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

SUMMARY

The *Industry Standards for the Prevention of Work Related Musculoskeletal Disorders (WRMSDs) in Sonography* is the work product of a 2016 Consensus Conference on Work Related Musculoskeletal Disorders involving 26 sonography-related professional organizations, accreditation bodies, and manufacturers. The organizations listed below, working collaboratively, and representing the sonographic professional community, updated the 2003 standards for use by clinical, academic, and manufacturing related sonographic industries. The objective of this project was to produce a detailed resource that, when implemented, may assist in the reduction of WRMSDs among users of sonographic equipment.

2016 CONSENSUS CONFERENCE SPEAKERS

The following content experts presented on occupational safety and health, the current research on WRMSDs in sonography, and point-of-care and sonography at the Consensus Conference.

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2016 CONSENSUS CONFERENCE ATTENDING ORGANIZATIONS

The following organizations were represented at the Consensus Conference. The organizations that have formally endorsed the document are identified with the † symbol. Supporting organizations are identified with the * symbol. (Note: Some organizations have internal policies that do not permit endorsement of external documents. "Supporting organization" denotes a more limited level of review and approval than endorsement and means the organization considers the clinical document to be of educational value, although it may not agree with every recommendation or statement in the document.)

- AHRA: The Association for Medical Imaging Management †
- Alliance for Physician Certification & Advancement *
- American College of Phlebology
- American College of Radiology
- American Institute of Ultrasound in Medicine *
- American Registry for Diagnostic Medical Sonography *
- American Registry of Radiologic Technologists †

- American Society of Echocardiography †
- Biodex Medical Systems, Inc.
- Cardiovascular Credentialing International *
- Carestream
- ECRI Institute *
- ESAOTE †
- Essential WorkWellness †
- GE Healthcare *
- Intersocietal Accreditation Commission
- Joint Review Committee on Education in Cardiovascular Technology
- Joint Review Committee on Education in Diagnostic Medical Sonography
- Medical Positioning, Inc. †
- Mindray/Zonare
- Philips
- Society of Diagnostic Medical Sonography †
- Society of Radiologists in Ultrasound
- Society for Vascular Ultrasound †
- Society of Nuclear Medicine and Molecular Imaging Technologist Section
- Sonography Canada *
- Sound Ergonomics †

OTHER SUPPORTING/ENDORSING ORGANIZATIONS

Other organizations that did not participate in the Consensus Conference, but have formally endorsed the document are identified with the † symbol. Non-participating supporting organizations are identified with the * symbol. (Note: Some organizations have internal policies that do not permit endorsement of external documents. "Supporting organization" denotes a more limited level of review and approval than endorsement and means the organization considers the clinical document to be of educational value, although it may not agree with every recommendation or statement in the document.)

- Australasian Sonographers Association †
- Committee on Accreditation for Advanced Cardiovascular Sonography *
- Samsung †

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BACKGROUND

Work Related Musculoskeletal Disorders (WRMSDs) are painful injuries affecting the muscles, nerves, ligaments, and tendons of up to 90% of sonographers and other users of diagnostic medical sonography. WRMSDs develop gradually over a period of time from repeated exposure to risk factors and are among the most frequently reported cause of restricted or lost work time. WRMSDs can impose a substantial personal toll on those affected since they may no longer be able to work or perform simple personal tasks and activities of daily living.

The *Industry Standards for the Prevention of Work Related Musculoskeletal Disorders in Sonography* were developed to expand, and make specific to sonography, abatement methods included in the Occupational Safety and Health Act, which is supported by the Occupational Safety and Health Administration (OSHA) and National Institute for Occupational Safety and Health (NIOSH).

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

Work Related Musculoskeletal Disorders (WRMSDs) affect many sonographers, sonologists, and other users of medical ultrasound equipment. Preventing injury or managing the progression of symptoms can be achieved by improving working posture and the ergonomics of the work environment. Maintaining a neutral posture, where there is the least amount of stress on the musculoskeletal system, is one of the fundamental principles of proper ergonomic design in the workplace. When risk factors cannot be completely eliminated, it is important to limit the time spent in risk-producing postures in order to reduce exposure.

Proper ergonomics must be an integral part of all aspects of the practice of sonography. The risks for WRMSDs among sonographers include a broad range of contributing factors. Therefore, the employer, manufacturer, sonographer/user, industry organizations, and educational programs all have the responsibility to do their part to educate, train, exercise best practices, and provide equipment and working conditions to prevent health and safety problems that cause WRMSDs.

I. MANUFACTURER'S RESPONSIBILITY/SCANNING WORKSTATION

With compelling evidence for WRMSDs in sonography, manufacturers must include ergonomics as a primary consideration in the design of apparatus and equipment. Innovative design addressing the ergonomics of workstation equipment for the sonographer/user can improve postural positioning and image acquisition and ultimately, exposure to risks associated with WRMSDs. The design of sophisticated and ergonomic workstation equipment (e.g. the ultrasound system, exam table, chairs, and ancillary equipment) assists in improving comfort and diagnostic accuracy, thus reducing sonographer/user fatigue and risk for injury.

A. ULTRASOUND SYSTEM

This section of the Industry Standards is specific to console based floor-standing models. See Section B for recommendations for point-of-care (POC) and compact systems.

1. SYSTEM CONSOLE

a) System console should be fully adjustable for seated or standing use for the anthropometrics of the 5th to 95th percentile of the user population.

b) System should be designed to be used in a seated position with adequate clearance for legs and knees.

c) Easily accessible controls for achieving two-wheel and four-wheel mobility, steering, and braked positions are recommended. For patient and worker safety, system should have central locking brakes.

d) The base of the console should not interfere with the ability of sonographer/user to position themselves close to the exam table while maintaining direct access to the system.

e) It is recommended that systems be designed to support external devices (e.g. external monitors, printers, recording devices, etc.) which do not interfere with the adjustability of the system or the sonographer/user's ability to maintain a neutral posture.

f) Console footrest configurations that support the length of the foot and encourage neutral position of the ankle are recommended.

g) Transporting equipment should not require more than 50 pounds of push/pull force by a single sonographer/user. Otherwise, it is recommended that additional personnel or motorized devices assist in moving the equipment.

h) Primary transport handles should be adjustable in height and extend far enough from the system to allow for leg clearance in a normal stride.

i) System height should be compatible with height differences for the user population and ensure a full field of vision during transport.

j) Power cord length should be suitable for access to electrical outlets without creating tripping or other safety hazards and with appropriate storage for Ethernet and power cords during transport.

k) System should support the connection of multiple transducers to reduce the frequency of manipulating transducer port connectors.

l) Systems that utilize a battery pack are recommended to have a battery standby or scan time of at least 20 minutes.

2. CONTROL PANEL

a) Control panel should be height-adjustable, separate from the video display monitor.

b) An appropriate degree of tilt is recommended to provide visibility of control panel icons by seated or standing sonographer/user while maintaining a neutral position of the wrist and forearm.

c) Control panel should include horizontal and rotational movement to allow sonographer/user to work with a neutral position of the non-scanning arm.

d) Touchscreens and/or keyboards should not restrict the ability to maintain neutral posture, including limiting excessive reaching beyond primary reach zone.

e) Software programming for the control panel should be aimed at reducing keystrokes with the option of customizable controls based on individual sonographer/user preferences.

f) Control panel should have an easily accessible, easy to use locking mechanism for transporting and repositioning of the system.

g) Control panel layout should be user centered for both right and left-handed sonographer/users.

h) Recommended control panel font size is equal or greater to ten millimeters. QWERTY lettering should be of a contrasting color to the key surface, with illumination, preferably adjustable in brightness. Key surface should be greater or equal to six millimeters.

3. MONITORS

a) Monitors should be adjustable, separate from the control panel, with the following features:

(1) Height adjustability appropriate for the anthropometrics of the 5^{th} to 95^{th} percentile of the user population and specific to the demographic area of the users to minimize excess neck flexion/extension

(2) Horizontal adjustability to maintain line of sight during scanning without rotation of the neck

(3) Adjustable tilt

(4) Depth adjustability to achieve the OSHA recommended eye-monitor distance of 20-40 inches, with font size appropriate for viewing at corresponding distance

(5) Handle to facilitate single-handed adjustments of height, tilt, and horizontal movement

(6) Locking mechanism with folding/collapsible feature for transport to maintain clear line of sight

(7) High resolution with anti-glare properties that allows viewing from seated or standing postures

b) Design of monitor arm should allow for single-handed adjustment in all positions.

4. TRANSDUCERS

a) Transducers and cables should be lightweight and balanced to minimize torque on the wrist.

b) Transducer designs that facilitate a palmar grip and a neutral wrist position are recommended.

c) Transducer housing should be slip resistant and sized to fit the 5^{th} to

95th percentile of the hand size of the user population to reduce grip force required to hold and manipulate the transducer.

d) It is recommended that cables be a suitable length for intended applications and not interfere with access to equipment, system interaction, or create safety hazards such as tripping or entanglement.

e) Low profile and easily accessible cable management systems are recommended.

f) Transducer holders should be easily accessible with the ability to secure a variety of probes, including endocavitary probes.

g) Transducer connector should be easily accessible, with minimal reach and permit single-handed use with minimal force or pinch grip; if applicable, customizable controls on transducers are recommended.

5. EXAMINATION TABLE

a) Tables should be height-adjustable to allow sonographers/users of various stature to scan in a seated or standing position, maintaining an arm abduction of less than 30 degrees. Electronic controls are recommended.

b) Tables should be capable of being adjusted low enough for unassisted access by patients, lateral transfers from wheelchairs, and/or in accordance with applicable safe patient handling legislation.

c) Tables should be compatible for use with patient lifting devices.

d) Tables should have fully maneuverable wheels with wheel locks and steering controls that are easily operated and accessed from scanning position; a central wheel locking mechanism is recommended.

e) Tables should provide adequate clearance for the chair base and foot ring, without restricting the ability of the sonographer/user to sit close to the exam table. Clearance for knees and feet when seated at the head or foot of the exam table is recommended.

f) For endovaginal scanning, tables should have easily accessible and adjustable footboard and stirrups.

g) For cardiac imaging, tables should have an easily operated cardiac access panel, drop away, or cut out section to allow unhindered access to the apical region, without compromising the wrist/hand posture of the sonographer/user.

h) For lower extremity venous reflux studies, tables must have the capability to achieve reverse Trendelenburg to a minimum of 15 degrees and up to 25 degrees, with a footboard for patient safety.

i) A suitable patient chair or exam table is recommended for examinations requiring the patient to be in a seated position, with access to the region of interest, without compromising the posture of the sonographer/user.

j) If side rails are present, they should not extend beyond the surface of the table when retracted, limit access to the patient, or result in contact stress to the sonographer/user in the lowered/stored position.

k) The following features may improve sonographer/user comfort and assist in reducing scan time by improving patient positioning depending on the procedure:

(1) Trendelenburg and reverse Trendelenburg to a minimum of 15 degrees; 25 degrees reverse Trendelenburg for lower extremity venous reflux studies

(2) Fowler back (adjustable table back)

(3) Arm extension

(4) Patient safety straps

(5) Electronic controls that are accessible, easy to use, and do not obstruct optimal patient positioning.

(6) Patient foot support (foot board)

6. SCANNING CHAIR

a) Chairs should be height-adjustable with sufficient range to allow for neutral posture for the 5^{th} to 95^{th} percentile of the user population. Height adjustment controls should be accessible from the seated position. Height range should be suited to the type of exams being performed and exam table specifications.

b) Chairs should have the following adjustable features, accessible from the seated position:

(1) Adjustable lumbar support

(2) Adjustable seat depth for thigh support

(3) Adjustable footrest that does not interfere with the sonographer/user's ability to get close to the system and/or exam table

(4) A seat that swivels to allow the sonographer/user to rotate from the patient to the system while maintaining an aligned posture.

c) Armrests are generally not recommended, as they result in increased reach distance to the patient.

d) Chair casters should be suitable to the type of flooring. Reverse braking casters may be preferred for cardiac scanning.

e) If performing lower extremity venous exams, an appropriate chair should be provided with a height range that allows the sonographer/user access to the lower leg in reverse Trendelenburg while maintaining a neutral posture.

7. ACCESSORIES

a) Gel dispensers should minimize the grip force needed to dispense gel. Consideration should be given to gel viscosity, size of opening, and rigidity of container.

b) Support devices for supporting the scanning arm in abduction are recommended, when applicable.

c) A wearable transducer cable support device is recommended to allow the sonographer/user to reduce the grip by reducing the amount of torque on the wrist/forearm.

d) Properly fitting, textured exam gloves should be available to reduce the force required to grip the transducer.

e) Anti-fatigue mats are recommended for workstations requiring prolonged standing.

f) External monitors should be available for exams where the image is shared with other staff members or patients.

g) Wedge support cushions designed for endovaginal scanning should be available for circumstances where exam table stirrups are not available.

B. POINT-OF-CARE/COMPACT ULTRASOUND SYSTEMS

A wide range of users such as paramedics, emergency physicians, pain management physicians, anesthesiologists, and other specialists are increasingly utilizing compact, handheld, and point-of-care (POC) ultrasound systems. Portability of these systems depends on many factors. System weight, physical dimensions, and design should be considered in determining the need for the use of a cart, backpack, suitcase, or other means of transport.

The ergonomic challenges of such systems may overlap with other compact technologies such as smartphones, tablets, and computer workstations on wheels. The use of multiple technologies with similar risk factors has the potential to increase the frequency and duration of exposure to risks, such as awkward postures of the neck and trunk. Consequently, many of the recommendations for ultrasound systems and

computer workstations on wheels are applicable to compact, handheld, and point-of care ultrasound systems. See Section II.E. for computer workstation on wheels recommendations.

II. EMPLOYER RESPONSIBILITY

The key to prevention of WRMSDs is the mutual ownership of the problem, where both the employer and employee accept a shared responsibility. As the owner of the work environment, the employer has the greatest ability to influence task design and workstation equipment through administrative and engineering (environmental) control measures. Furthermore, the employer has the responsibility to provide ergonomic control measures at least to minimal standards for compliance with the Occupational Safety and Health Act's "general duty" clause, which states employers must provide a place of employment free from recognized hazards. However, it is the culture, not the process that determines the ultimate success of a safety/ergonomics program. A culture of safety is the shared commitment between management and employees to ensure the safety of the work environment. In a positive culture, safety is a core value of the organization, even at the expense of productivity or efficiency.

A. RISK MANAGEMENT

Regular risk assessment, providing support for a culture of safety, and budgeting for state-of-the-art equipment allows for the newest ideas and most up-to-date ergonomic design in addressing sonographer/user fatigue and risk for injury.

1. Management must demonstrate a visible commitment to safety that positively engages employees and provides follow through to employee concerns in a timely manner. Opportunities and venues for open discussion about safety concerns should be provided in a non-threatening, supportive manner. Effective January 1, 2017, revised Federal OSHA requirements for reporting include provisions that encourage workers to report work-related injuries or illnesses to their employers and prohibit employers from retaliating against workers for making those reports. Employers must:

    a) Provide procedures for employees to promptly and accurately report injuries/illness.

    b) Inform employees of this procedure.

    c) Inform employees of their right to report injuries/illnesses without being discriminated against.

2. Employer should provide annual education and training to all sonographers/users, new hires, supervisors, and managers on the risks and prevention of musculoskeletal disorders related to sonography. Training format and content should be specific to the level of risk and influence over control measures.

3. Employer should perform risk assessments, at least annually, in consultation

with the sonographers/users to identify risks for musculoskeletal disorders related to the practice of sonography. Assessment should include, but is not limited to:

a) Scanning workstation equipment

b) Computer workstation equipment

c) Protocols

d) Scheduling (including breaks)

e) Room design layout

f) Workplace conditions (e.g., lighting, heat/AC, etc.)

g) Barriers to performance as identified by sonographer/user

h) Survey of sonographer/user symptoms (preferably anonymous)

i) A report of findings, determination of control measures, and a plan and timeline for implementing control measures for the prevention and/or reduction of identified hazards

4. Employer should conduct a needs assessment, with sonographer/user input, prior to the purchase of new equipment and maintain a budget that demonstrates ongoing planning toward adequate provision of ergonomic equipment and ancillary devices as part of the risk assessment process.

5. Employer should provide a system to report and document symptoms or concerns for WRMSDs and ensure sonographer/user knows how to use the reporting system.

B. PROTOCOLS AND SCHEDULING

Employers should be aware that it has been demonstrated that there are risks for WRMSDs associated with prolonged scanning time. Further research is needed to determine appropriate limits. Employers should utilize currently available standards and guidelines to establish protocols, scheduling, examination times, and volume of examinations performed.

1. Employer should solicit sonographer/user input on establishing protocols to:

a) Support workload and scheduling with consideration of examination type and length. The time allowed for each exam should take into consideration the associated risk for injury.

b) Include time for non-scanning duties associated with each exam when determining appropriate exam duration, including transport time for portable exams.

c) Avoid back-to-back scheduling of difficult exams.

d) Encourage exam or task rotation as much as possible.

e) Eliminate outdated protocols especially those that increase exposure to risk factors such as awkward postures and excessive force.

f) Limit standing protocols for lower extremity venous reflux studies. If standing protocols are deemed necessary, they should be reserved for isolated portions of the exam. Appropriate equipment, such as steps and/or exam tables, should be provided to allow sonographer/user to maintain neutral postural alignment while scanning regardless of patient position.

g) Reserve bedside exams for critically ill patients. Scheduling of bedside exams should include additional time allowance for transport of equipment. Implement control measures to minimize long-range manual transport of equipment. For example, consider allocation of space for imaging suite on patient floors where patients require monitoring and frequently undergo ultrasound examinations.

h) For the examination of difficult to image patients, such as those with high BMI, limited mobility, and/or monitoring/intensive care equipment, inform referring clinician and patients of the limitations of the exam.

i) Limit non-emergent add-ons that would compromise time available for examinations and/or muscle recovery time for sonographer/user.

2. To reduce the incidence of WRMSDs, it is recommended that employers implement a staffing schedule that:

a) Maintains adequate staffing levels for patient load

b) Allows for mandatory meal breaks and rest breaks from scanning, particularly for procedures comprised of similar postural and muscular force attributes

c) Avoids shifts greater than eight hours to limit the duration of exposure to risk

C. EXAMINATION AREA

1. Dedicated examination area should be at least 150 square feet to provide adequate space for equipment maneuverability around all sides of the exam table, patient privacy, and inclusion of a sink for hand hygiene compliance.

2. Cable length for Ethernet or similar Digital Imaging and Communications in Medicine (DICOM) should be suitable to access wall outlets with cable management to prevent safety hazards such as tripping. Cable length should

allow positioning of the system for access to any region of interest being scanned without compromising posture of sonographer/user.

3. Power and Ethernet/DICOM outlets should be spaced closely enough to eliminate tripping hazards from outstretched cables. Outlet placement is recommended to be approximately 43 inches from floor to reduce bending/reaching below knee level to access.

4. Examination area doorway should allow easy access for wheelchairs, beds, and ultrasound equipment.

5. Flooring should allow for movement of equipment with no more than 50 lbs of push/pull force and in compliance with infection control practices according to The Joint Commission or other agency standards.

6. Individual controls for heating and ventilation of the examination area is recommended to ensure the functionality of the equipment and comfort of sonographer/user and patient.

7. Lighting of the examination room should be adjustable with dimmer controls that are easily accessible from the scanning area. Any windows should be shaded to eliminate light.

8. Frequently used supplies (e.g. linens, gel, gloves) should be stored in the examination area and easily accessible without reaching above shoulder height or below knee height.

D. COMPUTER WORKSTATION

The following standards are recommended for stationary computer workstations frequently used for imaging related activities. As with any shared workstation, equipment should be adjustable enough to accommodate a wide range of workers.

1. Chairs should be height adjustable so that each sonographer/user can sit with feet flat on the floor or a foot rest, with a height range appropriate for the desk height.

2. Chairs should have lumbar support and a seat pan depth and width sufficient to support the width and length of sonographer/user's thighs. Lumbar support and seat pan depth should be adjustable if used by multiple sonographers/users.

3. Armrests should be adjustable and/or removable and should not restrict the sonographer/user's ability to get close to the workstation.

4. If desk height is not adjustable, a keyboard tray option should be provided.

5. Desk layout should provide a separate surface for hard copy documents and sufficient space underneath for legs while sitting, and should not restrict the ability to get close to workstation.

6. Desk depth should be sufficient to accommodate the keyboard and monitor while maintaining an eye-monitor distance of 20-40 inches.

7. Monitor should possess height/tilt adjustability to accommodate a neutral neck posture.

8. Keyboard and mouse should encourage neutral postures of the wrist, hand, and shoulders. Trackball mouse (or similar) designs are recommended to minimize movement of the upper extremity during mouse related activities.

E. COMPUTER WORKSTATION ON WHEELS

The following standards are recommended for computer workstations on wheels that are utilized for imaging related activities.

1. Cart should be height adjustable, to accommodate both seated and standing use, if applicable. It should be lightweight for ease of movement and adjustability, with a stable base and casters suitable to the type of flooring and with easily accessible braking capabilities. Multiple handle options are recommended for transport.

2. Monitor should be easily adjustable, independent from the remainder of the system, with anti-glare properties, and viewable from multiple angles. The range of monitor height adjustability should accommodate the 5^{th} to 95^{th} percentile of the user population. Wall mounted monitors should be on a height adjustable rail or monitor arm.

3. Keyboard/keyboard tray/mouse should be easily height adjustable, separate from the remainder of the system, with mousing surfaces on the same level as the keyboard. Height range should accommodate the 5^{th} to 95^{th} percentile of user population. The keyboard and mouse should encourage a neutral position of the wrists, hands, and forearms. Appropriate infection control properties should be maintained according to Joint Commission on Accreditation of Healthcare Organizations (JCAHO) or similar agency requirements.

4. Adequate cable management, for ease of movement and safety, should be provided.

5. CPU storage should be suitable for cart stability. Lightweight, minimal footprint CPU technology is recommended.

6. Accessories specific to the work environment, such as sharps disposal containers, hand sanitizer, bar code readers, and chart holders are recommended. Placement of accessories should not hinder neutral posture or interfere with adjustability of the system.

7. System should have battery capacity of at least 20 minutes with a battery status gauge.

8. Information security and infection control features applicable with local

requirements should be maintained.

III. SONOGRAPHER/USER RESPONSIBILITY – CONTROL MEASURES

It is the responsibility of sonographers, sonologists, students and other users of medical ultrasound to follow current best practices to reduce the risk of developing WRMSDs. Each employee is responsible for his/her own personal health and wellness including the knowledge and application of work practices for self-management, hazard identification, and implementation of control measures. Steps should be taken to minimize those factors known to cause WRMSDs and movements that require departure from a neutral posture. The following represents a collection of maneuvers and control measures that, when used in concert, reduce risk and improve comfort of those performing ultrasound examinations. Users performing POC ultrasound examinations should be aware of WRMSDs and follow applicable standards.

A. NEUTRAL POSTURE

Neutral posture is a seated or standing posture balanced around the sonographer/user's center of gravity. This posture reduces strain on the musculoskeletal system. When leaning, bending, or reaching out of this balanced posture, postural imbalances occur, along with increased muscle strain and uneven loads on the bones and joints. Prolonged exposure to imbalances causes muscles to become overstretched, tendons to fray, and skeletal structures to deviate from their normal alignment.

1. Sonographer/user should minimize risk by avoiding non-neutral and static postures, such as:

    a) Sustained reach

    b) Bending and twisting of the trunk

    c) Excess neck flexion, extension, and/or rotation

    d) Excess reach and abduction of the scanning and non-scanning arm

    e) Working with the arm behind midline

    f) Excess grip force and transducer pressure

    g) Prolonged awkward or static posture

    h) Uneven seated or standing weight distribution

2. Sonographer/user should take the time to ergonomically optimize all equipment to suit individual postural requirements and have accessories on hand before beginning to scan.

3. Sonographer/user should utilize measures to reduce risk factors for WRMSDs such as instructing the patient to move closer, adjusting the ultrasound system, exam table, and chair, avoiding shifts greater than eight hours, and using other ancillary devices.

4. Sonographer/user should employ muscle recovery time throughout the day.

    a) Relax the muscles of the hands, wrists, shoulders, and neck

    b) Take frequent mini breaks throughout the workday, including microbreaks throughout the exam

    c) Take meal breaks separate from work-related tasks or similar motions

    d) Re-focus eyes occasionally onto distant objects

    e) Vary procedures, tasks, and activities as much as reasonably possible

B. Safe Patient Handling

It is well documented that the single most important factor for reducing the risk of back injury among healthcare workers is to eliminate the manual lifting of patients. Several states have enacted safe patient handling legislation and a number of facilities have adopted best practices, replacing manual lifting with lifting devices and lift teams. While the focus of most of this legislation has been the reduction of risk factors related to patient transfer and repositioning among nursing personnel, orderlies and attendants, diagnostic imaging staff face a variety of patient handling tasks such as transferring patients from a stretcher or wheelchair to an exam table, and then back again. Sonographers are also frequently required to manually reposition patients to obtain optimal imaging. Repeated exposure to the strain and exertion inherent in these activities contributes to the cumulative trauma and associated risk for developing WRMSDs.

1. Sonographer/user should utilize correct body mechanics when moving, wheelchairs, beds, stretchers, and ultrasound equipment. Correct body mechanics guidelines are available from employers or regulatory bodies.

2. Manual transfer or repositioning of patients should not be undertaken by sonographer/user. Seek assistance and training from employer for safe patient handling devices as needed. Always utilize appropriate patient assist/lift/positioning devices.

C. The Sonographer/User's Role in Safety

Safety requires a team approach for success. While the oversight and support of safety and ergonomics must be employer driven, each individual should have a collective and personal commitment to safe work practices. Ultimately, the level of engagement, participation, and ownership of personal risk management is determined at the decision making level. Each individual has a risk perception and risk tolerance that drives behavior. It is up to each individual sonographer to be informed and pro-active in managing personal risk.

1. Sonographer/user should document and report to their employer any ergonomic concerns or persistent pain or injury and seek competent medical advice.

2. Sonographer/user should maintain a level of physical fitness appropriate for the demands of the work tasks required.

3. Sonographer/user should collaborate with employers on staffing solutions that allow sufficient recovery from physically demanding tasks and time away from the work environment such as:

    a) Adequate staffing levels

    b) Frequency of call rotation

    c) Task rotation

    d) Scheduling of examinations

    e) Limiting shifts to no more than eight hours

4. Sonographer/user should be aware of the duration of exposure to risk factors and take steps, when possible, to minimize prolonged exposure such as utilizing machine driven protocols and accepting limitations of imaging capabilities with difficult to image patients (e.g., those with high BMI, limited mobility, and/or monitoring/intensive care equipment).

IV. EDUCATION AND TRAINING

Ongoing education and training is an essential part of an effective safety and ergonomics program. According to the National Institute for Occupational Health and Safety (NIOSH), the appropriate level of training is determined by the position the staff member holds in relation to exposure and abatement of hazards. Recognizing different training needs is critical to developing and maintaining a successful ergonomics program. Workers with direct exposure to hazards should have more comprehensive training that includes blended learning formats of visual, auditory, and kinesthetic learning styles.

Potential education/training resources:

- Journals, textbooks
- Online resources such as webinars and videos
- Employer and/or academic sponsored in-services
- Seminars, lectures, workshops, or conferences offered by professional organizations or manufacturers

A. ACADEMIC SETTING

It is recommended that all program managers, students, and educators, including clinical site instructors, be able to recognize the general risks for WRMSDs, including signs and symptoms, and be able to participate in developing strategies to prevent or remediate hazards. Program Directors should be aware that it has been demonstrated that there are risks for WRMSDs associated with prolonged scanning time. They should

utilize reasonable guidelines when establishing the duration and frequency of scanning in labs.

Students going into clinical practice and their clinical instructors should have additional job specific training and formal instruction to be able to:

- Recognize risks for WRMSDs
- Identify signs and symptoms for WRMSDs
- Have a depth of knowledge sufficient enough to participate in developing strategies to prevent or remediate hazards
- Have the fundamental ability to remediate risk factors for WRMSDs within self-control
- Know the process for reporting injuries or concerns for WRMSDs
- Have a basic understanding of the Worker's Compensation claim process

Training should include documented competency in all areas for new students and at least annually thereafter. Persons expected to play a key role in problem-solving ergonomic hazards should have added instruction or seek the guidance of an ergonomics specialist. Additional training and continuing medical education (CME) may be required by accrediting agencies.

B. CLINICAL SETTING

It is recommended that all physicians, support staff, managers, supervisors, and sonographers/users be able to recognize the general risks for WRMSDs, including signs and symptoms, and be able to participate in developing strategies to prevent or remediate hazards.

In addition, sonographers/users should have job specific training and formal instruction to be able to:

- Recognize job-specific risks for WRMSDs
- Identify signs and symptoms for WRMSDs
- Have a depth of knowledge sufficient enough to participate in developing strategies to prevent or remediate hazards
- Have the fundamental ability to remediate risk factors for WRMSD within self control
- Know the process for reporting injuries or concerns for WRMSDs
- Have a basic understanding of the Worker's Compensation claim process

Training should include documented competency in all areas for new hire employees and at least annually thereafter. Persons expected to play a key role in problem-solving ergonomic hazards should have added instruction or seek the guidance of an ergonomics specialist.

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GLOSSARY

Administrative Control Measures: Changes in work practices that reduce the frequency and/or duration of exposure to risk factor for WRMSDs. Although not as effective as Engineering Controls, Administrative Controls such as staffing levels, task rotation, regulated breaks, and maintaining equipment can successfully reduce risk for injury.

Anthropometrics: Comparative data of human body dimensions for various populations. Often the 5th to 95th percentile of a user population is referenced in the design process in order to accommodate the largest cross section of users.

Compact Ultrasound Systems: See Point-of-Care Ultrasound Systems

Control measures: Ergonomic solutions implemented as a way to address risks for WRMSDs. Interventions include Administrative (work practice) controls and Engineering (environmental) controls, as well as Personal Protective Equipment. See Administrative Control Measures and Engineering Control Measures.

Control panel: The user interface of an ultrasound system for imaging controls and data input. May or may not include a separate keyboard.

Demographic area: The quantifiable characteristics of a given human population or population segment, such as when used to identify consumer markets.

Engineering Control Measures: Also called environmental controls, these are the most effective control measures since they result in physical change to the workplace, which eliminates/reduces the hazard of the job/task. Engineering controls such as protocol changes and providing appropriate equipment can eliminate risk factors altogether in some circumstances.

Force: Pressure applied uniformly over a surface, measured as force per unit of area. Examples include push/pull force, grip force, and applied compression force.

Keyboard: The user interface on an ultrasound system for input of patient data and other information. The keyboard may or may not be incorporated into the Control Panel.

Mini breaks: A small duration break lasting a minute or two taken frequently during a task to relax muscular tension. In scanning, these muscles include, but are not limited to, the neck, shoulder, wrist, and fingers.

Monitor: The image display portion of an ultrasound system or computer. The monitor may or may not also have touchscreen functionality for imaging control or data input.

Neutral Posture: The posture which, whether sitting or standing, minimizes the stress on the body by keeping joints aligned. Neutral posture places the least stress on the musculoskeletal system, providing maximum endurance, control, strength and comfort by maintaining a balanced, resting posture around a joint. The opposite of neutral posture is awkward posture.

Point-of-Care Ultrasound Systems: A smaller, portable, compact ultrasound system used to image a patient at the site of primary care. Systems may be hand-held, configured with or without a cart as an accessory, and are often used by non-sonographers such as paramedics, emergency physicians, pain management physicians, anesthesiologists, and other specialists.

Primary Reach Zone: The area in front of and to the side of the body that can be reached while keeping the elbows at the sides of the body. It is recommended that 80% of work be kept within the primary reach zone. Reaching frequently or for prolonged periods outside the primary reach zone increases muscular effort and fatigue and the associated risks for WRMSDs.

Sonographer: A medical professional who uses an ultrasound system to obtain images of structures inside the human body for medical diagnosis by a physician.

Steering: Relates to mobility and functionality of wheels or casters. A directional caster is sometimes known as a “steering” caster.

System Console: All the components of an ultrasound unit base, not including the control panel, monitor, or transducers, with accessories such as ECG leads and image/data acquisition devices.

Touchscreen: A system interface that allows input via touch, such as on the control panel or monitor of an ultrasound system.

User: A professional who utilizes ultrasound equipment to answer clinical questions in a medical setting.