

Ergonomics and Sonographer Well-being in Practice

by

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A 1997 survey of sonographers in Canada and the United States found that 57% of the respondents had wrist injuries and 55% reported hand and finger injuries that were work related. Many work tasks require the worker to grip an object such as a pen, computer mouse, tool, or in the case of sonography, any variety of ultrasound transducers designed for specific diagnostic procedures. The force necessary to grip small diameter objects is being applied by some of the smallest muscles in the human body. Additionally, the ease of positioning of the transducer depends on the transducer housing, flex relief cuff and the cable's ability to follow the movements of the sonographer's hand movements. Heavy, inflexible transducer cables put additional strain on the wrist, forearm and elbow of the scanning arm requiring increased grip force to resist the torque created by the transducer cable. Research has shown that forceful or prolonged grips or grips with awkward postures lead

to injuries of the upper extremity. Grip strength also decreases when the wrist is in an awkward posture.

Work-related musculoskeletal disorders (WRMSDs) refer to a group of disorders caused by or aggravated by workplace activities. These injuries are not caused

“Heavy, inflexible transducer cables put additional strain on the wrist, forearm and elbow of the scanning arm requiring increased grip force to resist the torque created by the transducer cable.”

by *what* workers do but *how* they do it. The increased use of technology in today's workplace has led to decreased movements in order to accomplish tasks and results in the relationship between the user and



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Many variables figure into sonographer comfort. Heavy cables that are draped around the neck and inflexible flex cuffs (as shown above) add to the strain on sonographers. Improvements to decrease cable weight and improve flexibility are part of better ergonomics in the workplace.

the equipment being “frozen.” The postures that result are not normal for the human body.

Epidemiologic and biomechanical studies have further supported a causal relationship between workplace exposures and the occurrence of musculoskeletal disorders (MSDs) of the upper extremities. Risk factors for sonographer occupational injury include forceful exertions, awkward postures, repetitive motions, “pinch” grip, and twisting of the upper extremity required to perform the exam. Many sonographers manage the weight of the cable by draping it around their neck while scanning, thus forcing them into unnatural postures in order to manipulate the transducer. Ideally, the transducer should be well balanced, lightweight, and an appropriate width. The cable should be flexible and lightweight with a flex relief cuff that allows the transducer to be positioned and held with the least amount of effort. These features allow the sonographer to effectively and comfortably manipulate the transducer during a diagnostic ultrasound examination.

Musculoskeletal disorders of the upper extremity are among the most prevalent of workplace injuries in many countries. Over 300,000 injuries are reported annually in the United States to the Occupational Safety and Health Administration. These injuries account for 56% of reported work-related illness and cause 640,000 lost workdays in the United States. Among sonographers in the United States, 81% reported some degree of musculoskeletal pain or discomfort related to their profession with the hands/fingers (55%), upper back (58%), wrist (59%), neck (74%) and shoulders (76%) accounting for the sites where pain was most often described. The average time reported experiencing pain was in excess of five years (mean 62.4 ± 51.4 months; median = 48 months). WRMSDs cost U.S. businesses \$60 billion per year. Worker’s compensation costs in the United States for carpal tunnel syndrome claims are \$3,000 above the average cost for claims from all causes. The mean cost per case of upper extremity MSD is \$8,070 versus \$4,075 for all types of occupational injury. Imaging departments incur the expense of replacing an injured sonographer, which includes approximately \$63,000 per year in salary and \$10,000 in recruiting costs.

In Australia, the overall incidence of WRMSDs is estimated to be 205 per 1000 persons per year, with



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Innovative cables that are smaller, lighter and more maneuverable are more comfortable for the sonographer.

95.4% of sonographers reporting some degree of musculoskeletal pain related to their job. These injuries cost Australian businesses \$5 to \$20 billion per year. The cost of an individual incident is between \$27,000 to \$28,000, which includes loss of incomes,

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Medicare benefits, and the monetary value of a worker’s pain. Cases of carpal tunnel syndrome account for 30% of days away from work in Australia. However, many sonographers reported pain in multiple areas, i.e., 91% experienced shoulder pain, 84% neck pain, 73% upper back, 61% wrist, 61% lower back, 59% eyes, 56% hands and fingers, 53% upper arm, 43% mid back, and 41% forearm. Additionally, studies indicated that the average time sonographers had experienced work related pain was 52 months. The WorkSafe Commission of Australia has suggested that a 10% reduction in workplace injuries would result in an increase in the Gross Domestic Product of \$340 billion.

In Great Britain, it has been reported that of all the cases of WRMSDs, 44% were disorders of the upper extremity. At least 375,000 workers suffer from

some type of upper extremity injury resulting in a total of 4.2 million working days lost due to this type of injury. Injured workers lose an estimated £5.6 billion a year in reduced income and other expenses. The cost of pain and suffering, although difficult to quantify, is estimated to be £5.5 billion. The cost to employers in Great Britain for upper extremity injuries is estimated to be between £208 million and £221 million a year.

China is still a developing country but has advanced significantly in industrialization and economic reform. Rapid economic development has brought about an increase in occupational health issues in that country, and work injuries have been ranked as one of the top occupational health issues for certain industries. Musculoskeletal disorders in the small-scale industries in China have been increasing since the 1980s and have impacted the productivity and income of these industries. Legislative regulations have been issued to address occupational health issues; however, limited capital resources and the lack of awareness of occupational health issues continue to place workers at risk.

Ergonomic equipment design is critical to decreasing the personal and financial impact of musculoskeletal disorders among sonographers. One important consideration when evaluating ultrasound equipment is the transducer assembly, including probe shape, weight, and balance point, as well as the size and flexibility of the cable. Thoughtful placement of monitors and controls will also help ease the strain associated with the sonographer's job. Consideration of ergonomics when purchasing ultrasound equipment is important because dollars spent on improving the ergonomic design of the workstation have an excellent return on investment. This investment leads to reduced risk of musculoskeletal injury among sonographers, allowing the most experienced workers to remain in the work force.

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