

# Designing Ultrasound Systems to Reduce Occupational Injury in Sonography.

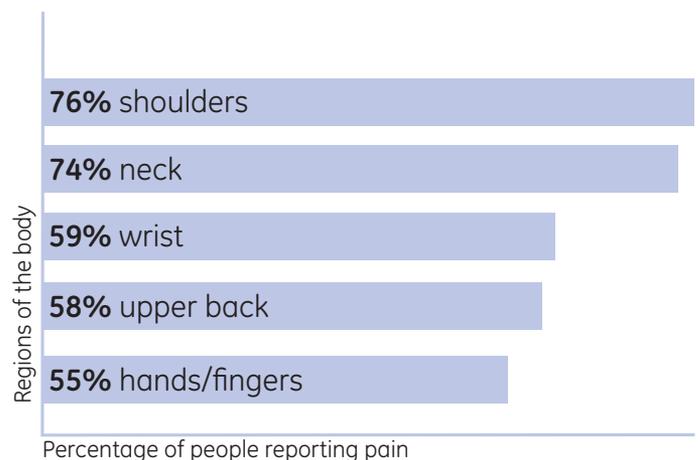
## Vivid S6 Signature Class Ultrasound from GE Healthcare

Product description and ergonomic evaluation by Sound Ergonomics, LLC

An ergonomically designed ultrasound system is important for avoiding work-related musculoskeletal injuries. Occupational injury is increasing among sonographers due, in part, to larger workloads and workforce shortages. According to the Society of Diagnostic Medical Sonography (SDMS), more than 80% of sonographers are scanning in pain and 20% of these professionals eventually experience a career-ending injury. On average, within 5 years of entering the profession, sonographers experience pain as a result of their work tasks.<sup>(1,2)</sup>

GE Healthcare's commitment to designing ergonomically friendly ultrasound systems has resulted in the new Vivid™ S6, which has been extensively evaluated by Sound Ergonomics. The Vivid S6 is a new Signature Class ultrasound system that offers many innovative ergonomic features, designed with the sonographer in mind. The advanced features of the Vivid S6 address the industry standards for the prevention of work-related injuries. From the monitor to the lightweight design, the Vivid S6 incorporates simplicity and comfort. After the ergonomic evaluation by Sound Ergonomics' consultants, the Vivid S6 was found to meet or exceed most of the industry standards for equipment design.<sup>(3)</sup>

**Figure 1**  
Most common pains described by sonographers.



Source: Employee Health and Safety Services, *An Update on Ergonomic Issues in Sonography*, July 2000.



# GE's Vivid S6 Complete

Complete innovative design with an ergonomic solution in mind!

Most of the equipment control measures recommended by the industry guidelines are addressed with the Vivid S6.

## Mobility

The lightweight design of the system provides a small footprint and simplicity.

It is a small ergonomic system with the comfort of a console!

- The "Flex Fit" allows for easy up and in, down and out movement of the keyboard and monitor for flexibility when standing or sitting while scanning.
- The 17" Flat Screen Monitor has wide angle visibility and incorporates an Auto Sensor feature, which adjusts appropriate brightness and contrast levels in any lighting conditions, minimizing eyestrain. The system has the ability to support a second display setting, optimized for an external monitor.
- The swivel footrest is designed to encourage neutral position of the ankle, as recommended by the industry standards.
- Cable management of the Vivid S6 is innovative – there are 4 cable hooks for easy access and there is less interference in the foot area.
- The 4 Port Connectors result in ease of use, single-handed use, and minimized strain on the worker.
- The system's versatile casters are designed for mobility on a variety of floor surfaces, such as tile and carpet. The system can easily be pushed or pulled with little force, even with one finger!
- The lightweight probes, such as the 3S, 4C, and 8L, offer a more ergonomic balance to minimize torque on the wrist and facilitate a more comfortable grip.



# Ergonomic Solution.

## Performance

The high performance of a console with one touch optimization features, such as Smart Depth, SmartStress, ATO, and ASO, are now available in a miniaturized ergonomic mobile system. The result is better image quality, quicker exam times, and ultimately less strain on the sonographer.

The optimized control layout accommodates both right- and left-handed users with its 3 easy-to-reach areas:

- 1) Scan Area** — centrally located near the track ball resulting in less reach.
- 2) Patient Area** — located on the left of the system, with all necessary patient information and archiving control.
- 3) Data Management Area** — on the right of the system, for storage of loops and still frame images.

The user interface is similar to other Vivid systems, thus making the Vivid S6 easy to use. We have streamlined the workflow so that the Vivid S6 is intuitive to new users after scanning only a few patients. This is due to the optimized layout of the control panel that can be easily adapted to any user. Each user can easily migrate from another system in no time.

The keys are illuminated and glow in the dark of the exam room, thus allowing for clear identification of control functions that can be activated during the exam. The keys that are activated are illuminated in green.

SmartStress allows the user to save settings at each stage and view of the stress echo examination, to lessen optimization needs when time is of the essence.

The Auto Key functionality allows Tissue Optimization and Spectrum Optimization with only one touch of the Auto Key which results in less optimization time for the user.



## Reach

The system offers several features that are within the user's reach and that require minimal keystrokes. The Vivid S6 provides a Flex Key that can be configured to perform any function that the sonographer or physician would like to have at a finger's reach.

Smart Depth automatically optimizes acquisition parameters according to the selected imaging depth in both 2D and Color. This lessens keystrokes.

As a complete shared-service system, the S6 has several ergonomic features to minimize keystrokes in vascular applications such as:

Wide Aperture — System automatically changes to this feature when below certain depths, for deeper penetration and better lateral resolution.

## Conclusion

The Vivid S6 is a new system representing the Signature Class Ultrasound where miniaturization meets console. Its performance brings workflow and productivity to the next level.

It was designed with ergonomics in mind!

You can see how a small lightweight design combined with proper ergonomics makes the Vivid S6 easy to maneuver for mobile studies.

Miniaturization is the future of ultrasound. At GE, we are committed to reducing system size — and increasing ergonomics — in our future products.



## Industry Standards:

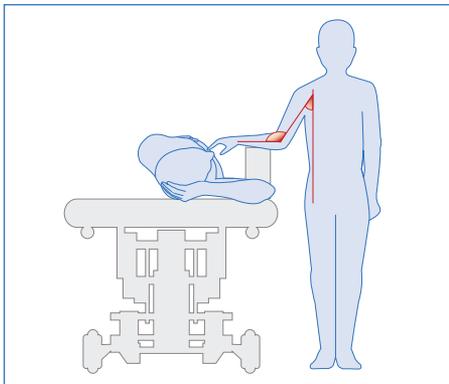
The industry standards for sonography address the role of employees, employers, educators, medical facilities, and equipment manufacturers in reducing the incidence and impact of work-related musculoskeletal injuries on the workforce. These standards are intended to assist all stakeholders in making informed decisions. Adoption of these industry standards will improve the well-being of sonographers and sonologists and, hopefully, assist in addressing the workforce shortage in the profession by keeping the most experienced sonographers on the job.<sup>(4)</sup>

### Top 4 musculoskeletal injuries found in the workplace, and how to reduce injury risk by using the Vivid S6.

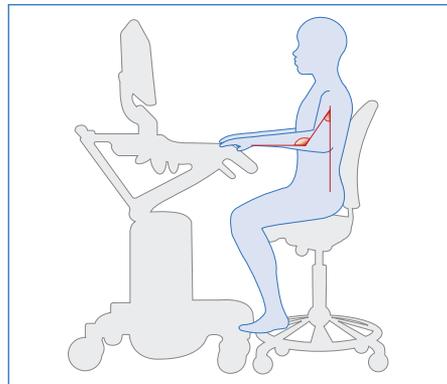
The major musculoskeletal disorders found in the workplace involve the shoulder, the neck, and the hand and wrist. The adjustability of the Vivid S6 and its compact size provide control elements within the user's reach, reduce arm abduction and allow the user to be positioned in front of the system's monitor and the most commonly used keys.

## References:

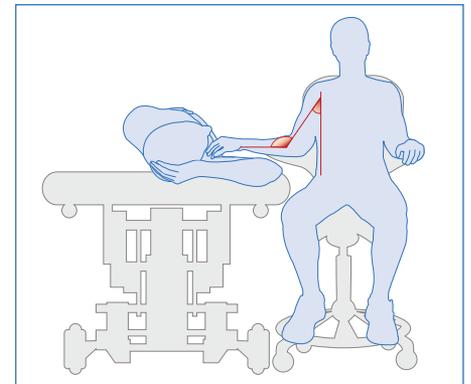
1. Society of Diagnostic Medical Sonography. *Sonography Benchmark Survey*. Dallas, Texas; 2000.
2. The Prevalence of Musculoskeletal Disorders and Related Work and Personal Factors Among Diagnostic Medical Sonographers (.pdf, 430 KB)  
Ian Pike, PhD, Andre Russo, BSc, Jonathan Berkowitz, PhD  
Joan P Baker, MSR, RDMS, Vickie A. Lessoway, RTR, RDMS
3. Society of Diagnostic Medical Sonography. *Industry Standards for the Prevention of Work-Related Musculoskeletal Disorders in Sonography*. May 2003
4. White Paper Industry Standards. *Consensus Conference on Work-Related Musculoskeletal Disorders in Sonography*



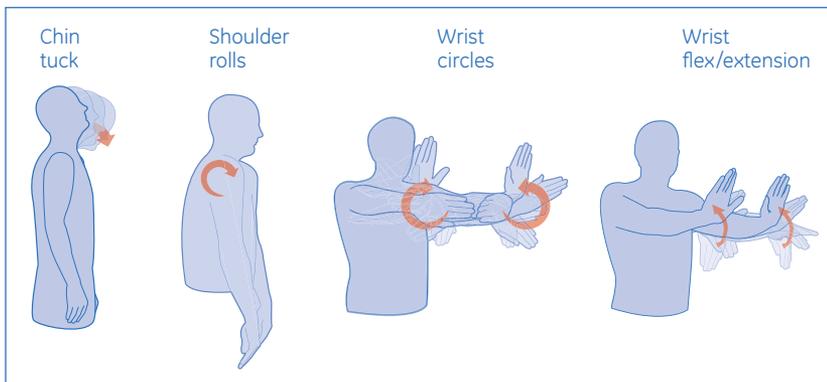
1. Minimize sustained bending, twisting, reaching, lifting, pressure, and awkward postures; alternate sitting and standing and vary scanning techniques and transducer grips.



2. Adjust all equipment to suit user's size and have accessories on hand before beginning to scan.

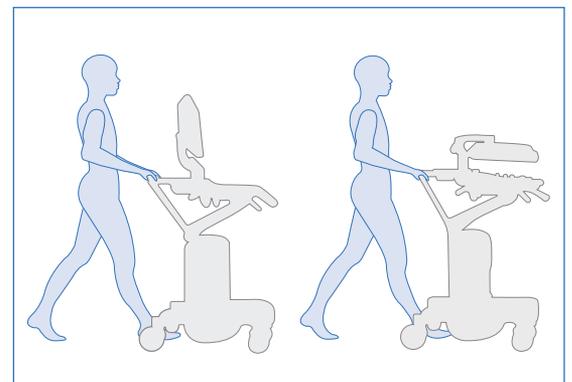


3. Use measures to reduce arm abduction and forward and backward reach to include: instructing the patient to move as close to the user as possible; adjust the exam table and chair; and use arm supports.



4. Relax muscles periodically throughout the day:  
a. Stretch hand, wrist, shoulder muscles, and spine.  
b. Take mini breaks during the procedure.  
c. Take meal breaks separate from work-related tasks.

d. Re-focus eyes onto distant objects.  
e. Vary procedures, tasks, and skills as much as reasonably possible.



5. Use correct body mechanics when moving patients, wheelchairs, beds, stretchers, and ultrasound equipment.  
a. Correct body mechanic guidelines are available from employers or regulatory bodies.

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Re-think, Re-discover, Re-invent, Re-imagine.

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