



# Hospital Hazards and Solutions Sonography

Sonographers who work with ultrasound equipment may be at risk for developing work-related musculoskeletal disorders (MSDs). Sonographers with heavy workloads or those who have been in the profession for many years are particularly at risk. This course will provide ways for employees to limit MSDs in sonography. Employees will also learn the best ways to transport and position patients to prevent injuries.

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# OSHAcademy Course 628 Study Guide

## Hospital Hazards and Solutions: Sonography

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This study guide is designed to be reviewed off-line as a tool for preparation to successfully complete OSHAcademy Course 628.

Read each module, answer the quiz questions, and submit the quiz questions online through the course webpage. You can print the post-quiz response screen which will contain the correct answers to the questions.

The final exam will consist of questions developed from the course content and module quizzes.

We hope you enjoy the course and if you have any questions, feel free to email or call:

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## Course Introduction

During patient evaluations, a high frequency ultrasound may be used by a diagnostic medical sonographer or sonologist to create diagnostic sonographic images.

As sonographers work with ultrasound equipment they may be at risk for developing work-related musculoskeletal disorders (MSDs). Sonographers with heavy workloads or those who have been in the profession for many years are particularly at risk.

According to the Society of Diagnostic Medical Sonography (SDMS), sonographers on average experience pain or MSDs within 5 years of entering the profession.

This course will provide ways for employees to limit MSDs in sonography. You will also learn the best ways to transport and position patients to prevent injuries.

## Course Components

Once you complete this course, you will have knowledge of the following components:

- transporting patients
- positioning patients
- body posture concepts
- use of orientation and equipment
- using ultrasound imaging equipment
- engineering, administrative, and work practice controls

## Module 1: Transporting Patients and Equipment

### Transporting Patients

Sonographers may be required to move patients or sonography equipment to various areas of the health care facility. This may require forceful pushing or pulling of imaging equipment, patient transport equipment (e.g., gurney, wheelchair, etc.) over differing floor materials and transitions for a significant distance.

In addition, sonographers may be required to assist patients onto and off the exam table when they arrive on any of a variety of transport devices (e.g., gurney, wheelchair, etc.). This may require heavy lifting in an awkward body posture.

### Potential Hazards

- Exerting force in awkward postures, such as bending or reaching, due to handles or push points that are too high or too low.
- Any unexpected, abrupt stoppage or deceleration when moving equipment resulting in the use of excessive force and awkward body postures. Examples include:
  - wheels that are the wrong size for the transitions between flooring types or rooms
  - wheels that are too small to easily pass over gaps between elevator and main floor
  - obstructions placed in line of travel
  - damaged floor
  - debris that is left on floor increasing the amount of force exerted, often in awkward postures
- Moving equipment with wheels (casters) that are poorly maintained or are inappropriate for the flooring surface. This results in the use of excessive force and awkward body postures.

### Possible Solutions

- Use smaller handheld equipment to perform bedside studies, whenever it is available and appropriate.

- Use mechanical powered assist devices whenever large or heavy patients or equipment must be moved for longer distances.
- Ensure equipment has the appropriate wheels (casters) to facilitate safe transport over all flooring and room conditions.
  - Generally, wheels that have a larger diameter, a narrower width and are made of a harder material will traverse gaps and changes in flooring more easily, reducing the necessary push force. Swivel casters should be used when maneuvering in tight locations. Note: At least one set of casters should be lockable to provide improved inline steering.
- Controls for equipment should be easily accessible without bending or reaching. These may include controls that allow selection between two-wheel, four-wheel and braked positions. Central locking is preferable.
- Aisles should be kept open and free of extraneous items such as gurneys, wheelchairs or other carts.
- Sonographers should be trained to use correct body mechanics when moving patients, wheelchairs, beds, stretchers and ultrasound equipment. Correct body mechanics suggestions may include:
  - Push instead of pull. Lean slightly into the load to let your body weight assist with force exertion.
  - Push at about chest height.
  - Push smoothly and slowly to start.
  - Do not bend or twist while exerting force.
  - Keep wrists straight.
  - Keep elbows close to the body.

### Transferring Patients To and From the Exam Table

Sonographers may need considerable support and assistance to move patients onto or from examination tables.

## Potential Hazards

- Pushing or pulling to position beds, gurneys and wheelchairs prior to transferring patients can require exertion of significant force, especially when dealing with bariatric (obese) patients, carpeted floors or poorly maintained wheels and casters.
- Assuming awkward postures such as bending, twisting or reaching when moving patients from wheelchairs, beds or gurneys to the exam table. Awkward postures, especially when combined with the exertion of force, increases the risk of injury to the back, shoulders, and lower and upper extremities.
- Using significant force when lifting bariatric patients from wheelchairs, beds or gurneys, increases the risk of injury to the back and shoulders.

## Possible Solutions

- Use mechanical powered transfer devices such as lifts or hoists to move patients, especially bariatric or non-ambulatory, from wheelchairs, beds, or gurneys.
- When appropriate, use multi-use devices, such as chairs, that can open up into beds. These allow patients to move from a sitting position to a prone position, without transfer.
- Additional employees should assist in moving and transferring equipment or patients if:
  - a mechanical powered device is not available
  - awkward postures must be used
  - push force exceeds about 50 pounds
  - amount of weight that the sonographer must support is in excess of 40-50 pounds

## Positioning Patients and Equipment

A successful sonographic scan depends on getting the transducer into an accurate position on the patient and being able to maintain that position for an appropriate period of time. Being able to accomplish this while protecting the sonographer depends on appropriate placement of the patient in relation to the sonographer. This placement can be highly variable depending on:

- the procedure being performed
- the size of the patient and the sonographer

- the type, size and placement of the equipment used
- the size and layout of the exam room

Sonographers must be diligent in positioning all equipment such as exam tables, chairs, lights, and carts to ensure the best possible ultrasound scan while minimizing risk to the patient and themselves.

### Body Posture Concepts

No matter what equipment you use or building you work in, keeping basic safe work practices in mind can help you work more safely when performing a scan. All the work items you use in your scanning techniques should be adjusted as much as possible to ensure proper body positioning.

### Potential Hazards

- Tipping the head back or forward places stress on the neck and shoulders.
- Reaching that involves pulling the elbow away from the body can stress the shoulder and back.
- Bending and twisting the torso places stress on the low back.
- Bending and twisting the lower arm and wrist places stress on the hand and elbow.
- Prolonged standing, sitting or holding the arm or neck in a static posture can fatigue the shoulder, leg, neck or hand, as well as create a contact stress on various body parts such as feet, buttocks and the legs.

### Possible Solutions

- Keep the head balanced and look straight ahead. Do not turn your head to the side or look up or down.
- Keep your shoulders relaxed. Do not hunch or raise your shoulders up during the procedure.
- Keep your torso straight. Do not bend.
- Alternate between sitting and standing positions.
- When sitting, make sure your feet, back, and buttocks are supported.

## Module 1 Quiz

Use this quiz to self-check your understanding of the module content. You can also go online and take this quiz within the module. The online quiz provides the correct answer once submitted.

- 1. When moving equipment, you should always \_\_\_\_.**
  - a. pull instead of push
  - b. push instead of pull
  - c. find a helper
  - d. wait until the end of your shift
  
- 2. Keep elbows \_\_\_\_ to the body when transferring patients.**
  - a. far away
  - b. close
  - c. away
  - d. bent
  
- 3. Additional employees should help in moving and transferring equipment or patients if \_\_\_\_.**
  - a. Push force exceeds 75 pounds
  - b. A mechanical powered device is not available
  - c. Amount of weight that a sonographer must support is more than 50 pounds
  - d. Both B and C are correct
  
- 4. Use smaller handheld equipment to perform bedside studies.**
  - a. True
  - b. False
  
- 5. What effect does prolonged standing, sitting or holding the arm or neck in a static posture have on your body?**
  - a. Stress fractures
  - b. You will eventually fall over
  - c. Cause fatigue
  - d. It won't have any effect

## Module 2: Use and Orientation of Equipment

### Examination Rooms

The layout of the examination room may have an impact on the sonographer by making equipment hard to maneuver and position.

### Potential Hazards

- Doorways that are too narrow may require frequent turning and repositioning to get patients and equipment into the exam room. More force is required when starting, stopping or turning during transport activities.
- Inappropriate flooring material (e.g., thick carpet) or elevated or pronounced transitions between rooms and halls make movement of patients and equipment more difficult and may require the use of excessive force.
- Examination rooms that are too small make it difficult to properly arrange the patient and equipment for a variety of procedures.
- Examination rooms that are arranged for only one configuration force sonographers to repeatedly use the same body posture or motions for prolonged periods of time. This increases the risk of injury to the shoulders, elbows, wrists, and hands.
- Lighting that does not include dimmer switches or controls, makes monitors difficult to read. This may lead to eye strain and back and neck discomfort as sonographers lean forward to detect items on the screen.

### Possible Solutions

Examination rooms should:

- Provide adequate space for maneuvering and orienting people and equipment around the exam table, allowing access from all sides.
- Have doorways that allow easy access for wheelchairs, beds and ultrasound equipment, minimizing the amount of turning and repositioning.
- Have hard surface flooring which allows easy movement of equipment. Anti-fatigue mats or pads can be placed around the exam area if sonographers must stand for prolonged periods.

- Provide easy access to imaging supplies, such as having supplies available in a number of locations.
- Have equipment such as thermal printers or recording devices in an area that reduces reach but allows the equipment to be accessed. Placing equipment or supplies on carts or stands may increase mobility and accessibility
- Have controllable environmental conditions, especially light levels. Switches, curtain or blind mechanisms should be placed in convenient locations.
- Provide adequate ventilation and temperature controls to ensure the comfort of the sonographer and patient while allowing the equipment to function properly.

### **Positioning and Adjusting the Exam Table**

The position of the table in the exam room is critical. It should be positioned in an area where there is access to all sides of the patient, as well as to other tools and devices needed for the scan.

You should be aware of and use ergonomic principles when moving heavy items, such as exam tables or consoles.

- Unlock wheels before attempting to move items.
- Push rather than pull unless the item moves easily.
- Try to push with the hands at about chest height.
- Enlist the assistance of others if the object is difficult to move.

### **Positioning the Ultrasound Equipment**

Using ultrasound equipment including the console, keyboard and transducer may present a significant risk of (MSDs) to the sonographer if not properly arranged. Due to the high cost of ultrasound equipment, older equipment may stay in use for some time. Older equipment often has the monitor, console and keyboard bundled into a single unit, allowing for few adjustments.

In addition, the transducer is generally designed based on diagnostic performance and not necessarily for ease of use. Newer equipment is much more adjustable. When replacing this ultrasound equipment, models with maximum adjustability may help to prevent work-related MSDs.

## Using the Transducer and Imaging Supplies

The transducer is the part of the ultrasound equipment that comes in contact with the patient's skin. It is almost always handheld and, depending on the application, it may be small or large. Generally, the transducer is made from a hard, smooth material to ensure it can be adequately cleaned. Many procedures require the sonographer to exert force when pressing the head of the transducer toward the area of interest. To get the best picture of the affected area, the sound wave emitted from the transducer needs to be redirected during the process, often requiring the use of highly repetitive motions.

In addition to the transducer, other items such as gloves and coupling agents may be necessary to improve the scans and provide sanitary conditions. Use and placement of these items may create additional hazards.

## Potential Hazards

- Using highly repetitive motions and prolonged forceful hand exertions often in bent wrist postures when using the transducer can be a hazard. This increases the risk of injury to the hand, wrist and elbow.
- Exerting force while the forearm is rotated, especially if the wrist is bent inward (flexed) can increase the risk of injuries to the elbow.
- Supporting or moving heavy cables repeatedly or for prolonged periods of time increases the risk of injury to the shoulder, arm and wrist.
- Repeatedly dragging or pulling the transducer cable during scanning motions creates resistance to transducer movement causing torque. Torque increases the amount of force the muscles of the forearms must exert, increasing the risk of injury to the hand, wrist, and elbow.

## Possible Solutions

- Use arm rests or cushions to support the arm during scans. This reduces the muscle force needed to hold the arm and any devices held in the hand.
- Transducer cables should be supported during the exam. A cable brace may be used to position cables overhead or along the arm. Using a cable brace to manage transducer cable to minimize the amount of force exerted by muscles.
- Always scan while maintaining the arm in front of the body and spread less than about 30 degrees.

- Position yourself as close to the patient as possible to minimize reach distances.
  - Move around the table rather than reaching over the patient.
  - Keep the elbows close to the torso and the forearm approximately parallel with the floor.
- Store all imaging supplies within easy access in the examination area.

### Ultrasound and Monitor Placement

The keyboard and the monitor are the principle interface points between the sonographer and the ultrasound equipment.

#### Potential Hazards

- Repeated reaching to the keyboard while performing ultrasound exams can stress the upper arm and shoulder.
- Repeated toggling and keystrokes with the wrist in an extended posture can stress the wrist and hand.

#### Possible Solutions

- Provide adjustable chairs and exam tables so the posture of the sonographer can be properly adjusted in relation to the patient and ultrasound equipment.
- Place the ultrasound equipment as close to the exam table as possible to minimize the awkward postures, such as reaching and turning of the head. Ideally, sonographers should be able to access all equipment and materials while keeping the elbows close to the body.

### Positioning the Monitor

The monitor is a critical part of the exam ultrasound equipment. Sonographers must view the monitor while operating the transducer to ensure they are obtaining the proper visual scan. Older ultrasound equipment often provides little adjustment possibility, especially for the monitor which is often attached directly to the console.

#### Potential Hazards

- Repeated use of awkward postures due to inappropriately placed monitors.

- Eye strain, blurred vision, double vision, dry eyes and headache resulting from prolonged concentration to view images that are unclear or washed out on the monitor.

### Possible Solutions

- Provide a fully adjustable monitor on a monitor arm which is detached from the main console. It should be easily positioned for both sitting and standing postures and for a variety of procedures.
- Have a monitor on each side of the bed. These should be easily repositionable. LCD or plasma monitors are preferable in high light areas.
- Do not share the monitor with patients if this compromises proper placement of the monitor for the sonographer. Provide an additional monitor for patients if they need to view the procedure.

## Module 2 Quiz

Use this quiz to self-check your understanding of the module content. You can also go online and take this quiz within the module. The online quiz provides the correct answer once submitted.

- 1. When performing an ultrasound, what should you use to reduce muscle force?**
  - a. Arm rests
  - b. Mouse pad
  - c. Cushions
  - d. Both A and C are correct
  
- 2. What can happen after prolonged concentration on an ultrasound monitor?**
  - a. Eye strain
  - b. Crying
  - c. Blindness
  - d. Cross-eyed vision
  
- 3. The \_\_\_\_\_ is a critical part of the exam ultrasound equipment.**
  - a. computer keyboard
  - b. monitor
  - c. gloves
  - d. lift equipment
  
- 4. You should provide adequate \_\_\_\_\_ to ensure the comfort of the sonographer and patient.**
  - a. materials
  - b. ventilation
  - c. paperwork
  - d. x-ray machines

- 5. Place ultrasound equipment as close to the exam table as possible to \_\_\_\_\_ the awkward postures.**
- a. increase
  - b. minimize
  - c. improve
  - d. fix

## Module 3: Engineering, Administrative, and Work Practice Controls

In the day-to-day operations of a sonography lab, there is always pressure to increase the number of procedures performed. To reduce the risk of potentially career-ending MSDs, management should ensure the need to perform a high number of procedures does not compromise management commitment to implementing proper ergonomic measures for sonographers.

When your employer does not make safety a priority in your workplace, the institution can experience the following costs:

- excessive sick leave absences
- reduced production
- loss of workforce
- costs related to temporary staff
- all other costs associated with recruiting and training for a hard-to-fill position

On average, if today's sonographers have been scanning for more than 10 years, their training did not include instruction on occupational injury and how to avoid it. Recognition of the problems and possible interventions can help sonographers protect themselves by identifying and avoiding hazardous situations.

### Problem Recognition and Intervention

Many sonographers operate with relative independence. It is necessary they remain informed about the possible hazards associated with the procedures they are performing. They should use all controls available to minimize the intensity and time they are exposed to stressful procedures.

Employers should ensure sonographers receive appropriate training and follow best practices in order to reduce the risk of developing MSDs. These best practices include:

- Take time to adjust all available equipment to minimize periods of the following:
  - sustained bending
  - twisting
  - reaching

- lifting
- contact pressure and awkward postures
- alternating between sitting and standing positions
- varying scanning techniques and transducer grips
- Reducing arm abduction (spread) and forward and backward reach by using measures such as:
  - requesting the patient move to a position which is advantageous from a posture standpoint, usually as close to you as possible
  - adjusting the exam table and chair
  - using arm supports
- Lower the light level in the room to eliminate glare on the monitor and to increase contrast on the monitor so the image can be seen comfortably and without strain.
- Relax muscles periodically throughout the day:
  - Stretch hand, shoulder, and back muscles.
  - Take mini breaks during the procedure.
  - Refocus eyes onto distant objects.
  - Vary procedures and tasks as much as reasonably possible.
  - Take meal breaks away from work-related tasks.
- Maintain a high level of physical fitness and range of motion in order to perform the demanding work tasks that are required. Spend a few minutes warming up muscles prior to undertaking tasks.

Employers should ensure that sonographers participate in education and training to reduce the risk of developing musculoskeletal disorders. This education and training could include:

- attending employer sponsored in-services
- attending seminars, lectures, workshops or conferences offered by professional organizations or manufacturers

- accessing journals, textbooks or online resources
- attending a formal sonography program which includes education on MSDs prevention in the curriculum

### Engineering Controls, Work Practices, and Scheduling

There are several factors that may increase the force, posture, or repetition of a task which may result in injuries.

#### Potential Hazards

- locating equipment in a room that is too small to allow for proper arrangement and alignment of the machine, bed, chair and sonographer
- inadequate ventilation
- lighting that is too bright and unable to be controlled
- poor orientation of diagnostic suites in relation to other critical areas requiring excessive frequency and distance of equipment or patient transfer
- lack of time to properly adjust equipment or patients for optimal procedure performance
- lack of knowledge about how to design, setup and equip the diagnostic suite for a particular procedure
- lack of knowledge concerning basic body biomechanics to minimize stress to the body
- improper staffing for the procedures performed

#### Possible Solutions

- Provide adequate space in the examination area for the maneuverability of equipment around the exam table and easy access from all sides.
- Provide adjustable room lighting with easily accessible dimmer controls and/or window shades or curtains.
- Provide adequate ventilation and temperature control to ensure the comfort of sonographer and patient while enabling the equipment to operate at a functional temperature.

- New equipment should always be assessed for its suitability in the physical space in which it will be used.
- Provide adequate rest breaks between examinations, particularly for challenging procedures which are comprised of similar postural and muscular force requirements.
- Provide annual training to all employees on the risk and prevention of musculoskeletal disorders.
- When planning to purchase new equipment, the employer should seek the input of technical staff to assess the risks and suitability of the equipment. For example, at least some tables should be able to accommodate bariatric (obese) patients weighing up to 600 pounds.

### Module 3 Quiz

Use this quiz to self-check your understanding of the module content. You can also go online and take this quiz within the module. The online quiz provides the correct answer once submitted.

- 1. On average, if today's sonographers have been scanning for more than \_\_\_\_ years, they didn't receive training on reducing MSDs when they first entered the profession.**
  - a. 5
  - b. 10
  - c. 8
  - d. 12
  
- 2. \_\_\_\_ the light level in a sonographing room so the image can be seen comfortably and without strain.**
  - a. Lower
  - b. Increase
  - c. Decrease
  - d. Fix
  
- 3. When planning to purchase new equipment, the employer should not seek the input of technical staff.**
  - a. True
  - b. False
  
- 4. Your employer should provide \_\_\_\_ training to all employees on the risk and prevention of musculoskeletal disorders.**
  - a. weekly
  - b. annual
  - c. bi-weekly
  - d. monthly

- 5. Why should you spend a few minutes warming up your muscles before working in a sonography area?**
- a. It prevent injuries
  - b. It will help you wake up
  - c. It will help reduce MSDs
  - d. You will warm up in a cold office

## Endnotes

1. Occupational Safety and Health Administration.(2014). Clinical Services: Sonography. Retrieved from: <https://www.osha.gov/SLTC/etools/hospital/sonography/sonography.html>
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