The importance of ergonomics for endoscopists



Ergonomics: The study of work

- **Optimize tools, tasks, and workplace to minimize injury and maximize efficiency.**
- **Risk factors for work-related injury: repetition, prolonged awkward postures, high forces, contact stress and vibration.**



- Ergonomics in endoscopy: endoscopists' interactions with elements of their work environment, including the endoscope and endoscopy unit, minimize the risk of endoscopy-related injury, optimize endoscopist well-being, maximize overall system performance.

- prevalence of endoscopy-related musculoskeletal pain and injury, ranging from 39% to 89% in practicing endoscopists(begin as early as during fellowship training (20%-49% of trainees)

- Endoscopy involves many risk factors:
  - repeated pinching or gripping of the endoscope,
  - pushing, pulling, and torqueing of the insertion tube
  - working in awkward postures.

- more than 70% of trainees report not having received any formal training in endoscopy ergonomics.

- Musculoskeletal symptoms and injuries related to the practice of endoscopy can shorten endoscopists' careers, reduce personnel available for healthcare delivery, and thereby negatively impact patient care.

Risk Factors for Injury

- Repetitive motion injury (RMI) is the most common cause of workplace injury
- Muscles overuse results in tiny tears in the muscles and scarring; these contribute to inflammation and muscle stiffness
- **Static work:** musculoskeletal effort required to hold a certain position, even a comfortable one.
- Overuse and small repetitive movements disturb balance of muscles, tendons, ligaments and nerves

- Most common sites of injury among the GI group:
  - thumb (19%),
  - lower back (19%),
  - hand (17%)
  - and neck (10%).

- **Gastroenterologists performing more than 20 endoscopies per week are at risk of endoscopy-related injury.**

  The ASGE Technology Committee

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- Colonoscopist's thumb" : De Quervain's tenosynovitis of the left thumb due to repetitive strain from controlling the endoscope dials

- "Biliary endoscopist's knuckle" : injury to the metacarpophalangeal joint due to forceful pinch grip and advancing catheters
- (GIE 2010)

Training environment

- Ergonomic training should start early during fellowship.
- Training facilities should be equipped with endoscopic equipment and monitors that allow adjustment for optimal ergonomic posture.

- Musculoskeletal injury or strain associated with endoscopy was reported by 86 percent of AGA physician members who responded to the AGA/Duke study.
- The time to chronic injury is after 11 years of endoscopy.
- Predictors of injury included prior musculoskeletal injury, increase in procedure volume and incorrect height of the endoscopy screen.

K. Garman/ AGA women's committee

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- good ergonomic principles during endoscopy require a ***culture change*** where the use of ***ergonomic-specific checklists***, ***micro-breaks*** during long procedures, ***mini-breaks*** between cases, ***restructuring of endoscopy schedules*** to facilitate endoscopists' health

Cognitive skills

Trainees should be able to

- define the term “ergonomics” and describe its importance in relation to endoscopic-related injuries and well-being.
- explain how the design of endoscopy equipment and the environment can enhance endoscopic performance.

Cognitive skills

- ***Trainees should be able to :***
- **list the most common types of injuries related to repetitive strain.**
- **dentify risk factors for endoscopy-related injuries, including female sex, pregnancy, small hand and wrist size, low muscle strength, procedural volume and time, improper body posture, and lack of an ergonomic room design**



- Physicians experienced greater ergonomic strain when performing colonoscopies on female patients and on patients with a BMI < 25.

Cognitive skills

- *Trainees should be able to*
- cognizant of the signs and symptoms of common endoscopy-related injuries and recognize the importance of early diagnosis and treatment
- synthesize important ergonomic principles.
- recognize the signs of muscle strain while performing procedures and potential mitigating steps.



Cognitive skills

- ***Trainees should be able to :***

- **list examples of device and room accessories (eg, antifatigue cushioned floor mats, angulation dial adaptors, endoscope stands, adjustable monitors and patient beds)**

- **personal care strategies (eg, cushioned insoles, compression stockings) aimed at decreasing strain during endoscopy.**



Cognitive skills

- For example, 2-piece lead aprons, as compared with 1-piece, distribute the weight of the apron more evenly across the spine and pelvis.
- eyewear can impact ergonomics because individuals wearing bifocals may have to extend their neck to adequately visualize the monitor
- Dedicated monofocal lenses that provide tailored correction for monitor viewing at a comfortable distance.





Technical skills

- A neutral body posture is fundamental to minimizing strain during endoscopy .
- modify the endoscopy room setup (eg, monitor, endoscopy tower, and bed position) to maintain a neutral body posture and minimize strain on their neck, arm, and back muscles (Fig. 1).

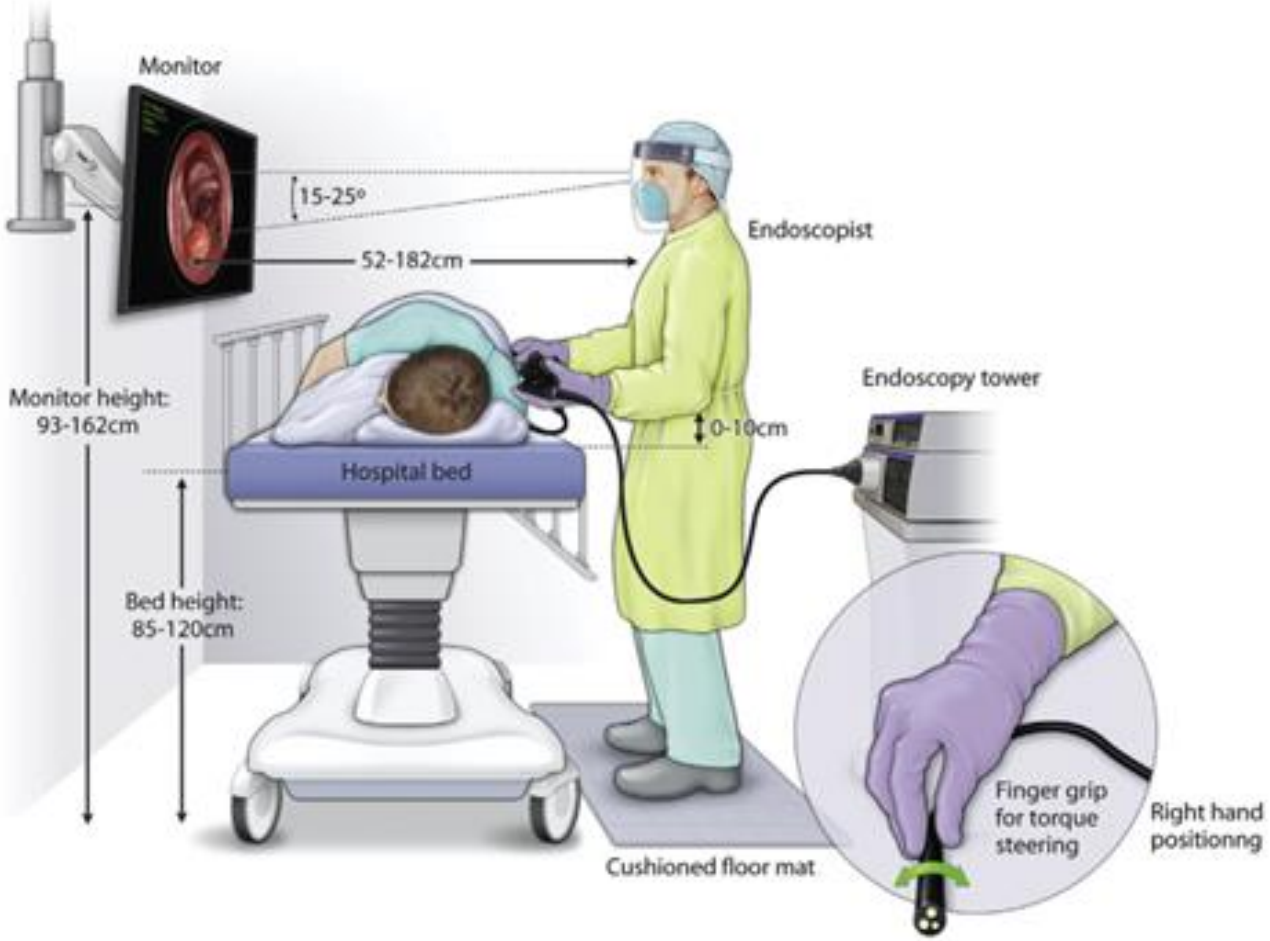


Figure 1. Recommended positioning of the monitor, bed, endoscope, processer, patient, and endoscopist for optimal ergonomics during endoscopy. Both the bed and monitor should be adjustable to accommodate individuals from the 5th percentile female to 95th percentile male height. Use of a finger grip (vs fist grip) is suggested to enhance the endoscopist's ability to feel resistance and enable precise torque control (inset).

Optimal Ergonomic Room

- The optimal ergonomic room design includes :
- Adjustable screen with monitor height tailored to endoscopist's eye level or below.
- Screen height should be adjustable range of 56"–69".
- Adjustable bed with table height between elbow and 10 cm below elbow. The table adjustable range of 33"–46".
- Anti-fatigue floor mats and two-piece lead aprons.
- Ergonomic design of computer and chair position and adequate work space.
- Use of two staff to move heavier patients.



Optimal Ergonomic Room

- The monitor should be adjusted so that it is directly in front of the endoscopist (52-182 cm) with the center of the screen at resting eye position, 15 to 25 degrees below the horizon, to prevent neck strain.
- The bed should be adjustable and positioned between elbow height and 10 cm below elbow height to allow for a working range of the right and left forearms between 0 to 10 degrees below the elbows.



- For colonoscopy, the endoscopic processer ideally should be behind the endoscopist such that the patient's anorectum is at the level of (and in line with) the insertion of the colonoscope into the processer.



Technical skills

- **The endoscopic trainer is best positioned at the foot of the bed on the same side as the trainee to ensure they have a good view of the patient, monitor, and the trainee's hands (Fig. 2)**

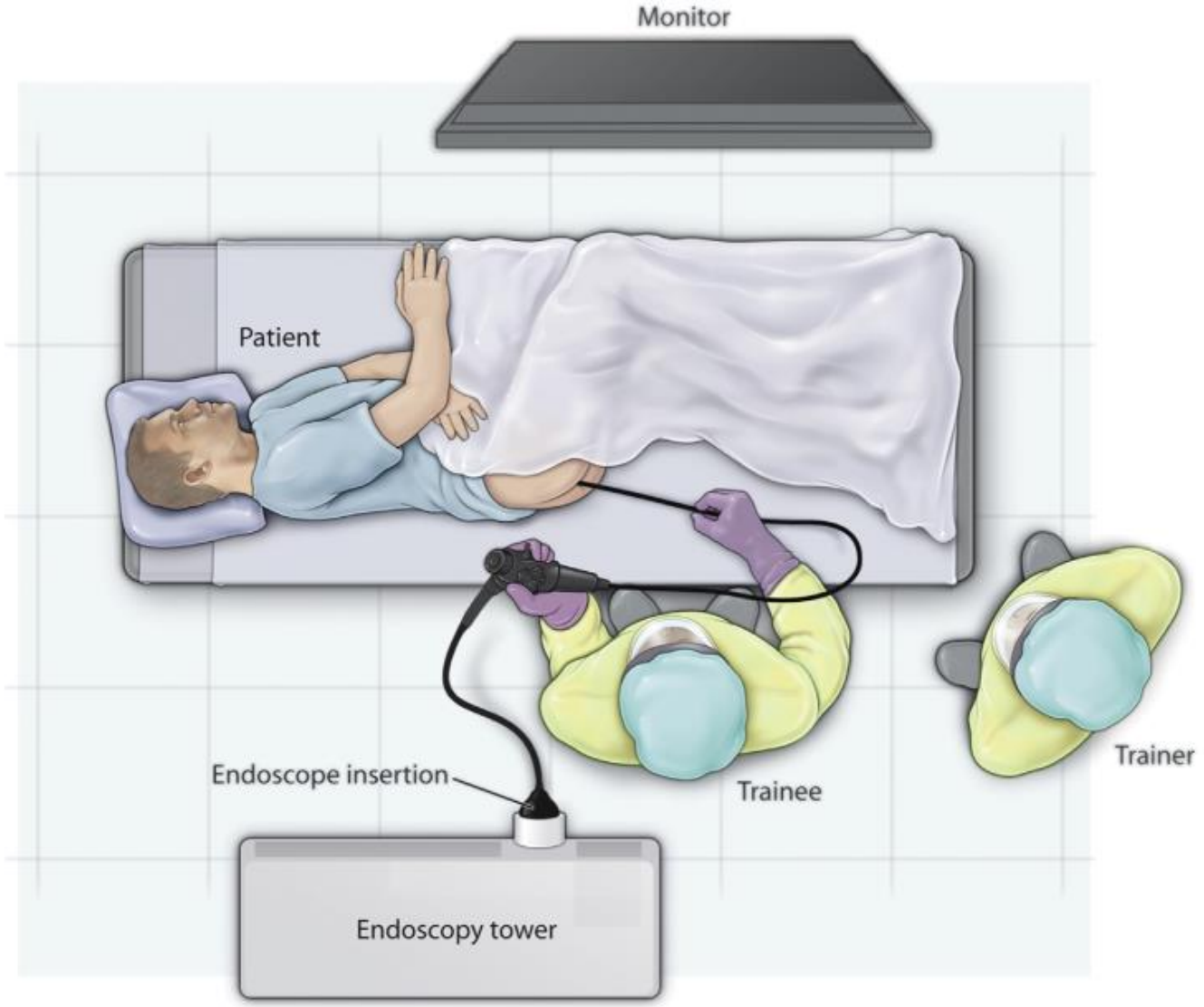
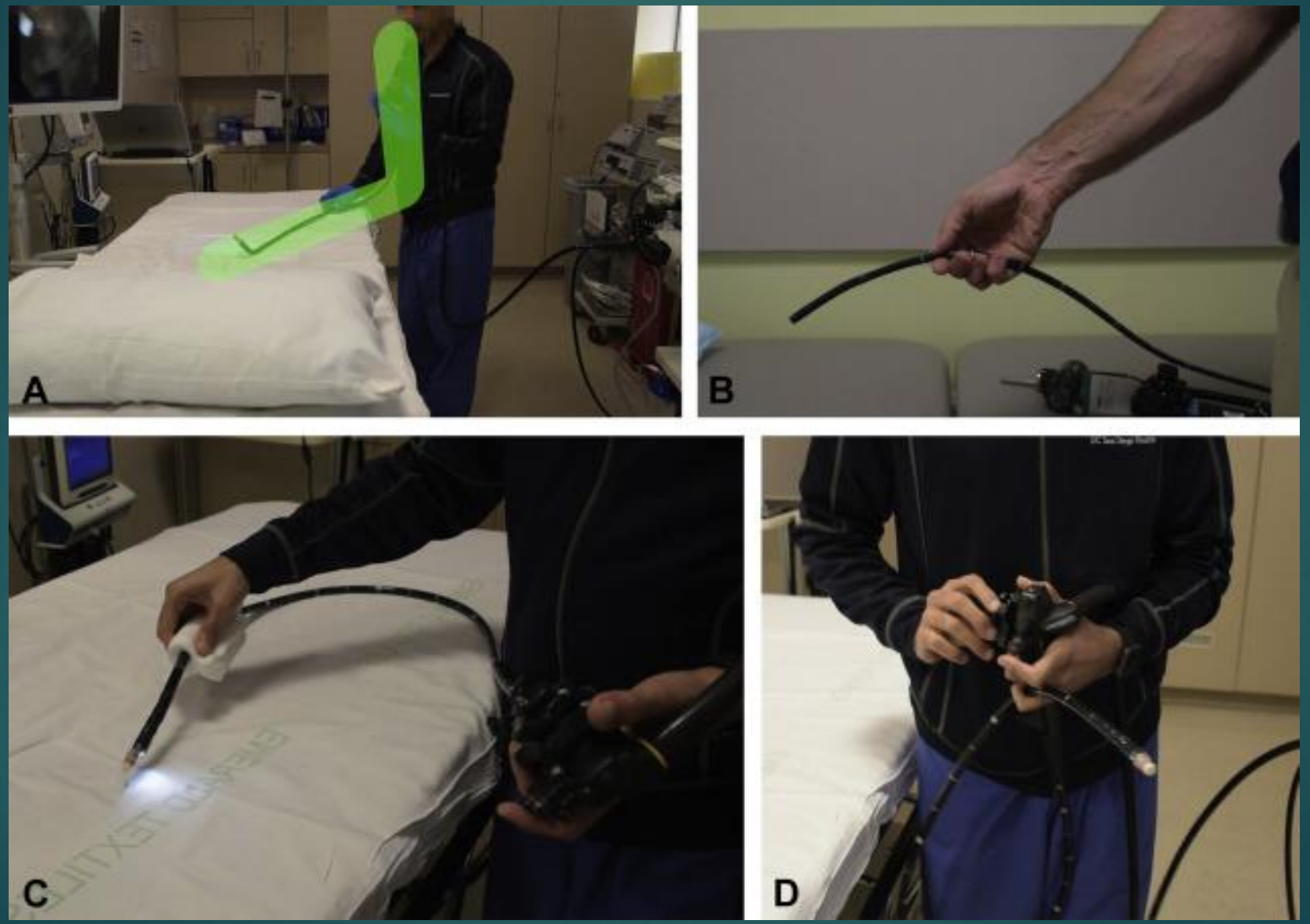


Figure 2. Endoscopy room setup during training to optimize the trainer's visualization of the patient's face, video monitor, and trainee's hands.

Technical skills

- **Proper endoscopic technique is key to reducing the risk of muscle strain and injury.**
- **For colonoscopy, use of a 1-handed steering technique is recommended such that the right hand holds the endoscope shaft between the thumb and fingers (ie, finger grip or “cigar-rolling” technique) 15 to 20 cm from the anus**



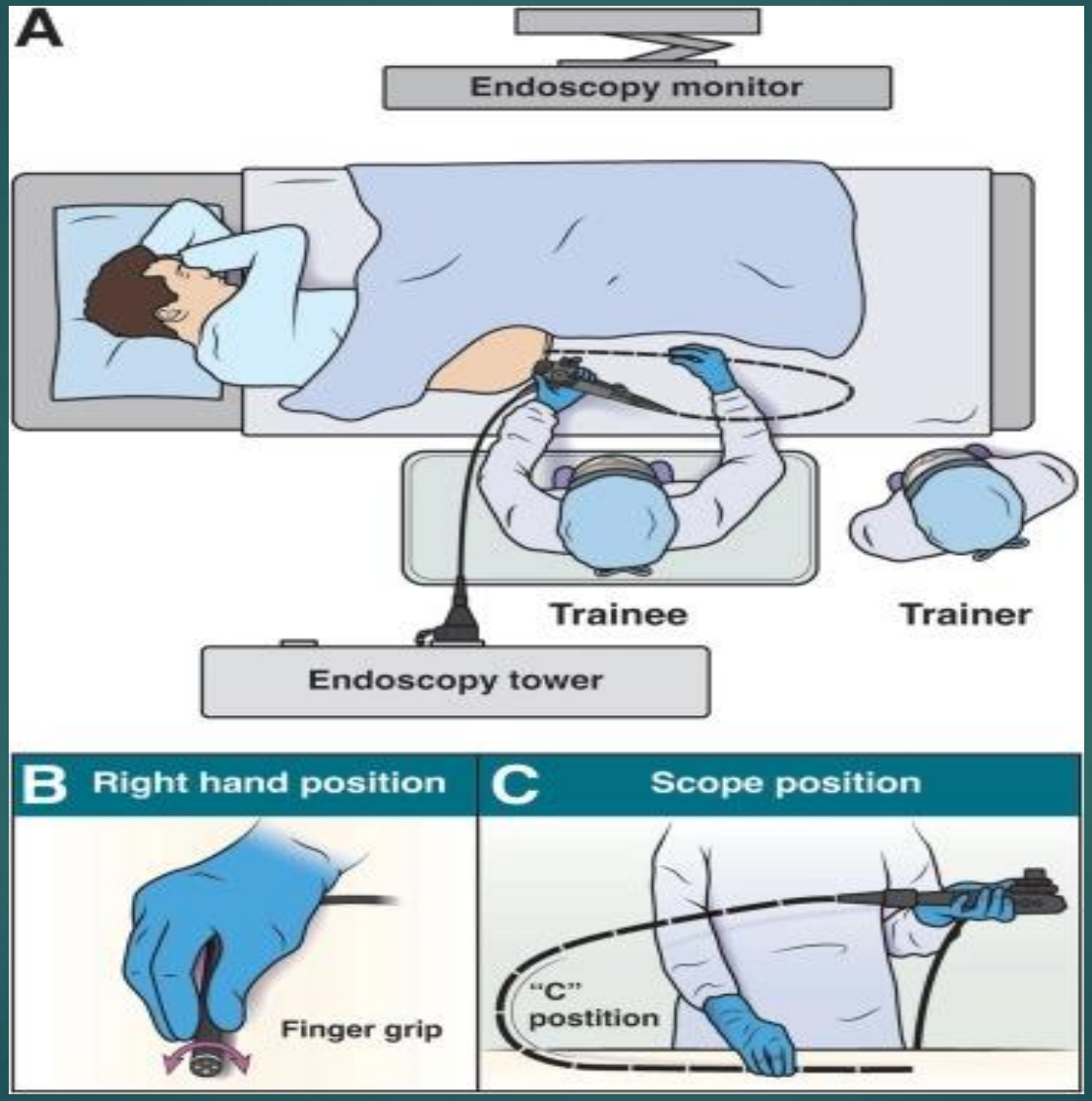

A
B
C
D

- steering is accomplished primarily with the use of the up–down angulation wheel alone accompanied with rotational torque of the endoscope shaft.

- Use of a cigar-rolling technique to achieve torque is preferred as opposed to a fist grip, which can cause excessive angulation of the wrist joints.

Technical skills

- **Some endoscopists suggest positioning the head of the colonoscope horizontally because it is perfectly balanced at the head when the shaft is supported on the bed and the umbilicus is on the outside the endoscopist's forearm arm (ie, "*C" position*).**


A
Endoscopy monitor
Trainee
Trainer
Endoscopy tower
B Right hand position
Finger grip
C Scope position
"C" postition

- C-position enables the use of the larger muscles of the left arm to aid with torque steering when the endoscope shaft is straight and may help to minimize forces on the endoscope head.

TABLE 1. Core cognitive, technical, and nontechnical skills for ergonomics training

Cognitive	Technical	Nontechnical
• Define the term "ergonomics" • Describe the importance of ergonomics in relation to endoscopy-related injuries, cognitive abilities, and mental strain • List the most common types of endoscopy-related injuries • Identify risk factors associated with endoscopy-related injuries • Know the signs of symptoms of endoscopy-related injuries and the importance of their early recognition • Understand important ergonomic principles (neutral body posture, neutral endoscope position, optimal room design) • Discuss the signs of muscle strain during endoscopy and ways to mitigate it • Name examples of device and room accessories and personal care strategies to decrease muscle strain • Recognize the advantages and disadvantages of protective devices and eyewear • Explain the importance of implementing ergonomic principles pre- and postoperatively in preparing endoscopy-related documentation	• Implement a proper body position and athletic stance during endoscopy • Adjust the room setup to maintain a neutral body posture and minimize muscle strain • Demonstrate the proper way of holding and handling the endoscope • Understand the role of different strategies (eg, turning patients, torque steering) in minimizing musculoskeletal load	• Apply leadership and effective communication skills • Support team members to adopt ergonomic principles and avoid injury • Demonstrate situational awareness and assess procedural and nonprocedural factors that contribute to musculoskeletal injury • Understand the utility of an "ergonomic time out" before procedures • Discuss the importance of adequate rest and scheduled breaks between procedures and during long procedures • Explain the impact of heavy procedure scheduling on endoscopy-related injuries • State strategies to optimize scheduling • Describe and demonstrate stretching exercises aimed at improving muscle recovery • Learn the potential value of a medical scribe or medical dictation software • Assess the value of endoscopists maintaining physical fitness to improve overall health and minimize risk of injury • Recognize the potential impact of disability on the endoscopist's career



Nontechnical skills

- **The application of ergonomic principles applies not only to the endoscopy room but also extends to physicians' interactions with other team members, control over their endoscopy schedule, and general well-being.**

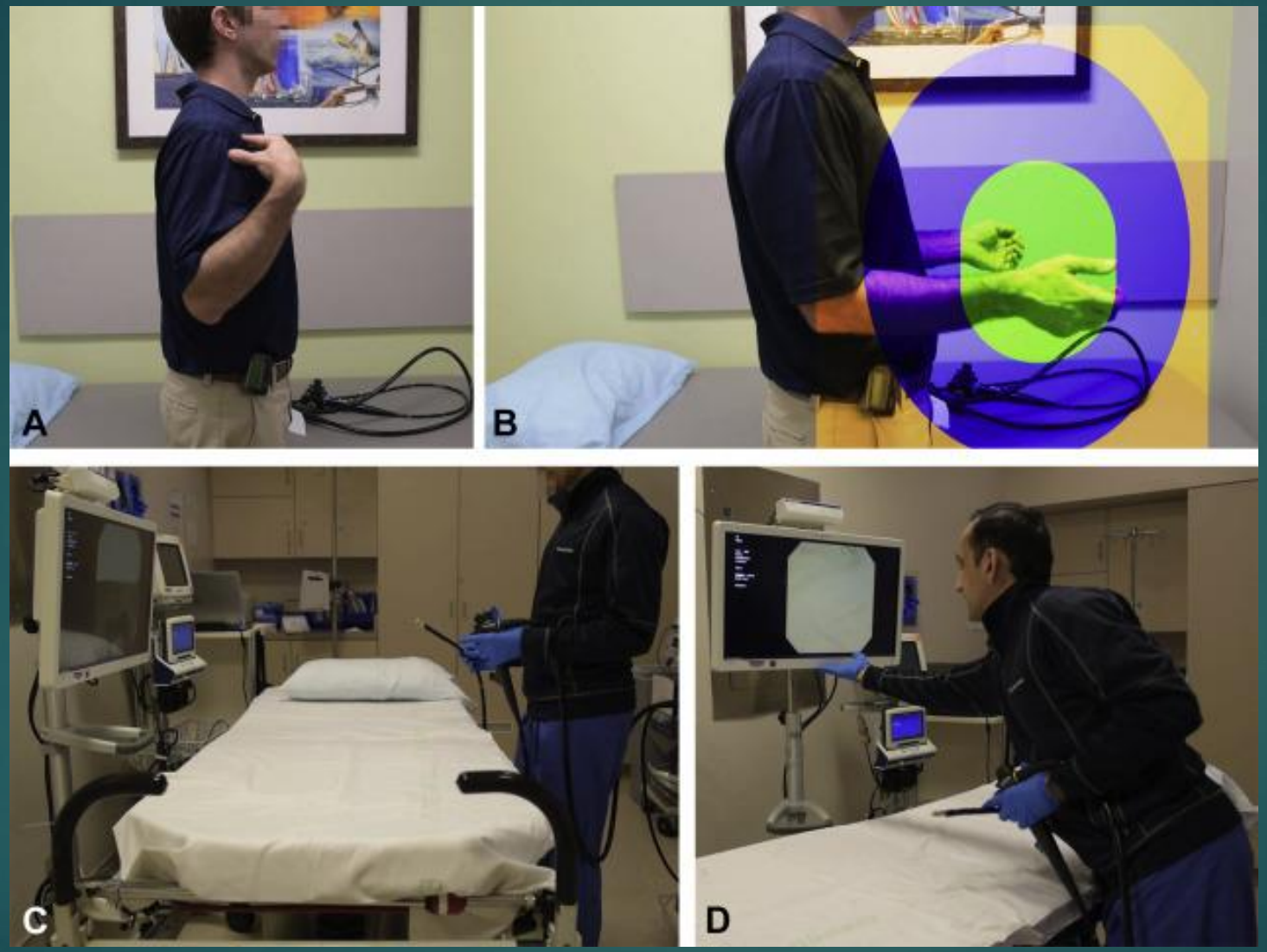
- **Trainees should encourage nurses and technicians to recognize their own limitations in performing activities related to endoscopy (eg, turning and moving patients).**





- Trainees should understand the potential utility of an “ergonomic time out” before beginning a procedure as a reminder for all team members to check their posture, bed and monitor height, and other elements of proper ergonomics.




A
B
C
D

Ergonomic Strategies Pre Endoscopy (Ergonomic "Time Out")

- **Personal Protective Gear**
- **Gowns, gloves, face shield, two piece lead apron**
- **Maintain correct posture, keep neck in neutral position**
- **Wear comfortable shoes, Stand on gel mat**
- **Keep weight balanced on both feet, knees slightly bent**
- **Position monitor in front at eye level (15 degree from horizontal visual field).**
- **Optimize distance of screen from endoscopist 52-182 cm**
- **Keep upper arms close to the body, elbows 90-100 degrees**
- **Wrists as neutral as possible; up to15° in all directions**




A
B

After Endoscopy, between Procedures

- **Take "Micro breaks"**
  - **1-2 minute breaks every 45-60 minutes**
- **Do arm/ back stretching exercises between procedures**
  - **Use gloves, gowns to stretch arms, neck, flex neck,**



Desk and Computer

1. Use a chair with a dynamic chair back and sit back slightly.
2. Chin parallel to the floor
3. No glare on the screen
4. Sit arms length from the monitor
5. Feet on the floor or stable footrest
6. Wrists flat and straight in relation to forearms to use keyboard
7. Arms and elbows relaxed, close to body
8. Center monitor and keyboard in front
9. Use a keyboard tray if the desk is too high to achieve 7 above



Nontechnical skills

- **The patient's position should be optimized to avoid undue pressure on any part of their body and to ensure they are secure on the bed.**

- **In addition, appropriate positioning of the patient on the bed is important for the ergonomics of the endoscopist as well.**



- Trainees should recognize the importance of adequate rest between procedures and plan to take short, scheduled breaks to improve muscle recovery.



Nontechnical skills

strategies to optimize endoscopy scheduling for injury prevention

- split-day endoscopy and office scheduling, avoidance of consecutive full-day endoscopy schedules, avoidance of prolonged endoscopy sessions, and allow adequate rest for muscle recove



Nontechnical skills

- stretching exercises as a way to improve muscle recovery.
- the potential value of medical dictation software or a medical scribe to decrease computer work and typing.
- the value of maintaining physical fitness to improve overall health and muscle strength and minimize risk of injury.
- trainees should recognize the potential impact of disability on the endoscopist's career and income



Training process and assessment of training

- Endoscopy training programs should incorporate formal ergonomics training into their curricula .

- This will help build long-term habits that prevent injury, enhance well-being, and improve efficiency and performance over their careers.



THE END

