SCoR
THE SOCIETY & COLLEGE OF RADIOGRAPHERS

Work Related Musculoskeletal Disorders (Sonographers)

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Executive summary

The Society and College of Radiographers (SCoR) receives many enquiries from sonographers about work-related musculoskeletal disorders (WRMSDs) and ways to prevent them. The following is a compilation of some of the most common questions and the answers that have been given. It provides a broad overview of the subject and gives links to more definitive documentation and advice.

Background

WRMSDs are common among sonographers[1,2]. Mechanisms leading to WRMSD are multifaceted and literature is available to suggest ways to reduce risks and prevent further harm. Due to the plethora of information available, this document is designed to be read as an overview of the topic, with reference to relevant documents where in-depth information can be found.

An employer has a legal responsibility under the Health and Safety at Work Act (1974)[3] and Management of Health and Safety at Work Regulations (1999)[4] to ensure the health, safety and welfare at work of their employees. There is also a duty to provide appropriate equipment and training within the legislation, as documented in the Health and Safety (Display Screen Equipment) Regulations (1992)[5] and Manual Handling Operations Regulations 1992[6].

1. What information and general advice is available on WRMSDs?

A sonographer should aim for what might be called 'sensible scanning' practices. If a sonographer feels that conditions are likely to induce or exacerbate WRMSDs, whether as a result of the workload, inadequate equipment, reporting facilities, high patient body mass index (BMI) or list management, or for other reasons, it is their professional duty to inform their manager, preferably in writing, at an early stage. Incident reporting should take place if a sonographer does experience work-related injuries, as this allows occupational health and the senior management team to assess for trends within a department.

The Health and Safety Executive's (HSE's) Upper Limb Disorders in the Workplace (HSG 60)[7] outlines what upper limb disorders are, what causes them and what preventative measures can be taken to avoid them. This guidance stresses the need for risk assessments and for applying ergonomic principles so that the job fits the worker rather than the other way round. The guidance makes it clear that employers should look at the principal risk categories:

- task related – repetition, working postures, force and duration of exposure
- worker related – individual differences

- environment related – the working environment and psychosocial factors

The SCoR has published several documents that give advice on WRMSDs and how their incidence can be reduced. These can all be accessed via the SCoR website[8]:

In 2012 the HSE published a report on WRMSD problems in ultrasound, which is advised reading. The report highlights issues within ultrasound departments and practice and provides suggestions for action[2].

1.1 Working practice

There are changes that can be made to working practices to reduce the chance of developing WRMSD. Public Health England[9] advises that all staff should have an understanding of "good MSK [musculoskeletal] health workplace practice" and know how to use MSK toolkits in practice.

1.1.1 Service delivery

- If at all possible, scanning lists should have a variety of case types, rather than a long sequence of the same types of examination, to vary muscle movements.
- From the perspective of preventing WRMSDs, ultrasound examinations on wards should be limited to those cases where the examination is clinically important and the patient cannot be brought safely to the department. This guidance can be relaxed if there are proper facilities for scanning on the ward, the equipment is suitable and the proposed scanning activity has been risk-assessed.

Two documents relating to ultrasound service delivery are of relevance:

- RCR/SCoR (2014) "Standards for the Provision of an Ultrasound Service"[10]
- SCoR/BMUS (2019) "Guidelines for Professional Ultrasound Practice" Section 1.9[11]

1.1.2 Breaks

- The HSE website gives information on the legal requirement for work breaks under the Working Time Regulations[12].

There is also guidance about screen breaks for those using visual display units (VDUs)[13].

- Mini and micro breaks are important with regard to good scanning practice and are also discussed in Society of Diagnostic Medical Sonography (SDMS) and SCoR documents[14,15]. These can be as simple as taking the transducer off the patient and resting the arm while taking measurements.
- When using a computer for reporting during a scan, the sonographer should try to avoid holding the probe on the patient while entering data with the other hand.
- Utilising breaks to effectively change the pressure placed on the body from scanning is advised. If breaks are spent, for example, looking at screens, typing on mobile devices and sitting down, this will use similar muscle groups to scanning, thus reducing the potential for recovery[16].
- Breaks in scanning can be for a variety of work-related reasons as well as scheduled rest breaks such as for lunch. Time should be allowed for continuing professional development (CPD) activities, although allowing time for CPD is unfortunately not yet mandatory for most sonographers[17].

Trusts and health boards do have mandatory requirements for training, some of

which is online and can be completed over several days, e.g. infection control, risk management, health and safety, basic life support. This will all need time to complete and may help to break up what can, in some departments, be an extended day. Such activities as audit, multidisciplinary team meetings, reporting discrepancy meetings, Fetal Anomaly Screening Programme (FASP) quality procedures, including the Down's Syndrome Screening Quality Assurance Support Service (DQASS), student mentoring and protocol updating can all form part of a working day and can be considered as breaks from physical scanning.

1.2 Physical aspects and ergonomics

- The Visual Display Unit (VDU) regulations apply and sonographers and managers should be aware of these. Employers should provide free eyesight tests or allow re-imbursement of the cost of the test and a basic pair of glasses if required for VDU work[18] (see section 4).
- Sonographers should try scanning in different positions (e.g. standing or sitting) and find what is most comfortable. They should be 'body aware', and should alter their position if they are overstretching or feel any aches and pains during a scan.
- Trusts and health boards should have back care and ergonomics advisers available who are able to give advice and undertake risk assessments. SCoR health and safety representatives can also undertake risk assessments.
- Independent providers and those working in the community should ensure that the published good practice principles associated with room layout and design, environment, ultrasound chairs and examination couches are also applied. Equipment selected should be suitable for the task required.
- The patient should be positioned as close as possible to the edge of the couch, thereby minimising the load on the scanning arm through unnecessary leaning and arm abduction. Note that the arm operating the machine controls should also not be extended for long periods as this can exacerbate problems.
- In obstetric scanning, the use of the couch Trendelenburg (head down) function, if available, can help to improve visualisation of the fetus when it is positioned low in the maternal pelvis.
- A relaxed abdomen is easier to scan than a tense one. Careful explanation and the use of patient relaxation techniques can help to reduce the overall time of the examination.
- 'Body mapping' tools are available from the SCoR website. These can help with recording where individual sonographers experience pain or discomfort. They can also be used to audit sonographers across a department/centre over a period of time and to highlight changes following the introduction of new methods of working or new equipment[19].
- Exercises for sonographers can be found in the 2007 SCoR document 'Prevention of Work Related Musculoskeletal Disorders in Sonography'[20] and also via online searches. Warm-up exercises prior to a scanning session and gentle stretching during the working day have been found to be effective by many sonographers.

The HSE also has guidance: 'Exercises to reduce musculoskeletal discomfort for people doing a range of static and repetitive work' (2011)[21].

- Courses on the use of the Alexander Technique for sonographers have proved popular for improving awareness of posture and movement.
- Increased muscle strength has been shown to reduce the risk of injury. Physical activity, particularly regular muscle- and bone-strengthening activities, are recommended by Public Health England[9], and Pilates has been suggested as another way to reduce the chance of developing WRMSDs.

1.3 Facilities and environment

The environment should be comfortable for patients and for staff working in the room. Some aspects that can help to reduce the risks of WRMSDs include the following:

- The temperature of the ultrasound room should be able to be set as required by the sonographer for a more comfortable working environment. Ultrasound rooms tend to be overheated and air conditioning can be very welcome, although a room that is too cold can also exacerbate muscular injury and can, in addition, be a problem from the point of view of patient care. Having effective control of room temperature will, in turn, lead to a more productive and less stressful working environment. Equipment must be stored and used following the manufacturer's published advice with respect to room temperature.
- Room lighting should be subdued, but not to the point that movement becomes hazardous.
- Slave monitors are recommended by the FASP in Scotland[22] for the two obstetric screening scans under its remit.

Additional information about the working environment, room dimensions, room temperature, workstation set-up and general workplace facilities is available in the HSE (2013) document 'Workplace health, safety and welfare: Workplace (Health, Safety and Welfare) Regulations 1992'[23].

2. Is there any published advice on examination times?

The SCoR has published an advice document on ultrasound examination times[24]. In addition, other documents provide examination time guidance.

Times for the two obstetric ultrasound screening scans are now within NHS England FASP Service Specifications Nos 16 and 17.

- Service specification 16[25], page 10 (the ultrasound component of the combined screening test) suggests a minimum of 20 minutes.
- Service specification 17[26], page 10 (18+0 to 20+6 weeks ultrasound scan) suggests a minimum of 30 minutes for a singleton pregnancy and 45 minutes for a multiple pregnancy.

NICE Guidelines on Multiple Pregnancy (CG 129) published in September 2011[27] state that:

- 45 minutes should be allowed for anomaly scans in twin and triplet pregnancies (section 1.3.3.3, page 19), concurring with FASP guidelines
- 30 minutes should be allowed for growth scans on twins and triplets (section 1.3.3.4, page 19)

The Abdominal Aortic Aneurysm Screening Programme (2017) has guidance on clinic booking times and overall session numbers in its Standard Operating Procedures28. Appointments are at 5- to 10-minute intervals, with short breaks within each session, to include 15 to 18 scans in a 3-hour session.

Sonographers have a professional responsibility to ensure that the time allocated for an examination is sufficient for it to be carried out and reported

safely and competently. If there are concerns, these should be raised with the manager in the first instance and any subsequent risks, as a result of inadequate time allocation, should be reported in a risk report.

3. Does the SCoR have any advice on how to scan with the non-dominant hand?

We do not have any specific advice at present. The advantage of scanning with the non-dominant hand is that the dominant hand and arm can be rested, but there is then the risk of additional problems arising on the non-dominant side. Time will also be needed to adapt to scanning with the non-dominant hand, and this will inevitably initially increase examination times[29,30]. A small study of eight sonographers[29] showed longer scan times when learning to scan with the non-dominant hand, and seven of the participants experienced pain in their left hand during the scan. It is also not easy to change the physical layout of many ultrasound rooms and time must be allowed for this in examination schedules.

Before any changes are made, the employer has a legal duty to conduct a risk assessment, and a full review of the practicalities should be undertaken. Engaging sonographers in this risk assessment is good practice as employers are then fully aware of what actually happens within the department and not simply what is assumed to happen.

It is also worth noting that sonographers use both hands as a matter of routine: the non-scanning hand is continually manipulating the equipment settings, which can also put strain on muscles and tendons if posture is poor.

4. What do the regulations say about eye tests?

Although it is not a legal requirement, sonographers have a clear professional duty to ensure that their eyesight is regularly tested and that glasses or contact lenses are worn if required. Eyesight may deteriorate subtly over a period of time, hence the importance of regular testing. Sonographers are classed as VDU users owing to the considerable time they spend looking at screens while scanning and inputting information, and employers should provide free eyesight tests or allow for re-imbursement of the cost of the test. The employer does not have a legal obligation to permit paid time off to attend an eye test.

Under the HSE guidance on VDUs[31] the employer must also pay for a basic pair of glasses if required: “If a user or a potential user requests an eye test you are required to provide one. If the test shows that the user needs glasses specifically for DSE [display screen equipment] work, you must pay for a basic pair of frames and lenses. Eye tests are not an entitlement for the self-employed”

5. What should I do if there are problems?

The employer has a legal duty to conduct a risk assessment before any changes in work practice are made4,32. These can include changing scanning times, changes in equipment, changes in rota systems or out-of-hours cover, and extending the working day. When there has been any accident or injury, the risk assessment needs to be reviewed, and risks acted upon.

All ultrasound rooms and procedures should be subject to a regular and on-going risk assessment process.

If sonographers are suffering from a WRMSD they should ask their local health and safety representative or industrial relations representative to look at the risk assessment in place, and check whether any risks were noted on a previous assessment, and what preventative measures were taken.

- It is important that concerns about WRMSDs are put in writing to management.
- If an injury has been sustained during the course of employment, the sonographer should report this to their manager, complete an incident report and seek advice from occupational health.
- Many departments have open access for sonographers to physiotherapy or back care specialists.

6. I scan for more than one employer. How does this affect me as far as WRMSDs are concerned?

Many sonographers also undertake sessional work on a private basis or for an additional employer to their main NHS employer. The above considerations also apply. If the sonographer is already suffering from a WRMSD, this could be exacerbated, particularly if the scanning environment is poor. This may be a consideration if a claim were to be brought against a sonographer's main employer, who may have made every effort to reduce the risk of WRMSDs. Every case is, however, reviewed on its individual circumstances. The extension of working hours either for their main employer or as described above may also affect a sonographer's risk of developing or exacerbating a WRMSD.

7. What other information is available?

Much information can be found on the internet by using search words such as ‘ultrasound’, ‘exercises’ and ‘ergonomics’, ‘WRMSD’ and ‘RSI’. The SCoR does not endorse any particular site or company but a search may be of value to individual sonographers. The usual cautions about the accuracy and content of some web-based material apply.

Guidelines are available from other societies such as:

- Australasian Society of Ultrasound in Medicine (2010) ASA and ASUM joint Guidelines for Reducing Injuries To Sonographers/Sonologists[33]
- Society of Diagnostic Medical Sonography (2017) Industry standards for the prevention of work related musculoskeletal disorders in sonography[14]

There are a number of review articles which provide an overview of the risks and ways to reduce them[1,16,30,34,35] and in 2017 the Society of Diagnostic Medical Sonography produced an infographic, ‘Prevent WRMSDs: ergonomics for sonographers’[36].

8. Do you have any specific information on scanning a patient with a high body mass index (BMI)?

A study of over 1000 sonographers in America suggested that almost 40% were unable to follow industry-standard ergonomic practice because of patient obesity or being too busy[37]. Scanning patients with high BMI can cause overstretching, arm abduction and increased pressure on the transducer[38,39].

The following points are all particularly relevant when scanning high BMI/bariatric patients and are in addition to general good practice methods of reducing the incidence of WRMSDs.

All trusts and health boards should have policies relating to care and manual handling associated with high BMI/bariatric patients, and these should also be available and consulted.

8.1 Equipment

- Use a ‘high BMI’ preset on the machine as a starting point for manipulating the image. Manufacturers can set these up to your requirements at the time of installation and will optimise features such as transducer frequency and harmonics.
- Use good-quality equipment with good harmonics. Use the equipment settings to optimise the image wherever possible.
- Do not exceed the couch weight limit, which should be clearly posted.
- Use available moving and handling aids when necessary; scan in-patients in their beds rather than transferring them to an examination couch.

8.2 Working practices

- Wherever possible, the sonographer workforce should be rotated to ensure that it is not the same sonographer group exposed to risk. This will, of course, depend on the skill mix of the local sonographer workforce.

- Try standing to scan, placing one leg in front of the other in a static lunge if necessary, to ensure that your arms and shoulders are not under strain and your back remains straight (image 1). If standing, ensure the weight is evenly balanced between both feet.

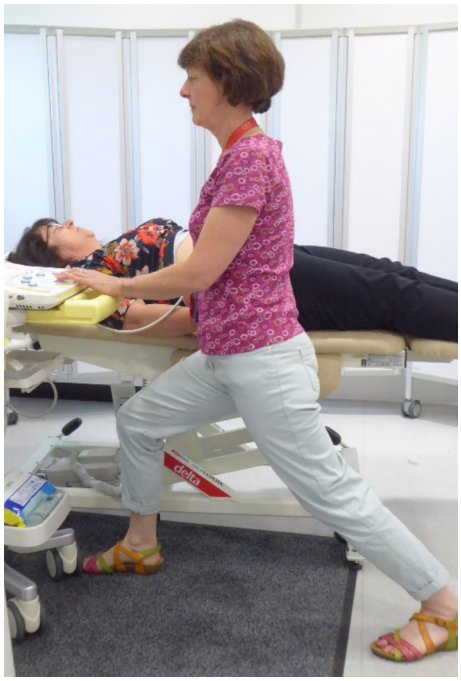

Image 1: A static lunge to reduce arm abduction

- Remember to use micro breaks to relax muscles and tendons during the scan. When measurements are taken, remove the probe from the patient and rest the scanning hand for a few seconds.
- Do not extend the examination time beyond what is normally allowed if there is unlikely to be any gain.
- It may be that a second appointment is necessary in some cases.
- FASP provides guidance with respect to repeat examinations on those women attending for the 18–20+6 week fetal anomaly scan and where the image quality is compromised by an increased BMI. “The woman should be informed that the screening is incomplete and this should be recorded40.” Sensitivity and honesty are needed when discussing this with the woman.
- There is also ‘twice on the couch’ advice for the 11+2 to 14+1 week scan, which forms part of the combined screening test. Women should be referred for second trimester screening if the nuchal translucency cannot be accurately measured at the second attempt.
- Avoid pressing unnecessarily hard and for too long. This may increase the risk of WRMSDs and it can be uncomfortable for the patient. Increased transducer grip or pressure can increase the chance of a WRMSD[41]. A power grip is recommended to reduce the risk of injury.
- Firm pressure may be contra-indicated for some types of pathology or clinical situations.
- Try alternative techniques such as:
- Use a helper to support tissue/fatty aprons (panniculus) and generally assist with the examination.
- Lift the panniculus or scan above or to the side. Often scanning above and angling the probe inferiorly can be useful, rather than trying to scan underneath.
- Decubitus scanning can assist by moving the panniculus to the side away from the region of interest.

- The Sims position[42] can also help. This involves having the patient almost prone on the couch and scanning around the side, thus reducing the tissue mass to be scanned[16].

8.3 Reporting and communication

- Consider the wording of information leaflets about limitations of scanning at the time of booking or use posters within the department[43].
- BMI should be recorded on request forms if it is above 30.
- If image quality is compromised, state in the report how the examination has been affected.
- Record BMI on the report. For obstetrics, it is good practice to do this for all patients, to avoid complaints.
- Be aware of the patient's feelings when discussing limitations.
- Report pain/injury to occupational health or the line manager as a record and so that current practice can be reviewed.
- Keep current practice for high BMI patients under review.

9. How can we protect direct-entry graduate sonographers who will potentially be scanning for many years?

There are many suggestions within this document and associated literature on how to reduce the chance of injury. All ultrasound programmes accredited by the Consortium for the Accreditation of Sonographic Education (CASE) have to include elements of ergonomics and WRMSD reduction[44].

Employers and practice educators can also assist in the education of students, to increase their awareness of poor practice and support them to develop good working posture and habits.

Workload management should also be considered when planning lists and working hours. Supportive working environments, good management and the inclusion of time for other work-related activities should help to reduce the chance of developing injuries.

Students can be encouraged to fully understand ergonomics, risk reduction and personal well-being strategies. Regular risk assessment and body mapping exercises can help with the early identification of concerns.

Summary

WRMSDs are caused by many different factors. This document provides some advice for employers and sonographers, which – if used well – could reduce the chance of injury. The advice and further reading includes statutory information and best-practice guidance covering workload planning, ergonomics, scan time, support and other factors for improving the working environment for sonographers. Changes within departments should be made in partnership with managers, sonographers and occupational health, back care or ergonomics advisers. Regular monitoring of staff workloads, injury rates and posture could highlight any areas of concern that might cause or exacerbate WRMSDs among sonographers, enabling preventative action.

References

1. Murphey, S. (2017). Work Related Musculoskeletal Disorders In Sonography. Journal of Diagnostic Medical Sonography 33, 354–369. Available at: https://doi.org/10.1177/8756479317726767 [Accessed May 29, 2019].
2. Monnington, S.C., Dodd-Hughes, K., Milnes, E., and Ahmad, Y. (2012). Project Report: Risk management of musculoskeletal disorders in sonography work Available at: http://www.hse.gov.uk/healthservices/management-of-musculoskeletal-disorders-in-sonography-work.pdf [Accessed May 29, 2019].
3. HSE (1974). Health and Safety at Work etc Act 1974 – legislation explained Available at: http://www.hse.gov.uk/legislation/hswa.htm [Accessed May 29, 2019].
4. Health and Safety Executive (1999). The Management of Health and Safety at Work Regulations 1999 Available at: http://www.legislation.gov.uk/uksi/1999/3242/contents/made [Accessed May 29, 2019].
5. Health and Safety Executive (1992). The Health and Safety (Display Screen Equipment) Regulations 1992 Available at: http://www.legislation.gov.uk/uksi/1992/2792/made/data.pdf [Accessed May 29, 2019].
6. Health and Safety Executive (2016). Manual handling. Manual Handling Operations Regulations 1992 4th ed. (HSE) Available at: http://www.hse.gov.uk/pubns/priced/l23.pdf [Accessed June 26, 2019].
7. Health and Safety Executive (2002). Upper limb disorders in the workplace 2nd ed. Available at: http://www.hse.gov.uk/pubns/priced/hsg60.pdf [Accessed June 26, 2019].
8. The Society and College of Radiographers Health & safety for sonographers (n.d.). Available at: https://www.sor.org/practice/ultrasound/health-safety-sonographers [Accessed May 29, 2019].
9. Public Health England (2019). Musculoskeletal health: 5 year prevention strategic framework. Available at: https://www.gov.uk/government/publications/musculoskeletal-health-5-year-prevention-strategic-framework [Accessed July 4, 2019].
10. Royal College of Radiologists and Society and College of Radiographers (2014). Standards for the provision of an ultrasound service (London) Available at: https://www.rcr.ac.uk/publication/standards-provision-ultrasound-service [Accessed May 29, 2019].
11. The Society and College of Radiographers and the British Medical Ultrasound Society (2018). Guidelines For Professional Ultrasound

Practice Available at: https://www.sor.org/sites/default/files/document-versions/2019.3.10_scor_bmus_guidelines_amend_mar_2019_final.pdf [Accessed May 29, 2019].
12. Health and Safety Executive (1998). What breaks am I entitled to under the working time regulations? Available at: http://www.hse.gov.uk/contact/faqs/workingtime.htm [Accessed June 5, 2019].
13. Health and Safety Executive (1992). Should VDU users be given breaks? Available at: http://www.hse.gov.uk/contact/faqs/vdubreaks.htm [Accessed June 5, 2019].
14. Society of Diagnostic Medical Sonography (2017). Industry Standards for the Prevention of Work Related Musculoskeletal Disorders in Sonography, developed through a 2016 consensus conference hosted by the Society of Diagnostic Medical Sonography Available at: https://www.sdms.org/docs/default-source/Resources/industry-standards-for-the-prevention-of-work-related-musculoskeletal-disorders-in-sonography.pdf?sfvrsn=6 [Accessed May 29, 2019].
15. Sunley, K. (2006). Industry Standards for the Prevention of Work-related Musculoskeletal Disorders in Sonography. Available at: https://www.sor.org/sites/default/files/document-versions/sor_industrystandards_prevention_musculoskeletal.pdf [Accessed June 12, 2019].
16. Harrison, G., and Harris, A. (2015). Work-related musculoskeletal disorders in ultrasound: Can you reduce risk? Ultrasound 23, 224–230. Available at: http://www.ncbi.nlm.nih.gov/pubmed/27433262 [Accessed May 29, 2019].
17. The Society and College of Radiographers (n.d.). Protected study time. Available at: https://www.sor.org/learning/cpd/protected-study-time [Accessed May 29, 2019].
18. The Society and College of Radiographers (2010). VDU Regulations (H&S (Display Screen Equipment) Regulations): A Guide to dealing with Health and Safety Issues arising from their use. Available at: https://www.sor.org/learning/document-library/vdu-regulations-hs-display-screen-equipment-regulations-guide-dealing-health-and-safety-issues [Accessed May 29, 2019].
19. Society and College of Radiographers (2007). Body mapping: A resource for SoR Health and Safety Representatives Available at: https://www.sor.org/system/files/document-library/public/sor_body_mapping_health_safety_reps.pdf [Accessed May 29, 2019].
20. The Society and College of Radiographers (2007). Prevention of work-related musculoskeletal disorders in sonography Available at: https://www.sor.org/system/files/document-library/members/sor_prevention_work_related_musculoskeletal.pdf [Accessed June 5, 2019].
21. Health and Safety Executive (2011). Exercises to reduce musculoskeletal discomfort for people doing a range of static and repetitive work Available at: http://www.hse.gov.uk/research/rrhtm/rr743.htm [Accessed May 29, 2019].
22. NHS Scotland (2015). Fetal Anomaly and Down's Syndrome Screening Available at: https://www.nsd.scot.nhs.uk/publications/other/guidelines.html [Accessed July 17, 2019].
23. Health and Safety Executive (2013). Workplace health, safety and welfare : Workplace (Health, Safety and Welfare) Regulations 1992 : Approved Code of Practice and Guidance. Available at: http://www.hse.gov.uk/pubns/priced/l24.pdf [Accessed May 29, 2019].
24. The Society and College of Radiographers (2015). Ultrasound examination times and appointments. Available at: https://www.sor.org/learning/document-library/ultrasound-examination-times-and-appointments-0 [Accessed May 29, 2019].
25. NHS Fetal Anomaly Screening Programme (2018). NHS public health functions agreement 2018-19 Service specification no.16 NHS Fetal

Anomaly Screening Programme-Screening for Down's Syndrome, Edwards' Syndrome and Patau's Syndrome (Trisomy 21, 18 & 13) Available at: https://www.england.nhs.uk/wp-content/uploads/2017/04/Gateway-ref-07837-180913-Service-specification-No.-16-NHS-FASP-Trisomy-screening-2018-19.pdf [Accessed May 29, 2019].
26. NHS Fetal Anomaly Screening Programme (2018). NHS public health functions agreement 2018-19 Service specification no.17 NHS Fetal Anomaly Screening Programme - 18+0 to 20+6 week fetal anomaly scan Available at: https://www.england.nhs.uk/wp-content/uploads/2017/04/Gateway-ref-07838-180913-Service-specification-No.-17-NHS-FASP-Fetal-anomaly-scan.pdf [Accessed May 29, 2019].
27. National Institute for Health and Care Excellence (2011). Multiple pregnancy: antenatal care for twin and triplet pregnancies. Available at: https://www.nice.org.uk/guidance/cg129/resources/multiple-pregnancy-antenatal-care-for-twin-and-triplet-pregnancies-pdf-35109458300869 [Accessed May 29, 2019].
28. National Screening Committee (2017). AAA screening: standard operating procedures. Available at: https://www.gov.uk/government/publications/aaa-screening-standard-operating-procedures [Accessed May 29, 2019].
29. Seto, E., and Biclar, L. (2008). Ambidextrous Sonographic Scanning to Reduce Sonographer Repetitive Strain Injury. J. Diagnostic Med. Sonogr. 24, 127–135. Available at: http://journals.sagepub.com/doi/10.1177/8756479308315230 [Accessed May 29, 2019].
30. Wooten, A. (2019). Literature Review Work-Related Musculoskeletal Disorders in Sonography. Radiol. Technol. 90, 215–224. Available at: http://www.radiologictechnology.org/content/90/3/215.abstract [Accessed May 29, 2019].
31. Health and Safety Executive (2013). Working with display screen equipment (DSE) A brief guide Available at: http://www.hse.gov.uk/pubns/indg36.pdf [Accessed May 29, 2019].
32. Health and Safety Executive (n.d.). MSD Risk Assessment. Available at: http://www.hse.gov.uk/msd/risk.htm [Accessed June 26, 2019].
33. Australasian Society of Ultrasound in Medicine (2010). Policies and Statements C6 ASA and ASUM joint Guidelines for Reducing Injuries To Sonographers/Sonologists. Available at: http://www2.asum.com.au/wp-content/uploads/2015/09/C6-Policy.pdf [Accessed May 29, 2019].
34. Alshuwaer, T.A., and Gilman, F. (2019). Prevention of Shoulder Injuries in Sonographers: A Systematic Review. J. Diagnostic Med. Sonogr., 8756479319850140. Available at: http://journals.sagepub.com/doi/10.1177/8756479319850140 [Accessed May 29, 2019].
35. Tinetti, C.J., and Thoirs, K. (2019). Prevalence, risks, underlying mechanisms, preventative guidelines, and interventions of sonographer work-related injuries: A literature review. Sonography, doi.10.1002/sono.12187. Available at: https://onlinelibrary.wiley.com/doi/abs/10.1002/sono.12187 [Accessed May 29, 2019].
36. Society for Diagnostic Medical Sonography (2017). Prevent WRMSDs: Ergonomics for sonographers. Available at: https://www.sdms.org/docs/default-source/Resources/prevent-wrmsds-infographic.pdf?sfvrsn=4 [Accessed May 29, 2019].
37. Scholl, C., and Salisbury, H. (2017). Barriers to Performing Ergonomic Scanning Techniques for Sonographers. J. Diagnostic Med. Sonogr. 33, 406–411. Available at: http://journals.sagepub.com/doi/10.1177/8756479317726768 [Accessed May 29, 2019].
38. Coffin, C. (2014). Work-related musculoskeletal disorders in sonographers: a review of causes and types of injury and best practices for reducing injury risk. Reports Med. Imaging 7, 15. Available at: http://www.dovepress.com/work-related-musculoskeletal-disorders-in-sonographers-a-review-of-cau-peer-reviewed-article-RMI [Accessed May 29, 2019].

39. Dhyani, M., Roll, S.C., Gilbertson, M.W., Orlowski, M., Anvari, A., Li, Q., Anthony, B., and Samir, A.E. (2017). A pilot study to precisely quantify forces applied by sonographers while scanning: A step toward reducing ergonomic injury. Work 58, 241–247. Available at: http://www.medra.org/servlet/aliasResolver?alias=iospress&doi=10.3233/WOR-172611 [Accessed May 29, 2019].
40. NHS Fetal Anomaly Screening Programme (2018). NHS Fetal Anomaly Screening Programme Handbook Valid from August 2018 Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/749742/NHS_fetal_anomaly_screening_programme_handbook_FINAL1.2_18.10.18.pdf [Accessed May 29, 2019].
41. Harrison, G., Harris, A., and Flinton, D. (2018). Can Teaching Ultrasound Ergonomics to Ultrasound Practitioners Reduce White Knuckles and Transducer Grip Force? J. Diagnostic Med. Sonogr. 34, 321–327. Available at: http://journals.sagepub.com/doi/10.1177/8756479318758324 [Accessed May 29, 2019].
42. Medical Dictionary (n.d.). Available at: https://medical-dictionary.thefreedictionary.com/Sims+position [Accessed June 19, 2019].
43. Oates, C., and Taylor, P. (2016). Helping expectant mothers understand inadequate ultrasound images. Ultrasound 24, 142–146. Available at: http://www.ncbi.nlm.nih.gov/pubmed/27867406 [Accessed May 29, 2019].
44. Consortium for the Accreditation of Sonographic Education Standards for Sonographic Education, version 2.0. (2019). Available at: http://www.case-uk.org/information/publications/ [Accessed June 5, 2019].

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