



SOUNDERGONOMICS

Education and Occupational Health

Samsung R20 Ergonomic Evaluation



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Ergonomics Meets AI: The Ultrasound Machine Designed for Comfort and Efficiency

The Challenge

Work-related musculoskeletal disorders (WRMSDs) are a prevalent and costly issue in sonography, affecting up to 90% of professionals over their careers¹. These injuries result from repetitive motions, sustained awkward postures, and physical strain during scanning, often leading to pain, restricted work time, or career-ending conditions. Despite advancements in equipment, many sonographers face significant ergonomic risks due to outdated techniques, prolonged workloads, and suboptimal work environments. This underscores the critical need for ergonomically designed ultrasound systems that prioritize user comfort and safety, enabling sonographers to deliver high-quality patient care while minimizing injury risks.



Introduction

The Samsung R20 was evaluated against standards such as the Industry Standard for the Prevention of Work-Related Musculoskeletal Disorders in Sonography (ISPWRMSDS) and ISO 941-210, according to anthropometric standards in North America.

In all 37 evaluated standards measured, the R20 was shown to either meet or exceed industry standards. For some standards, the R20 rendered them obsolete due to its advanced technology and design.



Ergonomic Innovation Sets New Industry Benchmark

The R20 represents a comprehensive imaging system that combines technology and consideration for the end user. This combination of software advances and advanced flexibility to adjust the machine, helps reduce musculoskeletal injury and promotes increased comfort for the user.

- Completely customizable user profiles allow individual sonographers to configure both physical buttons and software settings according to their personal preferences, ensuring the system is adapted for the user.
- The AI-driven software minimizes repetitive motions on the control panel by accessing large data sets that assist the sonographer in capturing the highest quality images
- Lightweight transducer cords eliminate the physical burden associated with tension and drag during scanning

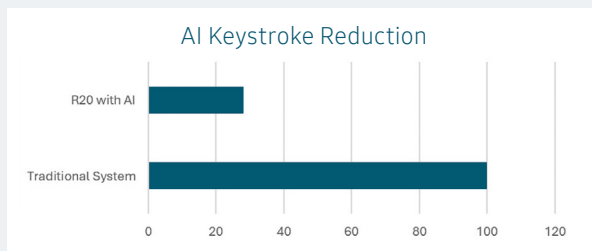
R20 Technical Evaluation Summary

Comprehensive ergonomic analysis against ISPWMSDS and ISO 9241-210 standards. The R20 meets or exceeds 100% of all 37 evaluated industry standards. The system exceeded 62% of standards and rendered 4 traditional standards obsolete through technological innovation.

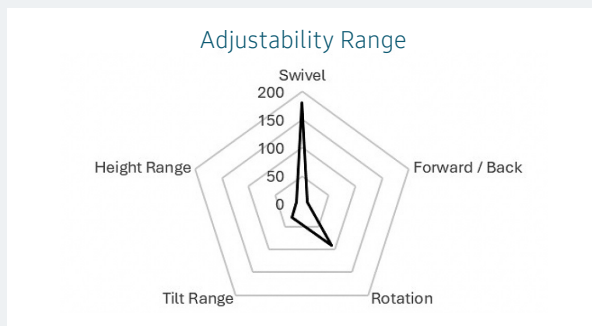


Control Panel and Touchscreen

The control panel features AI-driven software that reduces repetitive keystrokes by up to 80% compared to traditional systems². With dual articulating arms, the R20 Control Panel is able to swivel 180-degrees and provides 11.25 inches of height adjustability. It features an optimized reach distance that fits 100% of the standard anthropometric range for American users. Font sizes and key surfaces exceed industry standards in size by up to 166%, ensuring ease of use.

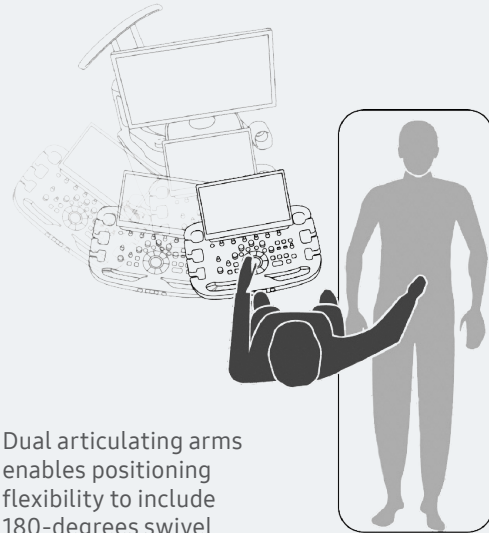


A 15.6" LCD touchscreen with 30 degrees of tilt for easy viewing from a standing or sitting position. This full range of motion allows sonographers to maintain neutral neck, shoulder, wrist and forearm positions. The touch screen feature allows the user to, in real time, cast a duplicate view of the live image to both the touch screen in front of them, and the monitor simultaneously, which has a 360-degree rotation capability. This feature creates the leading edge standard for eliminating neck and back strain when multiple parties are viewing an image.



Cart Design: Accommodating Every User

The cart height ranges from 30.5 inches to 41.75 inches, comfortably fitting users from the 5th percentile female (5' tall) to the 95th percentile male (6'1" tall) in either a sitting or standing position.



For seated users, the cart provides ample clearance, which measures 23.4 inches of clearance from the built-in footrest to the handle. This surpasses the industry standard by providing an additional 17% clearance for the shortest users and 9% for the tallest, ensuring comfort across diverse body types.





Monitor

The 27" OLED monitor reduces haze by 35% compared to LCD, provides high resolution views, and eliminates eye strain in bright lighting environments. This renders traditional anti-glare standards obsolete, as the monitor ensures visibility from all angles and positions. Fonts, colors, and sizes are all customizable, exceeding all OSHA standards for screen readability.

27" OLED monitor with 360-degree rotation to reduce eye strain.

Mobility and Transport

Dual electronic push button controls for brakes and 2- and 4-wheel mobility are present on both the front and rear of the machine, simplifying repositioning. This innovation not only exceeds mobility standards but also provides the option of steering and maneuvering the machine from either side.

The Mobile Sleep function increases efficiency with a 72% time savings on boot up from Sleep Mode (60% on boot up and 75% on shut down).



Push pull force to move the machine using the rear handle on a hard surface average just 2.23 pounds of force compared to the 50 pound industry standard. Electronic controls are accessible on both the front and rear handles for maximum flexibility.

	Booting Time	Shut Down
Regular On/Off	80 seconds	20 seconds
Mobile Sleep	32 seconds	15 seconds

Condition Avg.	Initial Force (pounds)	Avg. Sustained Force (pounds)	Force Reduction
Back - Hard Surface	7	2.23	68.1%
Back - Carpet	14.5	7.23	50.1%
Front - Hard Surface	9.67	3.33	65.5%
Front - Carpet	13.73	7.27	47.1%



Transducer Design: Lightweight and Balanced

While well-crafted engineering design supports ergonomics and AI-driven technology reduces user movements, innovations in the transducer cord address a longstanding ergonomic challenge. Traditional ultrasound transducers and cords create cumulative weight strain due to their weight that sonographers must counteract through grip strength and constant readjustment. With over hundreds of daily movements, these compensations can contribute to carpal tunnel syndrome, tendonitis, and rotator cuff injuries.

The R20's transducers demonstrate a 9-26% weight reduction compared to conventional designs through advanced materials engineering and internal wire reconfiguration. The redesigned cord technology achieves a cross-sectional area reduction of 18-50% and weight reduction of 33-66%.



50% thinner
60% lighter



Redesigned cord technology achieves 33- 66% weight reduction

Surface electromyographic (EMG) validation studies were performed that measured deltoid muscle activity during different exams in both standing and sitting positions. Lightweight transducer assemblies with flex cords reduced deltoid muscle activation by 20-30% during standard imaging protocols of the liver, thyroid, leg venous, and pelvis.

Notably, flex cord transducers performed similarly without a supportive brace as conventional transducers with a brace. And when flex cable transducers were combined with a supportive brace, deltoid muscle activation decreased 96-98% compared to conventional cords without a supportive brace.

Beyond weight reduction and cord redesign, the R20's transducers incorporate tactile features that guide users' hands toward a neutral grip and wrist positioning. Curved surfaces fit naturally in the hand, intuitively placed thumb grooves provide reference points, and slip resistant textures help maintain the user's grasp, even when gel compromises grip security.



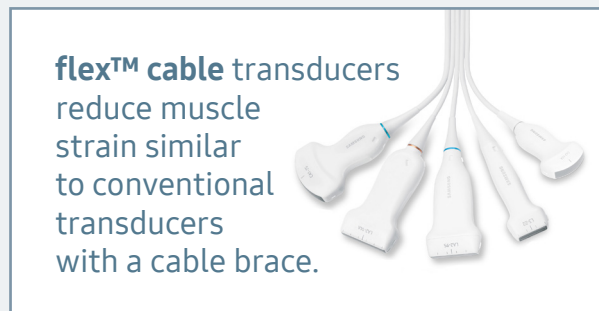
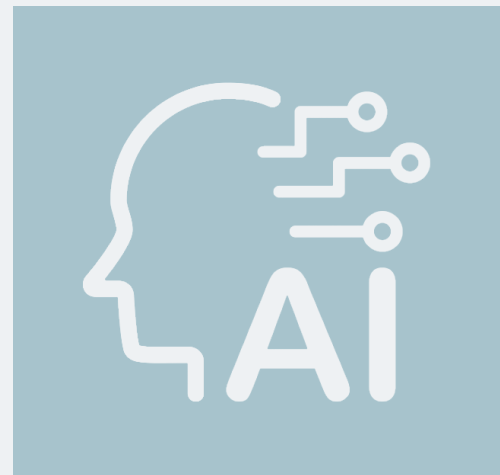
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Conclusion

Samsung's latest addition is an example of how engineering focused on ergonomics and safety can simultaneously advance image acquisition and diagnostic capabilities while protecting sonographers from occupational injury. The R20 meets or exceeds 100% of all 37 standards in every evaluated category, distinguishing itself as a leader in ergonomic innovation. The R20 met 38% (14/37) of the standards, exceeded 62% (23/37), and rendered 4 standards obsolete.

For healthcare facilities facing sonographer shortages and rising injury related costs, investing in equipment designed around human factors is both an ethical imperative and sound business strategy. The integration of lightweight transducer cords along with system ergonomics places the R20 at the leading edge of transforming sonographer health outcomes while supporting sustainable, high quality patient care.

Meets or exceeds
100%
of all 37 standards



flex™ cable transducers
reduce muscle
strain similar
to conventional
transducers
with a cable brace.

4 Standards
Rendered
Obsolete



[To learn more
about R20, please
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