

Medical Ultrasound:

Ergonomics

Ergonomics- Definition

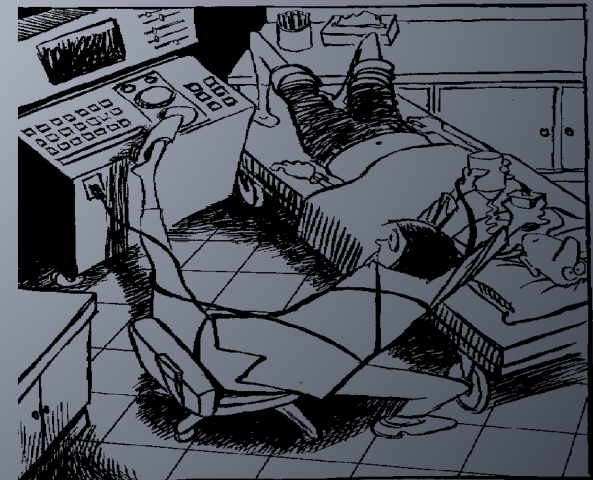
“Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance”.

(International Ergonomics

Association, 2014)

Ultrasound

- Ultrasound practitioners are generally considered predisposed to Work-Related Musculoskeletal Disorders (WRMSD) due to repetitive upper limb movements and static postures.
- Diagnostic ultrasound presents multiple ergonomic concerns, including:
 - Type and use of Equipment
 - Scanning environment
 - Work load
 - Practitioner/patient factors



SONJA REACHED FOR THE GAIN CONTROL, AND REDEFINED THE MEANING OF FLEXIBILITY.

Risks

- Poor ultrasound practice ergonomics can lead to:
 - Work-related Musculoskeletal Disorders (WRMSD)
 - Absenteeism through ill health
 - A significant economic burden

Ultrasound WRMSD

- WRMSD's range in severity from pain and tingling to loss of function; acute, chronic and irreversible damage may lead to episodes of sickness from employment which carries a significant financial and social burden

(Murphy & Coffin, 2002)

- Between **80-90%** of sonographers scan in pain

(Baker 2001; Evans et al, 2010)

- Anatomical regions commonly affected by WRMSD include:

- Shoulder
- Neck
- Wrist
- Back
- Hand/fingers
- Upper arm

WRMSD-Scanning risks

- Repetitive micro movements
- Poor scanning posture
- Sub standard equipment
- Inefficient transducer grip
- Excessive or sustained reaching
- Application of force/pressure

Work load risks

- Increased referrals
- Government waiting time targets
- Staff shortages
- Insufficient rest periods/breaks
- Repetitive examination lists

Practitioner risks

- Aging workforce
- Inappropriate environment/equipment set-up
- Inappropriate moving & handling techniques

Client risks

- Increasingly obese population
 - Displacement of adipose tissue in obese patients often requires increased probe pressure and stretching (HSE, 2012), this can elevate muscle fatigue and may lead to injury.

Risk reduction of WRMSD in Ultrasound

- Regular Health & Safety risk assessments
- Appropriate equipment
- Safe working environment
- Moving and handling training
- Education of risks of occupational injury
- Appropriate equipment and ancillaries
- Training and support.

Employers have a duty of care to provide regular health and safety risk assessments and an appropriate working environment for ultrasound practice.

(SCoR & BMUS, 2015).

Ultrasound Equipment

- Ultrasound equipment specifications vary, however scanners should be:

- Mobile - Multidirectional wheels (scanner or cart)

With the following credentials:

- Monitor- Fully adjustable height with swivel screen
- Transducer- Lightweight, flexible cables
- Console- Height adjustable with side tilt
- Operator controls- Well lit, Intuitive, logically arranged

Ancillary equipment

- ❖ Essential
- ❖ Table - height adjustable
 - Ultrasound table/couches should be height adjustable ideally by electronic control to allow operator to adjust appropriately throughout examination and in response to altered patient positions
- ❖ Seat – ergonomically designed/adjustable
 - Ergonomically designed chairs help relieve and prevent postural stress (Bambach, 2013)
- ❖ Desirable
- ❖ Arm/cable support
 - Arm supports can be placed between the patient and practitioner to provide arm rest to reduce muscle loading in examinations (NSH, 2014)
 - Sagging cables should be positioned in cable supports to reduce wrist torquing (SoR, 2006)
- Anti-fatigue mat



Scanning Environment

- Appropriate floor area to allow access around couch/flexible set-up
- Black out blinds/windowless
- Adjustable lighting
- Air conditioning for ventilation and room cooling

Good work practices

- Appropriate work list scheduling

- Adequate staffing levels

- Apply due ergonomic consideration
 - Adjust work environment prior to each scan (table height, chair height, patient position, lighting).

Transducer Grip

- Employ the power grip
 - The pinch grip is a common and natural approach to hold the US transducer however takes 4 to 5 more muscle and tendon force than the power grip and utilises only 25% of hand strength (Soundergonomics, 2014).

Power grip



Pinch Grip



Posture

- Avoid or minimize twisting of the spine
- Maintain an upright position
- Avoid overreaching and unnatural positions
- Limit arm abduction to less than 30°
- Scan with neutral wrist position

Move and stretch

■ Rotate tasks

■ Take regular mini breaks

■ Stretch

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Exercise Plan

Stretching Exercises

SHOULDER ELEVATION STRETCHING EXERCISE 1

1. Begin with shoulders relaxed.
2. Push shoulders upward toward the ears.
3. Hold briefly, then slowly and FULLY lower your shoulders.
4. 3 repetitions, 5 times per day.

THE EMPHASIS IN THIS EXERCISE IS ON RELAXATION

SHOULDER HORIZONTAL ADDUCTION EXERCISE 2

1. Stand grasping your elbow with other hand as shown.
2. Pull the elbow and arm across your chest as that you feel a stretch. You may feel some of a stretch if you keep your elbow straight, and if so, do it that way.
3. Hold 30 seconds.
4. 1 repetition at each of 3 different levels, 3 times per day, spread throughout the day.
5. Repeat with your other arm.

SHOULDER INTERNAL ROTATION EXERCISE 3

1. Kneel behind back with one arm.
2. Clasp the arm with your other hand.
3. Try to pull the arm spread as down as that you feel a stretch.
4. Hold 30 seconds.
5. 1 repetition, 3 times per day, spread throughout the day.
6. Repeat with your other arm.

CORNER STRETCH EXERCISE 4

Standing in a corner with hands at the shoulder level and feet away from the corner. Lean forward until a comfortable stretch is felt across the chest. Keep head and trunk on a straight plane. Do not get back, use your abdominals.

LEVATOR SCAPULA STRETCH EXERCISE 5

Place hand on head and gently stretch neck by pulling down and away. Alternate hands, holding for 8 seconds on each side.

WRIST FLEXOR & EXTENSOR STRETCH EXERCISE 6

Keeping elbow straight grasp one hand and slowly bend wrist up or down until stretch is felt. Repeat on other hand.

CERVICAL-THORACIC FLEXION STRETCH EXERCISE 7

Sitting upright, clasp hands around elbows. Retract cervical spine, then slowly head forward, one segment at a time, until your neck and upper back are rounded, and your elbows are dangling towards the floor, letting your shoulder blades separate. Ready for the flow.

CERVICAL-THORACIC EXTENSION EXERCISE 8

Clasp hands behind base of head. Retract chin, making neck long. Extend neck and upper back, while supporting head. Bend backwards over chair. Keep elbows back.

CERVICAL SPINE-NECK RETRACTION EXERCISE 9

Pull head straight back keeping jaw and eyes level. Hold and repeat.

SCALENE STRETCH EXERCISE 10

Sidehead head as far as possible to the right and left. Turn head onto shoulder then up again while maintaining the sidehead position.

CERVICAL SPINE UPPER TRAPEZIUS STRETCH EXERCISE 11

Gently grasp side of head while arching behind back with other hand. To head away and a gentle stretch is felt. Hold and repeat.

LOWER TRAPEZIUS STRENGTHENING EXERCISE 12

Sitting in a chair, with lower back supported and abdominal muscles engaged, pull your shoulder blades down and back.

SHOULDER EXTERNAL ROTATION EXERCISE 13

1. Grasp rubber tubing in hands as shown.
2. Rotate arms outward, keeping elbows bent.
3. Hold 3 seconds and slowly relax.
4. Start with 8 and work up to 30 repetitions, 1 time per day.

SCAPULAR PROTRACTION EXERCISE 14

1. Hold a weight in your hand.
2. Lie on back with arm pointed upward as shown.
3. Raise shoulder off floor in one path for outward riding.
4. Hold 3 seconds and slowly relax.
5. Start with 5 and work up to 30 repetitions, 1 time per day.

SHOULDER ABDUCTION EXERCISE 15

1. Place one arm slightly away from body.
2. Place the other hand on arm as shown.
3. Try to raise the arm out to the side, but resist the motion with your other hand.
4. Hold 3 seconds and slowly relax.
5. Start with 8 and work up to 30 repetitions, 1 time per day.

SHOULDER HORIZONTAL ABDUCTION EXERCISE 16

1. Anchor middle of rubber tubing to solid object.
2. Hold tubing in both hands, arms straight in front of you as shown.
3. Bend elbows and pull elbows straight backward (keep upper arm parallel to floor).
4. Hold 3 seconds and slowly relax.
5. Start with 5 and work up to 30 repetitions, 1 time per day.

SHOULDER EXTENSION STRENGTH EXERCISE 17

1. Anchor rubber tubing to a solid object.
2. Stand holding rubber tubing in both hands with arms in front of body.
3. Pull arms backward as shown.
4. Hold 3 seconds and slowly relax.
5. Start with 5 and work up to 30 repetitions, 1 time per day.

Strengthening Exercises

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Disclaimer
You should consult your physician before starting any exercise program.
Sound Ergonomics is not liable for any damages arising from the use of this exercise program.

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