



# Industry Standards for the Prevention of Work Related Musculoskeletal Disorders in Sonography





# INDUSTRY STANDARDS FOR THE PREVENTION OF WORK-RELATED MUSCULOSKELETAL DISORDERS IN SONOGRAPHY

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# 1. INTRODUCTION

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Musculoskeletal disorders (MSDs) are potentially one of the biggest causes of injury and ill health amongst sonographers. Many factors can contribute towards the development of MSDs in sonographers such as poor job design and poor posture. These standards primarily address poor equipment design which in a SoR study of sonographers<sup>1</sup> was believed by 49% of respondents to be a contributory factor towards the development of such injuries. The standards can be used by equipment manufacturers, employers, safety representatives, educators and employees as a means of reducing the risk of injury to sonographers.

The standards are divided into three sections, **equipment control measures** which detail the types of equipment and accessories that should be purchased; **administrative control measures** which outline organisational, environmental and educational factors that should be considered including the layout of the examination area and work scheduling and **professional control measures** which detail best practice measures professionals can take to reduce the risk.

The Society of Radiographers would like to thank the Society of Diagnostic Medical Sonography for allowing us to use their document "*Industry Standards for the Prevention of Work Related Musculoskeletal Disorders in Sonography*"<sup>2</sup> as the basis for this document. The standards were developed following a Consensus Conference held in the USA in 2003. Representatives from the Society of Radiographers participated in the Consensus Conference alongside representatives from other professional bodies and representatives from sonography equipment manufacturers. The Society of Radiographers would also like to thank the Health and Safety Executive for their contribution to this document.

## 2. EQUIPMENT CONTROL MEASURES

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### 2.1 Ultrasound systems

State of the art equipment allows for optimal visualisation which increases diagnostic accuracy and reduces sonographer fatigue. These industry standards are specific to floor standing models. Therefore, some recommendations may not apply to non floor standing models.

- Fully adjustable equipment that suits the anthropometrics of the 5th to the 95th percentile of the population and is specific to the demographic area of the users.
- Easily accessible controls for achieving two-wheel, four-wheel and braked positions. Central locking is preferable.
- Recording devices positioned to minimise the user's reach to external devices; external devices should not interfere with adjustability of the system.
- Optional footrests on the equipment for the user, designed to encourage a neutral position of the ankle. They are particularly important to people with shorter legs to avoid sitting with hanging feet.
- Transducer holder incorporates ease of access (unobstructed); should not be detrimental to the distance required to access controls; low force, minimal effort required for single handed use.
- Storage positions for paper roll and gel holder that can be easily accessed from the scanning position.
- Cables should not interfere with access to equipment or system interaction. British Standard EN ISO 9241 (part 6)<sup>3</sup> states that cables should meet the following standards:
  - o Safety – fastened, no trailing, use of ducting either horizontal or vertical
  - o Length – cable length sufficient to accommodate actual and foreseeable user needs
  - o Accessibility – to allow easy access for maintenance, cleaning without disruption to work activities (if required).
  - o Adjustability – cable should cover all ranges of adjustments
- Port Connector permits ease of use, single handed use; minimising the user's reach, force and necessity of a pinch grip; does not interfere with access to equipment or system interaction.
- System design such that transporting the equipment does not exceed 25kg<sup>4</sup> (16kg in females) of pushing or pulling by a single user on usual flooring surfaces. Where design does exceed



this limit further risk reduction measures should be implemented e.g. additional personnel are available to assist in moving the equipment.

- Height-adjustable handles suitable for transporting the equipment.

## **2.2 Control Panel**

- Height adjustable, separate from the monitor with appropriate degree of tilt to allow for standing or seated user to achieve neutral posture of wrist and forearm. Independent movement of control panel allows users to work while maintaining their elbow at their side.
- Control panels should be designed so that all dextrous activities can be done at their full potential i.e. so all left or right handed users can operate the panel with ease and to their full ability.
- Size, shape and spacing of controls designed according to occupational ergonomic guidelines (font size and control layout are visually discernable, the range of illumination permits, clear identification of control functions at applicable user positions).
- Entire system designed to be used in seated position without obstruction of legs/knees. An area of 300 x 650mm is recommended <sup>356</sup>.

## **2.3 Monitors**

- Incorporate features to minimise eye strain such as:
  - o Reduced flicker
  - o Appropriate brightness and contrast levels
  - o Resolution
- Height adjustable, separate from control panel with appropriate degree of tilt to enable standing or seated users to achieve neutral posture of their necks.
- Single handed movement of the monitor allows users to work while maintaining their neck in a forward, neutral position with monitor at a range of 18-30 inches.
- System must support the ability to use an external monitor.

## 2.4 Transducers

- Lightweight and balanced to minimise torque on the wrist, facilitate a palmar grip without an expanded stretch of the hand and encourage a neutral wrist position.
- Sized to support appropriate anthropometric data for the majority of users, encourage a palmar grip and be slip resistant.
- Cables and cable management systems must be suitable in length to permit unrestricted use; and be of suitable length for intended applications.

## 2.5 Table

The standards below are considered essential when new or replacement tables are being purchased.

- Height adjustable capable of being adjusted low enough to allow patients to get on and off easily unassisted, and to allow user to scan in a sitting or standing position while maintaining arm abduction of less than 30 degrees.
- Manoeuvrable, full wheel mobility, and wheel locks that are easily operated.
- Open access from all sides to allow the users to place their knees and feet underneath, if needed. Table support structure and/or table mechanisms should not extend beyond the table top such that it prevents the user from minimising reach and arm abduction.
- For endovaginal scanning, suitable patient access and support such as adjustable footboard and stirrups.
- For cardiac imaging, an easily operated, drop away or cut out section to allow unhindered access to the apical region while allowing the user's wrist to remain supported in a neutral position.
- There should be electronic controls that are accessible and easy to use.
- The following options may assist in reducing scan time by improved patient positioning depending on the procedure:
  - o Trendelenberg and reverse Trendelenberg
  - o Fowler back (upright table back)
  - o Arm extension
  - o Central locks
  - o Patient restraints

## **2.6 Chair**

- Height adjustable with sufficient range to suit the majority of the users. Range of height adjustability optimises position of less than 30 degrees abduction of the scanning arm and allows the forearm of the non-scanning arm to be approximately parallel to the floor.
- Adjustable lumbar support, adjustable seat for thigh support and an adjustable footrest. Seat design must encourage an upright posture.
- Swivels to allow the user to rotate from the patient to the ultrasound system while maintaining an aligned posture.
- Casters on chairs should suit the flooring to achieve the right amount of ease for the user to move the chair.

## **2.7 Accessories**

- Gel bottles should have large openings to reduce the strength needed to squeeze the bottle and of suitable diameter to avoid extended grip position.
- Support devices available to all users for arm support in abduction.
- When required, the patient chair (and/or table converted to sitting position) used for seated procedures (e.g. shoulder ultrasound) should be fully adjustable, easy to rotate, lockable and armless or with removable arms to achieve unobstructed access for proper ergonomics.
- A transducer cable support device to allow users to reduce their grip by reducing the amount of torque on the wrist/forearm.
- Properly fitting, textured examination gloves to reduce the force required to grip the transducer.

### **3. ADMINISTRATIVE CONTROL MEASURES**

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#### **3.1 Education and Training**

- Inductions for new staff and annual refresher for existing on the risks of musculoskeletal disorders.
- Perform risk assessments in consultation with safety representatives and the users on a regular basis to identify musculoskeletal disorders and formulate and implement controls for the prevention and/or reduction of disorders.
- Provide a system to report and document acute or chronic musculoskeletal disorders and make all employees aware of the need to report incidents.
- Machines accepted for trial should satisfy ergonomic requirements. Risk assessment and full ergonomic assessment should be conducted prior to acceptance for trial.
- Equipment specifications sent to companies wishing to tender should include the full ergonomic specifications required.
- Maintain all equipment in good working order as per requirements of the Provision and Use of Work Equipment Regulation 1998<sup>7</sup>.

#### **3.2 Workload and Scheduling**

- Gain safety representative and user input on establishing protocols on examination scheduling.
- Provide adequate rest breaks between examination particularly for procedures comprised of similar postural and muscular force attributes.
- Encourage task rotation in the workplace as much as possible.
- Establish maximum transducer time per hour.
- Minimise portable/bedside examinations.
- Psychosocial factors will affect the user's performance during a task. If the users are under pressure, this could be due to the physical demand or the volume of work. This may influence them to adopt poor posture or not carry out the tasks as competently as they can. Factors which can lead to undue pressure and stress should be subject to risk assessment and the Health and Safety Executive's stress standards should be implemented.

### **3.3 Examination Area**

- Dedicated examination area that provides adequate space for the manoeuvrability of equipment around the examination table and allows easy access from all sides.
- Examination room doorways must be wide and tall enough so that hand trapping, abrasions and cuts do not occur when pushing or pulling the equipment and patient.
- Suitable flooring to allow for easy movement of equipment.
- Adequate ventilation and temperature control to ensure the comfort of user and patient while enabling the equipment to operate at a functional temperature.
- Adjustable room lighting with easily accessible dimmer controls; shaded windows to eliminate light.
- Accessories that improve posture and reduce muscular force should be available and easily accessible to the user.
- All imaging supplies stored in the examination area are easily accessible.

## 4. PROFESSIONAL CONTROL MEASURES

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### 4.1 Best Practice

- It is recommended that sonographers follow current best practices to reduce the risk of developing musculoskeletal disorders. These best practices include: preventing or minimising awkward postures; alternate sitting and standing and vary scanning techniques and transducers grips.
- Adjust all equipment to suit users' size and have accessories on hand before beginning to scan.
- Use measures to reduce arm abduction and forward and backward reach to include: instructing the patient to move as close to the user as possible; adjust the table and chair; and use arm supports.
- Relax muscles periodically throughout the day:
  - Stretch hand, wrist, shoulder muscles and spine
  - Take mini breaks during the procedure
  - Take meal breaks separate from work-related tasks
  - Re-focus eyes onto distant object
- Vary procedures tasks and skill as much as reasonably possible.
- Use correct manual handling techniques when moving patients, wheelchairs, beds, stretchers and ultrasound equipment.
- Report and document any persistent pain to employer and safety representative.
- Maintain a good level of physical fitness in order to perform the demanding work tasks required.
- Work together with employers on staffing solutions that allow sufficient time away from work.
- Participate in education and training to reduce the risk of developing musculoskeletal disorders:
  - Attend employer sponsored training
  - Attend seminars, lectures, workshops or conferences offered by professional organisations or manufacturers
  - Access journals, textbooks online resources etc.
  - Attend a formal sonography program that includes work related musculoskeletal disorders prevention in the curriculum.

## REFERENCES

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