Medical Ultrasound:

Ergonomics

Ergonomics- Definition

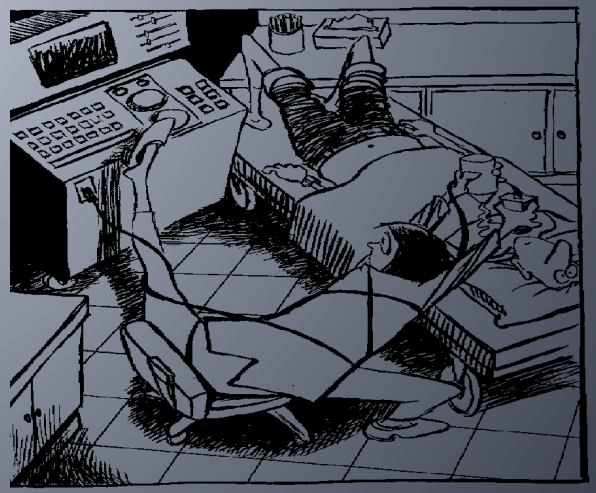
"Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance".

(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



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 (Rothlisand, 2014 ; HSE,2012)

  - Sagging cables should be positioned in cable supports to reduce wrist torqueing (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

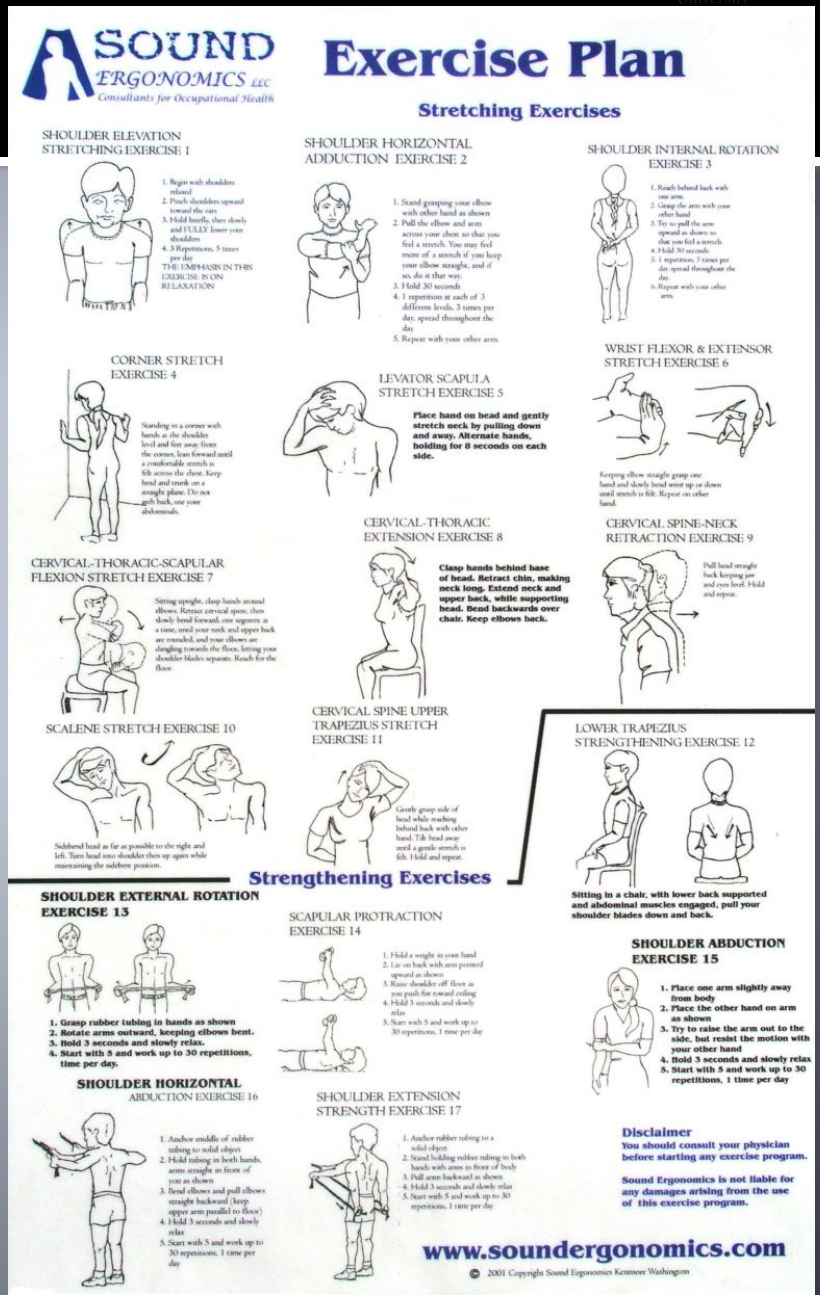
Pinch Grip

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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