**

**Comments:**

**Scanned And Reported By:** **Status:**

**Equipment:** **Anomaly Appointment Made For:**

**United Kingdom Association of Sonographers**
36 Portland Place, London W1B 1LS.
**www.ukasonographers.org**