

Preventing Work-Related Musculoskeletal Disorders in Sonography



Description of Exposure

Work-related musculoskeletal disorders currently account for one-third of all occupational injuries and illnesses reported to the Bureau of Labor Statistics (BLS) by employers every year.

The following are factors that, in combination and over time, lead to musculoskeletal injuries:

- Static and awkward postures and movement resulting from the use of the transducer and positioning of both patients and equipment
- Persistent and continual pressure for sustained periods of time during exams
- Poor workplace ergonomics in the design of equipment, chairs, tables, and lighting
- Increased exam scheduling
- Sonographer height, age, and gender
- The main risk factors noted during trans-abdominal ultrasound procedures were awkward postures (mainly right shoulder flexion and abduction), sustained static forces, and various types of pinch grips while maneuvering the transducer. Extreme wrist postures varied because of the way sonographers had to move the transducer to accommodate different patient sizes. Small patient abdomens mainly led to the use of shoulder movements while large abdomens led to greater wrist flexion and extension.

Case Study

NIOSH [1999] conducted an investigation at a hospital antenatal unit in which most of the sonographers had reported neck, shoulder, and arm pain while performing ultrasound. NIOSH investigators interviewed several workers and assessed the jobs using video analysis. The following findings were noted:

- Standard positioning of the equipment resulted in twisting of the neck to view the monitor, flexion and abduction of the shoulder, and extension of the elbow while operating the controls.
- The shape of the abdominal transducer resulted in several distinct types of grips, ranging from a pinch grip to a

power grip to an intermediate type of grip (the most commonly seen is with the 3rd and 4th fingers on one side and the thumb on another). The power grip—the most comfortable over the long term was used when the hand could be spread along the wide (3-inch) edge of the transducer.

Controls

NIOSH recommends the following controls to reduce the risk of musculoskeletal injury for sonographers:

Equipment

- Provide adequate work space for personnel, sonography equipment, the patient table, and other equipment.
- Ensure that sonography equipment is fitted with a high-resolution screen that has a high refresh rate (85 Hertz or higher), a noninterlaced monitor and an easily adjustable “brightness control” to reduce eye strain. Position the equipment monitor directly in front of the sonographer.
- Position the keyboard to allow the arm to be in a relaxed position with the upper arm close to the body (minimal flexion and abduction) and the elbow at a 90-degree angle. A laptop computer may enable the sonographer to achieve a favorable position with respect to the patient. However, be aware that laptops can present other problems because the keyboard and monitor cannot be positioned separately, which make them difficult to handle at the bedside.
- Use a posture-enhancing adjustable chair to accommodate the sonographer through adjustable footrests, seat heights, and lock and release casters. Casters should allow for rolling between patients and the ultrasound machine when necessary, yet prevent rolling backwards when performing necessary procedures.
- Use motorized adjustable tables (including those equipped with drop-down side rails) to optimize the positions of the patient and the sonographer.

The table should be as narrow as possible (preferably 24 to 27 inches wide) to allow for proximity to the patient and to reduce the amount of shoulder abduction needed to reach the patient’s far side.

Work Practices

- Decrease the duration of static posturing:
 - Vary postures throughout the day.
 - Sit or stand, depending on the exam.
- Decrease hand-grip pressure:
 - Alternate the scanning hand and vary the grip used.
 - Take short breaks.
 - Loosen grip on the transducer.
- Minimize awkward and extreme postures.
- Increase tissue tolerances through exercise and adequate rest.

Scheduling

- Schedule different types of exams for each sonographer in a workday to decrease strain on musculoskeletal tissues specific to one type of exam.
- Limit the number of portable exams to help minimize those tasks with higher number of pinch grips and increased static or awkward postures.
- Consider a maximum number of scheduled exams for sonographers. Take into account existing ergonomic conditions and equipment, the type of exams performed, experience of the sonographer, and the duration of the individual exams. Because of the complexity of each diagnostic situation, it is difficult to specify an allowable limit to the number of exams per day. Until better information is obtained, take into account the total examination time per day (more exams of shorter duration or fewer exams of longer duration).

Training

Periodic training and reassessment regarding the above ergonomic interventions should include the following:

- Setting up the equipment, bed, and chair
- Modifying the equipment positioning during scanning
- Positioning patients
- Using adaptive equipment or devices, such as cushions and wedges and the patient's limbs for resting the elbows during scans
- Taking rest breaks during the procedures
- Maintaining good physical fitness and conditioning
- Optimal handling of specialized tests such as trans-vaginal examinations
- Having symptoms promptly evaluated by a licensed health care provider.

Acknowledgments

The principal contributors to this publication were Robin Epp MD, MPH, University of Iowa, Department of Occupational and Environmental Medicine; Bruce Bernard, MD, MPH and Daniel Habes, National Institute for Occupational Safety and Health; Ashok Nimgarde, MD, Harvard University; and Joan Baker, Society of Diagnostic Medical Sonography.

References

NIOSH [1999]. Hazard evaluation and technical assistance report: University of Medicine and Dentistry of New Jersey, St. Peter's University Hospital, Piscataway, New Jersey. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, NIOSH HETA 99-0093-2749, Health Hazard Evaluation Report No. 99-0093. Available at: www.cdc.gov/niosh/hhe/.

For More Information

For more information about work-related musculoskeletal disorders in sonographers, see

NIOSH, Society of Diagnostic Medical Sonography [2003]. *Industry Standards for the Prevention of Work-Related Musculoskeletal Disorders in Sonography*. Plano, TX.

To receive documents or other information about occupational safety and health, contact NIOSH at

NIOSH—Publications Dissemination
4676 Columbia Parkway
Cincinnati, OH 45226-1998

Telephone: 1-800-35-NIOSH (1-800-356-4674)
Fax: 513-533-8573 ■ **E-mail:** pubstaf@cdc.gov
or visit the NIOSH Web site at www.cdc.gov/niosh

For a monthly update on news at NIOSH, subscribe to *NIOSH eNews* by visiting www.cdc.gov/niosh/eNews.

Mention of any company or product does not constitute endorsement by NIOSH. In addition, citations to Web sites external to

• NIOSH do not constitute NIOSH endorsement of the sponsoring organizations or their programs or products. Furthermore, NIOSH is not responsible for the content of these Web sites.

• **This document is in the public domain and may be freely copied or reprinted. NIOSH encourages all readers of the *Workplace Solutions* to make them available to all interested employers and workers.**

• As part of the Centers for Disease Control and Prevention, NIOSH is the Federal agency responsible for conducting research and making recommendations to prevent work-related illnesses and injuries. All *Workplace Solutions* are based on research studies that show how worker exposures to hazardous agents or activities can be significantly reduced.

• **Preventing Work-Related Musculoskeletal Disorders in Sonography**

• **DHHS (NIOSH) Publication No. 2006-148**

DEPARTMENT OF HEALTH AND HUMAN SERVICES

Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health
4676 Columbia Parkway
Cincinnati, OH 45226-1998

