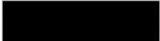
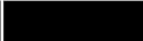




The Register of Clinical Technologist

RCT Sonographer Evidence Portfolio



  (Sonographer)
24/11/2025

Abbreviations List:

2WW - Two-Week Wait

AC - Abdominal Circumference

ACJ – Acromio-clavicular joint

AIIS - Anterior inferior iliac spine

AiTFL – anterior inferior tibiofibular ligament

ALARA - As Low As Reasonably Achievable

AP – Anteroposterior

APL - Abductor pollicis longus

ASIS – Anterior superior iliac spine

ATFL – anterior talofibular ligament

ATV - Anterior tibial veins

BLS – Basic Life Support

BMUS - British Medical Ultrasound Society

CASE - Consortium for the Accreditation of Sonographer Education

CBD – Common bile duct

CDPR - General Data Protection Regulation

CEO - Common extensor origin

CFL – calcaneofibular ligament

CFO - Common flexor origin

CFV - Common femoral vein

CIV - Common iliac vein

COSHH - Control of Substances Hazardous to Health

CPD - Continuing Professional Development

CRL - Crown–rump length

CSP - Cavum septi pellucidi

CT – Computed Tomography

DVT – Deep vein thrombosis

ECU - Extensor carpi ulnaris

EDL - Extensor digitorum longus

EFW - Estimated Fetal Weight

EHL - Extensor hallucis longus

EIV - External iliac vein
EPB - Extensor pollicis brevis
FCR – flexor carpi radialis
FCU – flexor carpi ulnaris
FDP - flexor digitorum profundus
FDS – flexor digitorum superficialis
FL - Femur Length
FMU - Fetal Medicine Unit
FPL - flexor pollicis longus
FV - Femoral vein
GP - General practitioner
HAI - Healthcare-associated infection
HC - Head Circumference
HCPC - Health and Care Professions Council
HRT - Hormone Replacement Therapy
IBUS - International Breast Ultrasound School
IG - Information Governance
IR(ME)R - Ionising Radiation (Medical Exposure) Regulations
IVC - Inferior vena cava
LCL – Lateral collateral ligament
LMP - Last menstrual period
MAS - Maternity Assessment Suite
MCA - Middle Cerebral Artery
MCL – Medial collateral ligament
MDT - Multidisciplinary team
MHz – Megahertz
MI - Mechanical Index
MRI - Magnetic resonance imaging
MRSA - Methicillin-resistant Staphylococcus aureus
MSK – Musculoskeletal
MTP - metatarsophalangeal
NICE - National Institute for Health and Care Excellence

NT - Nuchal translucency
NWL - North West London
OFD - Occipitofrontal diameter
PACS - Picture Archiving and Communication System
PI - Pulsatility Index
PL – palmaris longus
PMB - Postmenopausal bleeding
PPE - Personal Protective Equipment
PTV - Posterior tibial veins
QA - Quality Assurance
QT – Quadriceps tendon
RCI - Rotator Cuff Interval
RCT - Register of Clinical Technologist
SASD - Subacromion-subdeltoid bursa
SOPs - Standard Operating Procedures
SoR – Society of Radiographers
TA - Tibialis anterior
TFL – Tensor fasciae latae
TI - Thermal Index
UK – United Kingdom
WHO - World Health Organisation's

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SAMPLE

1. Introduction

2. Safe Working Practice

2.1 Infection Control Measures

Stringent infection control is an essential aspect of my ultrasound practice, particularly given the frequent direct contact with patients. I am fully compliant with all Tristel Trio wipes training (Appendix 12.2.1) and mandatory infection control training (Appendix 12.2.2), which is refreshed regularly to ensure that my knowledge and practice remain in line with current national guidelines and local policy. This training enhances my understanding of healthcare-associated infection (HAI) prevention, including how to recognise risks, apply protective measures, and respond appropriately in clinical environments. My role in preventing nosocomial infections is continuous, proactive, and supported by the latest evidence-based practices.

Hand hygiene is central to infection prevention, and I strictly follow the World Health Organisation's (WHO) Five Moments for Hand Hygiene framework (WHO, 2009). I clean my hands before touching a patient to protect them from harmful microorganisms I may be carrying. I also perform hand hygiene before any clean or aseptic procedure, which helps prevent both the transfer of my own germs and the patient's endogenous flora into sterile body sites. After any exposure to bodily fluids, or after removing gloves, I wash or sanitise my hands

to protect myself and prevent environmental contamination. Additionally, I clean my hands after touching the patient or their immediate surroundings before leaving the room, thereby reducing the risk of spreading contaminants to the next patient or environment. I use alcohol-based hand rubs when appropriate and wash with soap and water when hands are visibly soiled or when dealing with spore-forming organisms.

Between patients, I ensure that the ultrasound room and equipment are thoroughly decontaminated. Surfaces such as the ultrasound machine, couch, transducers, and any areas touched during the scan are wiped with hospital-approved disinfectants, specifically Clinell Universal Wipes, which are proven effective against a wide range of pathogens, including methicillin-resistant *Staphylococcus aureus* (MRSA). For external ultrasound examinations, the probe is wiped with Clinell wipes between uses. For transvaginal and other internal examinations, I follow the Tristel Trio Wipes System in full compliance with local high-level decontamination protocols. The process begins with Step 1 – Pre-Cleaning, where I disinfect my hands, don gloves, and use the Pre-Clean Wipe to remove any visible organic material from the transvaginal probe. If the probe is heavily soiled, I use more than one wipe to ensure complete removal of contaminants. I then discard the wipe and gloves according to local waste regulations. In Step 2 – High-Level Disinfection, I take the Sporicidal Wipe and apply Activator Foam directly to the wipe following the instructions on the foam container. I then scrunch the wipe to activate the chlorine dioxide, ensuring the foam spreads evenly across the wipe. I thoroughly wipe the surface of the probe, taking care to reach all ridges and indentations, and maintain a contact time of at least 30 seconds. Once disinfection is complete, I move to Step 3 – Rinsing, where I take a Rinse Wipe and use it to clean the probe surface, removing any residual disinfectant. Again, I dispose of all used materials appropriately and remove gloves with care to avoid contamination. Each disinfection cycle is logged using the Tristel Quality Audit Trail Record Book (Appendix 12.1.1), where I record the empty sachet details alongside the patient's information to ensure full traceability and compliance.

When scanning a patient known to be colonised or infected with MRSA, I implement enhanced precautions to reduce the risk of transmission. MRSA is a strain of *Staphylococcus aureus* that has developed resistance to methicillin and other beta-lactam antibiotics, making it a particularly difficult pathogen to treat (Klein et al., 2013). It is a leading cause of HAIs and can result in mild to severe clinical conditions, including skin infections, wound complications, sepsis, and pneumonia (Chambers & DeLeo, 2009). Because MRSA can be transmitted via direct contact or contaminated surfaces, strict infection control measures are necessary to prevent spread, especially to vulnerable patients (NICE, 2019).

To minimise the risk of cross-infection during ultrasound examinations, I wear appropriate personal protective equipment (PPE) based on risk assessment and local protocols. For MRSA-positive patients, this includes single-use gloves and a disposable plastic apron or gown to protect my hands and clothing from contamination. In situations where there is a risk of fluid splashing or if I am assisting interventional ultrasound procedures, I wear a face mask and eye protection as an additional precaution. I assess the required level of PPE before each procedure, ensuring it matches the nature of the task and level of contamination risk. All PPE is single-use, and I follow best practices for donning and doffing to avoid self-contamination. Once removed, PPE is disposed of in appropriate clinical waste bins, and I perform hand hygiene immediately afterwards. A daily PPE checklist (Appendix 12.1.2) is used to ensure all equipment is in good condition and restocked or replaced if damaged or depleted.

After the scan is completed on an MRSA-positive patient, I follow a rigorous cleaning protocol to prevent environmental contamination. This includes high-level disinfection of ultrasound probes, ensuring proper drying and storage, and thorough wiping of the ultrasound machine, couch, and all other contact surfaces with disinfectants that are effective against MRSA, such as alcohol-based or chlorine-based products. Probes are never reused without complete cleaning and disinfection, and special care is taken to avoid biofilm development, which can make bacteria resistant to disinfection agents (Rutala & Weber, 2019). Once the room is vacated, I request a deep clean through the estates team. A reference number for the clean is added to a sign placed on the outside of the room door. After the deep clean is completed, the estates team writes the time on the sign to indicate when the room is safe for use again. These scans are scheduled at the end of the list wherever possible to allow sufficient time for cleaning and airing of the space before another patient enters.

Through diligent adherence to these infection control procedures, I ensure that both patients and staff are protected from the risks associated with MRSA and other healthcare-associated infections. My practice is grounded in national and international guidance, and I consistently aim to uphold the highest standards of cleanliness and professional accountability in all aspects of ultrasound care.

2.1.1 Infection control audits

Clinical audits play a crucial role in driving continuous quality improvement within our ultrasound department. They provide an objective means to measure how well healthcare is delivered in alignment with established standards and departmental protocols. Through systematic evaluation, audits offer valuable feedback to both staff and patients, highlighting

areas of strength and identifying opportunities for improvement to enhance overall service quality and patient safety.

In support of our rigorous infection control practices, we regularly conduct audits focused on hand hygiene and PPE compliance. The hand hygiene audit assesses adherence to the World Health Organization's Five Moments of Hand Hygiene framework—ensuring that hand cleansing occurs at the critical times: before patient contact, before performing aseptic tasks, after exposure to bodily fluids, after patient contact, and after contact with the patient's immediate surroundings. The audit also evaluates the effectiveness of the handwashing or hand sanitising technique, ensuring that it is performed thoroughly and correctly to minimise the risk of pathogen transmission.

Complementing this, PPE audits (Appendix 12.1.2) are conducted specifically during ultrasound examinations involving infectious patients, such as those colonised or infected with MRSA. These audits verify that appropriate PPE—including gloves, aprons or long-sleeve gowns, eye protection, and masks—is selected and used correctly in accordance with local infection prevention policies. The audit evaluates several key elements: whether PPE is donned and doffed in the recommended sequence to prevent contamination, whether PPE is changed appropriately between patients, and whether all used PPE is immediately disposed of in the correct clinical waste streams. This systematic monitoring ensures that the protective barriers designed to reduce cross-infection risks are consistently maintained throughout clinical practice.

Together, these audits reinforce a culture of safety and accountability within the department. They serve as essential tools to validate that infection prevention measures are embedded into everyday practice, supporting my commitment to providing safe, high-quality ultrasound care. The audit outcomes inform targeted staff education and process improvements, ultimately enhancing patient protection and staff wellbeing.

2.2 Mandatory Training

As a Sonographer, completing mandatory training in Basic Life Support (BLS), Manual Handling, and Safeguarding (Appendix 12.2) is essential for maintaining a safe and effective working environment. BLS training equips me with the critical skills needed to respond swiftly and confidently to medical emergencies, such as cardiac arrest, ensuring patient safety throughout ultrasound procedures. This training includes the ability to initiate the adult basic life support algorithm, use a defibrillator, and escalate emergencies by activating the red emergency button or calling 2222. In our facility, the cardiac arrest trolley is located near the magnetic resonance imaging (MRI) room, the closest emergency resource to the ultrasound

rooms, while nurses in the Interventional Radiology department can be alerted via a call button on the wall, enabling rapid response.

Manual Handling training is fundamental to my role, particularly when assisting immobile or post-surgical patients. This training covers the safe use of hoists and slide sheets, and emphasises the importance of maintaining correct posture during scanning to prevent injury to both the patient and myself. Ergonomic assessment is integrated into my routine practice, where I ensure the patient is positioned close enough to reduce arm abduction to less than 30 degrees, adjust the height of the chair, couch, and ultrasound machine so that my forearm remains horizontal, my neck relaxed and neutral, and my spine aligned. Proper positioning also involves aligning the patient relative to the couch and machine to keep my humerus vertical and close to my body. While handling the transducer, I use a modified power grip with my wrist in a neutral position, applying only the minimal pressure clinically necessary. Additionally, I keep the ultrasound machine within easy reach for my non-scanning hand and incorporate micro-breaks during examinations to reduce strain and fatigue.

Safeguarding training, spanning Levels 1 to 3, has enhanced my ability to identify and escalate concerns, especially in antenatal cases or when working with vulnerable adults. Safeguarding adults at risk reflects a collective commitment to protect all patients, staff, and visitors. As an acute trust, we play a leading role in safeguarding children and young people, where vigilance and prompt action by all staff are imperative for the wellbeing of children. Domestic abuse, recognised as a significant public health issue, has profound consequences on patients' health and treatment outcomes, often exacerbating acute and chronic conditions and increasing healthcare costs. Safeguarding team contact details are prominently displayed in all ultrasound rooms, facilitating immediate access if concerns arise. Given that ultrasound scans are performed in an intimate and safe environment, many patients feel comfortable disclosing safeguarding issues. It is therefore my responsibility to act in the patient's best interests by involving the relevant safeguarding team before the patient leaves the department. This ensures that the safeguarding team can speak to the patient privately and provide the necessary support in a safe environment.

Through this comprehensive training and vigilant practice, I uphold my responsibility to provide compassionate, safe care while contributing to a secure, professional healthcare setting for patients and colleagues alike.

2.3 Risk of working in a clinical setting and lone working as a sonographer

Working as a sonographer in a clinical setting involves exposure to a range of occupational risks that span physical, psychological, clinical, and professional domains. These challenges are further compounded when the sonographer is working alone, a situation that is becoming increasingly common due to staffing pressures and extended service hours.

One of the most prevalent risks faced by me as a sonographers is the development of work-related musculoskeletal disorders, which affect a significant majority of my colleagues in the field. These injuries typically result from the repetitive nature of scanning, sustained static postures, and awkward positioning required to accommodate patients with diverse physical needs. The absence of ergonomic equipment such as height-adjustable beds or appropriately designed transducers can exacerbate this problem. When working alone, these physical demands become more pronounced, as I am unable to request help in positioning or moving patients, leading to increased strain and a higher likelihood of injury.

Psychological and emotional stress is another significant concern. I often work in high-pressure environments with tight schedules and are expected to remain composed and compassionate while dealing with anxious, unwell, or occasionally uncooperative patients. The emotional burden is heightened when I must convey or manage the implications of distressing findings, even when I am not always directly responsible for delivering diagnoses. When working in isolation, there is no immediate peer support or opportunity for informal consultation, which can intensify feelings of stress, anxiety, and professional isolation. Over time, this can contribute to burnout and reduced job satisfaction.

From a clinical perspective, I also play a crucial role in the diagnostic process, and errors can have serious consequences for patient outcomes. Lone working increases the likelihood of such errors, particularly in complex or ambiguous cases where a second opinion or immediate supervision would be beneficial. The lack of direct access to colleagues for clinical discussion can delay decision-making or lead to misinterpretation of findings. In emergency situations, such as if a patient becomes acutely unwell or collapses during a scan, the absence of additional staff can result in delays in initiating appropriate medical responses, which may compromise patient safety.

There are also ethical and legal implications associated with lone working. There is expected of me to maintain professional boundaries and adhere to safeguarding standards, particularly during intimate or sensitive examinations. Conducting these types of scans without a chaperone can expose both me and the patient to uncomfortable or even risky situations. In addition, without the presence of another professional, there is an increased burden of accountability on me, especially in the event of a complaint or adverse outcome. Lone working

thus places greater responsibility on me to ensure that all aspects of patient care, documentation, and professional conduct are managed independently and without oversight.

Finally, personal safety is a serious concern in lone working environments. Clinical settings, especially during off-peak hours, can present risks such as slips, trips, and falls, which become more dangerous when no one is immediately available to assist. Furthermore, the potential for verbal or physical aggression from patients or visitors remains a concern, particularly in unsupervised or isolated scanning rooms. In such situations, the absence of nearby colleagues can leave me vulnerable. While our department have implemented lone worker policies, including alarm systems and regular check-ins, these measures cannot fully replace the reassurance and immediate support that comes from working within a team.

In conclusion, while I provide an essential diagnostic service in modern healthcare, the risks associated with their role—particularly when working alone—are substantial and multifaceted. Addressing these risks requires a combination of improved workplace ergonomics, formal support structures, adherence to lone worker safety protocols, and a commitment to maintaining adequate staffing levels. Ensuring a safe and supportive environment is critical not only for the well-being of me as a sonographers but also for the delivery of high-quality, safe, and effective patient care.

2.3.1 Risk Assessment

Risk assessments are performed in our department to identify and manage risks that may affect the health and safety of staff and patients. As mentioned above, sonographers are particular prone to risk assessments which focus on lone working, slips and falls, and work-related stress. Lone working can pose risks in emergency situations where immediate assistance may not be available. Slip and fall hazards—often due to spilled gel, cluttered walkways, or wet floors—can result in injury to both staff and patients. Work-related stress, often caused by high workloads, prolonged scanning times, or emotional strain from challenging cases, can lead to burnout or decreased job performance. Therefore, risk assessments are performed to evaluate the consequence (from negligible to catastrophic) and the likelihood of these risks occurring. This allows the department to implement effective safety measures, promote staff wellbeing, and maintain a safe, compliant, and supportive working environment.

As part of my deputy superintendent role, I have performed a stress risk assessment for a new employee as part of her induction.

During the assessment it came clear that the employee needs extra time to complete tasks like mandatory and core training and for report writing. Extra time was provided during

the induction week to complete all the online learning modules. Obstetric reports are auto generated which reduces report writing time and catch-up time is allocated at the end of the list. Gynaecology lists included catch-up time in the middle and end of the list for report writing. Auto report templates are also available on the reporting Soliton system used. Dictaphones' are available in all of the rooms which will help with report writing. Regular check-ins were also provided to ensure ongoing support.

2.4 Legislation in Imaging Department

2.4.1 Legislation that governs sonographers

Sonographers in the UK are guided by professional standards set out by the Health and Care Professions Council (HCPC) and supported by the Society of Radiographers (SoR) and the British Medical Ultrasound Society (BMUS). Although sonography is not yet a statutorily regulated profession in its own right, many practitioners are registered with the HCPC under related professional titles such as *radiographer*. Others, including myself, pursue voluntary registration through the RCT, which provides professional recognition and assurance of competence for sonographers who meet defined educational and practice standards. As part of maintaining high standards, I also adhere to the HCPC's Standards of Conduct, Performance and Ethics, and Continuing Professional Development (CPD) requirements. Additionally, the SoR and BMUS provide key professional guidance through documents such as the BMUS Guidelines for Professional Ultrasound Practice, which outline best practice in clinical protocols, documentation, consent, infection control, ergonomics, and chaperone use. While these guidelines are not statutory legislation, they underpin clinical governance, support evidence-based practice, and ensure that sonographers deliver safe, effective, and ethical care in line with national standards.

One of the principal legislative frameworks guiding my practice is the Health and Safety at Work etc. Act 1974, which sets out the responsibilities of both employers and employees in creating and maintaining a safe working environment. I uphold my duty by complying with Trust health and safety protocols, using equipment appropriately, reporting incidents or hazards, and attending all mandatory training to remain up to date with evolving safety guidance.

Additionally, my practice is framed by Trust-specific local rules and standard operating procedures (SOPs). These are developed to reflect national guidelines, clinical governance standards, and local risk assessments. SOPs provide step-by-step guidance on areas such as infection control, equipment maintenance, patient safety, and procedural workflows, helping to standardise care and promote safety and efficiency across the department.

A crucial area of legal and professional responsibility under these local procedures is data protection. I follow the UK General Data Protection Regulation (GDPR) and the Data Protection Act 2018, which ensure that all patient data—whether electronic or paper-based—is handled securely and confidentially. I only access patient records on a strictly need-to-know basis and in accordance with my Trust's information governance policies. I ensure that any emails containing patient-identifiable data are sent via NHS.net with "[secure]" in the subject line. Additionally, I do not store confidential information on local drives, personal devices, or non-trust platforms. Documents are disposed of in designated confidential waste bins, and I never share login credentials or smartcards. I also lock my workstation when unattended and observe a strict clear desk policy. I stay current with Information Governance Training and, if I suspect or witness any breach of confidentiality, I log the incident through DATIX and seek advice from the Information Governance team. This meticulous approach to data security is essential not only for patient trust but also to maintain regulatory compliance.

In my Deputy Sonographer role, I also work closely with several key professionals and advisors who ensure compliance with employer procedures. For instance, the Clinical Governance Manager supports the implementation of risk management strategies, monitors incidents and trends, and advises on best practice. The Infection Control Team develops policies, offers training, and has executive authority in managing outbreaks or infection-related incidents. The Occupational Health Department monitors staff wellbeing, facilitates risk assessments for fitness to work, and supports health surveillance programmes such as immunisations. The Estates and Facilities Directorate ensures that medical infrastructure, ventilation systems, and equipment maintenance meet statutory safety requirements.

2.4.2 Radiation Protection Advisors

Although diagnostic ultrasound does not involve the use of ionising radiation, I recognise the importance of radiation safety regulations within a shared imaging environment. The Ionising Radiation (Medical Exposure) Regulations 2017 (IR(ME)R) ensure that all exposures to ionising radiation—such as those performed in X-ray, CT, and fluoroscopy—are justified, optimised, and performed by appropriately trained and entitled practitioners. While my own work as a sonographer does not directly involve ionising modalities, I understand the critical role of the Radiation Protection Adviser (RPA) in maintaining departmental safety and compliance.

The RPA provides expert guidance on all aspects of radiation protection under the Ionising Radiations Regulations 2017 (IRR17), ensuring that both staff and patients are protected from unnecessary exposure. Their responsibilities include advising on the designation of controlled

and supervised areas, supporting radiation risk assessments, reviewing staff dose monitoring, and ensuring that all practices adhere to the principle of As Low As Reasonably Achievable (ALARA). The RPA also plays a key role in training, governance, and incident investigation, working closely with the Radiation Protection Supervisor (RPS) and imaging leads to promote a strong safety culture.

2.4.3 Control of Substances Hazardous to Health (COSHH) assessors

In my role within the ultrasound department, I recognise that the safe and effective use of cleaning and disinfectant products is essential to maintaining infection control standards and ensuring both staff and patient safety. In compliance with the Control of Substances Hazardous to Health (COSHH) Regulations, our department ensure that all substances used for cleaning and decontamination undergo a formal COSHH assessment with our dedicated COSHH assessor. This process allows for the evaluating potential risks associated with each product, outline safe handling procedures, and implement appropriate control measures to minimise exposure.

In my daily practice, I commonly use Clinell Universal Wipes and the Tristel Trio Wipes System for equipment and transducer decontamination.

- Clinell Universal Wipes are used for routine surface cleaning and low-level disinfection of ultrasound equipment and patient-contact areas. The active ingredients, including benzalkonium chloride and other biocidal agents, have been assessed under COSHH for their potential to cause skin or eye irritation. As a result, I always wear gloves, maintain good hand hygiene, and ensure adequate ventilation when using them. When used in accordance with the manufacturer's instructions and disposed of correctly in clinical waste, these wipes present a low occupational risk.
- The Tristel Trio Wipes System provides high-level disinfection specifically for transvaginal ultrasound transducers. These wipes contain chlorine dioxide and citric acid-based solutions, which are effective biocides but can cause irritation to the skin, eyes, or respiratory mucosa if mishandled. The COSHH assessment for Tristel highlights the importance of wearing gloves, working in a well-ventilated area, and washing the skin immediately in the event of accidental contact. I have received training in the correct application techniques to ensure both user safety and effective decontamination (Appendix 12.2.1).

All COSHH documentation for these products (Appendix 12.3.3) is readily available in the departmental safety file. These assessments are reviewed regularly and whenever new products are introduced. Each assessment includes:

- Identification of hazardous components and potential exposure routes.
- Evaluation of risk levels based on frequency and duration of use.
- Specification of control measures such as PPE requirements, ventilation, and staff training.
- Safe storage, handling, and disposal procedures.
- Clear actions to take in the event of accidental exposure or spillage.

By following COSHH assessments and adhering strictly to manufacturer guidance, I help ensure compliance with health and safety legislation, reduce occupational risk, and uphold the highest standards of infection prevention and control in ultrasound practice. This proactive approach supports both patient safety and staff wellbeing within the clinical environment.

2.4.4 Manual Handling Facilitators

In my role within the ultrasound department, I recognise the importance of safe manual handling practices in protecting both staff and patients. Ultrasound can be physically demanding, often involving assisting patients with limited mobility, moving equipment, and maintaining static postures during examinations. To minimise the risk of injury and ensure a safe working environment, I understand and support the vital role of the manual handling facilitator in our department.

The manual handling facilitator provide guidance to ensure that all manual handling activities comply with the Manual Handling Operations Regulations, thereby reducing the risk of musculoskeletal injury and promoting best practice across our department. They play an essential role in training and education, ensuring that staff are up to date with safe lifting, transferring, and positioning techniques. They liaise with our department to ensure appropriate handling aids—such as slide sheets, transfer boards and hoists—are available and well maintained.

Through manual handling training, I am reminded of the importance of maintaining good posture, taking regular breaks, and positioning both myself and my patients correctly during scans. The training also ensured that I am confident in use the hoist and slide sheets.

3. Clinical practice and responsibilities

3.1 Communication

Effective communication in my role as a sonographer

In my daily role as a Sonographer at [REDACTED] I perform a wide range of ultrasound examinations across various departments, each with specific protocols and procedures. Working across multiple teams requires flexibility, adaptability, and a strong emphasis on effective communication to ensure the safe, efficient, and high-quality delivery of ultrasound services. I recognise that clear, timely, and compassionate communication is central to excellent patient care and the smooth operation of the ultrasound department. Therefore, I completed numerous CPD training courses in leadership and effective communication (Appendices 12.9.1 -12.9.8) before starting my role as deputy superintendent sonographer.

Communication in clinical practice

Effective communication plays a crucial role in the clinical management of patients. In the Radiology Department, I frequently discuss urgent or unexpected ultrasound findings with Consultant Radiologists to ensure appropriate escalation, further imaging, or multidisciplinary team (MDT) review when necessary.

In the Obstetric Ultrasound Department, communication is vital to ensure the timely onward referral of patients when an abnormality is detected. This may involve arranging Fetal Medicine Unit (FMU) appointments or scheduling additional growth scans in line with departmental protocols. In more urgent cases, I liaise directly with Screening Midwives or the Maternity Assessment Suite (MAS) to facilitate same-day referrals and ensure that patients receive prompt and appropriate care.

Communication with patients

Patient communication is one of the most essential aspects of a sonographer's role. Before each scan, I take time to explain the procedure clearly, using non-technical language so that the patient understands what the examination involves and what is expected of them. This approach helps reduce anxiety and promotes patient cooperation during the scan.

Delivering difficult or unexpected news, particularly in obstetric ultrasound, requires sensitivity, empathy, and clarity. I ensure that information is conveyed compassionately and that patients

understand the next steps in their care pathway. Medical jargon is avoided to prevent confusion, and appropriate emotional support is provided. For non-English-speaking patients, I use the hospital's Language Line or arrange in-person interpreters to ensure accurate and culturally sensitive communication. Any additional communication barriers identified on the referral are addressed early by ensuring the necessary support is arranged during the booking process.

Communication within the ultrasound department

Effective internal communication within the ultrasound department is vital for maintaining safety, efficiency, and high clinical standards. Most departmental communication occurs through staff meetings, operational emails, and daily handovers. These communications often include updates on scanning protocols, new clinical guidelines, and any changes to patient management procedures. Operational issues or service changes are discussed collectively to ensure that all team members are informed and aligned.

An important aspect of my role is the prompt reporting of equipment malfunctions or quality concerns to the Superintendent Sonographer. This ensures timely intervention and minimal disruption to patient care. Safety and incident reporting is also a crucial part of our practice. If a potential patient safety issue is identified, I escalate it immediately and document the incident through the DATIX system. This ensures that the Clinical Governance Team can review, investigate, and implement measures to prevent recurrence, thereby promoting a culture of safety and accountability.

Constructive communication and feedback

Communication also occurs on a one-to-one basis, particularly during audit reviews and feedback sessions. These sessions provide an opportunity to discuss performance, identify areas for improvement, and ensure adherence to departmental protocols and safe working practices. Constructive feedback is shared to encourage professional growth and support colleagues where needed.

In addition, I provide regular feedback to student sonographers to help them meet their learning objectives and develop their clinical and professional skills. These sessions promote reflective practice, build confidence, and ensure high standards of patient care are maintained across the team.

Leadership communication as deputy superintendent

As part of my role as Deputy Superintendent Sonographer, I am responsible for managing daily staffing challenges, including on-call duties for staff sickness or lateness. When a team member is delayed, I communicate this promptly to the rest of the team to ensure early patient appointments can be covered wherever possible. Patients are kept informed of any delays to maintain transparency and manage expectations.

In cases of staff sickness, I liaise with the team to adjust the rota and redistribute workload to ensure service continuity. If cover cannot be arranged, I communicate with the reception and booking teams so that affected patients can be rebooked as soon as possible. This proactive approach helps maintain operational efficiency and patient satisfaction.

Another key aspect of my role involves close collaboration with administrative and booking staff. Effective communication ensures vetting protocols are followed and that patients are booked onto appropriate lists, reducing rebooking rates and ensuring timely and accurate examinations. This coordination prevents delays, optimises workflow, and enhances the overall patient experience.

3.1.1 Challenging situation on a professional manner

As the deputy superintendent sonographer, I was required to address a situation involving a patient complaint relating to how one of our sonographers managed the care of a disabled patient. The patient, who was wheelchair-bound, had attended for a urinary tract ultrasound and flow rate test. Unfortunately, our departmental flow rate equipment only accommodates male patients who can stand and empty their bladder. Despite this limitation, the sonographer attempted to proceed with the test and encouraged the patient to undertake it, which he was unable to do. This resulted in the patient feeling uncomfortable and distressed, and he subsequently raised an informal complaint regarding both the experience and the sonographer's lack of awareness and training in dealing with disabled patients.

I first ensured the patient's concerns were acknowledged promptly and empathetically, offering reassurance that their feedback would be taken seriously and action would be taken to prevent recurrence. I explained the equipment limitation clearly and apologised for the distress caused. Importantly, I reassured the patient that alternative pathways would be explored in order to meet his clinical needs appropriately and with dignity.

Following this, I addressed the matter directly with the sonographer in a professional and constructive manner. I held a private meeting to outline the nature of the patient's complaint and to reflect on how her decision to attempt the procedure had impacted the patient. I

encouraged her to reflect on professional responsibilities in relation to dignity, inclusion, and equality of access to care, as well as the importance of escalating situations where departmental equipment or resources are unsuitable for a particular patient group. I highlighted that proceeding with an unsuitable test risk compromising both patient experience and professional standards.

To support learning, I arranged for the sonographer to undergo further training around equality, diversity, and inclusion, with a focus on managing patients with disabilities. In addition, I clarified the correct departmental pathway: flow rate tests for wheelchair-bound patients should be performed in the urology department, which has the appropriate equipment. Moving forward, all flow rate test requests will be vetted more thoroughly to ensure that only male patients who are able to stand and empty their bladder are booked into our department for the test.

The outcome was constructive: the sonographer acknowledged the issue and welcomed additional training to improve her confidence and skills in dealing with patients with disabilities. More broadly, the department benefitted from a reminder of the importance of patient-centred care, adaptability, and escalation when standard procedures are not suitable.

This situation demonstrated my ability to manage a sensitive and challenging scenario in a professional, empathetic, and solutions-focused way, ensuring the patient's dignity was prioritised, the staff member received the support and guidance required, and the service improved to better meet the needs of our diverse patient population.

3.1.2 Patient feedback

To ensure I consistently demonstrate a professional approach in all aspects of my sonographer role, direct patient feedback is essential. Patient feedback allows me to identify areas of strength as well as opportunities for improvement in my practice and service delivery.

Patient satisfaction surveys are accessible via QR codes located in the ultrasound scan rooms and corridors. After their scans, patients are encouraged to provide feedback through this portal so we can continuously monitor and enhance the quality of care we provide.

I have recently received patient feedback through the Patient Satisfaction Survey (Appendix 12.4). Reviewing this feedback has reinforced the importance of always introducing myself to patients and maintaining a helpful, polite, and respectful manner throughout every interaction.

As part of my professional practice, I consistently complete the three-point identification check — confirming the patient's full name, date of birth, and address — to ensure that the correct patient is scanned and selected on the ultrasound machine.

During the scan, I treat all patients with dignity and respect, particularly when performing intimate examinations. Prior to such procedures, I obtain informed consent by clearly explaining the examination process and reassuring the patient that they may withdraw consent or stop the procedure at any time. I ensure privacy by allowing patients time to undress and dress in private, providing them cover for comfort and modesty both before and after the scan.

Throughout the examination, I respond to patients' questions to the best of my ability. If a question falls outside my scope of practice, I refer the patient to the appropriate professional for further information.

Overall, the feedback I have received has been very positive, as reflected in the patient satisfaction forms provided. This feedback reinforces the value of maintaining professionalism, clear communication, and respect in every patient interaction.

3.2 Ultrasound request vetting

In my department, I take a structured and clinically focused approach to vetting ultrasound referrals. My primary responsibility is to ensure that each request is justified, appropriate, and aligned with the North West London (NWL) imaging guidelines if requested by a general practitioner (GP). Every referral I review is assessed to determine whether ultrasound is the most suitable modality to address the clinical question posed. I look for sufficient clinical detail, including relevant history, examination findings, and any supporting investigations. When information is inadequate or the request does not meet local NWL referral criteria, I return it with a clear explanation to support learning and guide more appropriate future referrals.

My vetting process supports the equitable and efficient use of ultrasound resources. By filtering inappropriate or incomplete referrals, I help reduce unnecessary imaging, ensure that clinically urgent cases are prioritised appropriately, and maintain diagnostic quality. I pay particular attention to cancer pathways, where I ensure that all Two-Week Wait (2WW) referrals are vetted on the same day to meet critical national targets. For urgent and routine requests, I use clinical judgement to adjust prioritisation if the referral information does not align with the stated urgency, always ensuring that decisions are well-documented.

Planned scans, such as annual liver surveillance or timed follow-ups for gallbladder polyps, are placed on hold where appropriate and marked clearly as planned care. This distinction allows the bookings team to manage time-sensitive or repeat imaging appropriately without

disrupting standard elective pathways. I also make sure that consultant referrals, while not formally vetted under the GP-focused NWL guidelines, are reviewed for clarity when necessary, and I seek clarification directly if anything is unclear, rather than rejecting them outright.

Vetting is not just a clerical task, it is a clinically essential step in the patient care pathway. It ensures imaging is targeted, timely, and appropriate, reducing delays in diagnosis while protecting patients from unnecessary tests. My role in vetting contributes directly to patient safety, service efficiency, and adherence to national waiting time standards. By providing consistent, guideline-based oversight of referrals, I help support a service that is responsive, clinically effective, and patient-centred.

4. Patient Preparation

4.1 Patient preparation before appointment

Appointments are scheduled and booked by the reception team in the Radiology Department at [REDACTED]. During the scheduling of the appointment the patients are advised to prepare according to the different ultrasound examinations. The patients will also receive electronic letters which will again guide them for preparation of the scan and what the scan may entail.

The ultrasound examinations preparation that I am involved in at [REDACTED] include the following:

- **Abdominal Ultrasound:** The patient should be fasted for at least 6 hours before the examination. They are allowed to drink small amounts of clear, non-carbonated fluids, but no milk. This will ensure the stomach is empty during the ultrasound study, therefore less bowel gas will be present which will allow for optimal visualisation of the soft tissue organs. In addition, the gallbladder will not be contracted and therefore allow for visualisation of the gallbladder. If the patient is diabetic we aim to schedule the appointment first thing in the morning to ensure that they can eat direct after the scan, to prevent any side effects of prolong fasting.
- **Urinary tract ultrasound and flow rate test:** The patient is advised to come to the appointment with a full bladder, by drinking one litre of non-carbonated fluid 45 minutes before their appointment and not to empty their bladder before the examination. This will allow me to visualise the bladder on ultrasound and perform a pre and post void volume. If a flow rate test is indicated this will also need a full bladder for the patient to empty in the flow rate machine and obtain diagnostic results.

- Pelvic ultrasound: Patients are advised to arrive at the appointment with a full bladder by drinking one litre of non-carbonated fluid 45 minutes before their appointment and advised not to empty their bladder before the examination. The full bladder is used during the ultrasound scan as an acoustic window to visualise the uterus and ovaries with a transabdominal ultrasound. If there are no contra-indicators for performing a transvaginal scan the patient will be asked to empty their bladder after the transabdominal pelvic scan was performed. With the appointment, the patients will receive an information leaflet explaining the two different types of pelvic ultrasounds.
- Nuchal translucency (NT) dating ultrasound: Patients are advised to come to the scan with a full bladder by drinking one litre of non-carbonates liquid 45 minutes before the appointment and not to empty their bladder before the scan. As the NT dating scan is performed during the 11 to 14 weeks gestational age period, the bladder is needed as an acoustic window to optimally visualise the fetus for the scan.
- Detail anomaly ultrasound: The patients are advised to ensure they have a small amount of fluid in their bladder, but they do not need to actively fill their bladder, but not to empty their bladder 30 minutes before the appointment. During the detail anomaly scan at 18 to 20+6 weeks gestational age, the bladder is used as an acoustic window to visualise the cervix clearly.
- Other ultrasound: Musculoskeletal, small parts, lumps and bumps, vascular ultrasound scans do not need any specific preparation before the examination.

4.2 Patient preparation during appointment

On the day of the scan general patient preparation steps need to be carried out. Patient identification is the first step which includes a three point check that needs to be completed to ensure the ultrasound examination is performed on the correct patient. The three point check includes full name, date of birth and address. Before performing any ultrasound examination, I also need to check if the examination is justified. For this I need to check examination history of other relevant recent imaging studies, notes and referral documentation. I will also discuss the clinical history and context with the patient as appropriate to ensure I have a clear clinical picture of how to perform the most appropriate examination.

Thereafter I will obtain informed consent for the ultrasound examination, by explaining to the patient in a simple and clear way the type of examination that will be performed, including which area needs to be exposed, ultrasound gel used on the area and probe pressure might be applied for optimal visualisation of the anatomy required for the examination. I will also confirm that preparation for the ultrasound has been followed. I confirm with the patient what

they expect of the examination, and if they consent for the examination to be done by me. If it is an intimate scan (transvaginal or testes ultrasound) written consent is required (Appendix 12.5.1). Patient will also be asked if they require a chaperone. If the patient are unable to understand English, the language line will be used to consent the patient for the scan and the reference number will be included in the report.

Then I will plan the examination so as to address the clinical question and be prepared to amend and extend the examination as necessary. Extension of our examination as per protocol includes the renal ultrasound scan if a varicocoele is detected during a testes ultrasound.

4.3 Aftercare of patient

After completing the ultrasound examination, all images and annotations are stored in the Picture Archiving and Communication System (PACS) along with the corresponding report. I ensure that the documentation is accurate, comprehensive, and appropriately labelled to facilitate easy access and review by referring clinicians.

Following the examination, I communicate the results to the patient in a manner appropriate to the findings, the clinical situation, and local departmental guidelines. If the referral originates from an internal hospital clinician, I inform the patient that their referring clinician will contact them directly regarding the results and any necessary follow-up. For GP referrals, I advise patients to arrange a follow-up appointment with their GP within approximately one week to discuss their report and any next steps.

For cases with urgent or significant findings, I ensure that the referrer is notified promptly. This is typically done via email to highlight the clinical concern and to ensure timely review and management. In addition, I apply an appropriate alert on the report within PACS, following the departmental alert protocol (Appendix 12.5.2):

- Red Alert: Used for any significant or unexpected findings requiring urgent clinical attention.
- FCT (Fast-Track Cancer Pathway): Reports are annotated with: “*** XYZ Radiology Cancer Fast-Track. A copy of this report has been sent to the Cancer Unit Office [REDACTED] / WMUH 0208 321 6355). This report will be forwarded to the relevant Consultant for urgent attention. Red Alert.***”
- VTE: All positive deep vein thrombosis (DVT) cases are also highlighted and communicated urgently to ensure immediate clinical action.

In the obstetric department, the reporting process differs, as patients receive their reports immediately after the ultrasound examination. For normal findings, I guide patients to follow the routine care pathway, which may include follow-up with their midwife or additional growth scans if there are pre-existing conditions requiring continued monitoring.

When an abnormality is detected, it is my responsibility to communicate this sensitively and clearly to the patient following the scan and to ensure that the correct referral pathway is followed. Examples include:

- Increased nuchal translucency (NT): Requires a same-day appointment with a Screening Midwife and a FMU review within three working days.
- Anomalies detected at the 20-week scan: An FMU appointment is arranged for the patient, prioritised based on the severity and nature of the finding—ranging from urgent to the next available slot.
- Growth scans indicating fetal growth restriction: Require a same-day referral to the MAS and an FMU appointment within 3–7 working days, depending on the clinical findings.

It is my responsibility to ensure that all referral protocols are followed accurately and that the appropriate follow-up appointments are arranged promptly for each patient. This ensures that all patients receive timely and effective care, minimising delays in diagnosis and management while maintaining a compassionate and professional approach to communication.

5. Ultrasound equipment and environment management

As a sonographer it is part of my daily checks to ensure the equipment in the room is in working order. These include, but is not limited to the ultrasound unit, transducers, couch and chairs. Any faults with the couch should be reported to the clinical engineering department which will send an engineer to inspect the couch and see if it can be fixed or needs to be replaced. In case of replacement of equipment this will be reported to the superintendent. Any faults with the ultrasound unit and transducers that cannot be fixed with trouble shooting will be reported to the superintendent which will raise a case with GE Health services to provide an engineer and parts to fix the problem.

5.1 Ultrasound unit and transducers

In our department, we use GE diagnostic ultrasound systems, which are designed to deliver excellent image quality with high diagnostic accuracy, precision, and speed. These machines

enhance the ultrasound workflow through advanced ergonomic design and productivity features, allowing for both efficiency and comfort during scanning.

Each ultrasound unit is equipped with a variety of transducers, each designed for specific imaging purposes. Transducers function by converting electrical energy into ultrasound waves, and then converting the returning echoes back into electrical signals that are processed to form an image. Different transducers operate at different frequency ranges to suit the imaging requirements of various anatomical regions. In general, higher frequencies provide better spatial resolution for superficial structures but have limited penetration depth, while lower frequencies penetrate deeper tissues but with lower image resolution. The footprint of each transducer also varies and is selected based on the anatomical area being examined to ensure optimal image acquisition.

The choice of transducer for each ultrasound examination depends on the body region and clinical indication. For example, to obtain optimal images of the abdomen, transabdominal pelvis, or obstetric growth scans, a curved array transducer operating within a frequency range of 3.5–6 MHz is used. This transducer provides a wide near and far field, allowing for good coverage of deeper anatomical areas, although scan line density decreases with increasing depth.

For detailed imaging of the pelvic organs, a transvaginal transducer operating at 5–9 MHz is used. The higher frequency provides superior resolution at the expense of depth penetration. However, because the transducer is positioned close to the pelvic structures, excellent detail of the uterus, ovaries, and adnexal regions can be achieved, making it ideal for gynaecological and early pregnancy examinations.

For imaging large joints such as the elbow, shoulder, hip, or knee, and small parts such as the breast, thyroid, or testes, a broad-spectrum linear matrix array transducer (ML6–15) is used. This transducer operates at 6–15 MHz, providing a broad footprint for visualising larger anatomical areas while maintaining high resolution for superficial soft-tissue structures.

In contrast, for small joints such as the wrist, hand, ankle, or foot, or for evaluating superficial lumps, a linear array hockey-stick transducer (L8–18i-D) is more appropriate. This transducer operates at 8–18 MHz, providing excellent resolution for very superficial structures. Its small footprint allows for optimal skin contact, even in areas with limited scanning surfaces, ensuring high-quality imaging of small anatomical regions.

For vascular ultrasound studies, a transducer operating at a moderate frequency is required—higher than that used for abdominal imaging but lower than that of a high-frequency linear probe. A linear broadband (9L) transducer, operating around 8.5 MHz, is ideal for vascular

examinations. This transducer provides an excellent balance between depth penetration and spatial resolution, making it well suited for imaging medium-depth structures, such as carotid arteries, peripheral veins, and other vascular territories.

5.2 Ultrasound knobology

The ultrasound machines in our department utilise real-time B-mode imaging to display two-dimensional grayscale images of internal structures. This mode provides dynamic visualisation, allowing continuous observation of anatomical movement and real-time assessment of organ morphology.

In addition to B-mode, Doppler imaging is used to assess the movement of fluids, primarily blood flow within vessels. There are two main types of Doppler used in diagnostic ultrasound: Colour Doppler and Power Doppler. Colour Doppler displays the direction and velocity of blood flow using a colour map, which helps in identifying turbulent or abnormal flow patterns. Power Doppler, on the other hand, is more sensitive in detecting the presence of low-velocity flow and small vessels, as it is not direction-dependent. Therefore, Power Doppler is particularly useful for assessing low-flow vascular structures, while Colour Doppler is preferred when evaluating higher flow velocities or when directional information is required.

In addition, Pulsed-Wave (PW) Doppler is employed to measure the velocity of blood flow at a specific and selectable point within a vessel. This feature enables quantitative assessment of flow dynamics and helps in the diagnosis of vascular pathologies such as stenosis or occlusion.

The ultrasound units are also equipped with a range of image optimisation features that allow sonographers to adjust parameters for the highest possible diagnostic quality. For instance, the overall gain controls the amplification of returning echoes, providing uniform brightness across the image and compensating for signal attenuation with depth. The depth control adjusts how much of the anatomy is displayed on the screen, allowing the operator to focus on either superficial or deeper structures as required.

Focal zones can be adjusted to improve lateral resolution at specific depths. By positioning the focus at or just below the area of interest, the ultrasound beam can be concentrated where the greatest image clarity is required. The freeze key is used to halt real-time image acquisition, allowing for measurements, annotations, and detailed image review. The P1 key is used to store static images, while measurements, annotations, and other functions are controlled using the trackball and surrounding function keys, providing precise and efficient image manipulation.

5.3 Quality Assurance in ultrasound practice

In our department, we uphold a comprehensive Quality Assurance (QA) programme designed to maintain the consistent performance, safety, and reliability of all ultrasound equipment. This proactive strategy enables early detection and resolution of technical faults, preventing minor issues from escalating into significant problems that could disrupt service delivery or compromise patient care.

We have secured preventative maintenance contracts with the ultrasound equipment manufacturers, ensuring all machines receive regular servicing and calibration by qualified engineers. These services adhere strictly to both manufacturer specifications and NHS guidelines, covering thorough evaluations of hardware and software to guarantee optimal system performance.

To complement this, we conduct routine QA checks at varying intervals. Daily QA checks (Appendix 12.6.1) include cleaning the machines, transducers, and scanning rooms—paying close attention to couches, chairs, and surfaces. Visual inspections are carried out on the machines, transducers, and cables, alongside reviewing any error messages displayed on the ultrasound equipment. Additionally, stock levels of essential supplies such as gel, couch rolls, probe covers, disinfectant wipes, gloves, aprons, and consent forms are monitored. We also ensure that sharps bins are securely positioned and not overfilled, and that waste bins are regularly emptied. Any faults or damage discovered during these daily checks are reported immediately to the ultrasound Superintendent to facilitate prompt resolution.

Weekly QA checks (Appendix 12.6.2) are more detailed, involving thorough assessments of each ultrasound machine and the transducers in regular use. These inspections verify the absence of visible damage to equipment, confirm proper start up without faults, and check that digital archives are maintained with adequate storage space. Connectivity to the PACS network is tested, spoolers are cleared, and the machine's display is examined for damage or artefacts. Accuracy of the date and time settings is verified, and safety indices such as Mechanical Index (MI) and Thermal Index (TI) are reviewed. Physical components including roller balls, power controls, focusing mechanisms, and console mobility are tested to ensure smooth functionality. Transducers undergo checks for cable integrity, housing damage, and signal quality to rule out faults such as crystal dropout or image artefacts. Any issues identified are promptly reported to the superintendent.

Annually, all ultrasound machines receive comprehensive QA testing conducted by specialist engineers arranged through the ultrasound superintendent. These annual inspections align with manufacturer and regulatory standards, ensuring long-term equipment reliability and safety.

This structured, multi-tiered approach to quality assurance underpins the safety, efficiency, and continuous improvement of our ultrasound services. It supports the delivery of high-quality patient care while minimising equipment-related downtime, reinforcing our commitment to best practice within diagnostic imaging.

5.4 Equipment safety standards

As a sonographer, ensuring the safe operation of ultrasound equipment in compliance with both national and international safety standards is a fundamental responsibility in my daily practice. I recognise that ultrasound, while generally considered safe, requires adherence to established guidelines to minimise any potential risks to patients and staff.

In practice, I ensure that each scan adheres strictly to the ALARA principle to limit ultrasound exposure time and intensity without compromising diagnostic quality. Before every scan, I conduct a thorough equipment check, verifying that the transducer is functioning properly and that machine settings are optimised for the specific examination, thereby avoiding unnecessary energy output. During scanning, I continuously monitor thermal and mechanical indices displayed on the ultrasound screen to ensure exposure remains within safe limits. I adjust scanning parameters dynamically, reducing output power and minimising dwell time on any single area to prevent tissue heating or cavitation effects.

To stay current with the latest safety standards, I regularly consult authoritative sources such as the BMUS guidelines, which provide UK-specific recommendations. According to the BMUS Safety Group, the TI and MI are displayed on the ultrasound machine, serve as real-time indicators of the potential bioeffects of ultrasound energy on tissues.

The TI estimates the potential temperature rise in tissues due to the absorption of ultrasound energy. A TI value of 1.0 suggests a maximum temperature increase of approximately 1°C. The BMUS guidelines emphasise keeping TI as low as possible, especially during scans of sensitive tissues such as the fetal brain, where even minor heating could pose risks. In my daily practice, I actively monitor the TI reading, ensuring it stays within safe limits. If the TI approaches or exceeds recommended levels, I reduce the output power or adjust scanning

techniques—such as shortening scan duration or moving the transducer to avoid prolonged exposure to one area—to mitigate thermal effects.

The MI reflects the likelihood of mechanical bioeffects, primarily cavitation, which is the formation of gas bubbles that can potentially cause tissue damage. BMUS recommends keeping the MI at a minimum while achieving diagnostic image quality, particularly when scanning gas-containing organs or fetal tissues where cavitation risk is higher. In practice, I observe the MI reading and modify settings such as pulse duration and output power to keep this index at safe levels.

Following BMUS guidance, I apply the ALARA principle rigorously, balancing diagnostic requirements with safety by using the lowest output settings and shortest exposure times necessary. This involves routinely adjusting machine presets, using pulsed rather than continuous wave Doppler where possible, and avoiding unnecessary repeat scanning.

In addition to TI and MI management, the BMUS guidelines reinforce the importance of operator training, equipment maintenance, and thorough documentation of exposure parameters to ensure ongoing safety compliance. I routinely update my knowledge through continued professional development and ensure that equipment servicing and quality assurance checks are up-to-date.

6. Ultrasound practice

As part of my responsibilities in the ultrasound department, I am directly involved in ensuring that accurate record keeping and comprehensive daily checks are carried out in every scanning room before the start of clinical lists. This process is essential for maintaining patient safety, infection control, and equipment reliability, as well as ensuring compliance with departmental and governance standards.

Each morning, I carry out and document a series of structured checks on both the ultrasound equipment and the clinical environment. This includes a careful inspection of the ultrasound machine, cables, and transducers for any signs of visible damage or wear, as well as monitoring for any error messages displayed on the machine. The machine, cables, probes, patient couch, chairs, work surfaces, and computer equipment are also checked to ensure they are clean and ready for safe clinical use.

I prioritise infection control and hygiene through ensuring the room is fully stocked with appropriate supplies. This includes ultrasound gel, probe covers, white couch roll, Clinell wipes, Tristel wipes, gloves of all sizes, alcohol hand gel, and full soap dispensers. Clinell wipes are used to clean all surfaces such as the ultrasound machine, couch, transducers, and any surface touched by the patient with hospital-approved disinfect. For transvaginal examinations, the Tristel Trio Wipes System is used which is compliance with high-level decontamination protocols. Each disinfection cycle is logged using the Tristel Quality Audit Trail Record Book, where I record the empty sachet details alongside the patient's information to ensure full traceability and compliance.

I also confirm that essential documentation is available and accessible, including consent forms for intimate ultrasound scans, the WHO safety checklist, and aftercare forms for interventional procedures. Waste management is checked daily by confirming that clinical waste bins are not overfilled and that sharps containers are available, correctly labelled, and not above the fill line.

These checks are formally recorded and signed off as part of the department's quality assurance processes, providing an auditable trail to demonstrate compliance. Where deficiencies are noted — for example, if stock is low, a bin is full, or equipment is damaged — these are rectified immediately or escalated to the appropriate team for resolution.

By ensuring that the ultrasound room is clean, fully stocked, and functioning safely each morning, I contribute directly to the smooth running of clinical lists, minimise disruption to patient care, and uphold the professional standards expected within the department. This daily routine also reflects a commitment to safe practice, infection prevention, and patient-centred care, ensuring every patient enters an environment that is clean, safe, and fit for purpose.

6.1 Obstetric Nuchal Translucency Dating scan

6.1.1 Clinical Indication

Patient attended for a first trimester nuchal dating scan.

The primary clinical indication was to confirm an intrauterine pregnancy, establish gestational age, and provide the option of first-trimester combined screening for chromosomal abnormalities. The scan was also indicated to exclude multiple pregnancy, assess fetal anatomy for gross abnormalities, and review maternal adnexa for associated pathology (e.g., masses, fibroids).

6.1.2 Consent

The purpose, process, and limitations of the dating ultrasound scan was explained. Options for combined first-trimester screening (for T21, T18, and T13) were discussed, including the possibility of alternative screening (Quad test, NIPT, or no screening). The patient was given time to review the information leaflet provided prior to the scan. She verbally consented to proceed with the ultrasound examination and to undergo combined screening. Consent was documented in her maternity notes.

6.1.3 Examination Technique

The patient was asked to attend the scan with a full bladder, having been advised to drink one pint of water one hour prior to the appointment. The patient was required to lower their trousers to hip level and lift up their shirt to expose the suprapubic region. The ultrasound was performed transabdominal, in accordance with the ALARA principle and BMUS safety recommendations, transvaginal approach was not required. High-frequency curvilinear transducer used with patient in supine position. Intrauterine pregnancy was identified. A single live fetus was visualised with visible fetal pole and cardiac activity. Crown–rump length (CRL) measured in mid-sagittal section with the fetus in neutral position. Nuchal translucency (NT) measured according to Fetal Medicine Foundation (FMF) and DQASS guidelines. Early anatomical survey performed including cranium, anterior abdominal wall, stomach, bladder, and limb presence. Uterus, gestational sac, and adnexa evaluated.

6.1.4 Ultrasound images and report

Ultrasound images were obtained according to the protocol as follows:



Figure 6.1.4 (a): Ultrasound image of the CRL measurement obtained in the midsagittal plane in a neutral position.



Figure 6.1.4 (b): Ultrasound image of the NT measurement obtained in the midsagittal plane in a neutral position.



Figure 6.1.4 (c): Ultrasound image of the internal cervical os confirming this is an intrauterine pregnancy.



Figure 6.1.4 (d): Ultrasound image of the fetal cranium and brain indicating the midline with the choroids on either side.

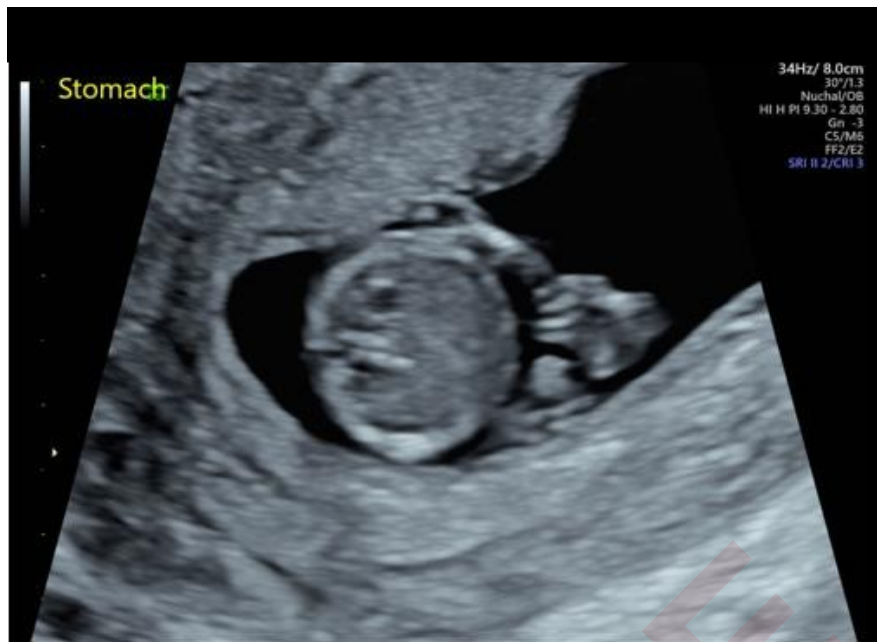


Figure 6.1.4 (e): Ultrasound image of the transverse fetal stomach.



Figure 6.1.4 (f): Ultrasound image of the transverse anterior abdominal wall demonstrating the cord insertion.

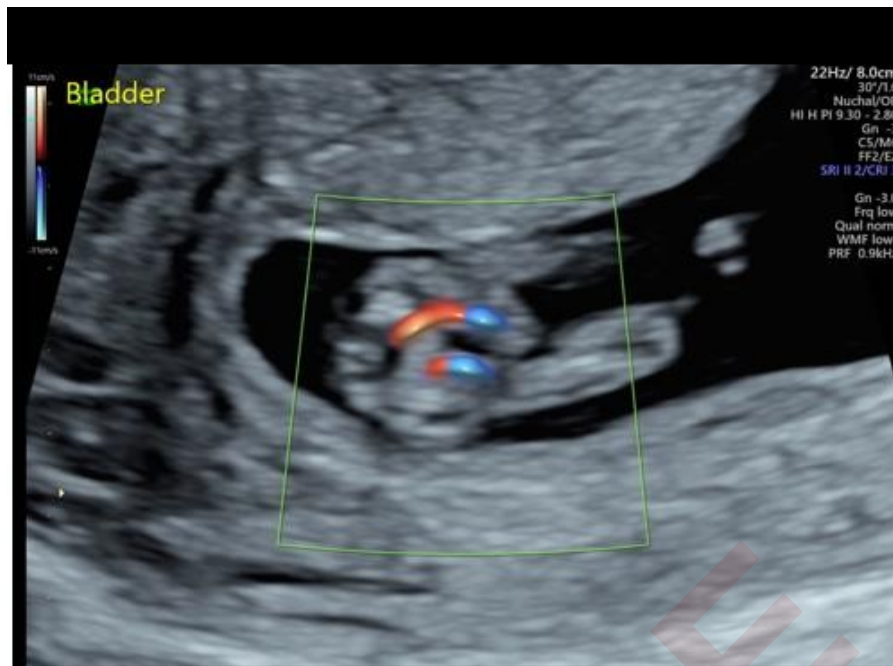


Figure 6.1.4 (g): Ultrasound image of the transverse fetal pelvis demonstrating the fetal bladder and Doppler indicating the umbilical veins on either side of the bladder confirming a 3-vessel cord.

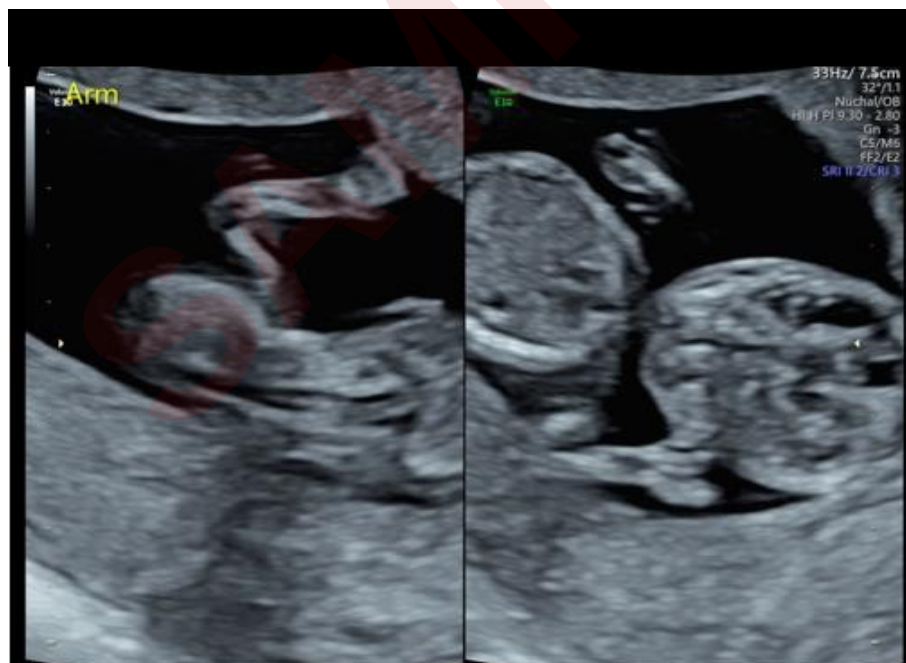


Figure 6.1.4 (h): Ultrasound image of the fetal arms and hands are present.



Figure 6.1.4 (i): Ultrasound image of the fetal legs and feet are present.

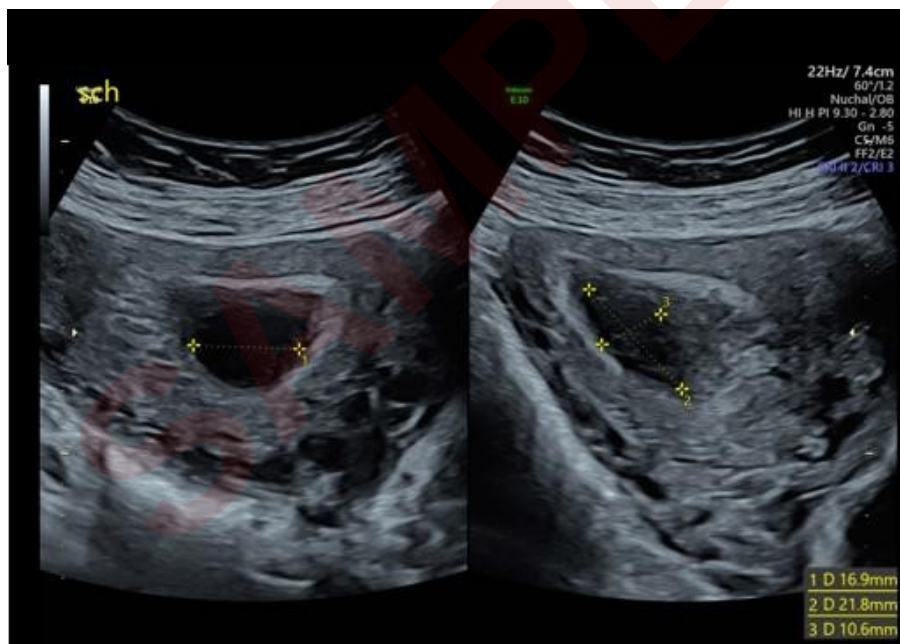


Figure 6.1.4 (j): Ultrasound image of the subchorionic haematoma measurement.

Ultrasound report generated for the nuchal translucency dating scan:

SAMPLE

6.1.5 Referral and communication

- Patient to undergo combined first-trimester screening (NT + biochemistry).
- The presence of a small subchorionic hematoma was discussed. As it was less than 50% of gestational sac volume, no routine follow-up was required, but safety-net advice was provided to attend the Emergency Department if fresh heavy bleeding occurs.
- Routine follow-up anomaly scan recommended at 20 weeks gestation.
- GP and community midwife informed via standard reporting pathway.

6.2 Obstetric fetal growth scan

6.2.1 Clinical Indication

The patient is under obstetric follow-up for serial fetal growth surveillance due to underlying autoimmune disease (Sjögren's syndrome). A previous drop in fetal growth was noted between the 32-week and 36-week scans. Today's scan represents a 2-week interval follow-up to assess fetal growth, Doppler's, and amniotic fluid.

6.2.2 Ultrasound Examination Technique

No patient preparation was required for the scan. The patient was asked to lower their trousers to hip level and lift up their shirt to expose the gravida uterus. The ultrasound was performed transabdominal, in accordance with the ALARA principle and BMUS safety recommendations, transvaginal approach was not required. High-frequency curvilinear transducer used with patient in supine position. The following fetal biometry and Doppler measurements were taken:

- Abdominal Circumference (AC): Measured at least three times in the standard transverse plane at the level of the stomach and umbilical vein, with a round abdomen and skin line visualised.
- Head Circumference (HC): Measured in the standard biparietal plane including thalami and cavum septum pellucidum, excluding the cerebellum.
- Femur Length (FL): Measured at least three times along the longest diaphysis of the femur, ensuring both ends were visible and excluding epiphyses.
- Estimated Fetal Weight (EFW): Calculated using the Hadlock formula, based on AC, HC, and FL.
- Single Deepest Vertical Pocket: The deepest unobstructed pocket of fluid was identified and recorded.
- Umbilical Artery: Pulsatility index (PI) measured in a free loop of cord; end-diastolic flow confirmed.
- Middle Cerebral Artery (MCA): Sampled close to its origin from the circle of Willis; PI measured.

The following anatomical and biophysical checks were also performed:

- Kidneys: Both visualised, normal appearance.
- Bladder: Visualised.
- Stomach: Visualised in the left abdomen.
- Placenta: Location documented, no evidence of previa.
- Fetal Presentation: Documented during scan.

6.2.3 Ultrasound images and report

The following images are a representation of the images and measurements taken during the fetal growth scan. The biometry measurements are taken at least three times to provide an average measurement which is used in the report as per our department protocol.

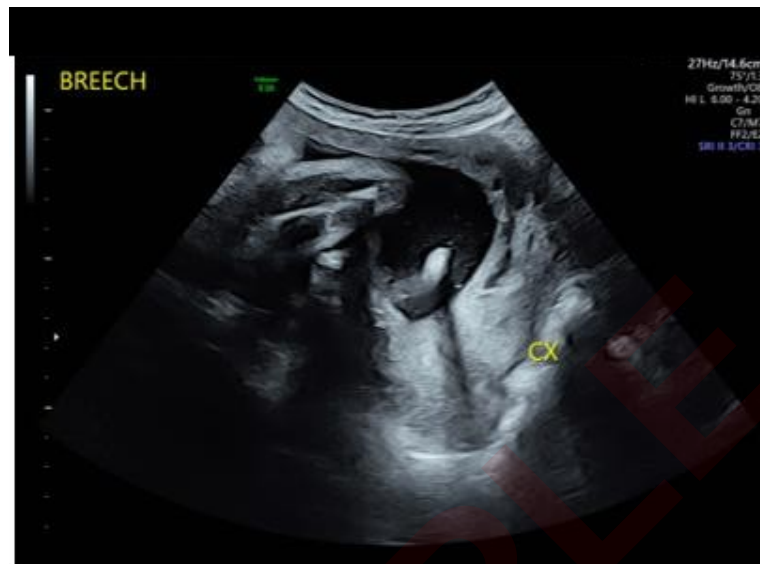


Figure 6.2.3 (a): Ultrasound image of the internal cervical os indicating the placenta is high and the fetus is in a breech presentation.

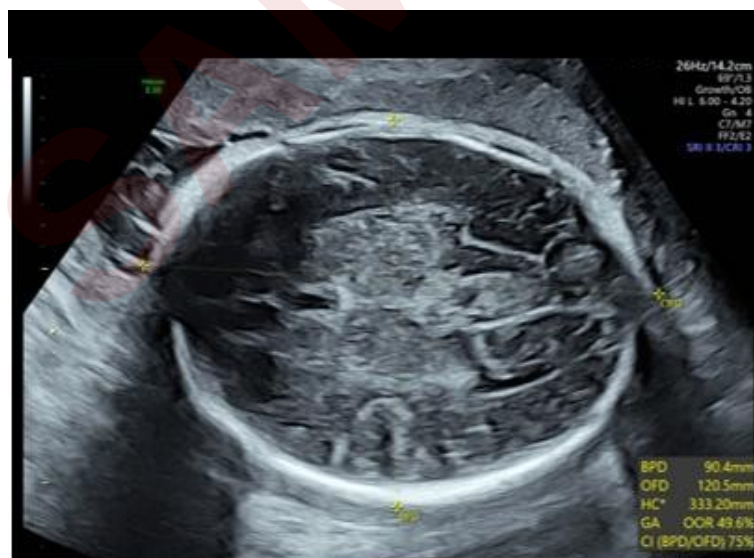


Figure 6.2.3 (b): Ultrasound image of the HC measured using the biparietal diameter (BPD) and occipitofrontal diameter (OFD) measurements from the outer-to-outer borders. The anatomical structures identified for this measurement includes the Cavum Septi Pellucidi (CSP) and posterior ventricles.



Figure 6.2.3 (c): Ultrasound image of the FL measured from the diaphysis to diaphysis.

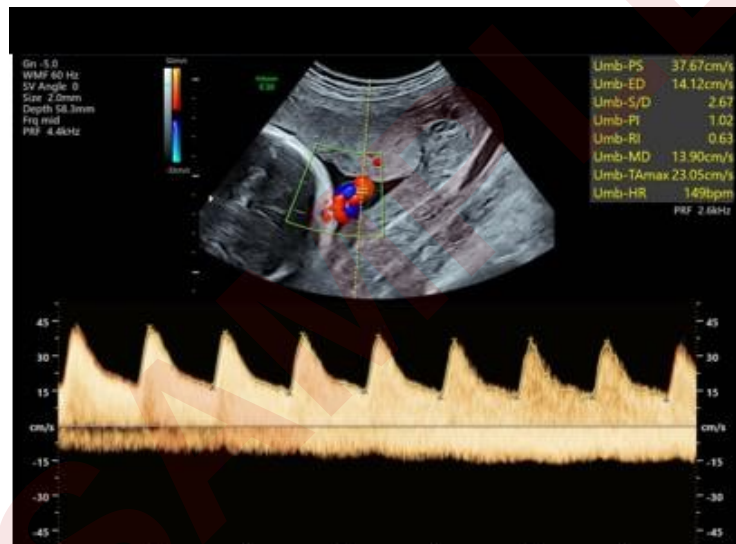


Figure 6.2.3 (d): Ultrasound image of the umbilical artery Doppler trace. The same is taken from a free-floating piece of umbilical cord. Positive end diastolic velocity is present with the PI value of 1.02.

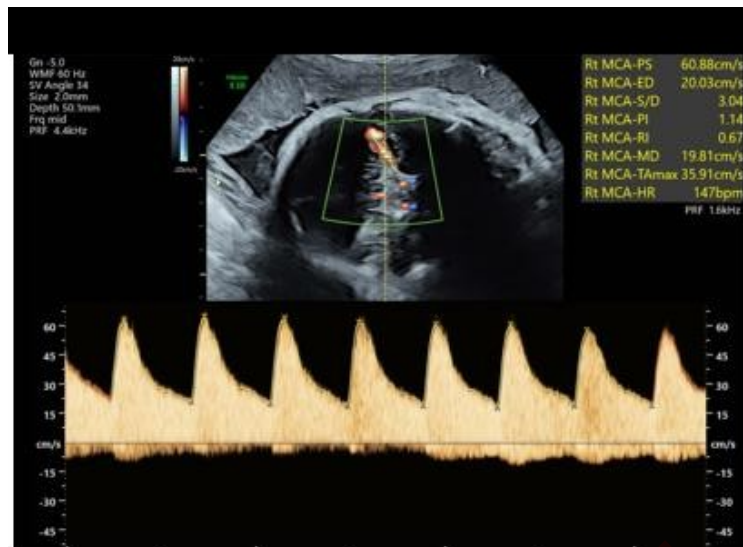


Figure 6.2.3 (e): Ultrasound image of the MCA Doppler trace. The same is taken close to the origin of the MCA and a Doppler angle correction is used.

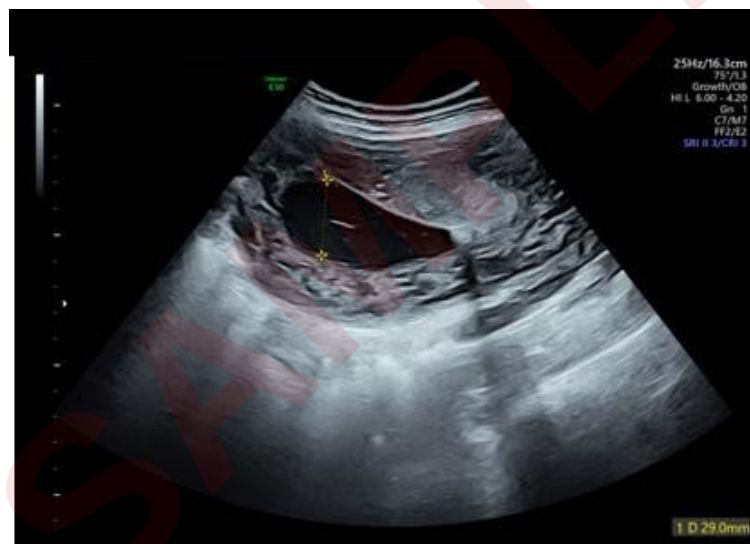


Figure 6.2.3 (f): Ultrasound image of the deepest vertical pocket of fluid measuring 29 mm. This was obtained by sweeping through the uterus with the transducer in longitudinal and measuring the deepest pocket of amniotic fluid free of fetal parts and umbilical cord.

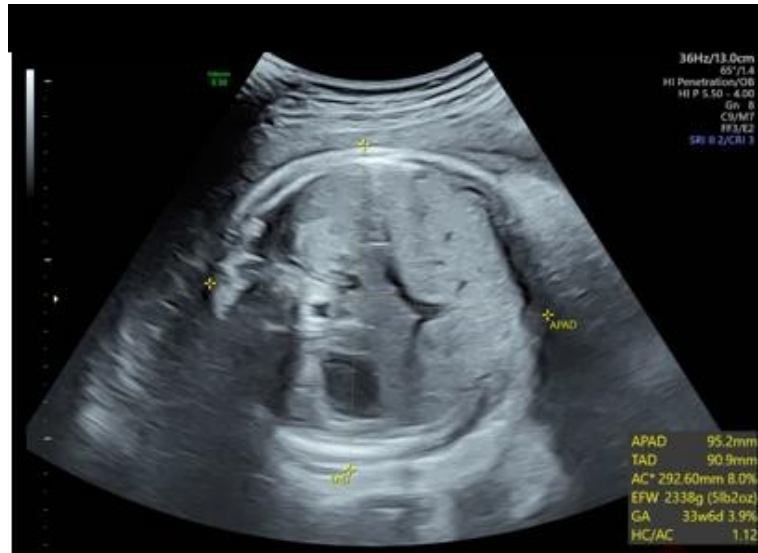


Figure 6.2.3 (g): Ultrasound image of the AC measurement obtained by the APAD and TAD measurement. The anatomical structures displayed is the stomach at the fetal left with the umbilical vein arching to the fetal right, two continues ribs and the fetal spine.

Ultrasound report generated for the obstetric fetal growth scan:

SAMPLE

SAMPLE

6.2 4 Referral and communication

Due to ongoing growth restriction, the MAS was contacted immediately by phone, and the patient was referred directly after the scan for senior obstetric review and management planning. A formal ultrasound report was also issued to the referring clinician.

6.3 Appendix Ultrasound

6.3.1 Clinical Indication

The patient presented to the Emergency Department with acute right iliac fossa tenderness, localised on palpation to a pinpoint area. Clinical differential diagnoses included ovarian pathology as a possible cause of pain versus early appendicitis. Ultrasound was requested to assess for possible appendicitis or alternative pathology.

6.3.2 Ultrasound Examination Technique

No patient preparation was required as the scan was performed in an emergency setting. The patient was asked to lower their trousers to hip level and lift up their shirt, thereby exposing the relevant anatomical region. A targeted ultrasound approach was followed, with a focus on the right iliac fossa. The ultrasound was performed, with the patient in a supine position. Graded compression technique was applied to displace overlying bowel gas and optimise visualisation of the appendix and peri-appendiceal structures. A high-frequency linear transducer (7–12 MHz) for superficial detail, supplemented by a curvilinear probe for deeper structures when required. The ultrasound examination included the caecal pole, appendix, peri-appendiceal fat, and regional iliac vessels. Groin lymph nodes were also assessed to exclude reactive lymphadenopathy.

6.3.3 Ultrasound images and report

The following images are a representation of the images and measurements taken during the targeted abdominal scan for appendicitis according to the Ambulatory and Emergency Department protocol.

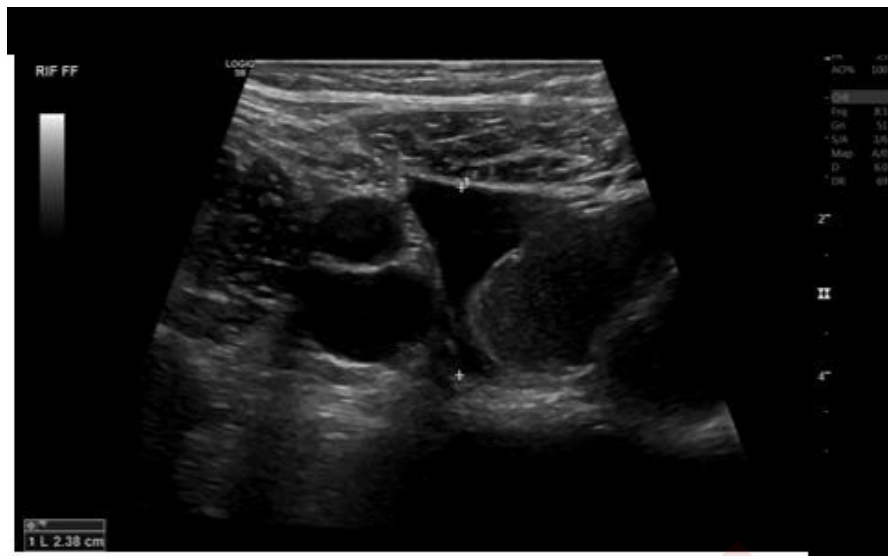


Figure 6.3.3 (a): Ultrasound image of the right iliac fossa demonstrating anechoic free fluid between the bowel loops measuring approximately 2.38 cm in AP.

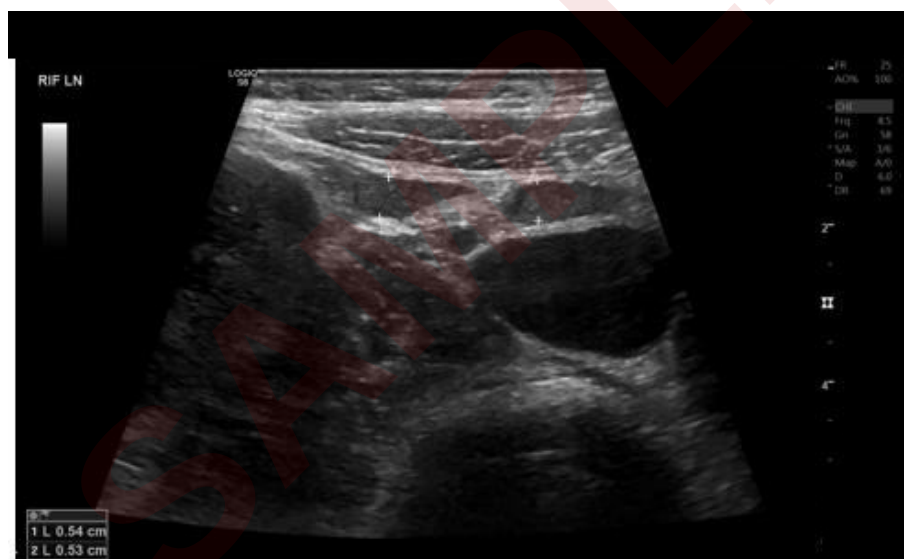


Figure 6.3.3 (b): Ultrasound image of a cluster of subcentimeter lymph nodes in the right iliac fossa.

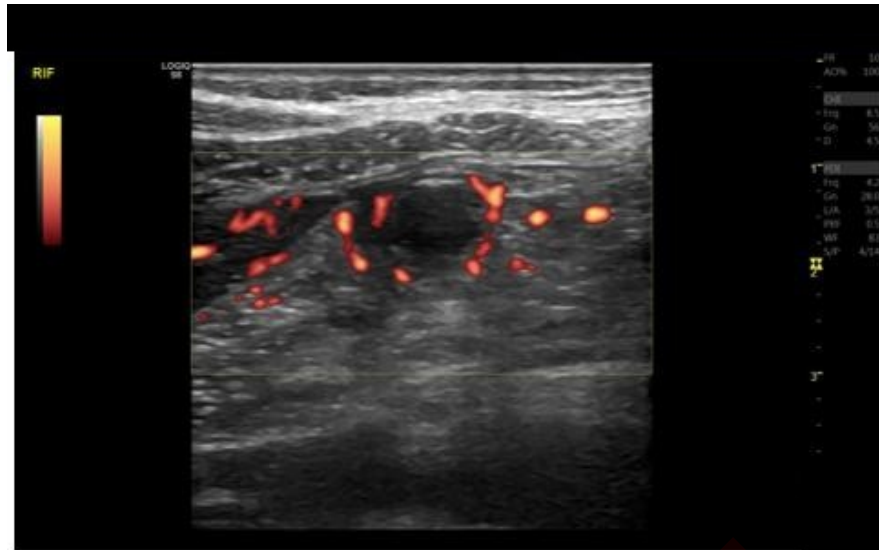


Figure 6.3.3 (c): Ultrasound image of the transverse appendix with power Doppler indicating flow within the wall of the appendix and surrounding hyperechoic tissue.

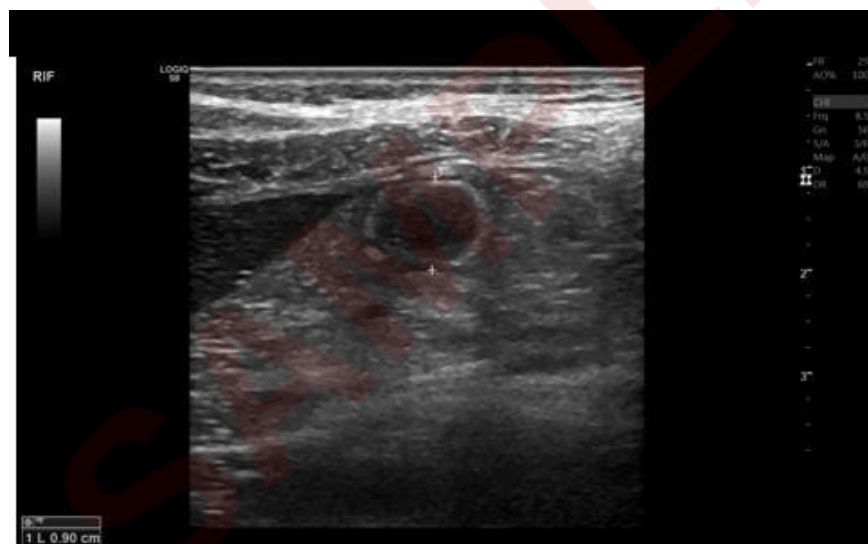


Figure 6.3.3 (d): Ultrasound image of the transverse appendix the AP measurement at 0.90 cm, indicating an enlarged appendix.

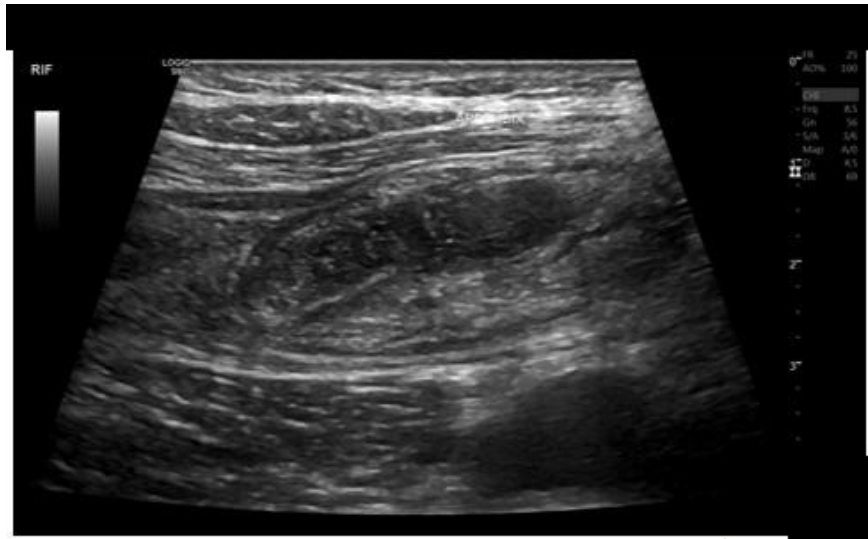


Figure 6.3.3 (e): Ultrasound image of the longitudinal appendix showing a blind ended, non-peristaltic, tubular structure.

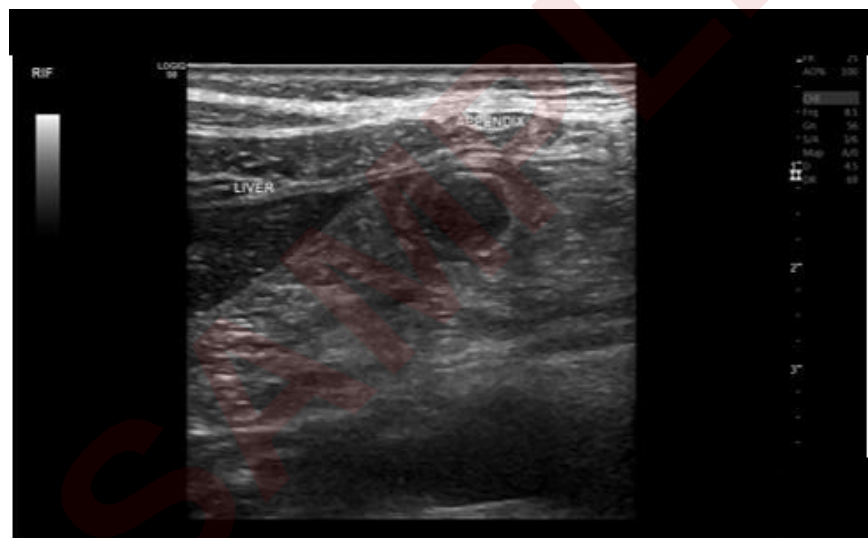


Figure 6.3.3 (f): Ultrasound image of the transverse appendix with the right lower border of the liver demonstrating the anatomical position of the appendix.

Ultrasound report generated for the target ultrasound of the RIF:

SAMPLE

6.3.4 Referral and Communication

The referring clinician in the Emergency Department was verbally informed immediately of the positive findings of acute appendicitis. A formal report was issued to support surgical decision-making.

6.4 Lower limb veins Doppler ultrasound

6.4.1 Clinical Indication

The patient presented with left thigh pain and swelling. Laboratory testing demonstrated a significantly elevated D-dimer of 3000, raising strong suspicion for DVT. An urgent duplex ultrasound was requested to evaluate the venous system.

6.4.2 Ultrasound Examination Technique

No patient preparation required for the ultrasound examination. Patient was asked to take off their trousers thereby exposing the left leg from groin to ankle. High-frequency linear probe (7–12 MHz), supplemented with a curvilinear probe for deeper pelvic segments were used.

The ultrasound scan was started with the patient in the supine with leg externally rotated and knee slightly flexed. The veins in the thigh were examined by starting with the Common femoral vein (CFV) at the groin and its junction with the great saphenous vein. Moving on to the Femoral vein (FV) proximally and along the thigh and ending behind the knee with the Popliteal vein at the fossa. Compression ultrasound was performed at 2 cm intervals, with B-mode imaging and colour Doppler used to assess lumen content, compressibility, and flow.

For the veins below the knee the patient was repositioned by letting them sit at the edge of the bed with the leg dependent to improve venous distension. The same compression method was used for the posterior tibial veins (PTV), anterior tibial veins (ATV), peroneal veins, gastrocnemius and soleal veins.

Given the positive findings of a DVT at the CFV, the examination was extended proximally to assess the external iliac vein (EIV), which was visualised and interrogated. However, due to the patient's recent abdominal surgery, the common iliac vein (CIV) and inferior vena cava (IVC) could not be adequately assessed.

6.4.3 Ultrasound images and report

The following images are a representation of the images taken during the lower limb venous ultrasound to rule-out a DVT and includes the vessels where a positive DVT was obtained. The protocol indicates that the CFV, FV, Popliteal vein, ATV, PTV, Peroneal vein, as well as the gastrocnemius and soleal veins need to be examined. If a DVT is demonstrated in the CFV, the EIV, CIV and IVC are included where visualised.

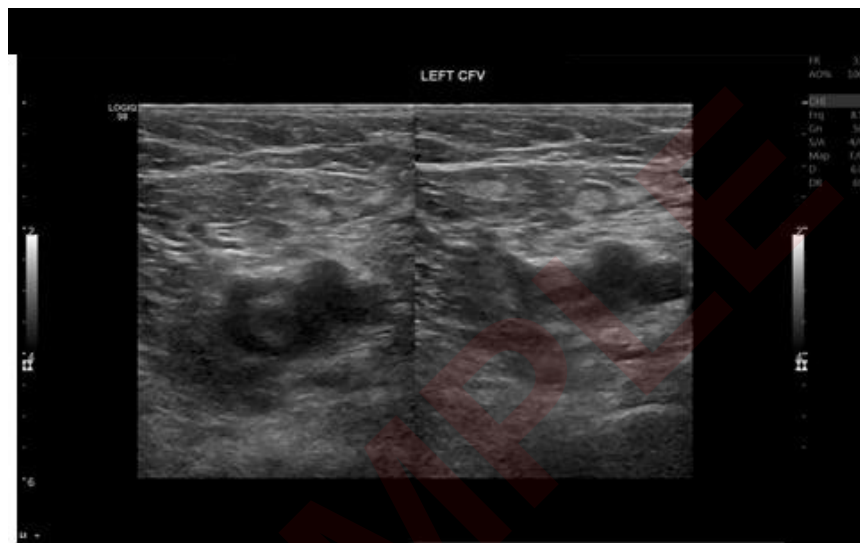


Figure 6.4.3 (a): Dual screen ultrasound image demonstrating echogenic thrombus within the left CFV and the non-compressibility of the vein in the second screen.



Figure 6.4.3 (b): Longitudinal ultrasound image of the CFV with echogenic thrombus and colour Doppler indicating no blood flow within this segment of the CFV.

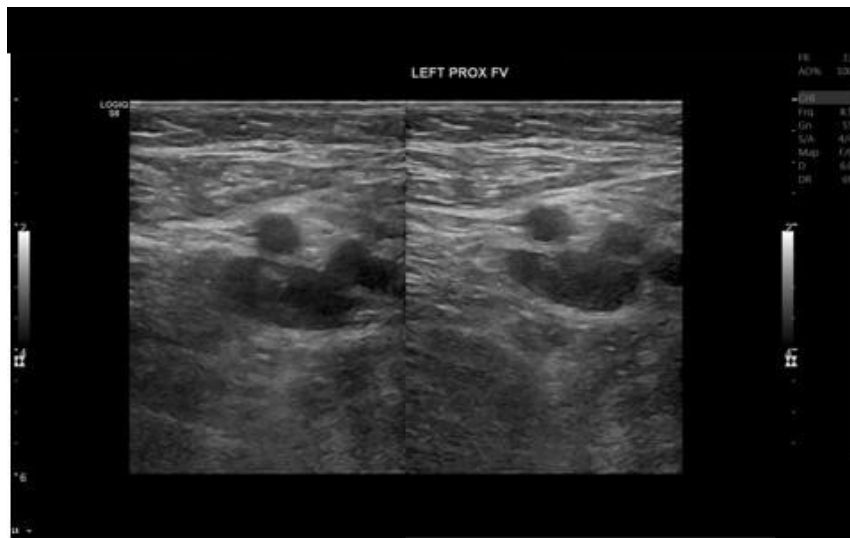


Figure 6.4.3 (c): Dual screen ultrasound images demonstrating echogenic thrombus within the left proximal FV and the non-compressibility of the vein in the second screen.

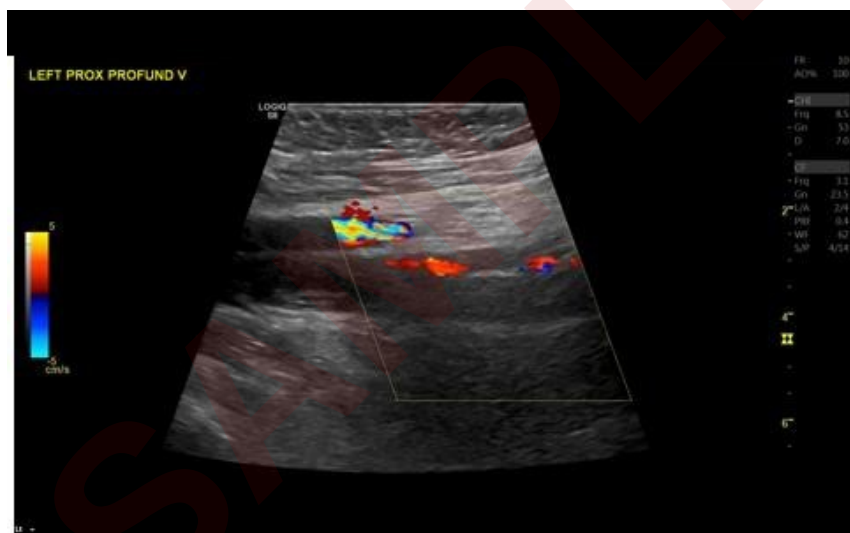


Figure 6.4.3 (d): Longitudinal ultrasound image of the profunda vein with echogenic thrombus and colour Doppler indicating no blood flow within this segment of the profunda vein.

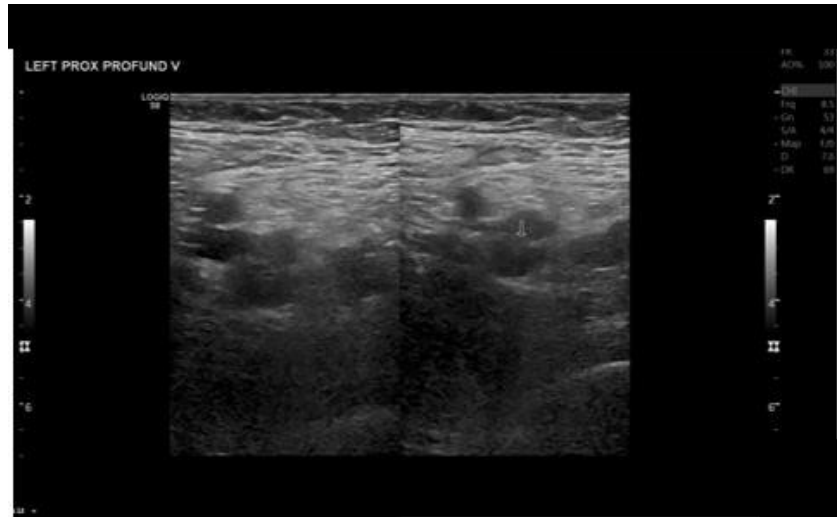


Figure 6.4.3 (e): Dual screen ultrasound image demonstrating echogenic thrombus within the left profunda vein and the non-compressibility of the vein in the second screen.

Ultrasound report generated for the lower limb venous Doppler scan:

SAMPLE

6.4.4 Referral and Communication

The referring Emergency Department clinician was verbally informed immediately of the positive findings. A formal written report was also issued to guide urgent management and vascular referral.

6.5 Soft tissue ultrasound

6.5.1 Clinical Indication

The patient was referred by their GP with a new, large 6 cm subcutaneous lump on the left chest wall, lateral aspect. The lesion was noted to be of recent onset and the provisional clinical impression was that of a sebaceous cyst, though the size and rapid development raised concern. Ultrasound was requested to characterise the lump further.

6.5.2 Ultrasound Examination Technique

No patient preparation required for the ultrasound examination. The patient was asked to remove their shirt and laydown on the couch in a supine position. A targeted ultrasound scan of the left chest wall lump was performed using a high-frequency linear transducer (7–15 MHz). The lesion was assessed in both longitudinal and transverse planes with grayscale B-mode imaging. Colour and power Doppler were applied to evaluate vascularity. Surrounding subcutaneous tissue and underlying muscle were included in the assessment to establish the lesion's origin and depth.

6.5.3 Ultrasound images and report

The following images are a representation of the images and measurements taken during the targeted soft tissue ultrasound of the palpable lump.

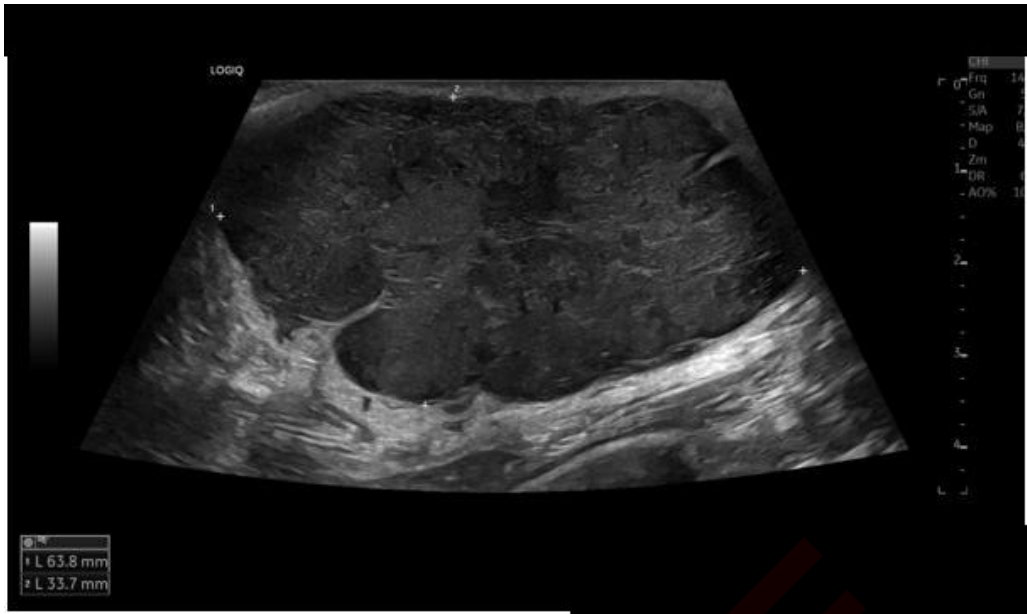


Figure 6.5.3 (a): Longitudinal ultrasound of the palpable lump in the left chest wall region. The lesion has irregular borders and appears solid with a heterogeneous/hypoechoic echotexture. The longitudinal measures are 63.8 mm and the AP diameter is 33.7 mm.

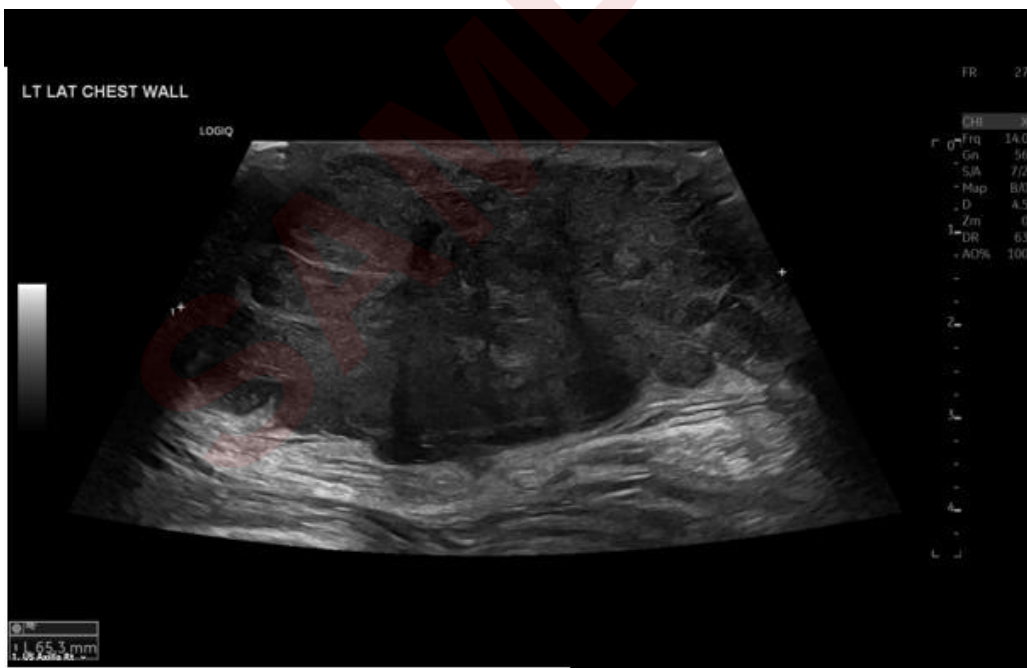


Figure 6.5.3 (b): Transverse ultrasound of the same lesion located in the left chest wall region. The a proximal transverse measurement is indicated at 65.3 mm. Due to the size of the lump and the limitations of the transducer footprint the transverse borders of the lesion are not clearly indicated on the ultrasound image.

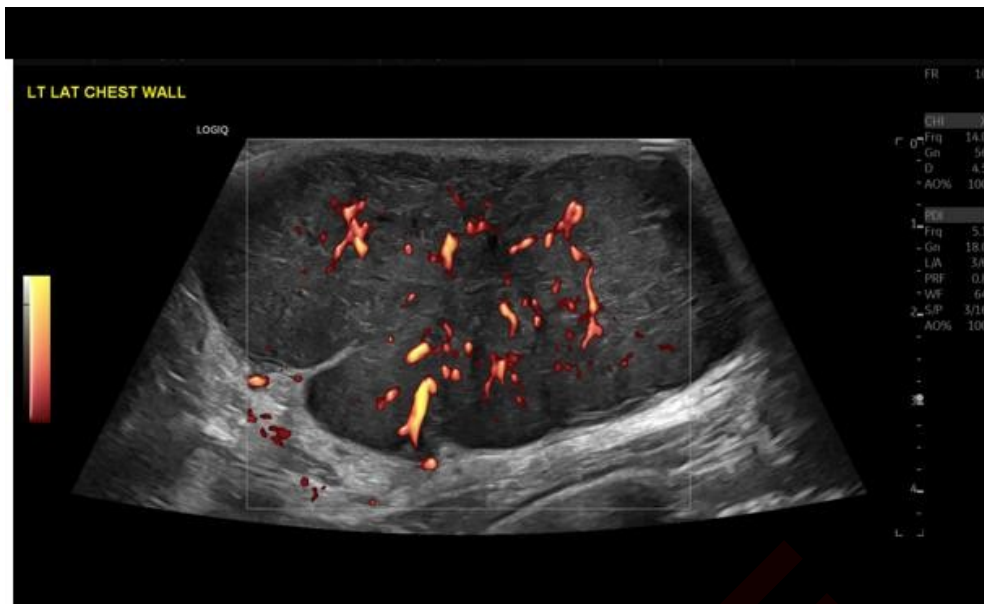


Figure 6.5.3 (a): Longitudinal ultrasound of the lesion with power Doppler demonstrating hypervascularity of the lesion.

Ultrasound report generated for the soft tissue scan:

SAMPLE

6.5.4 Referral and Communication

As the request originated from the patient's GP, the report and urgent recommendation were emailed directly to the GP. In line with local oncology referral protocols, the patient was also placed on the cancer fast-track (2-week wait) pathway for urgent sarcoma clinic assessment.

6.6 Testes ultrasound

6.6.1 Clinical Indication

The patient presented to the Emergency Department with acute left testicular pain and swelling following direct trauma sustained by striking the saddle of a bicycle. Clinical concern was raised for testicular rupture and urgent ultrasound was requested to evaluate.

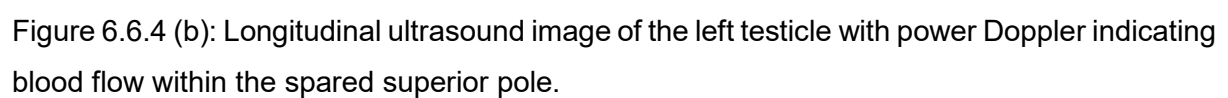
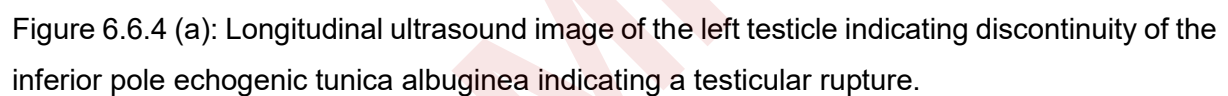
6.6.2 Consent Process

Prior to the scan, the patient was informed of the nature and purpose of the testicular ultrasound, including the need for both testes to be scanned for comparison, the use of Doppler assessment, and the sensitive nature of the examination. The patient provided verbal informed consent and reassurance was given regarding privacy and chaperone availability.

6.6.3 Ultrasound Examination Technique

No patient preparation required for the ultrasound examination. The patient was asked to remove their trousers and pants and cover the penis with a paper towel provided. The ultrasound scan was performed with a high-frequency linear probe (7–15 MHz). The patient was in the supine position, with scrotum supported on a towel and covered with warm gel. Both testes were scanned in longitudinal and transverse planes using B-mode grayscale imaging. Colour Doppler was applied to assess vascularity. The scrotal wall and epididymis were also assessed.

The following images are a representation of the pathological images taken during the scrotum ultrasound in the Ambulatory and Emergency Department. According to the Departments protocol, both testes and epididymis are examined.



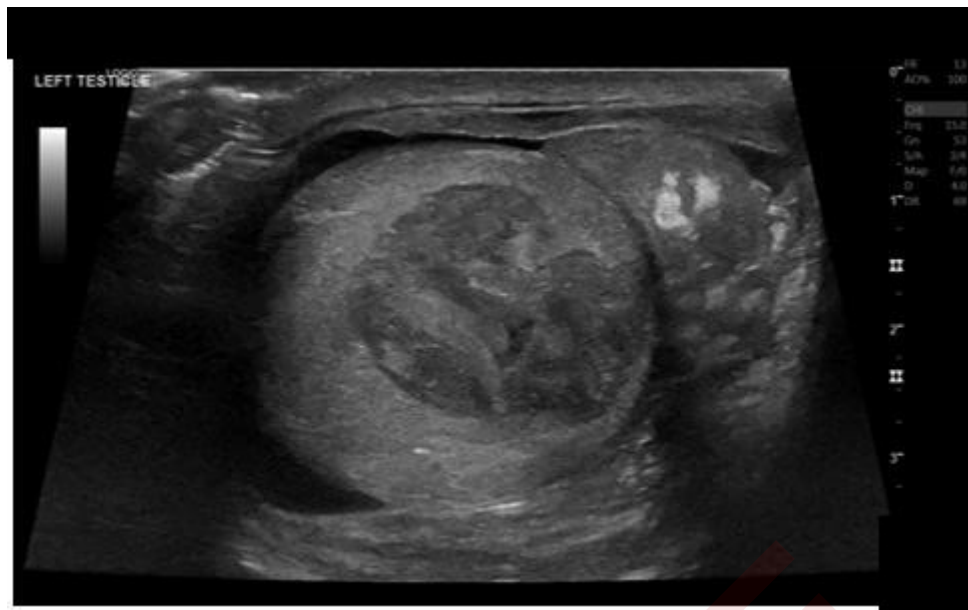


Figure 6.6.4 (c): Transverse ultrasound image of the left testicle indicating heterogeneous/hypoechoic collections representing intratesticular haematoma formation due to trauma.

Ultrasound report generated for the testes scan:

SAMPLE

6.6.5 Referral and Communication

The referring Emergency Department clinician was verbally informed immediately of the findings. A formal report was issued, and the patient was referred urgently for urological/surgical management.

6.7 Pelvis transabdominal and transvaginal

6.7.1 Clinical Indication

The patient was referred for a pelvic ultrasound to assess uterine and ovarian anatomy and follicular development in the context of fertility investigation. The scan was performed on day 11 of the patient's menstrual cycle, which is within the appropriate timeframe (day 2–14) for assessing follicular growth and endometrial development in relation to ovulation.

6.7.2 Consent Process

The procedure was explained fully to the patient, including the purpose of the examination, the technique used for both transabdominal and transvaginal scanning, and what to expect during the procedure. The patient provided informed, signed consent (Appendix 12.7.1) prior to the examination. The offer of a chaperone was declined by the patient, and there was no known latex allergy. All consent and safety checks were completed according to departmental and professional guidelines.

6.7.3 Ultrasound Examination Technique

The ultrasound examination was performed using both transabdominal and transvaginal approaches to ensure optimal visualisation of the uterus, endometrium, and ovaries. The transabdominal scan was performed first with the patient in a supine position and a full bladder to provide an overview of the pelvic organs and assess uterine orientation. The patient was asked to lower their trousers and pants to hip level to obtain adequate access to the pelvic region and the curvilinear transducer was used.

Following the transabdominal scan, a transvaginal ultrasound was performed using a high-frequency transvaginal transducer for detailed assessment of the uterus, endometrium, and adnexal structures. Prior to use, the transvaginal transducer was cleaned and disinfected

using the Tristel Trio system in accordance with infection prevention and control protocols. Sterile gel was then applied to the probe, which was subsequently covered with a sterile probe cover. Additional sterile gel was applied externally to ensure optimal acoustic coupling during the scan.

The patient was asked to empty her bladder prior to the transvaginal examination. The patient was asked to remove all clothing below their waist. The patient was positioned at the edge of the bed with their feet on a stool and a paper towel was used to cover their lap. Privacy was provided to the patient for getting undressed and dressed again. All images were obtained and stored in accordance with departmental protocol while maintaining patient comfort, dignity, and safety throughout the procedure.

6.7.4 Ultrasound images and report

The following images are a representation of the pathological images taken during the pelvic ultrasound in the main ultrasound department. According to the Department's protocol, a transabdominal and transvaginal ultrasound should be performed with the uterus, endometrium, bilateral ovaries and adnexa examined.

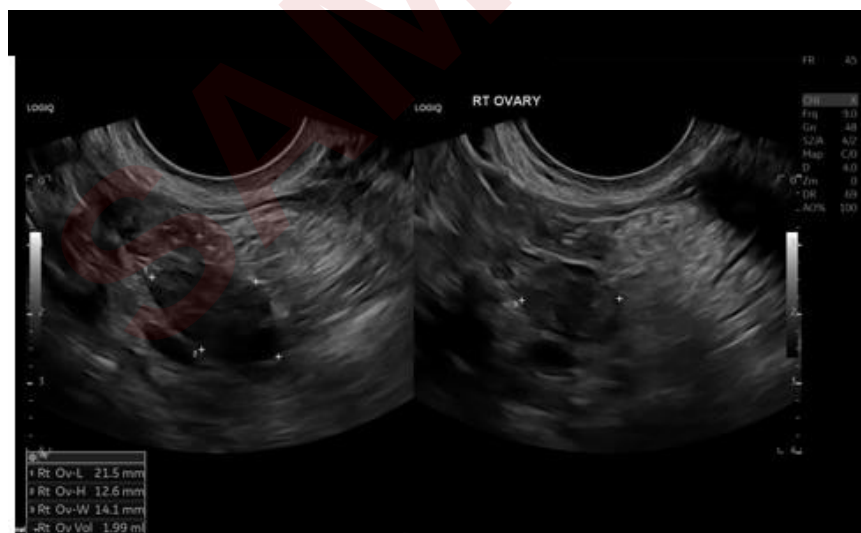


Figure 6.7.4 (a): Dual screen ultrasound image of the right ovary indicating the volume measurement taken in the longitudinal and transverse plane.



Figure 6.7.4 (b): Ultrasound image of the right ovary with the largest antral follicle measured at 0.5 cm.

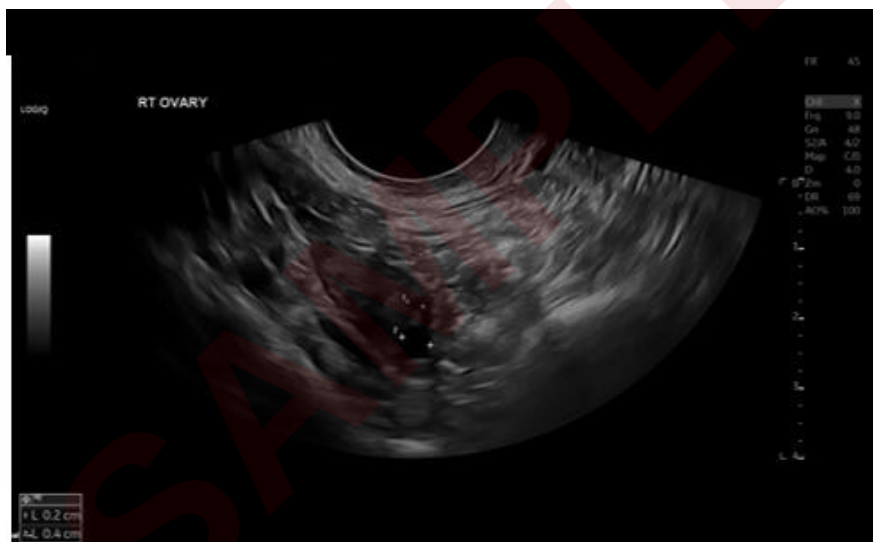


Figure 6.7.4 (c): Ultrasound image of the right ovary with the smallest antral follicle measured at 0.2 cm.

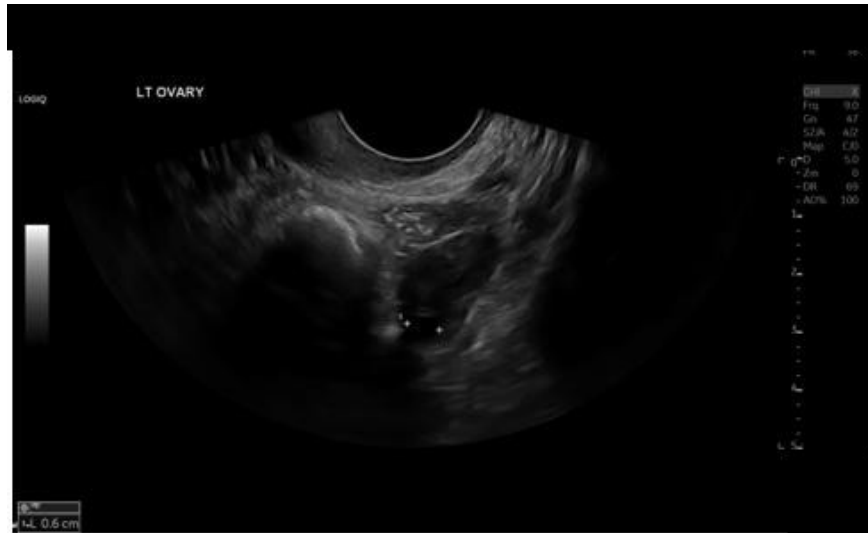


Figure 6.7.4 (f): Ultrasound image of the left ovary with the smallest antral follicle measured at 0.5 cm.

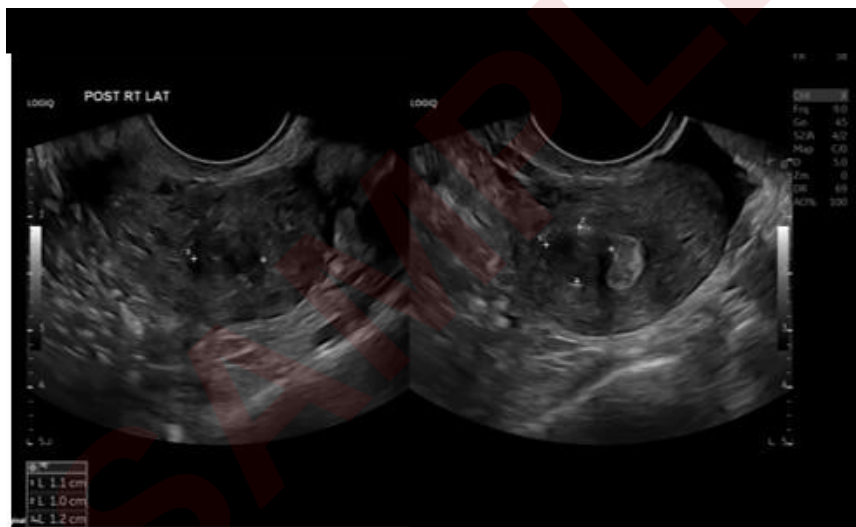


Figure 6.7.4 (g): Dual screen ultrasound image of the right lateral fibroid indenting on the endometrial lining measured in longitudinal and transvers images.

Ultrasound report generated for the transvaginal scan:

SAMPLE

6.7.5 Referral and Communication

The findings were discussed with the referring clinician in line with the fertility assessment protocol. The presence of a right lateral fibroid and the antral follicle count were communicated as relevant findings for fertility planning. The patient was informed that the report would be sent to their referring fertility specialist for further review and management. All documentation and image data were recorded and stored securely in accordance with local policy and data protection regulations.

Appendix 12.7.1 (b) includes the pelvic ultrasound reporting recommendations for GP referrals.

6.8 Ultrasound examinations

6.8.1 Obstetric detail fetal anomaly

The routine second trimester detail anomaly scan a methodical approach is used to ensure that none of the measurements or anatomy are over looked. The uterus is firstly scanned through starting at the symphysis pubis. Thereafter the fetus is evaluated beginning at the fetus head and ending with the feet. It is however important to use a check list to ensure that important anatomy was not overlooked during the scan.

6.8.1.1 Cervix, uterus and adnexa

The transducer is placed just above the symphysis pubis in the sagittal orientation on the maternal abdomen. The cervix is identified and evaluated to exclude any pathology and determine the length. The cervical length should be more than 2.5 cm and no funnelling of the internal cervical os should be identified. The transducer is used to sweep through the uterus to confirm a smooth uterus wall and thus excluding fibroids. The adnexa are also evaluated to exclude ovarian pathology.

6.8.1.2 Placenta

The placenta is evaluated to confirm a homogenous and hyperechoic appearance and the distance from the internal cervical os. The placental will have a homogeneous low-level

echogenicity, but it may be interrupted with anechoic lucanae. The placenta is also examined to exclude placenta previa. This occurs when the internal cervical os is covered by the inferior border of the placenta. The placenta is classified as a low-lying placenta when the lower edge of the placenta is within 2 cm from the internal cervical os. Other placental pathologies like placenta accreta and placental masses are also excluded during the scan.

6.8.1.3 Fetal brain

The BPD and HC are measured in the same transverse plane of the fetal head known as the transthalamic plane. As the name indicates the plane is a cross-section of the fetal head at the level of the thalami. The transthalamic plane must include the falx cerebri that is broken in the middle by the cavum septum pellucidum and thalamus. No cerebellum must be visualised and the transverse section of the head should be oval shaped. The shape of the head is very important because a lemon shape head is associated with spina bifida.

The BPD measurement is taken at the widest part of the skull that is perpendicular to the midline falx. The calipers are placed at the outer border of the proximal parietal bone to the outer border of the distal parietal bone. The BPD is used to exclude pathologies like dolicocephaly and brachycephaly. The HC are measured on the same section by placing the ellipse on the outside of the skull bone, not including the skin line.

The transverse plane used to measure the lateral ventricle is called the transventricular plane. In this section of the fetal brain the lateral ventricles further from the probe is assessed and consist of the anterior and posterior horns. The posterior horn is more clearly seen and is a fluid filled anechoic structure. The choroid plexus is observed in the posterior horn as a bright echogenic structure. The lateral ventricles are examined to exclude choroid plexus cysts, ventriculomegaly and hydrocephalus.

The measurement is obtained by placing the calipers inside the echogenic walls of the posterior horn at the level of the glomus of the choroid plexus. The calipers should be perpendicular to the axis of the ventricle. The measurement should be less than 10 mm to be considered normal. If the measurement is more than 10 mm it indicates ventriculomegaly and a distance of 15 mm and more are an indicator of hydrocephalus.

The transcerebellar plane is used to assess the posterior fossa structures. These structures include the cerebellar hemispheres that is slightly more echogenic than the cerebral hemispheres. The cerebellum is a biconvex structure that is seen on either side of the midline

falx. A banana shape cerebellum is an indicator of spina bifida. In the middle of the cerebellum within the midbrain is the fourth ventricle that is only seen if it is dilated. The vermis is an echogenic structure connecting the hemispheres of the cerebellum and posterior to this is the anechoic cisterna magna. Most of the open spinal defects and Dandy-Walker malformation are excluded if the cisterna magna is normal. In the posterior fossa view the nuchal fold is located posterior to the cisterna magna. The nuchal skin fold is a strong marker for trisomy 21 if dilated because of oedema of the skin at the occipital bone.

The transcerebellar distance is measured by placing the calipers from the outer edge of one hemisphere to the outer edge of the other hemisphere. Next the cisterna magna is measured by placing the calipers from the vermis to the occipital bone on the midline. This measurement should be less than 10 mm to exclude pathology. Care is taken with this measurement as an inappropriate plane can cause over measuring. Lastly the nuchal fold is measured by placing the calipers on the outer surface of the occipital bone to the outer surface of the skin. This distance should not be greater than 6 mm and gave an indication of the fetal risk for chromosomal abnormalities.

6.8.1.4 Fetal face

When examining the fetal face various planes are used to evaluate the face for any pathology. The coronal plane is used to firstly establish that the interorbital diameter is the same as the ocular diameter and the lenses are present. A transverse plane through the orbits can also be used to evaluate the distance between the orbits. If the orbits are too far apart it is hypertelorism and if the orbits are too close together it is hypotelorism. Secondly the coronal plane is used to exclude cleft lip by viewing the nose and lips. The sagittal plane of the fetal face on the other hand shows the nasal bone that is used to exclude chromosomal abnormalities. The position of the mandible excludes micrognathia and no enlarged tongue eliminates macroglossia. The shape of the forehead is also evaluated to exclude frontal bossing or flattened face that is associated with trisomy 21.

6.8.1.5 Fetal heart

The abdominal situs: This is obtained by getting a transverse abdominal view with the stomach on the fetal left and the liver on the fetal right. The descending aorta could also be visualised

posteriorly to the left of the fetal spine. By moving the transducer cephalic the cardiac axis is identified at the same side as the fetal stomach.

The four chamber heart view: The fetal heart occupied one-third of the thorax and the long axis pointed to the left fetal side at a 45° angle from the midline. The left atrium is identified as the chamber closest to the fetal spine and the right ventricle is near the anterior abdominal wall. The pulmonary veins can be seen entering the left atrium. The widths of the two atriums are the same and the opening between the atriums is identified as the foramen ovale with the flap in the left atrium. The ventricular sizes are also equal and the moderator band is seen in the right ventricle and there were no signs of thickened walls. The interventricular septum is intact and the atrioventricular valves showed normal movement. The relationship of the atrioventricular septum and the mitral and tricuspid valves had the appearance of a slightly offset cross, because the tricuspid valve is closer to the apex. Colour Doppler is used to evaluate the one-way flow over the mitral and tricuspid valves and the integrity of the interventricular septum. The descending aorta can also be seen posterior to the left of the fetal spine.

The left ventricular outflow tract view: The aorta can be identified as it originated from the left ventricle thus creating the left ventricular outflow tract view. The aortic valve is identified and the anterior wall of the aorta is continuous with the interventricular septum. This heart view shows the left ventriculoarterial connection and that the ventricular septum is intact. Colour Doppler demonstrated blood flow in one direction over the aortic valve.

The right ventricular outflow tract: The pulmonary artery is seen as it emerges from the right ventricle and dividing into the firstly the right pulmonary artery and then the left pulmonary artery. The normal pulmonary artery continued to the left side until it ran into the ductus arteriosus. Colour Doppler is applied to identify the bifurcation of the pulmonary artery and confirm the cross-over of the great arteries. By moving the transducer up and down the crossing nature of the great arteries can be seen. The pulmonary artery crosses the aorta at a right angle just above its origin. The pulmonary valves are also inspected and moved freely.

The three-vessel view can be seen with the pulmonary artery on the fetal left, aorta in the middle and superior vena cava on the fetal right. The superior vena cava has the smallest diameter and the pulmonary artery has the largest diameter. The size, number, arrangement and alignment of the three vessels are established during the scan.

The 3-vessel view and trachea: The V-shape confluence can be identified as the aortic and ductal arches join the descending aorta. Both arches are seen on the left of the trachea and

colour Doppler demonstrated that the blood flow is in the same direction in the arches. The trachea is identified as a hyperechogenic ring with a small anechoic center.

6.8.1.6 Thorax and diaphragm

The fetal heart the lungs in the thorax is also examined. The lungs have a homogeneous echogenic texture that surrounded the heart and no fluid collections or cysts are observed. The transducer was rotated 90° to obtain a longitudinal view of the thorax. In this view the diaphragm is identified as a hypoechoic thin line that dividing the thoracic and abdominal cavity.

6.8.1.7 Fetal abdomen

The AC is used to contribute in estimating the fetal weight. But during the scan attention should be given to the stomach to exclude pathology. For instance, the double bubble sign known as duodenal atresia is an indicator for trisomy 21. Also, the absent of the stomach can be explained by a diaphragmatic hernia.

The abdominal circumference view should include the following landmarks: two continues ribs of equal size on each side, three ossification centers of one vertebra, short length of umbilical vein entering the liver on the right side and an anechoic stomach bubble on the left. The measurement is taken by an ellipse that is positioned around the abdomen to include the skin line.

6.8.1.8 Cord insertion

The abdominal wall is examined to exclude herniation defects at the cord insertion. Omphalocele is a herniation defect where the intestines of the fetus are seen outside the abdomen covered with a membrane. Gastroschisis is another hernia that occur at the umbilical cord, but here the intestines are free in the amniotic fluid. To confirm the presence of a 3-vessel cord, umbilical arterial flow colour Doppler is used to examine the umbilical arteries passing on either side of the bladder.

6.8.1.9 Urinary tract

Kidneys play an important role in the production of the amniotic fluid. Without proper functioning kidneys oligohydramnios can occur which causes other fetal abnormalities. Hyperechoic kidneys are one of the indicators of a fetal renal pathology. Severe renal pelvis dilatation that exceeds 7 mm is an indication of hydronephrosis.

The kidneys are identified in the transverse plane as hypoechoic areas with a hyperechoic border on either side of the spine. This plane is used to determine and measure dilated renal pelvis. The coronal plane can also be used to determine the presence of fetal kidneys and by applying colour Doppler the renal arteries can be demonstrated entering the kidneys.

Urinary bladder can also exclude renal pathology and confirm renal function. If no renal bladder is observed bilateral renal agenesis can be the cause and oligohydramnios will also be observed. When the bladder is overly distended urethral obstruction can be the reason. Bladder exstrophy will also be excluded by observing a normal urinary bladder between the fetal legs.

6.8.1.10 Lower limbs

The length of the femur is obtained parallel to the transducer. The length of the femur is measured by placing the calipers at the end of each metaphysis. The femur length is used to eliminate lethal skeletal dysplasia like thanatophoric dwarfism, achondroplasia and osteogenesis imperfecta type 2. To exclude these abnormalities the fetal head and thorax shape should also be evaluated.

The full lengths of both the tibia and fibula is also obtained. The echogenicity of the bones is also similar and the bones are straight and not bowed. The lateral view of the lower leg is used to evaluate the fetal ankles. With this view clubfoot is eliminated as the foot is perpendicular to the lower leg. Rocker-bottom foot is also excluded by assessing the heel of the foot. The plantar view of the foot is used to excluded polydactyly and sandal gap.

6.8.1.11 Upper limbs

The full length of the humerus is seen with the humerus parallel with the transducer and the measurement is obtained by placing the calipers at each end of the bone. The radius and ulna

are also examined and the ulna is longer and thinner than the radius. The metacarpals in the hand should be visualised and by obtaining an outstretch hand, clinodactyly and polydactyly can be excluded.

6.8.1.12 Fetal spine

It is important to examine the fetal spine to exclude spina bifida, the most common spinal malformation. Spina bifida occurs when the two halves of the vertebral arch fails to fuse. This lesion is commonly seen in the lumbosacral region and manifests as several varieties with different grades of severity. If the meninges and neural tissue protrude through the defect, it is a meningocele and if only the meninges are involved it is called a meningocele. These are severe forms of the disorder, while spina bifida occulta is a milder form where the defect is covered with skin and difficult to detect on ultrasound. The severe forms of spina bifida have neurological involvement that can be detected when evaluating the fetal head. Therefore, it is important to examine the fetal head first for Arnold-Chiari malformation and ventriculomegaly which are indicators of spina bifida.

The fetal spine is evaluated by examining the three echogenic ossification centres of the vertebra. The ossification centres consist of a developing vertebral body anterior and the junction of the pedicles and lamina posterolateral that forms a symmetrical triangular configuration. The skin covering the spine is also examined for any defects. To exclude spina bifida the fetal spine is examined in three planes, namely longitudinal, coronal and transverse from the cervical spine to the sacral region.

The longitudinal plane is obtained by angling the transducer until two parallel lines of small echoes were seen with the skin line on top. The two parallel lines represented the ossification of one of the lamina and the vertebral body. The skin line covering the fetal spine is also evaluated to exclude any defects.

The coronal view of the fetal spine is seen as three echoes forming parallel lines. These echoes represented the ossification of the vertebral body centrally and the two lamina ossifications on either side. The ossification centres are examined for spraying in the coronal view.

In the transverse view of the fetal spine, the spine appears as three ossification centres in a U-shape. The arms of the U were the lamina ossifications and the middle ossification was the

vertebral body. In the transverse view the lamina ossifications are evaluated for spraying and the skin line is examined for any herniation defects.

6.8.1.13 Fetal genitalia

The gender of the fetus should not be identified to the patient unless they asked to know the gender. The male genital is identified by obtaining a view of the mid-gray homogeneous penis and scrotum. The female genital on the other hand is identified by three echogenic lines representing the major labia flanking the less echogenic minor labia. Ambiguous genitalia will warrant a referral.

6.8.1.14 Amniotic fluid

The amniotic fluid must be evaluated as the amount of fluid surrounding the fetus provides valuable information about the fetal condition. During the second trimester most of the amniotic fluid is produced through fetal urination. The clearing on the other hand is performed by the swallowing of the amniotic fluid by the fetus. If the amount of amniotic fluid during the second trimester scan is too low or high the chances are good that there are fetal abnormalities. If there is not enough amniotic fluid it is called oligohydramnios. This condition can be caused by abnormal fetal renal functions, premature rupture of the amniotic membranes or uteroplacental insufficiency. If the amniotic fluid is too high it is called polyhydramnios. This condition is caused by decreased fetal swallowing or increased fetal urine reproduction. If the cause cannot be classified in these two categories, then it is called idiopathic polyhydramnios. The amniotic fluid amount is determined by using the deepest vertical pocket method and if it is below 2 cm it is oligohydramnios and above 8 cm is polyhydramnios.

Appendix 12.7.2 contains an example of the detailed obstetric anomaly ultrasound report.

6.8.2 Abdominal ultrasound

An abdominal ultrasound scan begins generally with the patient in a supine position. During the scan the patient is asked to change into various degrees of obliquity to obtain better images of the liver, biliary system, kidneys, pancreas or spleen. These abdominal organs are scanned both in the longitudinal and transverse plane. In these planes the organs are carefully sweep

through to ensure that no pathology was missed. The scan is performed in a systematic way to ensure that no pathology is over looked.

6.8.2.1 Abdominal aorta and Inferior vena cava

The aorta originates at the left ventricle of the heart and runs superior to inferior on the left side of the spine. This portion is the thoracic aorta that continues into the abdominal aorta from the aortic hiatus in the diaphragm. As the abdominal aorta descends it gives off several branches including the celiac axis, superior and inferior mesenteric arteries and the renal arteries. The aorta continues to descend until it bifurcates into the left and right common iliac arteries. The abdominal aorta decreases in size as it descends, but the superior portion of the abdominal aorta should not measure more than 2.5 cm in diameter. The aorta is evaluated to exclude aortic aneurysms, aortic atherosclerosis and aortic stenosis.

The IVC begins with the union of the left and right common iliac veins and ascends along the right side of the spine until it drains into the right atrium. As it moves superior there are many veins, including the renal veins and hepatic veins, which empty into the IVC before it goes through the diaphragm at the caval hiatus. The IVC is examined to exclude thrombosis.

6.8.2.2 Pancreas

The pancreas is found obliquely in the epigastrium and left hypochondrium area. It is both an endocrine and exocrine gland that consists of a head, neck, body and tail. The pancreas also has a pancreatic duct which joins the common bile duct (CBD) and enters the duodenum at the ampulla of Vater. When scanning the pancreas, the texture can vary from homogeneous to heterogeneous depending on the amount of fat that is present. But a normal pancreas is usually hyperechoic compared to the left lobe of liver.

6.8.2.3 Hepatic system

The liver is mostly found in the right hypochondrium region, inferior of the diaphragm. Normally the liver also extends into the epigastrium and left hypochondrium region. The liver is divided into the left, right and caudate lobe. The left lobe is further divided into the medial and lateral segments, whereas the right lobe is divided into the anterior and posterior segments. When

scanning through the liver it is important to use the longitudinal and transverse plane to ensure that no pathology is overlooked. The appearance of the liver should also be noted as homogeneous and hyperechogenic throughout compared to the renal cortex of the right kidney. This appearance will exclude pathologies which include lesions, cystic structures, hepatomegaly and intrahepatic duct dilatation.

The liver also has a dual blood supply from the portal vein and hepatic artery. The hepatic artery supplies oxygenated blood and the portal vein contains deoxygenated blood and absorbed nutrients. The main portal vein is formed at the junction of the splenic vein and the superior mesenteric vein. At the hilum of the liver the main portal vein divides into the left and right portal veins. The diameter of the main portal vein is approximately 13 mm and is used to detect portal vein hypertension or thrombosis. Colour Doppler is also applied to determine the hepatopetal flow within the portal vein. Leaving the liver are the three hepatic veins draining deoxygenated blood into the IVC. The blood vessels in the liver are therefore used as important landmarks in identifying the liver segments when scanning. The right hepatic vein separates the anterior and posterior segments of the right lobe, whereas the left hepatic vein divides the medial and lateral segments of the left lobe. The middle hepatic vein on the other hand drains the right lobe and medial left lobe.

6.8.2.4 Biliary system

The gallbladder is a pear-shaped sac that is located in the posteroinferior margin of the liver between the right and left lobes of liver. It consists of a body, neck and broad fundus, which is projected inferiorly. The gallbladder will be filled with bile after fasting and thus easy to identify on the ultrasound scan. The gallbladder wall should not exceed 3 mm. This measurement is an indication of cholecystitis and therefore the neck of the gallbladder should be carefully assessed for gallstones. The gallbladder is also evaluated for gallstones, sludge and polyps. To make sure no gallbladder pathology is present the gallbladder is also evaluated in the left lateral decubitus position.

From the gallbladder neck the cystic duct arises and unites with the hepatic duct to form the CBD. The CBD extends inferiorly and enters the duodenum at the ampulla of Vater near the head of the pancreas. The measurement of the diameter of the CBD should not exceed 6 mm.

6.8.2.5 Kidneys

The kidneys are located between the level of the twelfth thoracic and third lumbar vertebrae on each side of the spine. The right kidney is displaced inferior by the liver. But both kidneys are bean-shaped organs with a lateral convex side that is named the renal hilum. The renal hilum is where the renal vein exits the kidney and drains into the IVC and the renal artery enters the kidney from the abdominal aorta. Each kidney has a renal capsule which is a thin hyperechoic layer seen along the periphery of the kidney. The kidney is also divided into an outer renal cortex area and an inner renal medulla area. The medulla pyramids typically appear hypoechoic to the normal renal cortex because of the urine. The lengths of the kidneys are normally between 9 and 12 cm. The kidneys are scanned to eliminate hydronephrosis, renal lesions, cysts or calculi.

6.8.2.6 Spleen

The spleen is located in the left hypochondriac region between the stomach and diaphragm. It is an oval-shaped mass of lymphatic tissue with a splenic hilum where the lymphatic vessels and blood vessels are located. The splenic artery arises from the celiac axis and enters the splenic hilum. But the splenic vein exits the splenic hilum and at its confluence with the superior mesenteric vein forms the main portal vein. The normal measurement of the spleen is 8 to 13 cm in length, with a homogeneous appearance and hyperechoic compare to the renal cortex of the left kidney.

Appendix 12.7.3 contains an example of the abdominal ultrasound report.

6.8.3 Shoulder Ultrasound

6.8.3.1 Longhead of biceps brachii tendon

The patient sits with the elbow flexed 90 degrees, forearm half supinated resting on the lap. The longhead of the biceps brachii lies within the bicipital groove with the lesser tuberosity medially and the greater tuberosity laterally. The longhead of the biceps brachii is examined in transverse, and in longitudinal planes for tendinopathy, tenosynovitis or tears. The longitudinal view of a normal tendon reveals a fine fibrillar pattern. It may be necessary to angle superiorly (heel to toe) in order to visualise the tendon fibres properly.

6.8.3.2 *Subscapularis tendon*

The transducer is in the transverse plane over the lesser tuberosity. The patient's elbow is placed against the hip and the arm is externally rotated. This allows adequate visualisation of the subscapularis tendon and possible fluid within the subacromion-subdeltoid bursa (SASD). The tendon is examined by sweeping superiorly to inferiorly and scanned in two planes to exclude tendinopathy to tears.

6.8.3.3 *Supraspinatus tendon*

The patient's arm is hyperextended, with the dorsum of the hand placed on their back pocket. In this position the supraspinatus tendon becomes an anterior structure, emerging from underneath the cover of the acromion and helps accentuate cuff defects and tears. The supraspinatus lies laterally from the biceps tendon and inserts on the greater tuberosity. The tendon is scanned in its entirety. An apparent hypoechoic gap is often seen on either side of the biceps. This space is called the Rotator Cuff Interval (RCI) formed by the coracohumeral ligament passing superficially over the biceps tendon and merging with the subscapularis tendon medially and supraspinatus tendon laterally. This is the tendon most likely to tear. The most common site is the anterior aspect of the distal supraspinatus tendon adjacent to the RCI. The partial thickness tears are identified as articular surface, bursal surface or intrasubstance tears. Full thickness tear transverse the full thickness of the tendon from the bursal to the articular surface.

6.8.3.4 *Infraspinatus tendon* and posterior labrum

The patient's hand is placed on the contralateral shoulder. The transducer is moved laterally past the musculotendinous junction of the infraspinatus and the tendon, to investigate the insertion. The teres minor is not usually examined, as pathology involving this tendon is exceedingly rare. The transducer oriented in the axial plane until the head of the humerus is seen adjacent to the posterior labrum of the gleno-humeral joint. This plane will demonstrate a joint effusion, synovitis and labral cyst. A depression in the normally rounded contour of the humeral head will indicate a Hills-Sachs deformity.

6.8.3.5 Acromio-clavicular (AC) joint

The arm is placed in the neutral position. The transducer is oriented in the coronal plane over the AC Joint. This should be compared with the joint on the contralateral side. A bulging of the capsule on one side can indicate synovial hypertrophy with possible inflammation of the joint. Colour Doppler can be used to assess for active synovitis.

Appendix 12.7.4 contains an example of the shoulder ultrasound report.

6.8.4 Elbow Ultrasound

6.8.4.1 Anterior elbow

The arm will be placed in a stretch out position for the examination of the anterior compartment. The transducer is oriented in the transverse plane swept through the elbow starting 5 cm proximal and ending 5 cm distal to the ulnar-trochlear joint. First structure to be visualised is the hypoechoic hyaline cartilage at the articular surface of the distal humerus. Here we look for osteophytosis and osteoarthritis changes. In the longitudinal plane effusion and synovitis can be ruled-out at the radio-capitellar and ulnar-trochlear joints.

The short and long head biceps brachii muscle is visualised in the transverse plane as the transducer is moved distally the biceps tendon is seen. To visualise to distal insertion of the biceps tendon on the radial tuberosity the longitudinal plane is used. To obtain the tendon fibres perpendicular to the transducer the distal end of the transducer is heeled. The distal biceps tendon is evaluated for partial or full thickness tears.

The median nerve is located next to the brachial artery and is followed in the transverse plane to the cubital fossa. As the median nerve runs between the two heads of the pronator teres and the FDS can be seen, the sublimis fascia can be a source of compression.

6.8.4.2 Medial elbow

The patient rotates the elbow externally and the elbow should be in the flexed position. The transducer is placed on the medial epicondyle and the slightly hyperechoic UCL can be seen deep to the common flexor origin (CFO). The CFO is commonly evaluated for medial epicondylitis. By rotating the transducer in the transverse plane, the ulnar nerve can be seen as a honey-comb structure and should be traced from proximal to the cubital tunnel to the

distal section. During dynamic flexion of the elbow dislocation and subluxation of the ulnar nerve can be ruled-out.

6.8.4.3 Posterior elbow

The elbow is flexed at 90 degrees at the palm is resting on the bed. By placing the transducer on the longitudinal plane over the olecranon the triceps brachii tendon is visualised cranially. The triceps brachii tendon is evaluated in longitudinal and transverse plane especially to rule-out enthesitis. The olecranon bursa is examined for any bursitis.

6.8.4.4 Lateral elbow

The elbow is flexed and the hand is on a neutral position. The transducer is placed on the lateral epicondyle to visualise the common extensor origin (CEO) in longitudinal plane. The CEO is commonly evaluated for lateral epicondylitis. Posterior to the CEO; the radial collateral ligament can be seen.

Appendix 12.7.5 contains an example of the elbow ultrasound report.

6.8.4 Wrist and Hand Ultrasound

6.8.4.1 Dorsal Hand and Wrist

The examination starts with the evaluation of the extensor compartments in transverse plane. Extensor compartment I is seen if the wrist is in a lateral position. This compartment is associated with De Quervain's tenosynovitis which is an entrapment of extensor pollicis brevis (EPB) and abductor pollicis longus (APL) tendons. Compartment I is also evaluated at the intersection with compartment II for proximal intersection syndrome. With the palm facing down the remained of the extensor compartment can be evaluated. The next intersection is between compartment II and III and is known as distal intersection syndrome. Extensor compartment IV and V can be followed distally to the fingers. At the fingers the extensor tendons are evaluated in the longitudinal plane to demonstrate the central and lateral bands. The central slip inserts at the base of the middle phalanx and the lateral slips insert into the distal phalanx. Ultrasound is used to determine tendon rupture at this region, specifically

scanning a Mallet finger. This is caused by the avulsion of the extensor tendon slip from the distal interphalangeal joint.

At the level of the metacarpophalangeal joint in the transverse plane, the extensor hood can be seen as a thin echogenic fibrillar structure. The sagittal band injury can occur at this region leading to subluxation of the extensor tendons. The metacarpophalangeal, proximal interphalangeal and distal interphalangeal joints are also evaluated for synovial hypertrophy, active synovitis, osteophyte formation or bone erosion.

The extensor carpi ulnaris (ECU), the tendon in compartment VI is best evaluated with the wrist in the lateral position. During dynamic ulnar deviation subluxation of the ECU can be evaluated if more than 50% of the tendon lies outside the groove.

6.8.4.1 Volar Hand and Wrist

The volar aspect is examined with the hand in the palm up position. The median nerve can be seen in the transverse plane as an ovoid structure superficial to the Flexor digitorum tendons. The median nerve is evaluated for entrapment caused by a ganglion or tenosynovitis which led to carpal tunnel syndrome.

The tendons evaluated superficial to the retinaculum is the flexor carpi radialis (FCR) and flexor carpi ulnaris (FCU) tendons as well as the palmaris longus (PL) tendon if present. The flexor digitorum superficialis (FDS) and flexor digitorum profundus (FDP) tendons are deep to the retinaculum and median nerve. The flexor pollicis longus (FPL) can be distinguished by following its course to the thumb. Whereas, the FDS and FDP tendons can be followed the fingers with the FDS inserting on the base of the middle phalanx and the FDP inserting on the distal phalanx. Annular pulleys can be seen as thin focal hypoechoic structures overlying the flexor tendons. These pulleys are evaluated for rupture or thickening which can lead to trigger finger. Another cause for trigger finger will be tenosynovitis which cause tendon sheath thickening.

Guyon's canal is at the ulnar aspect of the wrist, superficial to the flexor retinaculum and contains the ulnar nerve artery and veins. The ulnar nerve is evaluated in the transverse plane to rule-out compression.

Appendix 12.7.6 contains an example of the hand and wrist ultrasound report.

6.8.5 Hip Ultrasound

6.8.5.1 Anterior hip

Patient is in a supine position with the hip in a neutral position in extension and slight external rotation. Place the transducer in longitudinal plane of the femoral head and acetabulum. Move the transducer inferior to include the femoral neck and anterior recess for joint effusion. The iliofemoral ligament is noted superficial to the labrum and the iliopsoas muscle is anterior to the femoral head and joint space. The iliopsoas tendon is evaluated in two planes for tendinopathy and iliopsoas bursa fluid.

Place transducer transverse over the anterior superior iliac spine (ASIS), medial is short tendons of sartorius and laterally is the tensor fasciae latae (TFL). The sartorius is evaluated medially crossing rectus femoris and the TFL remains lateral in front of vastus lateralis. The lateral femoral cutaneous nerve is seen identified slightly inferior to the ASIS and superficial to sartorius. Place the transducer in longitudinal plane at the level of the anterior inferior iliac spine (AIIS), superior to the acetabulum and the direct head of rectus femoris can be seen at its origin. The rectus femoris is evaluated for injury, especially a central aponeurosis tear with haematoma formation.

6.8.5.2 Medial hip

The thigh placed in abduction and externally rotated and the knee flexed. Place transducer over the proximal medial thigh in the transverse plane to identify the relationship between the anterior quadriceps compartment and medial adductor compartment. There are three adductor muscle layers visualised: adductor longus, adductor brevis and adductor magnus. The adductor muscles are evaluated in the longitudinal plane until the attachment on the pubic bone, for tendinopathy or a tear.

6.8.5.3 Lateral hip

The patient is in the decubitus position with a pillow between the legs. The transducer is placed in transvers plane over the apex of the greater trochanter. The gluteus minimus tendon is at the anterior facet and the gluteus medius tendon over the lateral and superoposterior facet. The tendon insertion is evaluated in longitudinal and transverse plane for tendinopathy and tears. The bursae are also examined for fluid.

Appendix 12.7.7 contains an example of the hip ultrasound report.

6.8.6 Knee Ultrasound

6.8.6.1 Anterior knee

Patient is in a supine position with the knee flexed and the transducer is placed in the longitudinal position superior to the patella on the quadriceps tendon (QT). The QT is composed of the rectus femoris, vastus lateralis, vastus medialis and vastus intermedius and evaluated in longitudinal and transverse plane. Suprapatellar bursa is seen deep to the QT and evaluated for joint effusions. Inferior to the patella; the patellar tendon is evaluated in transverse and longitudinal plane from the inferior border of the patella to the insertion on the tibial tuberosity. Posterior to the distal patellar tendon insertion is Hoffa's fat pad which are associated with inflammation. The QT and patellar tendon are evaluated for tendinopathy and rupture. Tendinopathy will affect the patellar tendon more, especially the proximal patellar tendon insertion, where it refers to jumper's knee.

The medial and lateral joint recesses can be evaluated for effusion or synovitis in the transverse plane lateral and medial to the patella. The femoral trochlear cartilage is seen in the transverse plane with the knee in 90 degrees flexed. In osteoarthritis focal thickening or crystals deposits can be seen. The prepatellar bursae can also be identified when distended with fluid which leads to bursitis.

6.8.6.2 Medial knee

The medial knee is examined with the hip externally rotated, but the knee is still in a flexed position. The medial collateral ligament (MCL) is evaluated from the proximal origin until the distal insertion. Deep to the MCL the hyperechoic triangular medial meniscus can be seen. The meniscus is evaluated for parameniscal cyst. The pes anserine can be seen at the distal insertion of the MCL.

6.8.6.3 Lateral knee

The lateral knee is examined with the hip internally rotated, but the knee is still in a flexed position. The iliotibial band is visualised in the longitudinal plane starting at the lateral edge of

the patella until the distal insertion at Gerdy's tubercle. Posteriorly the lateral collateral ligament (LCL) is visualised and evaluated from the proximal origin until the distal insertion at the fibula. Deep to the LCL the hyperechoic triangular lateral meniscus can be seen. The biceps femoris tendon can be visualised by rotating the proximal end of the transducer posteriorly.

6.8.6.4 Posterior knee

The patient is in a prone position with the knee extended. The posterior knee is evaluated for a Baker's cyst by identifying the medial head of the gastrocnemius in the transverse plane and sweeping the transducer superiorly until the semimembranosus tendon is seen at the medial aspect of the medial head of gastrocnemius and the semimembranosus gastrocnemius bursa in-between.

Appendix 12.7.8 contains an example of the knee ultrasound report.

6.8.7 Ankle and Foot Ultrasound

6.8.7.1 Anterior ankle and dorsal midfoot

Knee is flexed and the foot is flat on the bed. Transducer is placed in the longitudinal plane over the anterior ankle recess evaluate the entire joint for a joint effusion by sweeping the transducer from side to side. The transducer is then moved in the transverse plane distal to the medial malleolus to identify the retinaculum and the extensor tendons deep to it. From medial to lateral we have the tibialis anterior (TA), Extensor hallucis longus (EHL) and Extensor digitorum longus (EDL), these tendons are evaluated in the transverse and longitudinal plane from the ankle to the toes. At the dorsal midfoot the tarsal and metatarsal joint surfaces are evaluated for synovial hypertrophy, synovitis, osteophyte formation and bone erosion.

6.8.7.2 Medial ankle

The knee is slightly flexed with the foot rotated externally and the lateral malleolus resting on the bed. The transducer is placed in the transverse plane with the edge on the medial malleolus and the flexor tendons are examined starting with the tibialis posterior tendon

adjacent to the medial malleolus, flexor digitorum longus and flexor hallucis longus tendons. These tendons are evaluated in two planes from the musculotendinous junction to the distal insertion. Tendinopathy of the tibialis posterior tendon is common and tenosynovitis may also be evident with a thickened synovial sheath. Insertion tendinopathy of the tibialis posterior tendon also occurs due to an accessory navicular bone. In the tarsal tunnel the tibial nerve is evaluated for entrapment neuropathy that causes tarsal tunnel syndrome. The deltoid ligaments are also evaluated for sprain or tear injuries, but due to the fanning out of the ligament MRI is better to assess the ligaments.

6.8.7.3 Lateral ankle

The patient is supine with the leg internally rotated. The transducer is placed in the transverse plane with the edge over the lateral malleolus to identify the peroneal tendons. The peroneal brevis is on the medial aspect of the malleolus and the peroneal longus slightly lateral and both tendons are evaluated in two planes for tendinopathy or tears.

The anterior talofibular ligament (ATFL) ligament is assessed with the transducer parallel with the sole of the foot and on the anterior aspect of the lateral malleolus. To evaluate for tears inversion of the ankle is performed. The anterior inferior tibiofibular ligament (AiTFL) can be evaluated by rotating the anterior edge of the transducer towards the tibia until the thin ligament is seen between the bones. The calcaneofibular ligament (CFL) is seen deep to the transverse plane of the peroneal tendons. Anisotropy can be avoided by dorsiflexing the ankle

6.8.7.4 Posterior ankle

The patient is in the prone position with the foot hanging over the edge of the couch. The transducer is placed in the transverse plane and the Achilles tendon is evaluated from the myotendinous junction until the distal insertion; this is repeat in the longitudinal plane. The Achilles tendon is evaluated for tendinopathy, tears and enthesopathy at the site of insertion onto the calcaneum. The retrocalcaneal and superficial Achilles bursas are evaluated for bursitis

6.8.7.5 Plantar heel

The patient is in the prone position with the foot hanging over the edge of the couch. The transducer is placed in the longitudinal plane of the plantar fascia at the calcaneus and evaluated to the toes. The thickest part of the plantar fascia is at proximal aspect and normal measurement is less than 4 mm. The plantar fascia is evaluated to rule-out plantar fasciitis and plantar fibroma.

6.8.7.6 Forefoot

For the dorsal examination the patient is supine and the foot is flat on the couch. The forefoot is assessed in the longitudinal and transverse planes evaluating the metatarsophalangeal (MTP) joints and extensor tendons. The MTP joints are evaluated for effusion, synovitis or osteophyte formation. For the plantar examination the patient is supine and the foot is extended with the heel resting on the couch. The plantar aspect of the forefoot is assessed in the longitudinal and transverse planes evaluating the flexor tendons, plantar plate and joint surface. The intermetatarsal spaces can be evaluated from the dorsal and plantar surface to visualise that interdigital neurovascular bundle and interdigital bursa for suspected Morton's neuroma or intermetatarsal bursitis.

Appendix 12.7.9 and 12.7.10 contains an example of the ankle and foot ultrasound reports, respectively.

6.8.8 Thyroid ultrasound

Patient is in a supine position with the neck slightly overextended by the pillow under the shoulders. Both lobes of the thyroid gland are evaluated in the longitudinal and transverse plane. Normal thyroid echotexture is hyperechoic compared to the anterior strap muscles. The thyroid volume is obtained by measuring the thyroid lobe in three planes and a normal volume range from 10 - 15 ml. The isthmus is also measured in AP diameter and a measurement less than 5 mm is normal. Any nodules demonstrated in the thyroid lobe will be classified according to the U-classification.

The rest of the neck is systematically swept through in two planes for examination of the lymph nodes and the parotid and submandibular glands. From the thyroid the transducer is moved first inferiorly to level VII, the upper mediastinal nodes and then superior through level VI the

anterior cervical chain nodes to the submental and submandibular regions, level I. From here the transducer is moved posterior to the upper internal jugular chain nodes, level II, and then swept inferiorly covering the middle and lower internal jugular chain nodes, levels III and IV. Moving the transducer more posteriorly the posterior triangle is evaluated for lymph nodes, level V. Normal lymph nodes have an AP diameter of less than 10 mm, is hypoechoic with a central hyperechoic fatty hilum and hilum vascularity.

Appendix 12.7.11 contains the U-classification system and an example of the thyroid ultrasound report.

6.8.9 Breast ultrasound

During a breast ultrasound the most important consideration is that the breast tissue should be thinned maximally for adequate penetration. Depending on the size of the breast, multiple scanning positions may be required for the area of interest to be as thin as possible. The most common starting position is supine or contralateral posterior oblique positioning. During the ultrasound scan the patient is in a supine position and asked to elevate the ipsilateral arm and place the hand behind the head. This technique helped the breast tissue to lie as flat as possible against the chest wall, thus spreading the breast tissue. The elevation of the ipsilateral arm in the supine position adequately stretched the wrinkles out of the skin therefore; minimize the trapping of air bubbles during the sonographic survey. It also stretched the Cooper's ligaments, thus facilitating compression of the area of interest between the transducer and chest wall.

To further thin out the breast tissue, the transducer was used to compress the area of interest. This technique forced the breast tissue into a plane parallel to the transducer surface and perpendicular to the ultrasound beam. Thus, increased resolution, improve penetration and image quality. The compression with the transducer is also controlled to not cause the patient discomfort, pushing lesions out of the scanning plan or altering the focal zones so that superficial lesions might be missed.

The scan was performed according to the International Breast Ultrasound School (IBUS) guidelines for the ultrasonic examination of the breast. Therefore, a systemic approach is used to ensure that no pathology is over looked. The scan is also comprehensive by including all of the breast anatomy on the image and paying attention to the area of interest. To ensure that the scan can be reproduce the area of interest is appropriately marked on the image.

For identification of lesions in the breasts the Quadrant and "Clock" method of localisation is used. In the Quadrant method the breast is divided into four quadrants, the upper inner and outer and the lower inner and outer quadrant. With the "Clock" method the breast is further divided into segments of a clock. With 12:00 being from the nipple toward the clavicle in the centre of the breast and 6:00 from the nipple downwards.

6.8.4.1 Axilla

The ultrasound examination begins with the patient in the slight right lateral decubitus position and the left arm elevated above the head. The transducer is placed in the left axillary region in the transverse plane and moved from superior to inferior. The region is covered from medial to lateral, overlapping the previous scan path slightly with each new strip being scanned. The transducer is placed in the starting position and turned 90° in order to obtain a longitudinal scan plane. This is followed by sweeping the transducer from medial to lateral, overlapping the previous scan path slightly with each new strip being scanned. This technique is repeated at the end for the right axillary region with the patient in the supine position and the right arm placed behind the head. The axillary regions are visualised to exclude abnormal lymph nodes, but accessory breast tissue can also be identified on the axillary regions.

6.8.4.2 Breasts

The scanning of the left breast began in the 12 o'clock position, with the upper, outer quadrant. The transducer was placed in a transverse scanning plane and moved from superior to inferior through the quadrant. The region was covered from medial to lateral, overlapping the previous scan path slightly with each new strip of breast being scanned. The transducer was placed again at the 12 o'clock position and then turned 90° to obtain a longitudinal scanning plane and moved from medial to lateral through the quadrant. The region is covered from superior to inferior, overlapping the previous scan path slightly with each new strip of breast being scanned. This technique was repeated for each of the quadrants of the left breast. This technique is repeated for the right breast with the patient in the supine position and the right arm placed behind the head.

The breast can be roughly divided into three zones. Firstly, the subcutaneous or premammary which is mostly fat. Then the mammary region which contains the ducts, mixture of fatty and fibro glandular tissue and Cooper's ligaments. Lastly the retromammary zones which is mostly

fat and is located above the pectoral muscle. Depending on the patient's age and hormonal fluctuation occurring the glandular tissue present will be affected. In older women the breast is mostly hypoechoic fat, whereas in younger or lactating women, the breast will demonstrate mostly heterogeneous glandular tissue. The most common composition is a mixture of fatty and glandular tissue. The lesions in the breasts can range from benign, indeterminate to malignant.

Appendix 12.7.12 contains an example of a breast ultrasound report.

6.9 Interventional procedures

In our department we have advanced practitioner sonographers that is trained in MSK shoulder injections, but most of the musculoskeletal injections are performed by Consultant Radiologist and Registrars. I am not directly involved in the ultrasound guided injections, but our protocol for the administering of the steroids is as follows.

6.9.1 Competency for ultrasound guided injections

The advanced practitioner sonographer must be a registered professional and will hold a minimum of a postgraduate diploma in ultrasound with significant clinical experience. An injecting sonographer should have a comprehensive understanding of MSK medicine so they are able to discuss injection therapy as a treatment option and can provide detailed answers to questions regarding post-injection management including rehabilitation. Professionals must have the capacity to decline administering an injection to a patient if they discover a contraindication or significant risk factor. The degree of decision-making assigned to injecting clinicians in treatment pathways varies significantly, but some knowledge of musculoskeletal medicine and management is essential for safe practice. The injecting clinician's overall understanding of the patient and their ability to respond to questions regarding rehabilitation or risk factors for recurrence would be strengthened by advanced knowledge of musculoskeletal medicine including presentations, signs and symptoms, pathological features, treatment pathways and systems to evaluate change.

The advanced practitioner sonographer must have completed and documented a minimum number of cases and successfully completed the competency assessment, performed by the lead MSK Consultant Radiologist. A *COMPETENT* result for the assessment is needed to start

injecting without supervision. On successfully completing individual assessments, the sonographer may perform ultrasound guided injections within the scope of practice.

6.9.2 Patient preparation and documentation for ultrasound guided injections

Patient ID will be checked and confirmation of site for procedure will be obtained. Informed consent will be obtained and documented onto the patient's final report. Pre-procedural patient WHO checklist and injection consent form must be filled out by sonographer / registrar / health care assistant (HCA) and scanned into Soliton after procedure (Appendix 12.7.13.1 and 12.7.13.2). Patient will be scanned prior to injection to assess for any possible change in pathology since previous scan. The expiry date for the drugs to be used will be checked by the sonographer/registrar and added on the patients record (Appendix 12.7.13.3). Examination will be performed using an aseptic technique. Lidocaine 1% will be administered into the soft tissues around the area of the interest prior to the steroid injection. A combination of Triamcinolone (Kenalog) and Bupivacaine (0.25%) will be administered.

The following is documented in the patient's report (Appendix 12.7.13.4): Aseptic technique and informed consent obtained. Site of injection. The name of the drug/s administered. The concentration and quantity of the drugs injected. Any adverse reactions and after care given. Post-procedural patient information leaflet is provided for the patient (Appendix 12.7.13.5).

6.9.3 Aseptic ultrasound guided injection technique

Before performing an ultrasound-guided MSK injection, strict aseptic technique must be maintained to minimize the risk of infection. The procedure begins with thorough hand hygiene, performed using an alcohol-based hand rub or soap and water according to local infection control guidelines. Once hands are cleaned and dried, sterile gloves are applied to prevent contamination of sterile equipment and the injection site.

All equipment required for the procedure is prepared in advance on a sterile tray to maintain efficiency and reduce the risk of breaks in sterility. This includes sterile drapes, syringes, needles, antiseptic solution, sterile gel, and the required medications. Each item is checked to ensure its integrity, expiry date, and sterility. A sterile field is then created around the area where the injection will be performed.

The patient is positioned comfortably to allow optimal access to the target area while maintaining their safety and dignity. Proper positioning also helps to ensure accurate needle guidance during the procedure. The skin over the injection site is then cleaned using an appropriate antiseptic solution such as chlorhexidine in alcohol, applied in a circular motion from the centre outward. The area is allowed to air-dry completely to achieve maximum antiseptic effect.

The ultrasound probe is prepared by first cleaning it according to manufacturer and infection control guidelines. A sterile probe cover is then applied, and sterile ultrasound gel is placed inside the cover to maintain acoustic contact. Additional sterile gel is applied to the patient's prepared skin to provide a clear ultrasound image while preserving the sterile field.

During the injection, the target area—such as a joint, bursa, or tendon sheath—is identified under ultrasound guidance. The sterile needle is inserted using either an in-plane or out-of-plane approach, ensuring continuous visualization of the needle tip throughout the procedure. Once correctly positioned, aspiration may be performed to confirm that the needle is not within a blood vessel, after which the medication is injected slowly while observing the distribution of the injectate in real time on the ultrasound screen. The needle is then withdrawn carefully, and a sterile dressing is applied to the injection site.

Following the procedure, all sharps and contaminated materials are disposed of safely in appropriate containers. The practitioner removes gloves and performs hand hygiene once again.

6.9.4 Complications during the procedure

In the event of the patient becoming unwell, the procedure will be stopped and immediate care will be given (Appendix 12.7.13.6). If any other medical complications occur a radiologist/doctor will be called to assess the patient. All reactions must be recorded on RIS and in the report. An adverse incident form must be completed in accordance with the Trust policy. If technical difficulties occur during the procedure and the clinical specialist Sonographer feels that the procedure may not be completed safely and effectively then the MSK consultant radiologist will be called. If the radiologist is absent then the procedure will be abandoned and the patient rebooked.

7. Clinical audit

As part of my role within the ultrasound department, I actively participate in the clinical audit process, peer review, and quality assurance measures to ensure that both my personal standard of practice and the overall service are consistently monitored and improved. A monthly 5% audit of each sonographer's work is undertaken by a team of internal auditors, which includes consultant sonographers, senior sonographers, and junior sonographers. This is a structured process that reviews images, reports, and recommendations against clearly defined criteria. My involvement includes:

- Acting as an auditor for colleagues, providing constructive, evidence-based feedback on their work.
- Reviewing audit feedback on my own cases, reflecting on the results, and documenting learning in my CPD portfolio.
- Supporting the implementation of remedial actions where required, particularly if audit findings highlight gaps in practice or where escalation policies need reinforcing.

The audit criteria assess specific standard quality, overall image quality, report quality, and appropriateness of advice and recommendations. These measures ensure that technical performance, reporting accuracy, and compliance with protocols are all maintained to the highest standard.

While the audit process is essential, there are challenges that must be managed effectively:

- Time pressures: Balancing auditing duties with clinical workload can be demanding, especially when service delivery is already under pressure.
- Consistency of scoring: Even with clear criteria, there can be variation between auditors in scoring borderline cases. Peer calibration is therefore important to ensure fairness.
- Managing feedback: Some sonographers may feel defensive when receiving feedback, especially if errors are highlighted. The challenge lies in framing feedback constructively, focusing on learning and service improvement rather than criticism.
- Service impact of remedial action: When supervised practice or retraining is required (Category 2 or below), this can put pressure on departmental resources, as senior sonographers must be released to provide support.

Audit is not just about identifying errors; it is a continuous quality improvement tool. The structured actions that follow each audit category (1–5) ensure learning is embedded at both an individual and departmental level: (Appendix 12.8)

- Category 5–4 cases: No action required, but they reinforce good practice and highlight standards being met.
- Category 3 cases: Provide learning opportunities. Feedback is used in appraisals or CPD, and report addendums are completed if necessary to correct findings and ensure GP surgeries are updated. This reinforces accuracy in reporting and patient safety.
- Category 2 cases: Escalated to the Superintendent, documented on Datix, and result in direct communication with the GP and remedial actions for the sonographer. Reflection forms are required within one week, and additional audit or supervised practice is arranged if appropriate.
- Category 1 cases: Managed as formal incidents with Datix reporting, extended auditing of 6 months' work, and mandatory supervised practice. Persistent issues may lead to retraining or, in rare cases, formal escalation for competence concerns.

For me personally, audit feedback has helped refine how I structure reports, ensure measurements accurately reflect images, and strictly adhere to escalation pathways when abnormalities are detected. At a departmental level, recurring themes from audits are presented at the REALM discrepancy meeting, where they are openly discussed, and solutions agreed. This supports collective learning and standardisation of practice across the team.

Through active participation in audit and peer review, I have demonstrated a commitment to high-quality, safe, and patient-centred care. While audits can sometimes feel challenging, they ensure accountability, highlight strengths, and provide structured remedial pathways where needed. Ultimately, the audit process ensures that practice is continually improved, risks are minimised, and patients receive the best possible standard of ultrasound care.

8. Reflective practice as part of leaning process

Reflective practice is an essential aspect of professional development in healthcare, enabling me to evaluate my actions, identify areas for improvement, and enhance patient care. As a sonographer, I regularly engage in reflective practice, both informally through day-to-day experiences and formally through structured learning, CPD activities (Appendix 12.9), and

peer discussions. Below are specific examples where reflective practice directly influenced and improved my clinical performance.

Situation: During a routine first trimester scan when I was still a student sonographer, I identified a missed miscarriage. The patient was alone and became very distressed upon being told. I struggled to manage the situation emotionally and felt unprepared for how to support her.

Reflection: After the scan, I reflected on my communication style and emotional readiness to handle such sensitive situations. I also recognised that while I followed clinical procedure, I could have provided more emotional support and clearer signposting to next steps.

Action Taken:

- I spoke to the senior sonographer regarding the situation and she arranged for me to attend a session on delivering bad news and supporting patients during early pregnancy loss.
- I also updated myself on the hospital's early pregnancy loss care pathway and created a checklist of support options to give patients.
- I began building in more time for sensitive scans and using softer language to convey findings.

Outcome: After attending the delivering bad news session, I feel more emotionally equipped to handle sensitive conversations and have received positive feedback from patients and staff for my calm and compassionate communication style.

9. Critical Review of Evidence and National Standards in Sonographic Practice

Ultrasound imaging remains a cornerstone of diagnostic medicine, with the sonographer's role expanding in both complexity and autonomy. Maintaining high clinical standards requires ongoing engagement with the latest evidence and adherence to established national professional guidelines. In the UK, sonographic practice is primarily guided by professional bodies such as the SoR, the BMUS, and regulated by the HCPC. These organisations are supported by national frameworks including National Institute for Health and Care Excellence (NICE) guidelines and NHS England workforce development policies. Additionally, clinical audits provide valuable feedback on compliance with local protocols and help identify

opportunities for quality improvement. Access to peer-reviewed databases such as PubMed, Cochrane Library, and Embase further supports evidence-informed decision-making in sonographic practice.

Critical engagement with the evolving evidence base is essential for safe and effective ultrasound practice. The BMUS “Guidelines for Professional Ultrasound Practice” provide comprehensive recommendations on clinical protocols, documentation, infection control, chaperone use, ergonomics, and consent. These guidelines draw from peer-reviewed research, consensus statements, and clinical audits, offering a trusted benchmark for best practice (BMUS, 2022).

A practical application of these guidelines was demonstrated during the update of our pelvic ultrasound protocols at the end of 2024. The department’s previous escalation policy for postmenopausal bleeding (PMB) was found to be inconsistent with the most recent BMUS recommendations. The outdated protocol stated that:

- Endometrial thickness ≤ 4 mm in postmenopausal women, regardless of HRT use, is considered normal; thickness > 4 mm should prompt an urgent 2WW gynaecology referral.

Following multidisciplinary discussions and stakeholder meetings, the agreement was to update the PMB escalation protocol used within my department according to the latest BMUS recommendations:

- For asymptomatic postmenopausal patients not on Hormone Replacement Therapy (HRT), an endometrial thickness ≤ 10 mm requires no further follow-up, while > 10 mm necessitates urgent referral under the 2WW suspected cancer pathway.
- For symptomatic patients presenting with postmenopausal bleeding (PVB), an endometrial thickness ≤ 4 mm warrants no further follow-up, but > 4 mm demands urgent 2WW referral with notification to the referrer.
- In patients on HRT (sequential or continuous regimens), the thresholds differ: for asymptomatic patients, ≤ 7 mm (sequential HRT) or ≤ 4 mm (continuous HRT) require no further action, while symptomatic patients with thickness above these cut-offs require urgent referral.
- In cases with incomplete clinical information, optimisation of HRT as per BMUS pathway is advised, alongside a request for further clinical details before proceeding (BMUS, 2023).

Engagement in multidisciplinary team meetings, clinical case reviews, and peer observation sessions facilitates collaborative evaluation of how evidence is applied in practice. The HCPC's Standards of Proficiency for Radiographers (2014) and SoR's CPD framework further emphasise reflective learning and the application of research to improve patient care.

9.1 Using Evidence to Review Practice

I apply evidence in several ways to ensure my practice remains current, safe, and aligned with national standards. Firstly, I critically appraise new research and professional guidelines to benchmark my own practice against best evidence. This ensures that my clinical decisions reflect the most up-to-date recommendations and are underpinned by recognised frameworks. For example, the recent revision of the PMB escalation protocol directly influenced my reporting criteria and referral practices, improving both patient safety and pathway efficiency.

Secondly, I actively engage in peer discussions and departmental audits to share evidence-based changes and promote reflective learning among colleagues. This collaborative approach fosters a culture of continuous improvement and helps ensure that service delivery remains consistent with national standards. For instance, during a departmental audit, it was identified that a junior sonographer had not recommended a referral to the gynaecology department after detecting a persistent haemorrhagic cyst. Upon review, it became apparent that while our local protocol advised a repeat scan within 6–8 weeks following the identification of a haemorrhagic ovarian cyst, there was no clear guidance for cases where the cyst persisted at follow-up. As a result, we amended the protocol to provide clearer escalation guidance for junior sonographers, supporting consistent and safe decision-making.

Thirdly, I document all evidence-based practice changes and learning outcomes within my professional portfolio and CPD records. Our department holds monthly CPD meetings where missed findings or opportunities for improved patient care are discussed. For example, a recent case involved an abnormal CSP that was missed at the 20-week scan and only identified during a later growth scan. This highlighted that while the existing protocol emphasised identifying an absent CSP, it did not address the range of abnormal CSP configurations that also warrant escalation. Following this discussion, I refined my own practice to ensure not only that the CSP is present, but also that its morphology is normal.

Another case that influenced departmental learning involved a change in portal vein (PV) flow observed during a routine liver surveillance scan. Although the reversal of flow was noted, it

was not escalated as significant at the time. A subsequent CT scan, performed for an unrelated reason, revealed a hepatocellular carcinoma. This case prompted an in-depth CPD discussion on the importance of appropriately escalating abnormal findings during surveillance imaging. As a result, our departmental practice changed to ensure that any significant finding detected during liver surveillance is promptly escalated to a consultant radiologist for review and appropriate management recommendations.

Critical engagement with the evolving evidence base and alignment with national professional standards are essential for maintaining safe, effective, and accountable sonographic practice. Sonographers must proactively source and appraise evidence from recognised clinical and academic sources, integrating this knowledge into audit, reflective practice, and service development. This commitment to evidence-based practice not only enhances patient outcomes but also supports professional growth and compliance with regulatory frameworks such as those established by the HCPC, SoR, and BMUS.

10. Consortium for the Accreditation of Sonographic Education

I obtained a degree in the Bachelor of Science in Diagnostic Ultrasound at the Cape Peninsula University of Technology. Through UK ENIC I obtained a conversion level for my qualification. Included in this application is my Bachelor degree, transcripts and UK ENIC conversion certificate.

To demonstrate the qualification I obtained are meeting the standards of proficiency for a sonographer according to the Consortium for the Accreditation of Sonographer Education (CASE), I included the following: The learning outcomes for each of the modules complete for the BSc degree in Diagnostic Ultrasound for the four year course. Following the module outcomes, Table 1 is included which maps the module outcomes to the CASE standard.

Year one modules with outcomes

The Health Care Professional 1 (HPF106) Outcomes:

1. Understand his/her role as an integrated health care professional within the team of sonographers, radiographers, radiation therapists and nuclear medicine technologists; and within the broader health care professional team, in order to demonstrate insight into the health needs of the individual (patient) and the community.

2. Understand the organization of the health service including levels of health care, health professions, alternative/complementary medicine (refer to Patient Care and Management)
3. Understand and apply the principles of human rights, ethics and law:
 - a. Patients' rights charter (confidentiality, informed consent, telling the truth, etc.)
 - b. Medical ethics & law to case scenarios in health care practice (autonomy, beneficence, non-maleficence, justice)
4. Develop a professional identity (professionalism) within the context of the sonographer/radiographer/radiation therapist/nuclear medicine technologist, and within the context of the health needs of the individual (patient) and the community i.e. an integrated health care professional. Understand the professional regulations (scope of practice & code of conduct)
5. Understand the patient as a holistic being in society including his/her biophysical and psycho-social status.
6. Understand the nature and importance of communication in health care; take cognizance of factors influencing effective communication in health care; demonstrate conversational communication skills in English, Afrikaans and isiXhosa to be able to effectively communicate with patients

Human Sciences 1 (HSC106S) Outcomes:

1. Explain and apply basic anatomical terminology.
2. Describe the chemical, cellular and tissue levels of organization.
3. Describe the macroscopic and microscopic anatomy of the structures making up the various anatomical systems.
4. Identify and draw the macroscopic anatomy of the human body.
5. Identify and draw the microscopic (cell components) anatomy of the human body.
6. Explain the physiological processes related to each of the anatomical systems.
7. Apply knowledge of anatomy and physiology to all imaging and oncologic processes applicable to 1st year.

Patient Care & Management 1 (PCM106S) Outcomes:

Provide patient care responsibly and effectively in the imaging department by using nursing skills and knowledge to meet patient needs while maintaining patient dignity.

1. Describe, explain and apply nursing principles and procedures within the radiation therapy context.

2. Describe, explain and apply optimum patient care before, during and after all specified radiation therapy planning procedures and treatments.
3. Describe, explain and manage the communication process and psychological considerations of the patient before, during and after the radiation therapy planning procedures and treatments.
4. Describe, explain and apply emergency procedures and perform first aid procedures.
5. Describe, explain and perform appropriate actions to prevent cross-infection.
6. Describe and identify signs and symptoms of common illnesses occurring at primary care level.
7. Explain the prevention of common illnesses occurring at primary care level.
8. Identify and understand drugs in the scope of practice of the radiation therapist. Describe, explain and apply principles regarding the administration of injections and monitoring of the drip set.

Physical Science 1 (PSC106S) Outcomes:

1. Define and explain principles of Physics and Electronics.
2. Interpret principles and concepts of Radiation Physics.
3. Discuss the radiation safety principles and radiation protection measures in medical imaging.
4. Distinguish between and compare the principles of medical image formation in Diagnostic Radiography, Diagnostic Ultrasound, Radiotherapy and Nuclear Medicine.

Health Science literacy 1 (HSL101S) Outcomes:

1. Understand and apply the appropriate mathematics needed for health science studies, i.e. radiography;
2. Understand the principles of statistics used within health sciences studies i.e radiography;
3. Understand, develop and apply academic literacy skills such as, advanced reading, writing and presentation.
4. Understand and apply computer terminology, concepts and practical skills, such as, MS Word, Excel, PowerPoint, internet usage and email.
5. Understand, search and use a variety of information literacy sources, such as library software and data bases, internet and hard copy.

Medical Imaging and Oncological Modalities 1 (MIO106S) Outcomes:

1. Apply basic ultrasound physics to image formation.
2. Identify commonly used instrument settings and functions of a basic ultrasound unit.

3. Apply routine ultrasound scanning principles and protocols in a simulated environment i.e.
 - 3.1 Abdomen
 - 3.2 Obstetrics

Year two modules with outcomes

The Health Care Professional 2 (HFP201S) Outcomes:

1. Discuss theoretical models of health approaches to the Psychology of illness to better understand the behaviour of the patient.
2. Discuss the different theoretical models of health and their criticisms and implications when applied in health care
3. Discuss the social context of health & illness (social class, ethnicity, the family, etc) and how these factors determine patterns of disease.
4. Apply the principles of human rights and medical ethics and law in the clinical workplace
5. Discuss theoretical approaches to ethical practice in diagnostic ultrasound / diagnostic radiography / nuclear medicine / radiation oncology.

Human Sciences 2 (HSC201S) Outcomes:

1. Display an in- depth knowledge of the microscopic anatomy and physiology related to specific anatomical systems as related to imaging at this level.
2. Explain the physiological processes related to each of the anatomical systems.
3. Apply knowledge of anatomy and physiology to the radiographic imaging processes applicable to 2nd year.
4. Explain pathological terms.
5. Describe disease classifications.
6. Discuss altered cellular biology.
7. Explain the various categories of pathology related to each system.
8. Identify common pathologies on images associated with each system.

Patient Care & Management 2 (PCM201S) Outcomes:

1. Be able to assess the relevance of the x-ray request form.
2. Exercise independent judgement and discretion in the performance of relevant medical imaging procedures.
3. Critically assess the patient's medical condition.
4. Apply optimum patient care before, during and after the imaging examination.

5. Apply effective communication skills.
6. Practice professional ethics.
7. Apply appropriate first aid.
8. Perform appropriate actions to prevent the spread of infection.
9. Perform contrast media examinations according to protocol and with regard to possible patient reactions.

Physical Science 2 (DU) (PSC201S) Outcomes:

1. Articulate a clear conceptual understanding of the physical principles dealt with.
2. Apply this to a variety of medical imaging and clinical practical situations.
3. Apply explicitly taught problem solving techniques to a variety of imaging problems.

Health Science Literacy 2 (HSL201S) Outcomes:

1. Understand, develop and apply the advanced academic writing and reading skills needed to complete a literature review/s of specified disciplinary topics.
2. Understand, develop and apply the advanced academic writing and reading skills needed to complete a scientific report (for example, case-study reports, report of an experiment) of specified disciplinary topics.
3. Understand and apply advanced computer skills using appropriate software applications, for example, advanced MS Word, Excel, PowerPoint, Mendeley, Google Scholar & basic statistics software.
4. Understand, search and use a variety of information literacy sources, such as library software and data bases & internet.

Diagnostic Ultrasound Practice 2 (DUP201S) Outcomes:

1. Choose appropriate ultrasound equipment and apply appropriate settings for the sonographic examination of the abdomen and individual body habitus.
2. Discuss the importance of appropriate patient preparation before scanning the abdomen.
3. Show understanding of clinical problems that are typical reasons for abdominal sonography (correct interpretation of request for abdominal sonography).
4. Describe the routine sonographic protocol to demonstrate the appropriate anatomy in all planes applicable to individual abdominal organs and structures.
5. Describe alternate / modified sonographic imaging techniques where routine ones have failed.

6. Describe the normal sonographic appearance of all abdominal organs and structures including normal variants and measurements (where applicable)
7. Describe the clinical symptoms and pathologic basis for common disease processes of abdominal organs and structures.
8. Describe clinical laboratory tests for evaluating function of the individual abdominal organs.
9. Describe the sonographic appearance of abdominal pathology and possible associated complications.
10. Correlate clinical history, clinical laboratory tests and other diagnostic tests with sonographic patterns of abdominal organs and structures.
11. Describe the technical pitfalls associated with sonography of individual abdominal organs and structures
12. Discuss the criteria and the procedure/s best suited for each request.
13. Choose appropriate equipment to provide optimal visualization of organs under investigation.
14. Interpret scan findings.
15. List normal measurements - recognize abnormal measurements.
16. State alternative parameters to verify findings.
17. Interpret normal anatomy and recognize pathology

Year three modules with outcomes

Advanced Health Care Practice 3 (DU) (AHC301S) Outcomes:

1. Understand the context of the Radiographer and their role in phlebotomy (HPCSA rules & scope of the radiographer, ethical practice)
2. Demonstrate proper bedside manner and how to prepare for peripheral venous cannulation (including conditions for valid patient consent)
3. Identify locations on the human body appropriate for venipuncture.
4. Demonstrate venipuncture and needle placement.
5. Demonstrate the proper procedure for collecting skin puncture specimens.
6. Explain anatomy and physiology of the cardiovascular system as it pertains to venipuncture.
7. Use proper precautions with relation to handling blood and body fluids
8. Demonstrate venipuncture procedures according to accepted guidelines
9. Identify and classify all types of contrast media used in the imaging departments.
10. Discuss the indications and contraindications for administration of contrast agents (including paediatrics)

11. Recognize and apply appropriate patient care for all categories of adverse contrast agent reactions
12. Apply effective communication skills in complex situations.
13. Debate and apply ethical issues in clinical practice in the context of radiation medicine.
14. Possess an awareness of the impact of illness on the patient, family and friends.
15. Learn the mechanisms needed to cope with stress.
16. Understand the skills and attitudes needed for holistic patient care.
17. Know how to perform basic counselling skills and know referral channels.
18. Participate as a member of the multi-disciplinary health care team

Human Sciences 3 (DU) (HSC305S) Outcomes:

1. **Display** an in- depth knowledge of the microscopic anatomy and physiology related to specific anatomical systems as related to advanced imaging modalities at this level.
2. **Explain** the physiological processes related to each of the anatomical systems.
3. **Explain** the various categories of pathology related to each system.
4. **Identify** common pathologies on images associated with each system.
5. **Look at anatomy as a three-dimensional object.**
6. **Recognise** the structures you are already familiar with when they are displayed in different cross-sectional planes.
7. **Demonstrate** an understanding of transverse, coronal and sagittal images in the clinical setting.
8. **Identify** locations of functioning organs, vessels and pathology sites within the body structures

Ultrasound Management 3 (DU) (UMT301S) Outcome:

Provide theoretical knowledge of management principles to perform effectively within the health care team of a clinical department.

1. Demonstrate knowledge of the concepts of Management principles /functions.
2. Describe and apply the needed principles in the clinical work place (in order to manage a department effectively).
3. Explain optimal use of human resources for quality patient management and to promote personal development within the health care team.
4. Explain and discuss all forms of communication
5. Demonstrate the skill to communicate effectively with all levels of staff in the workplace

6. Explain and analyse control measures to maintain standards for the provision of optimal quality radiographic services, patient safety and efficient patient management.
7. Describe budget control to provide a cost effective radiographic service
8. Manage and utilise information technology.
9. Demonstrate skills and professional conduct such as punctuality, participation and attendance when working in interdisciplinary groups (planning project).
10. Critically reflect on their community-based experience (planning project).
11. Demonstrate the ability of working in a team (planning project).
12. Collect, analyse and evaluate information (research for planning project)

Ultrasound Imaging Equipment 3 (UIE302S) Outcomes:

1. Analyse the principles of ultrasound physics which allow application in the use of an ultrasound unit.
2. Demonstrate the knowledge of the operational principles of ultrasound equipment, so that the student may apply this to the choice of suitable equipment, accessories and instrument settings for various imaging techniques.
3. Demonstrate the knowledge of protocols for image and equipment quality control, artefact detection and fault correction.
4. Relate known biological effects of diagnostic ultrasound in human tissue to potential biological hazards

Health Science Research 3 (HSR304S) Outcomes:

1. Differentiate between research paradigms, research designs, research study types, and research methodology and research methods.
2. Discuss the significance of Ethics in Research
3. Summarise the steps in the research process concerning Qualitative and Quantitative research
4. Understand the role of a systematic literature review as a research methodology
5. Explain descriptive statistics, statistical concepts and inferential statistics
6. Evaluate Qualitative and Quantitative peer-reviewed research studies

Diagnostic Ultrasound Practice 3 (DUP302S) Outcomes:

1. Apply theoretical knowledge of embryology, anatomy, physiology and patho-physiology to the ultrasound examination / procedure

2. Apply theoretical knowledge of ultrasound physics and equipment to the ultrasound examination / procedure
3. Prepare the patient appropriately
4. Discuss the criteria and the procedure/s best suited for each request with due consideration for the clinical scenario (signs and symptoms, laboratory test results, other imaging reports, etc.)
5. Select appropriate equipment to provide optimal visualization of organs/structures under investigation
6. Scan using appropriate techniques
7. Interpret scan findings
8. List normal measurements - recognize abnormal measurements
9. State alternative parameters to verify findings
10. Interpret normal anatomy and recognize pathology
11. Complete a technical report of the ultrasound findings

Year four modules with outcomes

Health Care Management 4 (DU) HSM401S Outcome:

Provide theoretical knowledge and application skills to implement management processes and programs in order to ensure a high quality service to the customers while improving financial performance of the Radiography/Clinical Department

Specified outcomes:

1. Plan, develop and apply total quality management with consideration for equipment, human resources, quality assurance and health care needs
2. Assure that procedures are safely performed
3. Apply all relevant regulations to ensure the patients, personnel, public and self are protected from unnecessary radiation during radiographic examinations
4. Practice and maintain ethical professional standards for the provision of optimal quality service and patient management
5. Apply advanced ethical principles to daily practice
6. Design and draw the layout of a department
7. Manage a department/unit effectively
8. Utilise theoretical knowledge to operate effectively within the health care team to promote personal development and optimal use of human resources

9. Use and maintain equipment and accessories within the available budget to provide a cost effective service
10. Develop and maintain quality assurance programmes to optimise the services
11. Manage and utilize technology sources effectively

Ultrasound Imaging Equipment 4 UIE401S Outcomes:

1. Demonstrate the knowledge of the operational and physical principles of Sonoelastography, Harmonic Imaging and 3/4D ultrasound.
2. Discuss the applications of Sonoelastography, Harmonic Imaging and 3/4D ultrasound.
3. Understand advantages, limitations and potential risks of Advanced Ultrasound Imaging.

Health Science Research 4 (DU) (HSR401S) Outcomes:

1. Differentiate and apply various research paradigms, research designs, research study types, research methodology and research methods through the development of a research proposal (*and Health Science Research project where applicable**).
2. Discuss and apply the significance of Ethics in Research
3. Analyse and present data in a scientific manner.
4. Critically analyse scholarly material and scientific publications (research articles)
5. Explain and calculate descriptive statistics, statistical concepts and inferential statistics
6. Demonstrate the ability to prepare material (data) for scientific publication.
7. Demonstrate the ability to prepare research data in thesis format.
8. Demonstrate the ability to prepare research findings in conference presentation

Advanced Diagnostic Ultrasound Practice 4 AUP401S Outcomes:

1. Demonstrate an advanced understanding of the specific topic
2. Demonstrate problem-solving skills: analyze complex / abstract problems
3. Review literature on specified topics i.e. interrogate peer-reviewed literature
4. Critically analyze current practices in ultrasound
5. Complete ultrasound examinations with minimal supervision
6. Complete specialized ultrasound examinations with supervision
7. Demonstrate good ethical practice based on critical reflection of ethical and cultural values
8. Demonstrating academic communication skills: present to academic audiences showing insights and rigorous interpretations of issues in ultrasound practice

Entrepreneurship 4 (EEN401S) Outcomes:

1. Identify, define and understand key terms related to Entrepreneurship
2. Demonstrate/display understanding of the entrepreneurial process
3. Understand the economic effects of entrepreneurial activity (i.e. Describe the roles of entrepreneurs and small businesses in the economy)
4. To understand and develop a financial plan
5. To write, understand and effectively explain a business plan.
6. Apply ethical business principles in healthcare

Table 1: Mapping CASE Standards to Modules & Outcomes of the BSc Diagnostic Ultrasound degree.

CASE Standard	Module & Outcomes	Explanation / Alignment
1. Safe & Effective Practice	HPF106 (HCP1) Outcomes: 1, 2, 4, 5, 6 PCM106 & PCM201 (Patient care & infection control) AHC301S (Advanced Healthcare Practice) Outcomes: 1-8, 12, 14-18	Understanding professional role in healthcare team, organisational knowledge, ethics, holistic patient care, communication, phlebotomy skills, consent, infection control, patient handling
2. Legal & Ethical Boundaries	HPF106: Outcome 3 (Ethics, law) HFP201S: Outcomes 4, 5 (Ethics in clinical practice) AHC301S: Outcome 13 (Ethical clinical practice)	Legal frameworks, patient rights, confidentiality, ethical principles applied in real scenarios
3. Fitness to Practise	HPF106: Outcome 4 (Professional identity) HSL101S & HSL201S: Health science literacy and academic skills (CPD) HSR304S & HSR401S: Research & reflective practice	Professional regulation, CPD, reflective skills, research ethics, lifelong learning
4. Autonomous Judgement	DUP201S & DUP302S: Outcomes 1-17 & 1-11 (Diagnostic ultrasound protocols, equipment choice, interpretation) AUP401S: Outcomes 1-8 (Advanced problem solving, critical analysis, ethical reflection)	Independent clinical decision making, diagnostic reasoning, ethical judgment
5. Cultural, Equality & Diversity Awareness	HPF106: Outcome 6 (Communication skills including multilingual)	Communication respecting diversity, social context of illness, cultural competence

CASE Standard	Module & Outcomes	Explanation / Alignment
	HFP201S: Outcomes 1-3 (Psychosocial, cultural, social determinants of health) PCM106 & AHC301S: Holistic patient care, communication	
6. Non-Discriminatory Practice	HPF106: Outcomes 5 & 6 (Holistic care, communication) HFP201S: Outcomes 2 & 3 (Social context of health)	Equality in care delivery, avoiding bias
7. Confidentiality	HPF106: Outcome 3a (Patients' rights, confidentiality) PCM106/201: Patient privacy and records	Maintaining confidentiality and informed consent
8. Effective Communication	HPF106: Outcome 6 AHC301S: Outcome 12 PCM106 & PCM201: Communication & counselling skills UMT301S: Outcomes 4 & 5 (Inter-staff communication)	Communication with patients, team members, documentation
9. Teamwork	HPF106: Outcome 1 AHC301S: Outcome 18 (Multidisciplinary teamwork) UMT301S: Outcomes 3, 9-11 (Management, teamwork skills)	Collaborative practice within healthcare teams
10. Record-Keeping	DUP201S & DUP302S: Outcomes 11, 14-17, 19 (Documentation, technical reports) PCM201: Outcome 6 (Ethics, records)	Accurate clinical documentation and reporting
11. Reflective Practice	AUP401S: Outcomes 3, 4, 7, 8 (Critical analysis, reflection) HSR304S & HSR401S: Research and reflection skills	Ongoing self-assessment, audit, evidence-based practice
12. Quality Assurance	AHC301S: Outcomes 1, 7, 10, 11 (QA, management, tech use) HSM401S: Outcomes 1-3, 6-10 (Management, safety, QA)	Managing and maintaining quality and safety standards
13. Knowledge Base	HSC106S, HSC201S, HSC305S: All outcomes (Anatomy, physiology, pathology) PSC106S & PSC201S: Physics principles MIO106S: Ultrasound physics and protocols	Foundational and advanced scientific knowledge underpinning practice

CASE Standard	Module & Outcomes	Explanation / Alignment
14. Applied Knowledge & Skills	DUP201S, DUP302S, AUP401S: All outcomes (Clinical ultrasound skills) AHC301S, PCM106/201: Patient care skills UIE302S & UIE401S: Equipment use	Practical application of knowledge, scanning, patient handling, equipment operation
15. Safe Practice Environment	AHC301S: Outcomes 7, 8 (Handling fluids, safety) PCM106/201: Infection control, first aid UMT301S & HSM401S: Outcomes related to health and safety management	Health and safety compliance in clinical settings

11. Good Scientific Practice

The Good Scientific Practice document, developed by the Academy for Healthcare Science, defines the values, behaviours, and standards expected of professionals within the Healthcare Science workforce. As a practicing Sonographer, I demonstrate full adherence to this framework across every domain of my role. My practice consistently reflects high standards of patient-centred care, professionalism, scientific integrity, and clinical leadership.

In the area of professional practice, I align closely with the PROUD values of [REDACTED] putting the patient first, being responsive to patients and staff, promoting openness and honesty, demonstrating kindness, and showing determination to develop professionally. I maintain all my mandatory training—including patient safety, safeguarding, equality, diversity and inclusion, and information governance—ensuring that I meet organisational expectations and uphold best practices. I understand and apply the Duty of Candour, offering sincere apologies when things go wrong and taking appropriate steps to resolve the issue in a transparent and respectful manner. I advocate for patients' preferences, including requests for female sonographers during intimate examinations wherever possible, and always respect patients' autonomy and dignity.

Confidentiality and data security are integral to my role. I comply with the NHS Trust's Information Governance (IG) policies to ensure that all patient information is handled securely and only accessed on a need-to-know basis. This includes both clinical and safeguarding data.

I maintain up-to-date Information Governance training and follow strict local protocols regarding the handling, sharing, and disposal of patient information.

I operate strictly within my defined scope of practice, following my job description and engaging in regular competency reviews every two years (Appendix 12.10). These assessments help identify any learning needs and ensure my clinical decisions are informed by evidence-based practice. My ongoing professional development is supported through CPD activities (Appendix 12.9), reflective practice, and participation in departmental audits aimed at quality assurance and service improvement.

As communication is a fundamental component of effective healthcare, I maintain a high level of proficiency in spoken and written English, evidenced by my ECCTIS certificate and IELTS results included in my submission. I communicate clearly and respectfully with patients, avoiding technical jargon, and use interpreter services or Language Line when required. As deputy superintendent sonographer, I also facilitate clear and effective communication within the multidisciplinary team, contributing to coordinated and safe patient care.

I take full responsibility for my professional actions and decisions, adhering to the standards set by the HCPC and preparing for registration with the RCT. In addition to being covered by the Trust's indemnity, I also maintain personal indemnity insurance as a further professional safeguard.

In the domain of scientific practice, I follow standardised, evidence-based protocols and departmental SOPs during all ultrasound examinations. My reports are consistently accurate, clinically relevant, and delivered within expected timeframes. I am technically proficient in operating a range of ultrasound equipment, including performing basic troubleshooting and reporting faults directly to the manufacturer. I actively contribute to maintaining a safe working environment by observing all relevant health and safety protocols and participating in departmental risk assessments.

My commitment to maintaining scientific integrity extends to regular CPD and staying abreast of emerging research and technologies that enhance patient care and diagnostic accuracy. I ensure that my clinical practice remains current, safe, and aligned with the latest developments in ultrasound.

Under clinical practice, I prioritise patient safety, dignity, and ethical care. I always obtain verbal informed consent before commencing any scan, and seek written consent for intimate examinations. Based on the diagnostic findings, I take appropriate clinical action, including

recommending further investigations or referrals and communicating urgent or unexpected results to the relevant clinical teams without delay. My decision-making process is grounded in evidence-based practice, supported by regular reflection and a commitment to lifelong learning.

In support of research, development, and innovation, I actively engage in service development through audit participation and the evaluation of new clinical techniques or imaging protocols. I contribute to a learning culture by sharing knowledge and experience with peers and student sonographers. This engagement ensures that the department continues to evolve in response to changing clinical needs and technological advancements.

As part of my clinical leadership responsibilities, I help guide the team towards delivering consistently high standards of care. I have completed formal leadership training and apply these skills in mentoring junior staff, supporting student development, and participating in staff performance reviews. I foster a team culture that values openness, accountability, and continuous improvement, while also championing staff wellbeing and collaborative working.

My awareness of professional judgement and recognising limitations is fundamental to safe and effective practice. When faced with complex or uncertain cases, I seek guidance from more experienced colleagues or escalate appropriately to relevant specialists. I always document decisions and referrals thoroughly and view these experiences as opportunities for further learning. This reflective approach helps ensure I remain competent, confident, and safe in all areas of my practice.

In all aspects of my work, I am committed to upholding the principles set out in the Good Scientific Practice framework. I reflect regularly on my professional conduct, seek continuous improvement, and work in partnership with colleagues to deliver safe, effective, and compassionate care to every patient.

12. Appendices

12.1 Infection control measures

12.1.1 Tristel audit book

SAMPLE

12.1.2 PPE audit

SAMPLE

12.2 Mandatory training

12.2.1 Tristel Certificate

Certificates Redacted

Certificates Redacted

12.2.3 Basic Life Support

Certificates Redacted

Certificates Redacted

Certificates Redacted

Certificates Redacted

12.2.4 Manual Handling

Certificates Redacted

12.2.5 Safeguarding

Certificates Redacted

Certificates Redacted

12.2.6 Mandatory and Core training matrix

Category	Certification Name	Status	Date completed	Date due
Core Training	Conflict Resolution - Level 1			
Core Training	Fire Safety			
Core Training	Equality, Diversity and Human Rights			
Core Training	Health, Safety and Welfare			
Core Training	Information Governance and Data Security			
Core Training	Moving and Handling - Level 1			
Core Training	Preventing Radicalisation - Basic Prevent Awareness			
Core Training	Infection Prevention and Control - Level 2			
Core Training	Resuscitation Adults - Level 2 Theory			
Core Training	Resuscitation Adults - Level 2 Practical			
Core Training	Safeguarding Children - Level 2			
Mandatory Training	Patient Safety - Essentials of patient safety for all staff			
Mandatory Training	The Oliver McGowan Mandatory Training on Learning Disability and Autism			
Mandatory Training	Freedom to Speak Up in Healthcare in England			
Mandatory Training	Dementia - Tier 1			
Core Training	Safeguarding Adults - Level 2			
Mandatory Training	Patient Safety - Level 2 Access to practice			
Mandatory Training	Recognising and Managing Anaphylaxis			
Core Training	Resuscitation Paediatric - Level 2 Theory			
Mandatory Training	Mental Capacity Act (MCA) - Band 6 and above, SPR and above			
Core Training	Resuscitation Paediatric - Level 2 Practical			

Certificates Redacted

Certificates Redacted

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Certificates Redacted

12.3.3 COSHH documentation

SUMMARY SHEET		ID# 4723855	cms.helpdesk@ecoonline.com
FACILITY	WMUH	MAIN	SUB
Material/Process		IMC	
TRISTEL RINSE WIPE		113716	
LOW HAZARD		Health Hazards	
LIQUID		May cause ill health if ingested in quantity Skin - irritation and dermatitis may result from prolonged contact May cause eye irritation	
Supplier	TRISTEL SOLUTIONS LIMITED	Considerations	
Keyword	Disinfectant wipes		
Contents	Full details of constituents not provided by supplier, This product has been classified as per the supplier's safety data sheet		
Signal Word			
Exp Limit			
Method	Hand applying	Area	Inside Well Ventilated
Exposure		Up to 1/2 hour per shift	
LOW ACUTE RISK - FULL EXPOSURE		LOW CHRONIC RISK - FULL EXPOSURE	
LOW ACUTE RISK - INDIVIDUAL ACTIVITY		LOW CHRONIC RISK	
Control Measures		Spillage	
 AVOID SKIN CONTACT  IF OVEREXPOSURE LIKELY  IF CONTACT LIKELY  WASH AFTER EXPOSURE  IF HEAVILY SOILED  CLOSE ALL CONTAINERS  CONTROLLED STORE /WASTE		Ventilate area Wear polythene or nitrile gloves Wear eye protection if contact likely Wear respiratory protection for large spills in poorly ventilated areas Collect into a container, close lid Dispose or recycle of spillages in a controlled manner - Refer to Hazardous Waste Regulations if appropriate First Aid Inhalation - remove to fresh air; get immediate medical attention after significant exposure or if feeling ill Ingestion - do not induce vomiting, wash out mouth with water If feeling unwell consult your doctor immediately Eye - irrigate with water until irritation subsides; if irritation persists then consult a doctor Skin - wash with soap/cleanser and rinse with water; if irritation persists then consult a doctor Fire Isolated small scale fire: Water - carbon dioxide - powder - foam - inert material Large fire: evacuate area, call fire brigade or follow site procedure Wear self-contained breathing apparatus and protective clothing	
Activity Comments		This assessment was compiled by EcoOnline Sypol Limited from supplier's safety data sheets where appropriate. Safety in the use of assessments is the responsibility of the subscriber. For advice call the helpdesk on 01296 678464	
Date Printed 25/10/2024			
Assessment Reviewed	04/10/2024	Next Review	04/10/2029
Latest SDS Reference		06/02/2023	

WORKER REFERENCE SHEET				ID# 4723855	cms.helpdesk@ecoonline.com
FACILITY	WMUH	MAIN		SUB	IMC
					113716
Material/Process				LOW HAZARD	
TRISTEL RINSE WIPE				LIQUID	
Supplier	TRISTEL SOLUTIONS LIMITED				
Keyword	Disinfectant wipes				
Signal Word					
Method	Hand applying	Area	Inside Well Ventilated	Exposure	Up to 1/2 hour per shift
		LOW ACUTE RISK - FULL EXPOSURE		LOW CHRONIC RISK - FULL EXPOSURE	
Control Measures	LOW ACUTE RISK - INDIVIDUAL ACTIVITY		LOW CHRONIC RISK		
AVOID SKIN CONTACT IF OVEREXPOSURE LIKELY IF CONTACT LIKELY WASH AFTER EXPOSURE IF HEAVILY SOILED CLOSE ALL CONTAINERS CONTROLLED STORE /WASTE					
Health Hazards May cause ill health if ingested in quantity Skin - irritation and dermatitis may result from prolonged contact May cause eye irritation					
Sypol Part of EcoOnline Global This assessment was compiled by EcoOnline Sypol Limited from supplier's safety data sheets where appropriate. Safety in the use of assessments is the responsibility of the subscriber. For advice call the helpdesk on 01296 678464 Date Printed 25/10/2024					
Assessment Reviewed	04/10/2024	Next Review	04/10/2029	Latest SDS Reference	06/02/2023

SUMMARY SHEET		ID# 2898178	cms.helpdesk@ecoonline.com	
FACILITY	WMUH	MAIN	SUB	IMC
				165140
Material/Process CLINELL UNIVERSAL WIPES.,				Health Hazards Harmful to aquatic life with long lasting effects May cause ill health if ingested in quantity Skin - Irritation and dermatitis may result from prolonged contact May cause eye irritation May cause allergic reaction in susceptible individuals in contact with skin
MEDIUM HAZARD LIQUID		Considerations		
Supplier GAMA Healthcare Keyword Cleaner (Wipes) Contents Quaternary ammonium compounds, benzyl-C12-16-alkyldimethyl, chlorides: < 0.5%, Didecyldimethylammonium chloride: < 0.5%, Polymeric biguanide hydrochloride surfactant and preservative: < 0.1%, 2-phenoxyethanol: < 0.1%		Signal Word Exp Limit		
Method Hand applying Area Inside Well Ventilated Exposure Less than 5 minutes per shift		Spillage Ventilate area Wear polythene or nitrile gloves Wear eye protection if contact likely Wear respiratory protection for large spills in poorly ventilated areas Collect into a container, close lid Dispose or recycle of spillages in a controlled manner - Refer to Hazardous Waste Regulations if appropriate		
Control Measures		First Aid Inhalation - remove to fresh air; get immediate medical attention after significant exposure or if feeling ill Ingestion - do not induce vomiting, wash out mouth with water If feeling unwell consult your doctor immediately Eye - irrigate with water until irritation subsides; if irritation persists then consult a doctor Skin - wash with soap/cleanser and rinse with water; if irritation persists then consult a doctor		
LOW ACUTE RISK - FULL EXPOSURE LOW ACUTE RISK - INDIVIDUAL ACTIVITY LOW CHRONIC RISK - FULL EXPOSURE LOW CHRONIC RISK		Fire Isolated small scale fire: Water fog - carbon dioxide - powder - foam Do not use water jet Large fire: evacuate area, call fire brigade or follow site procedure Wear self-contained breathing apparatus and protective clothing		
 KEEP SKIN COVERED  IF CONTACT POSSIBLE  IF CONTACT LIKELY   WASH AFTER USE  IF SOILED  CLOSE ALL CONTAINERS  ECOTOXIC				
 Sypol Part of EcoOnline Global		Activity Comments This assessment was compiled by EcoOnline Sypol Limited from supplier's safety data sheets where appropriate. Safety in the use of assessments is the responsibility of the subscriber. For advice call the helpdesk on 01296 678464 Date Printed 25/10/2024		
Assessment Reviewed	04/10/2024	Next Review	04/10/2029	Latest SDS Reference
		31/07/2023		

WORKER REFERENCE SHEET		ID# 2898178	cms.helpdesk@ecoonline.com	
FACILITY	WMUH	MAIN	SUB	IMC
		165140		
Material/Process CLINELL UNIVERSAL WIPES.,		MEDIUM HAZARD LIQUID 		
Supplier	GAMA Healthcare			
Keyword	Cleaner (Wipes)			
Signal Word				
Method	Hand applying	Area	Inside Well Ventilated	Exposure
				Less than 5 minutes per shift
		Activity Comments		
LOW ACUTE RISK - FULL EXPOSURE		LOW CHRONIC RISK - FULL EXPOSURE		
Control Measures		LOW ACUTE RISK - INDIVIDUAL ACTIVITY LOW CHRONIC RISK		
       KEEP SKIN COVERED IF CONTACT POSSIBLE IF CONTACT LIKELY WASH AFTER USE IF SOILED CLOSE ALL CONTAINERS ECOTOXIC				
Health Hazards Harmful to aquatic life with long lasting effects May cause ill health if ingested in quantity Skin - irritation and dermatitis may result from prolonged contact May cause eye irritation May cause allergic reaction in susceptible individuals in contact with skin				
 Sypol Part of EcoOnline Global		This assessment was compiled by EcoOnline Sypol Limited from supplier's safety data sheets where appropriate. Safety in the use of assessments is the responsibility of the subscriber. For advice call the helpdesk on 01296 678464 Date Printed 25/10/2024		
Assessment Reviewed	04/10/2024	Next Review	04/10/2029	Latest SDS Reference
				31/07/2023

12.4 Patient feedback

SAMPLE

12.5 Patient preparation

12.5.1 Transvaginal ultrasound consent form

Consent for Intimate Ultrasound Examination

Please stick patient ID label here.
(NAME, DOB, MRN)

Your doctor has referred you for the following ultrasound examination:

TESTES /PENIS ☐	TRANSVAGINAL ☒	ENDOANAL/TRANSRECTAL ☐
--	--	---

Please read the patient information that explains the details of the procedure.

Please note that internal scans are undertaken by both Male and Female Clinicians.

- For transvaginal or endoanal/transrectal ultrasound examination, I understand that this study may involve the insertions of a probe into the vaginal or rectal cavity to properly visualise the anatomy.
- For testes ultrasound examination, I understand that this study will involve the use of an ultrasound probe to be in contact with both testes to properly visualise the anatomy.
- The purpose and procedure have been explained to me.
- I understand that I can terminate the procedure at any time.

Do you have a known LATEX ALLERGY	YES ☐	NO ☒
-----------------------------------	------------------------------	--

Please do not hesitate to speak to a member of staff if you have any questions.

I hereby give consent to the Clinician to perform the aforementioned Ultrasound scan.

Patient Signature: _____	Date: _____
Witness signature: _____	Date: _____
Clinician undertaking the scan: _____	

Chaperone Checklist:

• Patient has been offered a chaperone	☐
• Patient has agreed for chaperone to be present	☐
• Patient declined chaperone	☐
• Clinician requested a chaperone	☐

Chaperone Signature: _____ Date: _____

12.5.2 Protocol for reporting of critical, urgent and unexpected significant findings

1.4 REPORTING OF EXAMINATION AND TIME FRAMES

1.4.1 REPORTING OF CRITICAL, URGENT AND UNEXPECTED SIGNIFICANT FINDINGS

The Royal College of Radiologists' *'Alerts and notification of imaging reports recommendations'* (2022) recommend categorisation of imaging findings that require an alert into the following 3 categories:

- **New cancer diagnoses or newly detected cancer recurrence suspected from imaging, expected or unexpected:**

This includes expected or unexpected imaging findings that suggest new or probable new cancer and new or probable new cancer recurrence.

The fast track cancer alert (FTC) is inserted at the bottom of the radiology report and is triggered immediately when the report is verified (see Appendix E).

The patient should be 'cancer fast tracked' by the reporting radiologist. The report should include which MDT the patient should be reviewed in. Cancer services will then ensure the patient is added to the appropriate MDT.

Contact details must be documented in the report if there is verbal or written communication.

For GP patients the report should be flagged with red alert but in addition, the details communicated to the radiology admin team who will send the result to the GP via email (sent with an urgent notification, delivery receipt and read receipt) and document this on RIS (radiology information service).

- **Critical findings that are time-critical:**

Where emergency action is required as soon as possible; critical findings should be verbally communicated with the referrer as soon as they are identified. The radiologist / sonographer should document when this was done (time and clinician) in the radiology report or as an addendum to the report.

The red alert is inserted at the bottom of the radiology report and is triggered immediately when the report is verified.

Any acute life or limb threatening findings should urgently be verbally communicated to the referring clinician and documented in the examination report that the communication has occurred (documentation to include time and method of communication and full name and role of clinician informed).

Red alert and Cancer fast track code (FTC) should be used in reporting as appropriate.

- *Significant addenda in the report that may alter clinical management*

A significant addendum includes findings that are interpreted differently compared with a preceding report of the same examination that may result in immediate or acute harm to the patient or may result in adverse outcomes if timely action is not taken. This is a separate entity compared to an addendum containing new findings or a revised report which does not affect clinical management.

Red alert and Cancer fast track code (FTC) should be used in reporting as appropriate.

Contact details must be documented in the report if there is verbal or written communication.

1.4.2 REPORTING TURNAROUND TIMES

The standards for reporting times are to be considered from completion of the procedure to its availability on EPR or dispatch of the final report to external referrers. For referrals from General Practitioners this includes electronic sending of results via registered reporting transmission portals.

All in-patient investigations should be reported the same day or at the latest by the end of next working day.

Complex scans requiring discussion/second review may take more time but any urgent important findings/concerns should be communicated to referring clinicians at the earliest opportunity.

All out-patient investigations are to be reported within 5 working days.

All urgent suspected cancer (2WW) scans within 3 days.

Red alert and Cancer fast track codes (FTC) should be used in reporting as appropriate.

Contact details must be documented in the report if there is verbal communication.

12.6 Quality assurance checklists

12.6.1 Daily QA checklist

12.6.2 Weekly QA checklist

SAMPLE

12.7 Ultrasound practice

12.7.1 (a) Transvaginal consent form

SAMPLE

12.7.1 (b) Pelvic ultrasound report recommendations for GPs.

➤ Premenopausal

* No agreed upper limit for homogeneous endometrial thickening and should not be described as abnormal unless focal pathology is seen.

Premenopausal	Reporting and recommendation
Thickened cystic endometrium	Endometrium is thickened and cystic, gynaecology referral is recommended
Endometrial Polyps	
If uncertain	Ultrasound is suggestive of an endometrial polyp; repeat ultrasound on day 2-5 of menstrual cycle for confirmation is recommended
If certain (prior to mid-cycle)	Ultrasound demonstrates an endometrial polyp; routine gynaecology referral recommended
Retained Products of Conception	EPAG referral
Low-lying IUD	Report position within the endometrium in relation to the cervix
Malpositioned / perforated IUD	Contact Gynae Reg on call and refer accordingly
Unidentified IUD	Recommend correlation with plain film/x-ray

Postmenopausal	Reporting and recommendation
Endometrial polyp	Ultrasound suggestive of endometrial polyp; urgent suspected cancer gynaecology referral recommended
Non HRT	
<u>Asymptomatic:</u> Endometrium < 10mm	No further follow-up.
Endometrium > 10mm	Urgent referral for 2ww Urgent suspicion of cancer pathway recommended. Notify referrer
<u>Symptomatic (PVB)</u> Endometrium < 4mm	Urgent referral for 2WW Urgent suspicion of cancer pathway recommended.
Endometrium > 4mm	Urgent referral for 2WW Urgent suspicion of cancer pathway recommended. Notify referrer
HRT (S-Sequential; C-continuous)	
<u>Asymptomatic:</u> sHRT Endometrium < 7mm cHRT Endometrium < 4mm	Please optimise HRT as per BMS pathway.
<u>Symptomatic (PVB):</u> sHRT Endometrium > 7mm cHRT Endometrium > 4mm	Urgent referral for 2WW Urgent suspicion of cancer pathway recommended. Notify referrer.
Incomplete info from GP/Patient:	Endometrium xxmm, incomplete information on clinical history, please follow BMS guideline for onward management.

➤ MANAGEMENT & REPORTING

Premenopausal	Reporting and recommendation
Simple cyst < 50mm ➤ Unilocular (or single thin avascular septum), anechoic, avascular, well-defined	Likely physiological as described; these usually resolve spontaneously within 2-3 menstrual cycles
50mm – 70mm	Simple ovarian cyst as described. Annual follow-up is recommended unless symptomatic, in which case routine gynaecology referral recommended
> 70mm	Simple ovarian cyst as described. Recommend routine gynaecology referral
Para-ovarian cyst, simple	Simple para-ovarian cyst as described. Recommend routine gynaecology referral if symptomatic.
Haemorrhagic cyst	Haemorrhagic cyst as described. Recommend rescan in 6-8 weeks. If not resolved, recommend routine gynaecology referral
Dermoid cyst	Recommend routine gynaecology referral
Endometrioma	Recommend routine gynaecology referral to an Endometriosis Centre
Complex ovarian cyst / mass: ➤ indeterminate or solid - unclear nature or origin ➤ multiple thin septa, nodule - no flow ➤ malignant - thick septa >3 mm ➤ multilocular ➤ focal wall thickening ➤ papillary nodules (+/- vascularity) ➤ ascites	Apply IOTA simple rules: > 1B rule no M rules → ovarian cyst as described, benign by IOTA simple rules. Routine gynaecology referral recommended Any M Rule → indeterminate complex ovarian lesion as described, recommend immediate , immediate urgent suspected cancer gynaecology referral recommended <i>and red flag to MDT</i> If in doubt → complex ovarian lesion as described, immediate urgent suspected cancer gynaecology referral recommended
Postmenopausal *after 12 months of no menstrual periods	Reporting and recommendation
Simple cyst ≤ 50mm	Correlation with Ca125 and repeat ultrasound in 4 months is recommended.
Simple cyst ≥ 50mm	Correlation with Ca125 and gynaecology referral recommended
Haemorrhagic cyst	Haemorrhagic cyst as described. urgent suspected cancer gynaecology referral recommended
Complex cyst/s	Ovarian lesion as described, immediate urgent suspected cancer gynaecology referral recommended
Complex cyst/s with ascites	Ovarian lesion as described with ascites, , immediate urgent suspected cancer gynaecology referral recommended <i>and red flag to MDT</i>

12.7.2 Obstetric detailed anomaly ultrasound report

SAMPLE

SAMPLE

12.7.3 Abdominal ultrasound report

SAMPLE

12.7.4 Shoulder ultrasound report

SAMPLE

12.7.5 Elbow ultrasound report

SAMPLE

12.7.6 Hand and wrist ultrasound report

SAMPLE

SAMPLE

12.7.7 Hip ultrasound report

SAMPLE

12.7.8 Knee ultrasound report

SAMPLE

12.7.9 Ankle ultrasound report

SAMPLE

12.7.10 Foot ultrasound report

SAMPLE

12.7.11 Thyroid ultrasound

12.7.11.1 U-classification system

Comment should be made on the following features of the nodule:

- Size, Location, Border definition of the nodules.
- Cystic, Complex or Solid in appearance.
- Whether there are multiple nodules or a single dominant nodule.
- Vascularity.
- See the table below for appropriate referral options

U1. <u>Normal</u>
U2. <u>Benign</u> : (a) Halo, iso-echoic/mildly hyper-echoic (b) Cystic change +/- ring down sign (colloid) (c) Micro-cystic/spongiform (d&e) peripheral egg shell calcification (f) peripheral vascularity
U3. <u>Indeterminate/Equivocal</u> : (a) Homogenous, hyper-echoic (markedly), solid, halo (follicular lesion). (b) ? hypo-echoic, equivocal echogenic foci, cystic change (c) Mixed/central vascularity
U4. <u>Suspicious</u> : (a) Solid, hypo-echoic (cf thyroid) (b) Solid, very hypo-echoic (cf strap muscle) (c) Disrupted peripheral calcification, hypo-echoic (d) Lobulated outline
U5. <u>Malignant</u> : (a) Solid, hypo-echoic, lobulated/irregular outline, microcalcification (? Papillary carcinoma) (b) Solid, hypo-echoic, lobulated/irregular outline, globular calcification (? Medullary carcinoma) (c) Intra-nodular vascularity (d) Shape (taller>wider) (AP> TR) (e) Characteristic associated with lymphadenopathy.

12.7.11.2 Thyroid ultrasound report

SAMPLE

12.7.12 Breast ultrasound report

SAMPLE

12.7.13 Interventional procedures

12.7.13.1 WHO Checklists

SAMPLE

12.7.13.2 Ultrasound guided injection patient Checklists

SAMPLE

12.7.13.3 *Drug administered and expiring date*

SAMPLE

12.7.13.4 *Ultrasound guided injection report*

SAMPLE

ULTRASOUND GUIDED INJECTIONS

POST-PROCEDURAL PATIENT INFORMATION

The purpose of the injection is to reduce pain and/or inflammation in the affected joint or tendon.

RISKS

The side effects and risks of the procedure may include:

- Small risk of infection following injections. If you experience persistent redness or swelling around the area injected or a high temperature you should see your GP or attend A&E and explain you have recently had an injection
- Local bruising
- Mild increase in blood sugar levels in diabetic patients for several days and may last up to a week
- There is a small risk of depigmentation (lightening of the skin) and a skin dimple due to steroid-induced fat atrophy (loss of fat tissue).
- Transient increase in pain at the injection site before the cortisone takes effect. Occasionally this may be severe, however usually lasts only 24-48 hours and is treated with cold pack, paracetamol and anti-inflammatory medication.

AFTERCARE

The local anaesthetic numbing effect will wear off within a few hours, after this time you may experience a small amount of discomfort.

The corticosteroid can take 2-3 days to take effect. In this time we advise you to take it easy and to avoid heavy lifting or pulling.

If you plan to have a Covid vaccine or booster, please arrange for this to take place 2 weeks after your steroid injection.

ALTERNATIVES

Alternatives to steroid injections may include physiotherapy or more systemic treatments (such as anti-inflammatory tablets). Surgery is also a possibility in many conditions, but this is often reserved for when conservative measures have failed. You may discuss this option with your referring clinician/doctor.

CONSENT

Please be aware of the risks and benefits of being administered cortisone.

You need understand that multiple injections may be required before your condition improves and that your condition may not improve even with multiple injections.

You will be provided with the opportunity to have any questions answered.

ULT0004
Reviewed May 2025
Review Due May 2027

12.7.13.6 Ultrasound guided injections complication protocol

GUIDANCE FOR THE MANAGEMENT OF A PATIENT BECOMING UNWELL DURING AN ULTRASOUND GUIDED INTERVENTIONAL PROCEDURE

CALL FOR HELP – CRASH TEAM IF NECESSARY

D = Danger – safety of patient & responders e.g. x-rays, sharps etc.

R = Recognition of problem and activation of appropriate response

A = Airway management – clear, establish and maintain

B = Breathing – assess, assist, deliver O₂ at 10-15 litres per minute via non-rebreathing mask if bronchospasm or laryngeal oedema present.

C = Circulation – assess, obtain venous access, support

D = Disability – assess, monitor, check blood glucose

E = Expose and examine for rash, skin colour etc.

EMERGENCY DRUG BOX – make sure emergency drug box, anaphylaxis drug box, defibrillator and B.P. monitoring equipment are present – defib. is kept in main x-ray viewing area, B.P. monitor is in CT room. Do not leave the patient – get help.

POSITIONING – If conscious, help patient into whatever position best supports breathing. Lying patient flat assists hypotension, but may compromise breathing. If unconscious and breathing, place in recovery position.

VOMITING – Take supportive measures. Protect airway.

VASOVAGAL - The patient will immediately be laid head down on the couch. If symptoms are not immediately resolved the patient's blood pressure and pulse will be obtained and a radiologist will be called to assess the patient. If the patient remains unwell, the patient will be referred to the medical admissions unit for observation.

ALLERGIC REACTION – Urticaria / Rash / Itching

MILD/TRANSIENT	Observe and reassure
SEVERE	Refer to MSK radiologist for management and possible antihistamine treatment
PROFOUND	Manage by ABCDE

PATIENTS SHOWING ANY SIGNS OF MILD REACTION MUST BE OBSERVED UNTIL SYMPTOMS HAVE SUBSIDED

12.8 Clinical audit

12.8.1 Clinical audit matrix



4.2 AUDIT SCORE CHART

Score	Specific standard quality	Overall image quality	Report Quality	Advice and recommendations
5	Good images, support report & protocol followed	Images are of high quality throughout	Measurements and interpretation good and exactly reflect the images seen	Followed exactly the guidance and escalation policy and/sought advice as required
4	Images, support report and are acceptable & protocol followed	Images are of an acceptable diagnostic standard	Clinically insignificant error – measurement slightly wrong, typo, spelling or grammatical error.	Recommendation not in accordance with the policy but good clinical reason given for not following policy
3	Images provided support report but are sub optimal. Protocol followed	Suboptimal images but adjustments made, and actions / reasons recorded	Abnormal finding which is not reported but seen on images. Previously available report not referred to. Will not result in patient harm.	No clear guidance given regarding patient management despite being considered necessary, advice not sought, referrer would have no useful guidance.
2	Images provided are of a standard that makes interpretation difficult. Protocol not followed.	Suboptimal images and no attempt to optimise or reason given. Significant pathology might not be detected.	Error in measurements or interpretation which may affect the patient's management but not life threatening	Inappropriate recommendation given for further investigation or onward specialist referral
1	Images are of a standard that do not allow reliable diagnosis to be made. Protocol not followed.	Images are not of diagnostic quality and no attempt to optimise, or reason given. Significant pathology might not be detected.	Measurements and interpretation wrong and will definitely result in incorrect diagnosis and management	Urgent or emergency referral required but not made and patient may have effective treatment delayed.

12.8.2 Clinical audit example

SAMPLE

12.9 CPD Certificates

12.9.1 BMJ Learning – Medical Leadership

Certificates Redacted

Certificates Redacted

Certificates Redacted

Certificates Redacted

Certificates Redacted

Certificates Redacted

Certificates Redacted

Certificates Redacted

Certificates Redacted

12.9.10 The Ultrasound Academy – Ultrasound imaging of the groin and anterior abdominal wall

Certificates Redacted

12.9.11 Sport Medicine Ultrasound Group – Virtual MSK US Event

Certificates Redacted

12.9.12 The Ultrasound Site – Introductory MSK Ultrasound course

Certificates Redacted

12.9.13 The Ultrasound Site – Advanced MSK Ultrasound course

Certificates Redacted

12.9.14 SWL Imaging Training Academy – Head and Neck Ultrasound Study Day

Certificates Redacted

12.9.15 ABC Vascular – Carotid Ultrasound Course and Vertebral Arteries

12.9.16 ACB Vascular – Lower Limb Venous System Course

12.9.17 Canon Medical Academy – Heartbeat to Horizon: A Journey Through Prenatal Ultrasound

12.9.18 BMJ Learning – Quality Improvement

12.10 Competency assessments

Clinical Assessment: Abdomen

Skills & Knowledge	Standard Achieved	Assessors Notes
4.0 Clinical Scanning Skills:		
Selects correct transducer for the examination.	YES	
Prepares the patient for the examination.	YES	
Positions the patient correctly for the examination	YES	
Ensure a permanent record of all major organs being examined is maintained. Examines each organ in at least two planes and measurements made of the size of major organs and vessels and abnormal finding.	YES	
Takes images during the examination appropriate to the clinical presentation as per local scanning protocols.	YES	
Correctly annotates images and records images to hard drive	YES	
Correctly evaluates all major organs	YES	
Correctly identifies any abnormal pathology and takes appropriate images	YES	
Correctly identifies normal and abnormal anatomy	YES	
Reviews images for quality and pathology.	YES	
Attends to the post examination needs of the patient.	YES	
5.0 Clinical Reporting Skills:		
Knows own limitations - Where the appearances fall outside the personal knowledge of the operator, seek advice from other clinicians.	YES	
Recognises the limitations of ultrasound as a diagnostic tool and make recommendations for appropriate secondary examination or onward referral where required.	YES	
Correctly summarises diagnostic findings to patient and give differential diagnoses where the operator may doubt the findings.	YES	
Correctly describes the ultrasound appearances with the relevant measurements as necessary	YES	
Correctly formulates report, using correct medical terminology, forming a diagnostic opinion and recommending further investigations or onwards referral if necessary.	YES	

Able to check report text for accuracy of spelling, grammar and clinical content.	YES	
Verify patient report and save in patient record	YES	
Know when specialist referral is necessary and make such recommendations to the referring clinician	YES	
Recognise clinically significant pathology and take appropriate action to facilitate rapid onward referral.	YES	
Elastography: correctly applies the required software to take the necessary measurement for fibrosis score (shearwave) and steatosis score (UGAP).	YES	
6.0 Underpinning Knowledge:		
Prior to the assessment, Sonographers are required to make brief notes on the following subjects and bring them to the assessment.	YES	
Typical indications for Ultrasound of the abdomen	YES	
How to extend the examination if certain pathologies are identified, give examples.	YES	
Typical normal sizes of organs- liver, kidneys, spleen, common duct, gallbladder wall.	YES	
Describe 3 common abnormalities of the abdomen and their ultrasound appearance.	YES	
Describe an abdominal aortic aneurysm, how would it be measured?	YES	
Typical ultrasound appearances of a haemangioma	YES	
What are the ultrasound appearances of an Angiomyolipoma?	YES	
If suspected renal calculus, what other imaging may be recommended?	YES	

Clinical Assessment: Pelvis (transabdominal & transvaginal)

Skills & Knowledge	Standard Achieved	Assessors Notes
4.0 Clinical Scanning Skills:		
Selects correct transducer for the examination.	YES	
Prepares the patient for the examination.	YES	
Positions the patient correctly for the examination	YES	
Ensure a permanent record of all major organs being examined is maintained. Examines each organ in at least two planes and measurements made of the size of major organs and vessels and abnormal finding.	YES	
Takes images during the examination appropriate to the clinical presentation as per local scanning protocols.	YES	
Correctly annotates images and records images to hard drive	YES	
Correctly evaluates all major organs	YES	
Correctly identifies normal and abnormal anatomy	YES	
Reviews images for quality and pathology.	YES	
Attends to the post examination needs of the patient.	YES	
5.0 Clinical Reporting Skills:		
Knows own limitations - Where the appearances fall outside the personal knowledge of the operator, seek advice from other clinicians.	YES	
Recognises the limitations of ultrasound as a diagnostic tool and make recommendations for appropriate secondary examination or onward referral where required.	YES	
Correctly summarises diagnostic findings to patient and give differential diagnoses where the operator may doubt the findings.	YES	
Correctly describes the ultrasound appearances with the relevant measurements as necessary	YES	

Correctly formulates report, using correct medical terminology, forming a diagnostic opinion and recommending further investigations or onwards referral if necessary.	YES	
Able to check report text for accuracy of spelling, grammar and clinical content.	YES	
Demonstrates the knowledge and skill to apply 3D assessment of the endometrial cavity	YES	
Know when specialist referral is necessary and make such recommendations to the referring clinician	YES	
Recognise clinically significant pathology and take appropriate action to facilitate rapid onward referral.	YES	
6.0 Underpinning Knowledge:		
Typical indications for an Ultrasound scan of the female pelvis and their Ultrasound appearance.	YES	
Typical organs imaged during the examination	YES	
How to extend the examination if certain pathologies are identified, give examples.	YES	
Typical normal sizes of organs- uterus, endometrium, ovaries.	YES	
Typical indications for a Transvaginal Ultrasound scan of the female pelvis.	YES	
When is endo-vaginal ultrasound contra-indicated?	YES	
Ultrasound diagnosis of PCO	YES	

Clinical Assessment: Renal Tract

Skills & Knowledge I	Standard Achieved	Assessors Notes
4.0 Clinical Scanning Skills:		
Selects correct transducer for the examination.	YES	
Prepares the patient for the examination.	YES	
Positions the patient correctly for the examination	YES	
Ensure a permanent record of all major organs being examined is maintained. Examines each organ in at least two planes and measurements made of the size of major organs and vessels and abnormal finding.	YES	
Takes images during the examination appropriate to the clinical presentation as per local scanning protocols.	YES	
Correctly annotates images and records images to hard drive	YES	
Correctly evaluates all major organs	YES	
Correctly identifies normal and abnormal anatomy	YES	
Reviews images for quality and pathology.	YES	
Attends to the post examination needs of the patient.	YES	
5.0 Clinical Reporting Skills:		
Knows own limitations - Where the appearances fall outside the personal knowledge of the operator, seek advice from other clinicians.	YES	
Recognises the limitations of ultrasound as a diagnostic tool and make recommendations for appropriate secondary examination or onward referral where required.	YES	
Correctly summarises diagnostic findings to patient and give differential diagnoses where the operator may doubt the findings.	YES	
Correctly describes the ultrasound appearances with the relevant measurements as necessary	YES	

Correctly formulates report, using correct medical terminology, forming a diagnostic opinion and recommending further investigations or onwards referral if necessary.	YES	
Able to check report text for accuracy of spelling, grammar and clinical content.	YES	
Verify patient report and save in patient record	YES	
Know when specialist referral is necessary and make such recommendations to the referring clinician	YES	
Recognise clinically significant pathology and take appropriate action to facilitate rapid onward referral.	YES	
6.0 Underpinning Knowledge:		
Typical indications for US renal tract	YES	
Typical pathologies for US renal tract	YES	
If multiple cysts were identified within the kidneys, how might the examination be extended	YES	
What does CRF stand for, what might you expect to see	YES	

Clinical Assessment: Testes

Skills & Knowledge	Standard Achieved	Assessors Notes
4.0 Clinical Scanning Skills:		
Selects correct transducer for the examination.	YES	
Prepares the patient for the examination.	YES	
Positions the patient correctly for the examination	YES	
Ensure a permanent record of all major organs being examined is maintained. Examines each organ in at least two planes and measurements made of the size of major organs and vessels and abnormal finding.	YES	
Takes images during the examination appropriate to the clinical presentation as per local scanning protocols.	YES	
Correctly annotates images and records images to hard drive	YES	
Correctly evaluates all major organs	YES	
Correctly identifies normal and abnormal anatomy	YES	
Reviews images for quality and pathology.	YES	
Attends to the post examination needs of the patient.	YES	
5.0 Clinical Reporting Skills:		
Knows own limitations - Where the appearances fall outside the personal knowledge of the operator, seek advice from other clinicians.	YES	
Recognises the limitations of ultrasound as a diagnostic tool and make recommendations for appropriate secondary examination or onward referral where required.	YES	
Correctly summarises diagnostic findings to patient and give differential diagnoses where the operator may doubt the findings.	YES	
Correctly describes the ultrasound appearances with the relevant measurements as necessary	YES	

Correctly formulates report, using correct medical terminology, forming a diagnostic opinion and recommending further investigations or onwards referral if necessary.	YES	
Able to check report text for accuracy of spelling, grammar and clinical content.	YES	
Verify patient report and save in patient record	YES	
Know when specialist referral is necessary and make such recommendations to the referring clinician	YES	
Recognise clinically significant pathology and take appropriate action to facilitate rapid onward referral.	YES	
6.0 Underpinning Knowledge:		
Typical indications for US testes	YES	
What is the optimum frequency used during the examination and why?	YES	
If a varicocele was identified how might you extend the examination and why?	YES	
If a suspected testicular tumour was identified what would be the next step	YES	
What is the significance of microcalcifications under the US guidelines?	YES	

Clinical Assessment: Thyroid

Skills & Knowledge Indicators	Standard Achieved	Assessors Notes
4.0 Clinical Scanning Skills:		
Selects correct transducer for the examination.	YES	
Prepares the patient for the examination.	YES	
Positions the patient correctly for the examination	YES	
Ensure a permanent record of all major organs being examined is maintained. Examines each organ in at least two planes and measurements made of the size of major organs and vessels and abnormal findings	YES	
Takes images during the examination appropriate to the clinical presentation as per local scanning protocols.	YES	
Correctly annotates images and records images to hard drive	YES	
Correctly evaluates all major organs	YES	
Correctly identifies normal and abnormal anatomy	YES	
Reviews images for quality and pathology.	YES	
Attends to the post examination needs of the patient.	YES	
5.0 Clinical Reporting Skills:		
Knows own limitations - Where the appearances fall outside the personal knowledge of the operator, seek advice from other clinicians.	YES	
Recognises the limitations of ultrasound as a diagnostic tool and make recommendations for appropriate secondary examination or onward referral where required.	YES	
Correctly summarises diagnostic findings to patient and give differential diagnoses where the operator may doubt the findings.	YES	
Correctly describes the ultrasound appearances with the relevant measurements as necessary	YES	

Correctly formulates report, using correct medical terminology, forming a diagnostic opinion and recommending further investigations or onwards referral if necessary.	YES	
Able to check report text for accuracy of spelling, grammar and clinical content.	YES	
Verify patient report and save in patient record	YES	
Know when specialist referral is necessary and make such recommendations to the referring clinician	YES	
Recognise clinically significant pathology and take appropriate action to facilitate rapid onward referral.	YES	
6.0 Underpinning Knowledge:		
Prior to the assessment, sonographers are required to make brief notes on the following subjects and bring them to the assessment.		
Typical indications for US of the thyroid	YES	
Anatomy of the lymph node chains of the neck	YES	
Anatomy of neck great vessels	YES	
US appearances of thyroid nodules	YES	
What is U-Classifications for thyroid	YES	

Clinical Assessment: Paediatric Abdomen

Skills & Knowledge	Standard Achieved	Assessors Notes
4.0 Clinical Scanning Skills:		
Selects correct transducer for the examination.	YES	
Prepares the patient and parent/guardian for the examination.	YES	
Position the patient correctly for the examination	YES	
Ensure a permanent record of all major organs being examined is maintained. Examines each organ in at least two planes and measurements made of the size of major organs and vessels and abnormal finding.	YES	
Takes images during the examination appropriate to the clinical presentation as per local scanning protocols.	YES	
Correctly annotates images and records images to hard drive	YES	
Correctly evaluates all major organs	YES	
Correctly identifies any abnormal pathology and takes appropriate images	YES	
Correctly identifies normal and abnormal anatomy	YES	
Reviews images for quality and pathology.	YES	
Attends to the post examination needs of the patient.	YES	
5.0 Clinical Reporting Skills:		
Knows own limitations - Where the appearances fall outside the personal knowledge of the operator, seek advice from other clinicians.	YES	
Recognises the limitations of ultrasound as a diagnostic tool in the paediatric patient and make recommendations for appropriate secondary examination or onward referral where required.	YES	
Correctly summarises diagnostic findings to patient (or legal guardian) and give differential diagnoses where the operator may doubt the findings.	YES	
Correctly describes the ultrasound appearances with the relevant measurements as necessary and to compare with any previous available imaging.	YES	
Correctly formulates report, using correct medical terminology, forming a diagnostic opinion and recommending further investigations or onwards referral if necessary.	YES	

Able to check report text for accuracy of spelling, grammar and clinical content.	YES	
Verify patient report and save in patient record	YES	
Know when specialist referral is necessary and make such recommendations to the referring clinician	YES	
Recognise clinically significant pathology and take appropriate action to facilitate rapid onward referral.	YES	
6.0 Underpinning Knowledge:		
Prior to the assessment, Sonographers are required to make brief notes on the following subjects and bring them to the assessment.	YES	
Typical indications for Ultrasound of the paediatric abdomen	YES	
How to extend the examination if certain pathologies are identified, give examples.	YES	
Typical normal sizes of organs- kidneys and spleen.	YES	
Describe 3 abnormalities of the abdomen and their ultrasound appearance.	YES	

Clinical Assessment: Paediatric Renal Tract

Skills & Knowledge I	Standard Achieved	Assessors Notes
4.0 Clinical Scanning Skills:		
Selects correct transducer for the examination.	YES	
Prepares the patient and parent/gaurdian for the examination.	YES	
Position the patient correctly for the examination	YES	
Ensure a permanent record of all major organs being examined is maintained. Examines each organ in at least two planes and measurements made of the size of major organs and vessels and abnormal finding.	YES	
Takes images during the examination appropriate to the clinical presentation as per local scanning protocols.	YES	
Correctly annotates images and records images to hard drive	YES	
Correctly evaluates all major organs	YES	
Correctly identifies any abnormal pathology and takes appropriate images	YES	
Correctly identifies normal and abnormal anatomy	YES	
Reviews images for quality and pathology.	YES	
5.0 Clinical Reporting Skills:		
Knows own limitations - Where the appearances fall outside the personal knowledge of the operator, seek advice from other clinicians.	YES	
Recognises the limitations of ultrasound as a diagnostic tool in the paediatric patient and make recommendations for appropriate secondary examination or onward referral where required.	YES	
Correctly summarises diagnostic findings to patient (or legal guardian) and give differential diagnoses where the operator may doubt the findings.	YES	
Correctly describes the ultrasound appearances with the relevant measurements as necessary and to compare with any previous available imaging.	YES	
Correctly formulates report, using correct medical terminology, forming a diagnostic opinion and recommending further investigations or onwards referral if necessary.	YES	

Able to check report text for accuracy of spelling, grammar and clinical content.	YES	
Verify patient report and save in patient record	YES	
Know when specialist referral is necessary and make such recommendations to the referring clinician	YES	
Recognise clinically significant pathology and take appropriate action to facilitate rapid onward referral.	YES	
6.0 Underpinning Knowledge:		
Typical indications for US renal tract in the paediatric patient	YES	
Name at least 3 congenital renal anomalies that you may identify on ultrasound.	YES	
What is an urachal remnant? Describe an urachal cyst vs a patent urachus	YES	
Common ultrasound features of post vesicoureteral reflux procedures	YES	
According to local protocol – in what position should all babies and toddlers kidneys be scanned? Why?	YES	
What ultrasound probe should be selected for paediatric studies and why?	YES	
Describe the ultrasound features of distal ureteric dilatation and how will you extend your study?	YES	
Do you know the normal position and appearance of the adrenal glands? When are you most likely to visualise this? Why is this important to assess this especially in the neonate.	YES	

Clinical Assessment: Paediatric Pelvis (transabdominal)

Skills & Knowledge	Standard Achieved	Assessors Notes
4.0 Clinical Scanning Skills:		
Selects correct transducer for the examination.	YES	
Prepares the patient for the examination.	YES	
Positions the patient correctly for the examination	YES	
Ensure a permanent record of all major organs being examined is maintained. Examines each organ in at least two planes and measurements made of the size of major organs and vessels and abnormal finding.	YES	
Takes images during the examination appropriate to the clinical presentation as per local scanning protocols.	YES	
Correctly annotates images and records images to hard drive	YES	
Correctly evaluates all major organs	YES	
Correctly identifies normal and abnormal anatomy	YES	
Reviews images for quality and pathology.	YES	
Attends to the post examination needs of the patient/ legal guardian.	YES	
5.0 Clinical Reporting Skills:		
Knows own limitations - Where the appearances fall outside the personal knowledge of the operator, seek advice from other clinicians.	YES	
Recognises the limitations of ultrasound as a diagnostic tool and make recommendations for appropriate secondary examination or onward referral where required.	YES	
Correctly summarises diagnostic findings to patient and give differential diagnoses where the operator may doubt the findings.	YES	
Correctly describes the ultrasound appearances with the relevant measurements as necessary	YES	

Correctly formulates report, using correct medical terminology, forming a diagnostic opinion and recommending further investigations or onwards referral if necessary.	YES	
Able to check report text for accuracy of spelling, grammar and clinical content.	YES	
Know when specialist referral is necessary and make such recommendations to the referring clinician	YES	
Recognise clinically significant pathology and take appropriate action to facilitate rapid onward referral.	YES	
6.0 Underpinning Knowledge:		
Typical indications for an Ultrasound scan of the paediatric female pelvis and their Ultrasound appearance.	YES	
Why is it possible to identify prominent follicles in a paediatric pelvis?	YES	
How would you manage a paediatric patient with an ovarian cyst.	YES	
Describe the uterine shape at different ages	YES	

Clinical Assessment: Musculoskeletal (miscellaneous lumps, bumps or tears).

Skills & Knowledge	Standard Achieved	Assessors Notes
4.0 Clinical Scanning Skills:		
Selects correct transducer for the examination.	YES	
Prepares the patient for the examination.	YES	
Positions the patient correctly for the examination	YES	
Ensure a permanent record of the area being examined is maintained. Each area being examined in at least	YES	
Takes images during the examination appropriate to the clinical presentation as per local scanning protocols	YES	
Correctly annotates images and records images to hard drive	YES	
Correctly evaluates all relevant anatomy	YES	
Correctly identifies normal and abnormal anatomy	YES	
Reviews images for quality and pathology.	YES	
Attends to the post examination needs of the patient.	YES	
5.0 Clinical Reporting Skills:		
Knows own limitations - Where the appearances fall outside the personal knowledge of the operator, seek advice from other clinicians.	YES	
Recognises the limitations of ultrasound as a diagnostic tool and make recommendations for appropriate secondary examination or onwards referral where applicable.	YES	
Correctly summarises diagnostic findings to patient and give differential diagnoses where the operator may doubt the findings.	YES	

Correctly describes the ultrasound appearances with the relevant measurements as necessary	YES	
Correctly formulates report, using correct medical terminology, forming a diagnostic opinion and recommending further investigations or onwards referral if necessary.	YES	
Able to check report text for accuracy of spelling, grammar and clinical content.	YES	
Verify patient report and save in patient record	YES	
Know when specialist referral is necessary and make such recommendations to the referring clinician	YES	
Recognise clinically significant pathology and take appropriate action to facilitate rapid onward referral.	YES	
Correctly select patient study and send all images to PACS system and for successful transmission of images.	YES	
6.0 Underpinning Knowledge:		
Prior to the assessment, Sonographers are required to make brief notes on the following subjects and bring them to the assessment.		
Typical indications for US of lump or soft tissue	YES	
Ultrasound appearances of a simple lipoma	YES	
Where is a lipoma most commonly found	YES	
Ultrasound appearances of an enlarged lymph node	YES	
Ultrasound appearances of a ganglion, where are they most commonly found	YES	

Clinical Assessment: Shoulder

Skills & Knowledge Indicators	Standard Achieved	Assessors Notes
4.0 Clinical Scanning Skills:		
Selects correct transducer for the examination.	YES	
Prepares the patient for the examination.	YES	
Positions the patient correctly for the examination	YES	
Ensure a permanent record of the area being examined is maintained. Each area being examined in at least	YES	
Takes images during the examination appropriate to the clinical presentation as per local scanning protocols	YES	
Correctly annotates images and records images to hard drive	YES	
Correctly evaluates all relevant anatomy	YES	
Correctly identifies normal and abnormal anatomy	YES	
Reviews images for quality and pathology.	YES	
Attends to the post examination needs of the patient.	YES	
5.0 Clinical Reporting Skills:		
Knows own limitations - Where the appearances fall outside the personal knowledge of the operator, seek advice from other clinicians.	YES	
Recognises the limitations of ultrasound as a diagnostic tool and make recommendations for appropriate secondary examination or onward referral where required.	YES	
Correctly summarises diagnostic findings to patient and give differential diagnoses where the operator may doubt the findings.	YES	
Correctly describes the ultrasound appearances with the relevant measurements as necessary	YES	
Correctly formulates report, using correct medical terminology, forming a diagnostic opinion and recommending further investigations or onwards referral if necessary.	YES	

Able to check report text for accuracy of spelling, grammar and clinical content.	YES	
Verify patient report and save in patient record	YES	
Know when specialist referral is necessary and make such recommendations to the referring clinician	YES	
Recognise clinically significant pathology and take appropriate action to facilitate rapid onward referral.	YES	
Correctly select patient study and send all images to PACS system and for successful transmission of images	YES	
6.0 Underpinning Knowledge:		
Typical indications for US of the shoulder	YES	
What is imaged when examining the shoulder	YES	
What is a full thickness tear	YES	
What is the rotator cuff interval	YES	
Describe the ultrasound appearances of a distended SASD bursa (chronic or acute)	YES	

Clinical Assessment: Achilles

Skills & Knowledge Indicators	Standard Achieved	Assessors Notes
4.0 Clinical Scanning Skills:		
Selects correct transducer for the examination.	YES	
Prepares the patient for the examination.	YES	
Positions the patient correctly for the examination	YES	
Ensure a permanent record of the area being examined is maintained. Each area being examined in at least	YES	
Takes images during the examination appropriate to the clinical presentation as per local scanning protocols	YES	
Correctly annotates images and records images to hard drive	YES	
Correctly evaluates all relevant anatomy	YES	
Correctly identifies normal and abnormal anatomy	YES	
Reviews images for quality and pathology.	YES	
Attends to the post examination needs of the patient.	YES	
5.0 Clinical Reporting Skills:		
Knows own limitations - Where the appearances fall outside the personal knowledge of the operator, seek advice from other clinicians.	YES	
Recognises the limitations of ultrasound as a diagnostic tool and make recommendations for appropriate secondary examination or onward referral where required.	YES	
Correctly summarises diagnostic findings to patient and give differential diagnoses where the operator may doubt the findings.	YES	
Correctly describes the ultrasound appearances with the relevant measurements as necessary	YES	
Correctly formulates report, using correct medical terminology, forming a diagnostic opinion and recommending further investigations or onwards referral if necessary.	YES	

Able to check report text for accuracy of spelling, grammar and clinical content.	YES	
Verify patient report and save in patient record	YES	
Know when specialist referral is necessary and make such recommendations to the referring clinician	YES	
Recognise clinically significant pathology and take appropriate action to facilitate rapid onward referral.	YES	
Correctly select patient study and send all images to PACS system and for successful transmission of images.	YES	
6.0 Underpinning Knowledge:		
Typical indications for US of the Achilles	YES	
What is the difference between a tendinitis and a tendinosis	YES	
What is a paratenon?	YES	
Describe the ultrasound appearances of Haglunds syndrome.	YES	
Indicate the bursae in the Achilles region that you would assess.	YES	

Clinical Assessment: Foot and Ankle

Skills & Knowledge Indicators	Standard Achieved	Assessors Notes
4.0 Clinical Scanning Skills:		
Selects correct transducer for the examination.	YES	
Prepares the patient for the examination.	YES	
Positions the patient correctly for the examination	YES	
Ensure a permanent record of the area being examined is maintained. Each area being examined in at least	YES	
Takes images during the examination appropriate to the clinical presentation as per local scanning protocols	YES	
Correctly annotates images and records images to hard drive	YES	
Correctly evaluates all relevant anatomy	YES	
Correctly identifies normal and abnormal anatomy	YES	
Reviews images for quality and pathology.	YES	
Attends to the post examination needs of the patient.	YES	
5.0 Clinical Reporting Skills:		
Knows own limitations - Where the appearances fall outside the personal knowledge of the operator, seek advice from other clinicians.	YES	
Recognises the limitations of ultrasound as a diagnostic tool and make recommendations for appropriate secondary examination or onward referral where required.	YES	
Correctly summarises diagnostic findings to patient and give differential diagnoses where the operator may doubt the findings.	YES	
Correctly describes the ultrasound appearances with the relevant measurements as necessary	YES	
Correctly formulates report, using correct medical terminology, forming a diagnostic opinion and recommending further investigations or onwards referral if necessary.	YES	

Able to check report text for accuracy of spelling, grammar and clinical content.	YES	
Verify patient report and save in patient record	YES	
Know when specialist referral is necessary and make such recommendations to the referring clinician	YES	
Recognise clinically significant pathology and take appropriate action to facilitate rapid onward referral.	YES	
Correctly select patient study and send all images to PACS system and for successful transmission of images.	YES	
6.0 Underpinning Knowledge:		
Typical indications for US of the foot and ankle	YES	
What is imaged when examining the foot for a Morton's neuroma	YES	
Describe the anatomy of the medial ankle tendons	YES	
Describe the ultrasound appearances of a plantar fasciitis	YES	
Which ankle ligaments can be imaged successfully with ultrasound?	YES	

Clinical Assessment: Knee

Skills & Knowledge Indicators	Standard Achieved	Assessors Notes
4.0 Clinical Scanning Skills:		
Selects correct transducer for the examination.	YES	
Prepares the patient for the examination.	YES	
Positions the patient correctly for the examination	YES	
Ensure a permanent record of the area being examined is maintained. Each area being examined in at least	YES	
Takes images during the examination appropriate to the clinical presentation as per local scanning protocols	YES	
Correctly annotates images and records images to hard drive	YES	
Correctly evaluates all relevant anatomy	YES	
Correctly identifies normal and abnormal anatomy	YES	
Reviews images for quality and pathology.	YES	
Attends to the post examination needs of the patient.	YES	
5.0 Clinical Reporting Skills:		
Knows own limitations - Where the appearances fall outside the personal knowledge of the operator, seek advice from other clinicians.	YES	
Recognises the limitations of ultrasound as a diagnostic tool and make recommendations for appropriate secondary examination or onward referral where required.	YES	
Correctly summarises diagnostic findings to patient and give differential diagnoses where the operator may doubt the findings.	YES	
Correctly describes the ultrasound appearances with the relevant measurements as necessary	YES	
Correctly formulates report, using correct medical terminology, forming a diagnostic opinion and recommending further investigations or onwards referral if necessary.	YES	

Able to check report text for accuracy of spelling, grammar and clinical content.	YES	
Verify patient report and save in patient record	YES	
Know when specialist referral is necessary and make such recommendations to the referring clinician	YES	
Recognise clinically significant pathology and take appropriate action to facilitate rapid onward referral.	YES	
Correctly select patient study and send all images to PACS system and for successful transmission of images.	YES	
6.0 Underpinning Knowledge:		
Typical indications for US of the knee	YES	
What is imaged when examining the knee	YES	
Which tendons/muscles make up the quadriceps tendon	YES	
What is a Baker's cyst?	YES	
Describe the locations of the bursae of the knee	YES	

Clinical Assessment: Hand and Wrist

Skills & Knowledge Indicators	Standard Achieved	Assessors Notes
4.0 Clinical Scanning Skills:		
Selects correct transducer for the examination.	YES	
Prepares the patient for the examination.	YES	
Positions the patient correctly for the examination	YES	
Ensure a permanent record of the area being examined is maintained. Each area being examined in at least	YES	
Takes images during the examination appropriate to the clinical presentation as per local scanning protocols	YES	
Correctly annotates images and records images to hard drive	YES	
Correctly evaluates all relevant anatomy	YES	
Correctly identifies normal and abnormal anatomy	YES	
Reviews images for quality and pathology.	YES	
Attends to the post examination needs of the patient.	YES	
5.0 Clinical Reporting Skills:		
Knows own limitations - Where the appearances fall outside the personal knowledge of the operator, seek advice from other clinicians.	YES	
Recognises the limitations of ultrasound as a diagnostic tool and make recommendations for appropriate secondary examination or onward referral where required.	YES	
Correctly summarises diagnostic findings to patient and give differential diagnoses where the operator may doubt the findings.	YES	
Correctly describes the ultrasound appearances with the relevant measurements as necessary	YES	
Correctly formulates report, using correct medical terminology, forming a diagnostic opinion and recommending further investigations or onwards referral if necessary.	YES	

Able to check report text for accuracy of spelling, grammar and clinical content.	YES	
Verify patient report and save in patient record	YES	
Know when specialist referral is necessary and make such recommendations to the referring clinician	YES	
Recognise clinically significant pathology and take appropriate action to facilitate rapid onward referral.	YES	
Correctly select patient study and send all images to PACS system and for successful transmission of images.	YES	
6.0 Underpinning Knowledge:		
Typical indications for US of the hand and wrist	YES	
What is the difference between tendinitis and tenosynovitis	YES	
Which are the ultrasound appearances of carpal tunnel syndrome	YES	
Describe the ultrasound appearances of active rheumatoid disease	YES	
Where is Guyon's canal?	YES	

Clinical Assessment: Elbow

Skills & Knowledge Indicators	Standard Achieved	Assessors Notes
4.0 Clinical Scanning Skills:		
Selects correct transducer for the examination.	YES	
Prepares the patient for the examination.	YES	
Positions the patient correctly for the examination	YES	
Ensure a permanent record of the area being examined is maintained. Each area being examined in at least	YES	
Takes images during the examination appropriate to the clinical presentation as per local scanning protocols	YES	
Correctly annotates images and records images to hard drive	YES	
Correctly evaluates all relevant anatomy	YES	
Correctly identifies normal and abnormal anatomy	YES	
Reviews images for quality and pathology.	YES	
Attends to the post examination needs of the patient.	YES	
5.0 Clinical Reporting Skills:		
Knows own limitations - Where the appearances fall outside the personal knowledge of the operator, seek advice from other clinicians.	YES	
Recognises the limitations of ultrasound as a diagnostic tool and make recommendations for appropriate secondary examination or onward referral where required.	YES	
Correctly summarises diagnostic findings to patient and give differential diagnoses where the operator may doubt the findings.	YES	
Correctly describes the ultrasound appearances with the relevant measurements as necessary	YES	
Correctly formulates report, using correct medical terminology, forming a diagnostic opinion and recommending further investigations or onwards referral if necessary.	YES	

Able to check report text for accuracy of spelling, grammar and clinical content.	YES	
Verify patient report and save in patient record	YES	
Know when specialist referral is necessary and make such recommendations to the referring clinician	YES	
Recognise clinically significant pathology and take appropriate action to facilitate rapid onward referral.	YES	
Correctly select patient study and send all images to PACS system and for successful transmission of images.	YES	
6.0 Underpinning Knowledge:		
Typical indications for US of the elbow	YES	
What is imaged when examining the elbow?	YES	
What is medial epicondylitis also known as?	YES	
Describe the ultrasound appearances of a lateral epicondylitis	YES	

Clinical Assessment: Groin & Inguinal Canal

Skills & Knowledge Indicators	Standard Achieved	Assessors Notes
4.0 Clinical Scanning Skills:		
Selects correct transducer for the examination.	YES	
Prepares the patient for the examination.	YES	
Positions the patient correctly for the examination	YES	
Ensure a permanent record of the area being examined is maintained. Each area being examined in at least	YES	
Takes images during the examination appropriate to the clinical presentation as per local scanning protocols	YES	
Correctly annotates images and records images to hard drive	YES	
Correctly evaluates all relevant anatomy	YES	
Correctly identifies normal and abnormal anatomy	YES	
Reviews images for quality and pathology.	YES	
Attends to the post examination needs of the patient.	YES	
5.0 Clinical Reporting Skills:		
Knows own limitations - Where the appearances fall outside the personal knowledge of the operator, seek advice from other clinicians.	YES	
Recognises the limitations of ultrasound as a diagnostic tool and make recommendations for appropriate secondary examination or onward referral where required.	YES	
Correctly summarises diagnostic findings to patient and give differential diagnoses where the operator may doubt the findings.	YES	
Correctly describes the ultrasound appearances with the relevant measurements as necessary	YES	
Correctly formulates report, using correct medical terminology, forming a diagnostic opinion and recommending further investigations or onwards referral if necessary.	YES	

Able to check report text for accuracy of spelling, grammar and clinical content.	YES	
Verify patient report and save in patient record	YES	
Know when specialist referral is necessary and make such recommendations to the referring clinician	YES	
Recognise clinically significant pathology and take appropriate action to facilitate rapid onward referral.	YES	
Correctly select patient study and send all images to PACS system and for successful transmission of images.	YES	
6.0 Underpinning Knowledge:		
Typical indications for US of the groin	YES	
What is imaged when examining the groin	YES	
Why is the examination a dynamic study?	YES	
Describe the differences between an inguinal hernia, femoral hernia, umbilical hernia and Spigelian hernia.	YES	

13. References

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