

# Improving the Ergonomic Workstation: An Innovative Ultrasound System

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Today's ultrasound facilities are faced with many challenges including standardizing exams, diagnostic confidence, timely patient care, work flow and work-related musculoskeletal disorders (WRMSD) among the staff. Ninety percent of sonographers surveyed in 2008 reported some type of injury that they attributed to their work.<sup>1</sup> The cause of these injuries is multifaceted and, therefore, requires a spectrum of solutions to reduce the risk of further injury. Of equal importance are the work schedules, sonographer work postures, and the work station equipment.

Work schedules are generally the responsibility of the ultrasound department administrator but should also include some input from the staff sonographers. The schedule should include work breaks that allow for some muscle recovery time. Sonographers should be scheduled for a variety of exam types in order to use different muscle groups throughout the day. Bedside exams should be shared among sonographers rather than assigning one person to those exams all day.

Work postures are the one solution over which sonographers have the most control. Regardless of the work schedule or the work station equipment, if sonographers fail to make changes in how they perform exams, they will continue to be at risk for occupational injuries. Sonographers should make every effort to avoid non-neutral and static postures whenever possible. This involves patient positioning to reduce the sonographer's reach and arm abduction while scanning. It also involves arranging the work station equipment so that the monitor is easily viewed without twisting of the sonographer's neck and the control panel is accessible without excessive reaching.

The primary "tool" in a sonographer's work station is the ultrasound system. Equipment manufacturers have made great strides in improving their user interface and in researching how

sonographers use the features of the systems. Many of the features on current ultrasound systems not only help minimize injury risk factors, but also increase the user's efficiency and convenience, which contribute to increased throughput and patient satisfaction. Carestream Health has integrated user input into the new and unique features of the Touch Ultrasound System, which has resulted in an ergonomic and efficient "tool" for the sonography work station.

Features that contribute to comfortable work postures are those that allow the sonographer to position the system close to the exam table and to position the monitor and controls directly in front of the user's eyes. A fully articulated control panel allows the sonographer to move it closer to him or her and to move it from one side to the other without having to move the entire system.



*Figure 1: The CARESTREAM Touch Ultrasound System has a fully articulated control panel that swivels for optimal positioning of the system with respect to the position of the user.*

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<sup>1</sup> Evans K, Roll S, Baker J. Work-related musculoskeletal disorders (WRMSD) among registered diagnostic medical sonographers & vascular technologists: a representative sample. *J Diagn Med Sonography*. 2009;25:287-299.

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The most frequently used keys should be positioned directly in front of the sonographer. This can easily be achieved if the control panel can be moved horizontally from right to left. Grouping the controls according to function reduces reach and the need to “search” for related keys. Intuitive functionality reduces frustration and stress on the part of the sonographer—both of which contribute to a vulnerability to work-related musculoskeletal disorders.



*Figure 2: The most frequently used controls are grouped and centered around the track ball, which is fully integrated as a touch feature on the control panel. The panel can be moved from left to right for flexibility when positioning the system in an exam room.*

The CARESTREAM Touch Ultrasound System offers a full touch control panel, which differentiates it from other systems that have integrated touch panels. The track ball is integrated into the control panel as a touch feature as well. With the increasing trend toward touch panels on most electronic devices, it is innovative for an ultrasound system to have this technology incorporated in the control panel. The typing, or QWERTY, keys should be an integrated part of the control panel rather than a retractable keyboard that forces the sonographer to back away from the system in order to type.

Creative backlighting can indicate the active keys, and textured controls allow the sonographer to easily distinguish between keys.



*Figure 3: Textured controls help sonographers distinguish between keys quickly and intuitively.*

The system’s monitor should also be fully articulated and easily moveable for optimum positioning. Sonographers will more readily reposition the system’s monitor if it can be done with one hand while they are scanning. A handle on the bottom of the monitor frame makes this possible.



*Figures 4 & 5: A handle allows the sonographer to easily reposition the monitor with one hand.*

Transducer ports should be easily accessed with minimal reach. To remove or replace a transducer, the user should be able to use one hand. Systems such as the CARESTREAM Touch Ultrasound System, which can accommodate 3 to 4 transducers, are ideal since transducers are installed once on the system and choices can then be made on the control panel. This reduces excess reaching and bending to access the transducer ports.

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*Figures 6 & 7: Multiple transducer ports reduce the need to change transducers by plugging them in. When necessary to change the transducer, this should be easy to accomplish using one hand.*

Height adjustability is another important ergonomic feature for ultrasound systems. A wide height range addresses the working needs of a variety of sonographers, regardless of their physical height or of their need to stand while performing certain exams. A shared-services system should have a low enough height range to accommodate venous reflux exams and a high enough height range to accommodate obstetrical and abdominal exams. Adjusting the system's height should be controlled without the need for wrist deviation or extension.



*Figure 8: The height control on this system is easily engaged without forcing the wrist into an unnatural position.*

The ultrasound system should be easily transported on various flooring surfaces and over doorway thresholds. It should be easy to re-position throughout an exam. The overall height of the system, when being moved, should be low enough so that the majority of users can see over it.



*Figure 9: Most users can see over the Touch Ultrasound while moving it.*

The brake pedal should be accessible and not interfere with the movement of the system.



*Figure 10: The Touch Ultrasound brake pedal is conveniently located and easily accessible.*



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Other innovative features of the CARESTREAM Touch Ultrasound System also contribute to the enhanced work flow:

The **Smart Select button** on each transducer allows sonographers to engage the transducer of choice right on the transducer itself.



Figures 11 & 12: Sonographers can directly engage the selected transducer with a built-in Smart Select button.

A **swipe-and-go badge login feature** inputs the sonographer's identification for each exam.



Figure 13: Enter sonographer identifying information quickly with a badge.

The flat surface of the control panel design makes it **quick and easy to clean** throughout the day. This feature complies with, or may exceed, the infection control policies of most facilities.



Figure 14: It's easy to clean the control panel between procedures.

The wide variety of exam types and scanning styles, as well as the differences in worker heights, necessitate a great deal of flexibility in the features of the ultrasound system. Full mobility of all the components of the system provides the most opportunities for sonographers to optimize their work postures, thus significantly reducing their risk for occupational injuries.

A stable, experienced workforce is one of the cornerstones of a patient-centered imaging department, and worker injury can have a large impact on the department's bottom line, worker morale and the quality of patient care. Ergonomically designed ultrasound systems can impact an entire healthcare organization by enhancing the most important component of its business—the ability of workers to do their work. Ergonomics strives to fit the job to the worker rather than expecting the worker to fit into a static work environment. By reducing injuries, experienced workers can be retained and can perform at their best level. This impacts the quality of patient care, productivity and profits.

About Sound Ergonomics, LLC: This company is a woman-owned consulting company specializing in the injury risks and ergonomics of allied health professions with a particular focus on diagnostic ultrasound. The consultants are not only multi-specialized sonographers with extensive backgrounds in clinical sonography and education, but are also certified in basic occupational ergonomics. Sound Ergonomics was founded in 2000 to address the growing issue of occupational injuries in the ultrasound profession. Through extensive research and publishing activities, Sound Ergonomics' consultants have added valuable information to the design and use of ultrasound and computer workstation equipment.