Don’t get it twisted!
The ergonomics revolution in GI endoscopy

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Disclosures/Conflicts: None

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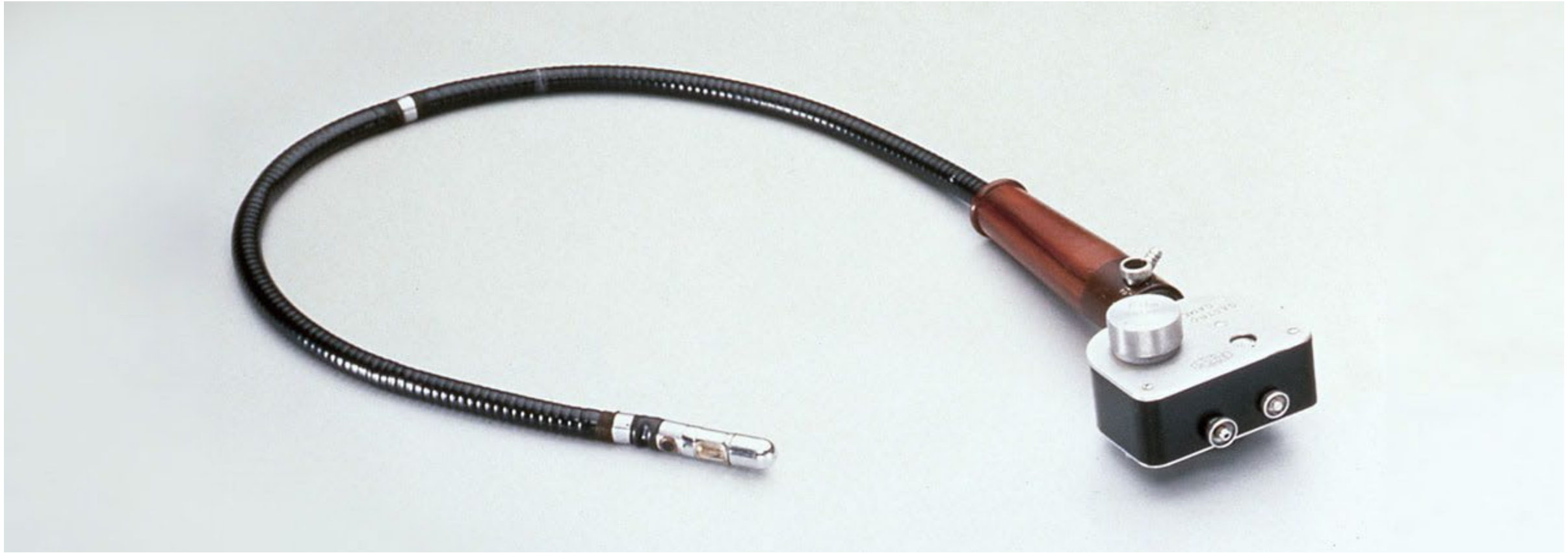
Learning Objectives

- Understand the rates and most common sites of endoscopy-related injuries (ERIs)
- Determine the predictors of ERI
- Understand interventions that can reduce the risk of ERI

Evolution of the modern endoscope



https://www.olympus-global.com/technology/museum/endo/gastro.html?page=technology_museum

Definitions

- Ergonomics
- Anthropometry
- Biomechanics

Ergonomics

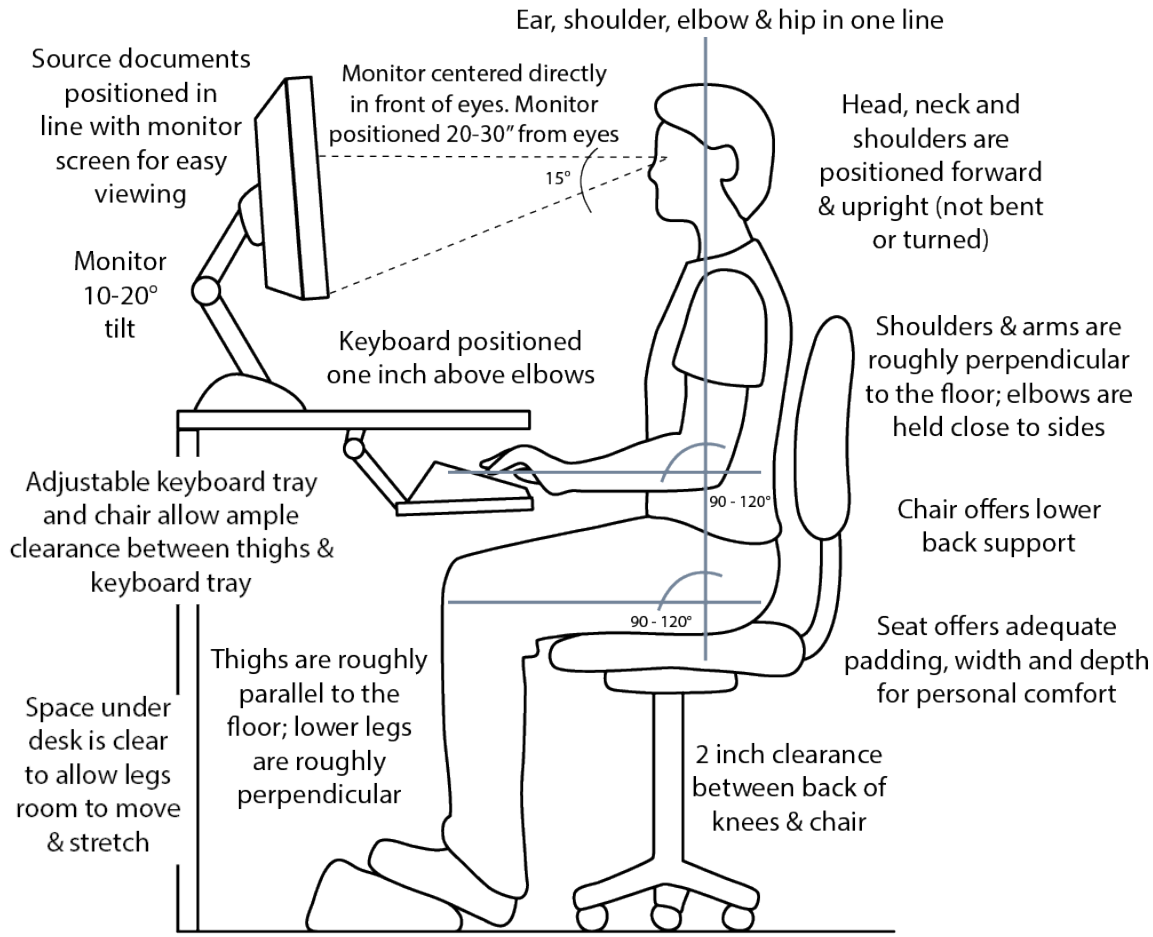
- An applied science concerned with designing and arranging things people use so that the people and things interact most efficiently and most safely
- Can be physical, cognitive
- Takes into account human capabilities and limitations then applies it to work
- How can a job best be fit to an individual rather than forcing individuals to fit into jobs

Merriam-Webster
A Shergill, NCSCG GI Symposium 2019.

De-boning knife, before.

De-boning knife, after.

THE ERGONOMIC WORKSTATION



FEET rest flat on the floor or are supported by a stable footrest

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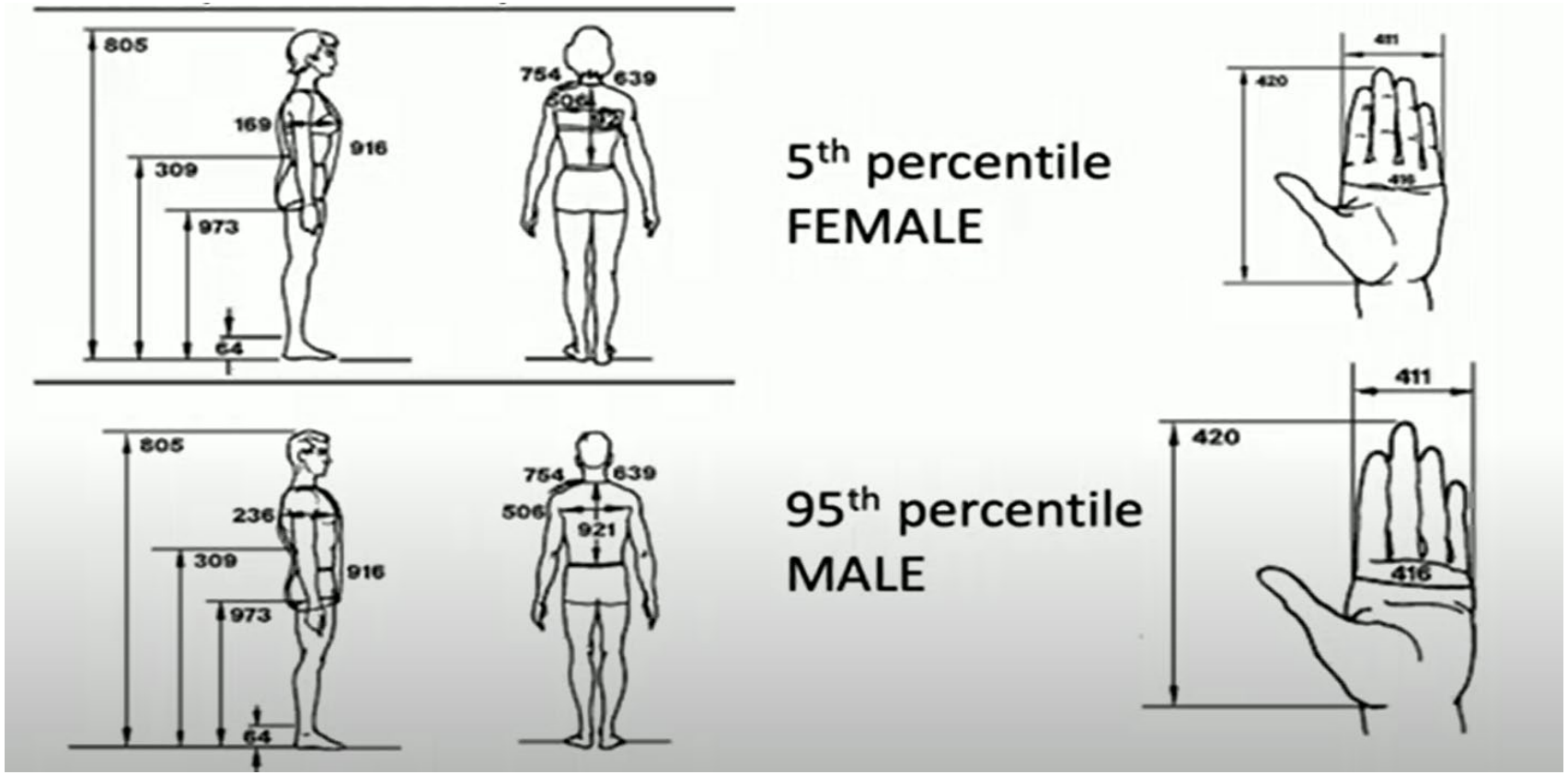
Anthropometry

- Study of human dimensions



A Shergill, NCSCG GI Symposium 2019.

Biomechanics

- How the body produces force and movement
- Force determined by
  - Length-tension relationship of a muscle
    - Neutral position = maximum overlap of actin and myosin filament is position of greatest strength
  - Muscle mass
    - Most important predictor is gender

A Shergill, NCSCG GI Symposium 2019.

Work-related musculoskeletal disorders

- External loads like holding/manipulating scope depending on forces required for those actions, duration of time, repetition can exceed internal tissue tolerances, causing repetitive microtrauma to connective tissue
- Strong evidence for causal relationship between posture (nonneutral posture), repetition, and high force and work-related musculoskeletal disorders

A Shergill, NCSCG GI Symposium 2019.

Work-related musculoskeletal disorders

- Early stage – aching and tiredness of affected limb occur during work shift but disappear during night and days off.
- Intermediate stage – aching and tiredness occur early in the work shift and persist at night. Reduced capacity for repetitive work.
- Late stage – aching fatigue and weakness persist at rest. Inability to sleep and to perform light duties.

A Shergill, NCSCG GI Symposium 2019.

Work-related musculoskeletal disorders

- Multiple survey based studies of endoscopist indicate high prevalence of injury
- 39 to 89% of endoscopists surveyed report some injury they perceive as being directly related to endoscopy
- 20 to 47% prevalence of injury in gastroenterology trainees

ASGE Guidelines, 2023

Rates and common sites of ERI

- Systematic review and meta-analysis
- 17 surveys assessing prevalence of ERI in 5227 respondents
  - 14 studies of practicing gastroenterologist
  - 2 studies of GI trainees
  - 1 study of colorectal surgeons
- Overall rate ERI 57.5%

ASGE Guidelines, 2023

Rates and common sites of ERI

- Common sites of ERI
  - Hands and fingers: 35.8%
  - Back: 35.3%
  - Upper back and neck: 32.6%
  - Thumb alone: 29.2%
  - Neck alone: 26.1%

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Predictors of ERI

- Gender of the endoscopist
  - Female gender associated with higher rates of ERI
- Exposure to performing endoscopies
  - Time spent during and volume of endoscopies associated with high rates of ERI

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Female endoscopists

- Systematic review of 8 studies with 3355
  - Two studies specific to GI trainees
- Overall rate of ERI in female 62.4% compared to male 45.5%
- Meta-analysis female endoscopist had higher odds of developing ERI (OR 1.79 95% CI 1.35-2.38 p<0.01)

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Exposure to performing endoscopies

- Systematic review found 24 studies
- Pawa et al 2021 surveyed 1698 ACG members
  - On multivariate analysis number of hours performing endoscopy per week (p=.009) and number of years in practice (p=.022) independent predictors of ERI
- Morais et al surveyed surveyed 171 European endoscopists
  - Greater than 15 years in practice (p=.03) independent risk factor for ERI

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Exposure to performing endoscopies

- Ritidid et al 2015 surveyed 684 ASGE members
  - Higher procedure volume (greater than 20 endoscopies per week, p<.001) more endoscopy hours per week (greater than 16, p<.001), and higher number of years performing endoscopy (p=.004) were associated with higher rates of ERI

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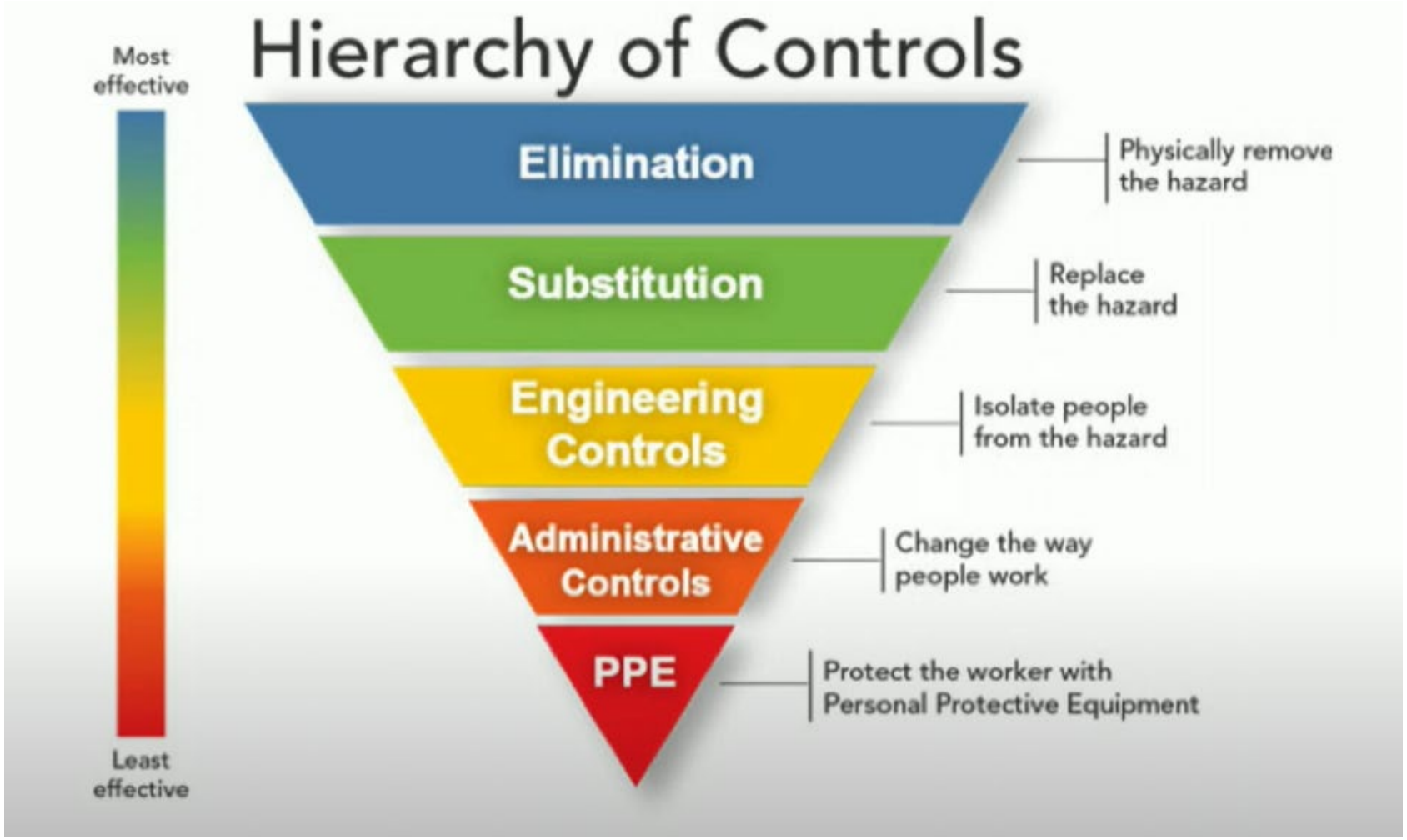
How can ergonomic principles help?



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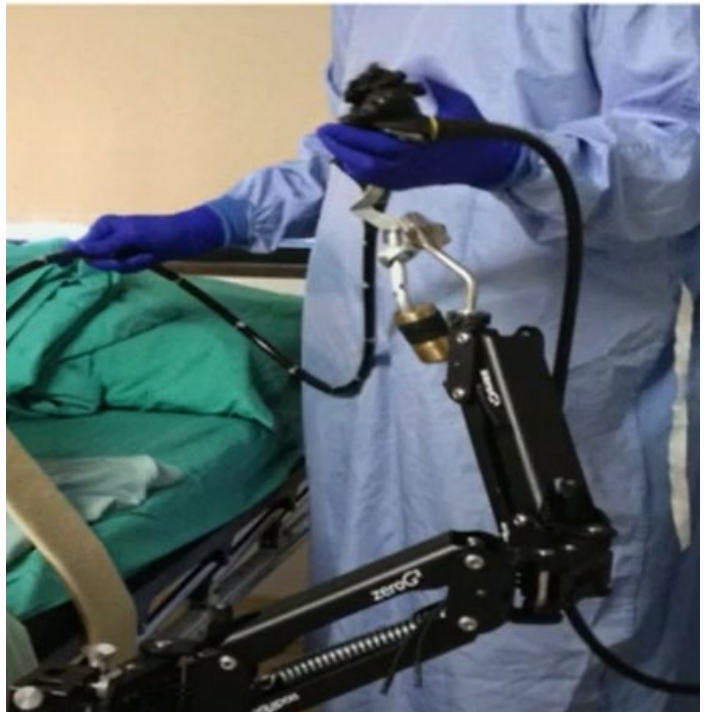
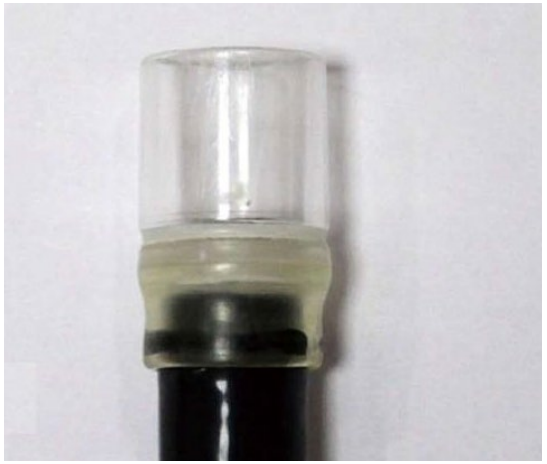
Examples of “engineering controls”





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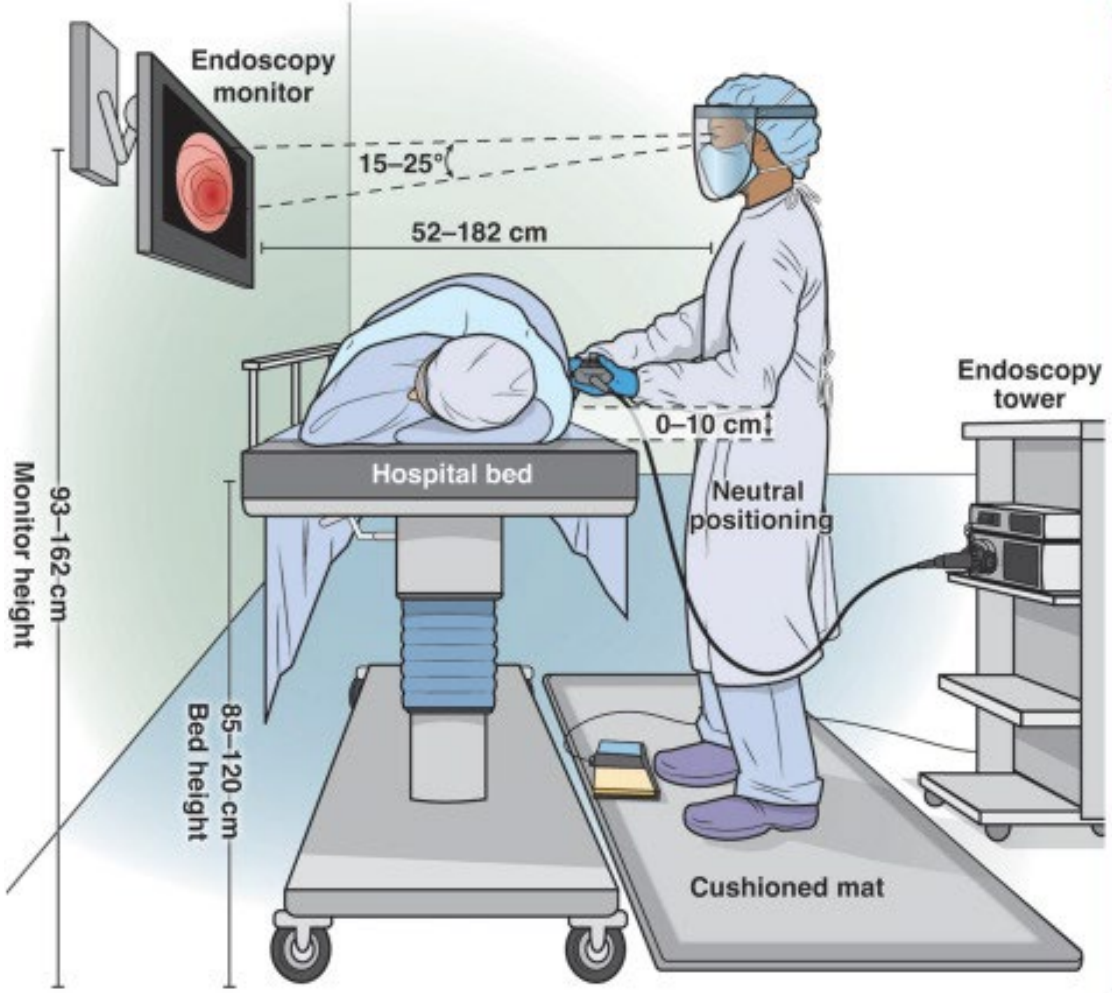
Engineering controls – the work environment



Pre-endoscopy ergonomic checklist

- **Monitor:** directly in front, 15–25° below eye height
- **Bed:** positioned between elbow height and 10 cm below elbow height
- **Endoscopy tower:** endoscope insertion in line with orifice to be intubated (i.e., patient's anorectum or mouth)
- **Foot pedal:** in front of body
- **Cords and wires:** contained on the floor
- **Cushioned floor mat:** in place
- **Led apron (if applicable):** 2-piece
- **Endoscopist position:** neutral posture (back, upper and lower extremities in neutral position and square to the monitor), feet hip-width apart
- **Endoscope positioning:** horizontal positioning of endoscope control head, shaft in 'C position', finger grip 15–30 cm from patient's anorectum
- **Communication:** encourage team members to raise any ergonomic-related concerns

Khan et al, CGH 2023

Administrative controls – change the way we work

- Scheduled endoscope maintenance
  - Over time responsiveness of dials may decrease requiring more force for comparable or lesser degree of tip deflection than intended
  - Currently only one of endoscope companies recommends a scheduled approach for maintenance/reevaluation of scopes

A Shergill, NCSCG GI Symposium 2019.

Administrative controls –ergonomic education

- Fellowship education
  - Small studies show some potential benefit though quality of data is low
  - Generally speaking this is a low cost intervention with potential high reward so it is a strong recommendation of ASGE
  - Resources:
    - ASGE video “Ergonomic Essentials for your practice” (https://learn.asge.org)
      - Includes post procedure stretching exercises
    - Video GIE series on ergonomics
    - YouTube videos on endoscopy ergonomics
- Ergonomic “Time out”
- Endoscopy schedule that is optimal?

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Personal protective equipment

- Technique

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Can exercise help?

- Not enough evidence
- Puts the burden on physician/user

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Do breaks reduce the risk of ERI?

- Systematic review of 3 studies with the following interventions
  - Microbreaks – short 30 second to 2 min
  - Targeted stretching microbreaks – 1.5 min stretching breaks at 20 to 40 min intervals targeting neck, shoulders, back wrists, hands, knees, ankles
  - Macrobreaks – 15 to 45 min breaks scheduled/built in
- Survey 1698 gastroenterologist – microbreaks and macrobreaks associated with lower odds of reporting ERI
- Surgical literature shows that TSMB associated with improved postprocedure pain, physical performance and mental focus without negatively affecting operating time

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Avoid static postures

- ASGE recommends use of antifatigue floor mats to reduce ERI
- Surgical literature Haramis et al looked at renal surgeries n=100 total, 18 providers gel mat vs none
  - Mats were associated with less pain in the feet, knees, and back, lower discomfort overall and higher energy and results persisted 24 hours postoperatively

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What about endoscopy nurses/technicians?

- Patient repositioning and sustained abdominal pressure to maneuver the colonoscope
- Endoscopy nurses and staff sustain work-related musculoskeletal disorders that is comparable to or greater than nurses in other fields

Common endoscopy-related injuries in nurses

- Annually 25-33% of endoscopy nurses report missing work due to musculoskeletal disorders
  - Upper extremity
  - Neck
  - Back
  - Tendonitis
  - Carpal Tunnel Syndrome

S. Drysdale 2007, 2011, 2013, 2014

Use of positioning wedge

- Applying sustained pressure for obese patient during colonoscopy is challenging and may result in injury for endoscopy RN
- Study found self reported pain lower in group using wedge vs standard of care

Fetzer 2020

Use of “colowrap”

- Reduced need for need for manual pressure and patient repositioning
- When used as directed, reduced frequency of staff reported musculoskeletal pain

Crockett et al, 2016, 2021

Summary

- Endoscopy related injuries are extremely common due in both male and female endoscopists as well as GI fellows
  - ERIs are common in endoscopy nurses as well
- Risk factors for endoscopists may include female gender as well as time spent performing (time in practice, high case load, etc.)
- The study of ergonomics in GI endoscopy is gaining popularity, now with the first major society guidelines
- More study is needed on all levels of the hierarchy of controls to improve safety and reduce ERIs