ASGE Guideline on the Role of Ergonomics for Prevention of Endoscopy-related Injury (ERI): Summary and Recommendations

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Acronyms:

ASGE	American Society for Gastrointestinal Endoscopy
CENTRAL	Cochrane Central Registry of Controlled Trials
CI	Confidence Intervals

EMBASE	Excerpta Medica Database
ERCP	Endoscopic Retrograde Cholangiopancreatography
ERI	Endoscopy-related Injury
ERIs	Endoscopy-related Injuries
EUS	Endoscopic Ultrasound
GI	Gastrointestinal
MIS	Minimally Invasive Surgery
REBA	Rapid Entire Body Assessment
RULA	Rapid Upper Limb Assessment
SOP	Standards of Practice
TSMB	Targeted Stretching Microbreaks

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This guideline document was prepared by the Standards of Practice Committee of the American Society for Gastrointestinal Endoscopy (ASGE) using the best available scientific evidence and considering a multitude of variables including, but not limited to, adverse events, patients' values, and cost implications. The purpose of these guidelines is to provide the best practice recommendations, which may help, standardize patient care, improve patient outcomes, and reduce variability in practice.

We recognize that clinical decision-making is complex. Guidelines, therefore, are not a substitute for a clinician's judgment. Such judgements may, at times, seem contradictory to our guidance due to many factors that are impossible to fully consider by guideline developers. Any clinical decisions should be based on the clinician's experience, local expertise, resource availability, and patient values and preferences.

This document is not a rule and should not be construed as establishing a legal standard of care, or as encouraging, advocating for, mandating, or discouraging any particular treatment. Our guidelines should not be used in support of medical complaints, legal proceedings and/or litigation, as they were not designed for this purpose.

ABSTRACT

This clinical practice guideline from the American Society for Gastrointestinal Endoscopy (ASGE) provides an evidence-based approach to strategies to prevent endoscopy-related injury (ERI) in GI endoscopists. It is accompanied by the document subtitled **Methodology and Review of Evidence,** which provides a detailed account of the methodology employed for the evidence review. This document was developed using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) framework. The guideline estimates the rates, sites, and predictors of ERI. Additionally, it addresses the role of ergonomics training, microbreaks and macrobreaks, monitor and table positions, anti-fatigue mats, and use of ancillary devices in decreasing the risk of ERI. We recommend formal ergonomics education and neutral posture during the performance of endoscopy, achieved through adjustable monitor and optimal procedure table position, to reduce the risk of ERI. We suggest taking microbreaks and scheduled macrobreaks, and using anti-fatigue mats during procedures to prevent ERI. We suggest the use of ancillary devices in those with risk factors predisposing them to ERI.

INTRODUCTION

A majority of gastroenterologists (61%) report spending greater than 40% of their time performing endoscopic procedures.[1] Survey-based studies report a 39% to 89% prevalence of endoscopy-related injuries (ERIs) [2-14] [15,16] in practicing gastroenterologists and a 20% to 47% prevalence in gastroenterology trainees.[17,18] ERIs are musculoskeletal injuries caused by repetitive microtrauma to the connective tissues of the body. Risk factors for ERI include higher procedure volume,[13] [1,9,12,16] time spent performing endoscopy,[1,2,13] cumulative time in practice,[1,3,10,13] small hand size,[19] age,[7,19,20] and female gender.[10,17] Biomechanical forces that contribute to ERI include repetitive, high force loads in non-neutral postures , such as while using torque steering (right wrist extensors), grasping and stabilizing the endoscope controller (left forearm extensors), manipulating the endoscope dial (left thumb abductors), and high-risk pinching. [21-24] [25] [26-29]

Long-term consequences of ERIs can be disruptive or even devastating to an endoscopist's livelihood and range from pain and physical restrictions while performing procedures to disability, all potentially leading to provider dissatisfaction and loss of a highly skilled workforce.[30] The aim of this ASGE guideline is to provide contemporary evidence-based recommendations regarding ergonomics in preventing ERI in gastroenterologists, surgeons, and others performing endoscopy.

Our committee acknowledges that the study of ergonomics in the endoscopy suite is relatively new with scant studies. As a result, we recognized, from the onset, that producing evidence-based guidelines on this topic is going to be challenging. However, we also recognize that ERIs

are common in GI, and as a society, it is our duty to provide meaningful and actionable guidance to our members on this very important topic.

METHODOLOGY

This document was prepared by the Standards of Practice (SOP) Committee of the ASGE and was conceptualized and conducted according to the Grading of Recommendations Assessment, Development and Evaluation (GRADE) framework. The GRADE panel developed recommendations based on certainty in the evidence as well as the overall balance of benefits and harms, patient values and preferences, cost-effectiveness, and resource utilization.[31,32] Consensus among the panel members was used to determine the recommendations. Using the GRADE approach, the recommendations were categorized as strong or conditional; "recommend" was used for strong recommendations and "suggest" for conditional recommendations. Further details of the methodology used for this guideline are presented separately including systematic reviews, evidence profile, and results from all meta-analyses. The guideline focused on three broad categories:

1. Estimation of the rates and most common sites of ERI,
2. Estimation of the predictors of ERI, and
3. Interventions that can reduce the risk of ERI. These included:

a) Dedicated ergonomics education
b) Targeted stretching microbreaks
c) Adjustable monitors to allow work in neutral posture
d) Adjustable patient bed/stretchers to allow work in neutral posture
e) Anti-fatigue mats

Neutral posture is defined in ergonomic literature as the position of the body when the muscles are in resting length and the joints are naturally aligned. This is achieved when the endoscopists work with their joints at about the middle point of their range of motion, thus allowing for maximum control and strength, and minimizing stress on joints and spine.[33]

Our panel included two content experts (AS, SCG), a GRADE methodologist (NT), and SOP committee members, and the SOP chair (BQ). For this document, there were no patient representatives since the study focused on ERI. Therefore, all panel members, who are practicing endoscopists, served as "patient representatives" on this panel.

EVIDENCE SYTHESIS

Details of our literature searches, data analyses, pooled effect estimates, evidence profiles, forest plots, and panel deliberation for each outcome can be found in the Methodology and Technical Review document. A summary of our final recommendations for the role of ergonomics for prevention of ERI are listed in Table 1.

1) RATES AND SITES OF ERI

Finding # 1: Endoscopists report high rates of ERI.

Summary of Evidence: For this question, we performed a systematic review and meta-analysis. Our search identified 17 survey studies assessing the prevalence of ERI in 5,227 respondents. Fourteen of the 17 included studies evaluated practicing gastroenterologists[1-3,5-14,34], one study evaluated colorectal surgeons[4], and two studies evaluated GI trainees.[17,18] Outcomes of interest

were overall rate of ERI and most common sites for ERI. Our meta-analysis identified the overall rate of ERI to be 57.7% (95% CI, 48.8-66.1%, I^2=93%). The most common sites of ERI included hands and fingers, back, and neck. Pooled rates of ERI based on our meta-analysis are as follows:

- Hands and fingers: 35.8%, 95% CI, 18.1% to 58.6%, I^2 97%.
- Back: 35.3%, 95% CI, 24.3% to 48%, I^2 92%.
- Upper back and neck: 32.6%, 95% CI, 21.3%-46.3%, I^2 93%.
- Thumb alone: 29.2%, 95% CI, 16.3% to 46.7%, I^2 98%.
- Neck alone: 26.1%, 95% CI, 16.9% to 37.9%, I^2 97%.

2) PREDICTORS OF ERI:

Several predictors of ERI were elucidated and included: gender of endoscopist, procedure volume and hand size.

a. Gender of the endoscopist:

Finding # 2: Female endoscopists are at higher risk of ERI compared to male endoscopists.

Summary of Evidence: To address the relationship of gender and ERI, we performed a systematic review and identified eight eligible studies, which included 3,355 GI respondents.[1,6,10,13,14,34] Two such studies were specific to GI trainees.[17,18] the overall rate of ERI in female endoscopists was 62.4% (96% CI, 46.7% to 75.9%) compared to the 45.5% (95% CI,

28.1% to 64.0%) in male endoscopists. On meta-analysis, female endoscopists had higher odds of developing ERI (OR= 1.79 [95% CI, 1.35 to 2.38], p <0.01), I^2=64%.

b. Exposure to performing endoscopy procedures:

Finding # 3:
Greater exposure to endoscopy procedures (time spent performing endoscopy and procedure volume) is associated with higher rates of ERIs.

Summary of evidence: Our systematic review identified 24 survey studies that assessed these exposure variables. Pawa et al. conducted a survey study of members of the American College of Gastroenterology with 1,698 respondents.[13] On multivariable analysis, the number of hours performing endoscopy per week (p=0.009) and the number of years in practice (p=0.022) were found to be independent predictors of ERI. [13] Morias et al. surveyed 171 endoscopists in Europe and reported >15 years in practice (p=0.03) as one of the independent risk factors of ERI. [10] Lastly, Ridtitid et al. surveyed 684 ASGE members and found that higher procedure volume (> 20 endoscopies per week, p <0.001), more endoscopy hours per week (>16 hours per week, p< 0.001), and higher total number of years performing endoscopy (p=.004), were associated with higher rates of ERI.[1]

SUMMARY OF RECOMMENDATIONS

Question 1: In those performing GI endoscopies, should ergonomics education be implemented to reduce the risk of ERI?

Recommendation 1. The ASGE recommends ergonomics education to reduce the risk of ERI.

(*Strong recommendation, very low quality of evidence*).

Summary of evidence. For this question, we performed a systematic review and identified six studies for inclusion.[35-40] Outcomes of interest included pain and formalized ergonomic assessments.

In a randomized trial of 15 fellows, Khan et al. showed that ergonomic education was associated with improved rapid entire body assessment (REBA) scores compared to no training ($p<0.001$).[35] Training in this study included didactic sessions, a video on ergonomics, ergonomic-specific feedback from supervisors, and an ergonomic checklist to review. Similarly, in a prospective non-randomized study of 58 GI fellows, Ahmed et al. demonstrated that ergonomic education via a teaching video was associated with improvement in ergonomic knowledge based on a pre- and post-training tests.[41] Several other studies have reported improvement in ergonomic assessments scores.[37,39,40] Markwell et al. assessed the utility of individualized training by a physical therapist and showed that 63% of endoscopists reported reduction or resolution of pain.[36]

No studies assessed cost-effectiveness of ergonomic education to reduce the risk of ERI. While posters as well as video-based didactic training are overall low-cost interventions, physical therapy assessments and individualized plans may incur additional costs. [36]

The panel noted that there is no standardized approach to ergonomic education at this time in the field's early development. Incorporating ergonomic techniques into fellowship curricula, education sessions, and teaching conferences would all be helpful in spreading awareness and

reducing the rates of ERIs. Until then, the responsibility of being educated on proper ergonomic techniques remains with the endoscopist. There are several approaches to pursuing ergonomic education including online courses, in-person teaching, and physical therapist consultation. Short written guides or posters hanging in the endoscopy unit and short videos (including those from the ASGE)[37] can also be considered. The ASGE provides several resources for ergonomics education including the ASGE training curriculum [42], the ASGE video " Ergonomic Essentials for your Practice"[43] which can be accessed at ASGE's GI LEAP website (https://learn.asge.org), the VideoGIE series on endoscopy ergonomics [44-46] and YouTube videos on endoscopy ergonomics. [47,48]

Despite the low quality of evidence, the panel made the decision to make a strong recommendation. The main reason was that the panel placed a high emphasis on preventing harm (ERI) to endoscopists, in addition to the relatively low costs of most currently available forms of ergonomic education. Hence, the panel is recommending that all endoscopists pursue some form of ergonomic education, at minimum in the form of a didactic session.

Question 2: *In those performing GI endoscopies, do breaks decrease the risk of ERI?*

Recommendation 2: The ASGE suggests that GI endoscopists take microbreaks and scheduled macrobreaks to reduce the risk of ERI.

(*Conditional recommendation, very low quality of evidence)*.

Summary of evidence: For this question, our systematic review identified three studies for inclusion. The outcomes of interest were reduced rates of ERI and improvement in post-procedure pain scores. The interventions were divided into microbreaks, targeted stretching microbreaks (TSMBs), and scheduled breaks (macrobreaks).

Microbreaks were defined as short biologically meaningful movement breaks that were lasting 30 seconds to 2 minutes in one national survey.[13] TSMBs were defined as 1.5 min stretching breaks at 20 – 40-minute intervals throughout each procedure targeting the neck, shoulders, back, wrists, hands, knees, and ankles.[49,50] Macrobreaks were defined as scheduled breaks which are 15 – 45-minutes long and built into a day's endoscopy schedule.[13]

In a survey of 1,698 gastroenterologists, taking microbreaks throughout the day was associated with lower odds of reporting ERI (OR=0.69 [95%CI; 0.54 – 0.87]).[13] Similarly, taking longer breaks (macrobreaks) ranging from 15 – 45 minutes were associated with lower odds of reporting ERI (OR=0.72 [95%CI; 0.92 -0.92]) and the duration of macrobreaks was not significantly associated with ERI (p=0.50). Two similar studies from the surgical literature showed that TSMB were associated with improvement in post-procedure pain, physical performance, and mental focus, without negatively affecting operative duration. [50,51]

While assessing the certainty of evidence, we rated down evidence for imprecision due to small number of studies and patients, and overall judged the quality of evidence to be "very low". The panel voiced concern about extrapolating the findings from surgical laparoscopic literature to endoscopy since surgical procedures, in general, often have longer procedure times compared to endoscopic procedures. However, the panel recognized the longer procedural times

required in more complex interventional procedures. The panel agreed that until data on optimal work and rest schedules in gastrointestinal endoscopy is available, the surgical literature could be used to provide guidance on breaks.

Based on the systematic review, and panel discussions, we concluded that there are benefits of microbreaks and macrobreaks, with or without targeted stretching, in reducing pain and possibly preventing ERI. The panel noted that microbreaks pose minimal to no risk to the endoscopists and no significant impact on procedure duration. The panel recognized that microbreaks can be incorporated in individual schedules by endoscopists, but macrobreaks may require administrative support. The ASGE has developed educational materials including pre- and post- procedural exercises, which can be easily implemented in the endoscopy units. These are available online at ASGE's GI LEAP website).[43] An intraoperative microbreak stretch web application called OR-Stretch was developed by the human factors engineering lab at Mayo Clinic to guide surgeons through a series of sitting and standing exercises and stretches between surgeries. These are available online at https://www.mayo.edu/research/labs/human-factors-engineering/or-stretch/or-stretch-pdf.[52]

Question 3: In those performing GI endoscopy, should a neutral monitor position be used to reduce the risk of ERI?

Recommendation 3: The ASGE recommends a neutral monitor position during endoscopies to reduce the risk of ERI.

(*Strong recommendation, very low quality of evidence*).

Summary of evidence: Monitor placement is an important determinant of torso and head/neck posture. An ergonomic stance during endoscopy involves neutral neck and back position without hyperextension or flexion, even weight distribution between both legs, and avoidance of knee hyperextension.[53] Monitor booms and mobile stands facilitate flexible monitor positioning.

Our search did not identify any gastroenterology studies to inform this question. However, we identified three published laparoscopic surgical studies assessing the optimal monitor positions.[54-56] The outcomes of interest included task performance, neck muscle strain, and electromyographic activity of the main neck muscles. Neck strain was lowest when the monitor was positioned in front, at the surgeon's eye level.[54] Task performance was best when monitor was directly in front (not to the right or to the left) of the laparoscopic surgeon.[55] The optimal distance between the monitor and surgeon was reported to be between 90 cm and 182 cm and the maximum distance at which the finest details of an image could still be seen was between 139 cm to 303 cm.[56]

Extrapolating from these studies, Shergill et al. concluded that monitors should be placed directly in front of the endoscopist just below eye level with an optimal viewing angle of 15 to 25 degrees below the horizon from the eyes with a viewing distance of 52 to 182 cm.[53] To accommodate the 5th percentile female to the 95th percentile male eye height, the monitor should be adjustable from 93 to 162 cm above the floor. [53]

Evidence was down rated for indirectness, since extrapolation from surgical literature was required, and for imprecision given the very small sample size in each study. Therefore, the overall quality of evidence was very low.

The panel felt that even though there maybe a cost factor involved in making monitors adjustable, it was important to reduce the high prevalence of upper body and neck injuries related to working in non-neutral positions due to ill-placed monitors.[10,20] Endoscopy units should make a concerted effort to make all the monitors within their unit adjustable to accommodate individual endoscopists by matching the above listed requirements. Endoscopists are strongly encouraged to adjust the monitor to an appropriate position before starting a procedure. We made a strong recommendation for an adjustable monitor to allow endoscopy in neutral neck and back posture to reduce the risk of ERI.

Question 4: In those performing GI endoscopies, should neutral bed height be used to reduce ERI?

Recommendation 4: The ASGE recommends the use of neutral bed height to reduce the risk of ERI.

(*Strong recommendation, very low quality of evidence*).

Summary of evidence: Our systematic review did not identify any studies in gastroenterology literature pertinent to this question. Our search yielded two observational laparoscopic surgical studies, which studied optimal procedure table position.[57,58] Buerger et al. reported that an

optimal table height was between elbow height and 10 cm below elbow height. This was associated with significant improvement in rating of discomfort.[57] Van Veelen et al. demonstrated that a neutral bed height during surgery allowed the surgeon's joints to stay in neutral positions.[58]

Shergill et al. concluded that the optimal bed height should be adjusted to allow holding of the endoscope between elbow height and 10 cm below elbow height. To accommodate the 5th percentile female to the 95th percentile male elbow height, the examination table height should be adjustable from 85 to 120 cm.[53]

The evidence for this question was downrated for indirectness, since extrapolation from surgical literature was required, and for imprecision given the very small sample size in each of the studies. Therefore, the overall quality of evidence was very low.

Despite the low quality of evidence, the panel again made a strong recommendation for neutral bed height because the intervention is relatively easy to achieve given the widespread use of adjustable stretchers and beds in endoscopy units and, in most settings, without additional cost.

Question 5: In those performing GI endoscopies, should anti-fatigue floor mats be used to prevent ERI?

Recommendation 5: The ASGE suggests the use of anti-fatigue mats to reduce the risk of ERI.

(*Conditional recommendation, very low quality of evidence).*

Summary of evidence: Prolonged standing has been directly implicated in lower extremity tiredness and discomfort, lower extremity swelling, venous blood restriction, low back pain, and whole body tiredness. [59] Our search did not identify any published studies in the GI literature relevant to this topic. We identified two studies from surgical literature.[60,61] Haramis et al. conducted a randomized study of either gel mat vs. no mat during laparoscopic renal surgeries (n=50 for each arm) performed by 18 providers.[60] The use of floor mats were associated with lower pain in the feet (p=.003), knees (p=.001), and back (p=.001). Mats were also associated with lower overall discomfort (p=.001) and higher levels of overall energy (p=.049). These benefits were still present 24 hrs post-operatively. Graverson et al. also found significant improvement in post-operative discomfort in a study of 11 urologists performing cystoscopy.[61] Both studies involved urologic procedures; thus, the results may not be entirely applicable to gastrointestinal endoscopy. The evidence ranged from very low to low and was rated down for indirectness and imprecision.

Floor mats are associated with reduced pain and discomfort and are inexpensive. Therefore, the panel concluded that the benefits of using anti-fatigue mats outweigh any potential risks.

These risks include the fact that floor mats get contaminated from routine use during GI procedures and need to be easily and regularly cleaned, otherwise representing a potential biohazard. They are also a potential tripping hazard and should have beveled edges to minimize the risk of falls. [62] Overall, a conditional recommendation for using anti-fatigue mats during

gastrointestinal endoscopy was made based on the very low quality of available evidence in addition to these considerations.

Other considerations

In addition to addressing the above questions, the panel has also provided general concept statements for endoscopists, in special circumstances, to reduce the risk of ERI. No systematic reviews were conducted for these statements and represent the expert opinion of this multidisciplinary panel.

i. Hand size and ERI

We wanted to assess the relationship between hand size and ERI. Overall, the data is inconsistent and could not be pooled. Our systematic review identified four studies that examined the rate of ERI and hand size.[10,13,19,20] In a large national study, the rate of ERI was not significantly different between those with small glove size (288 respondents, ERI 78.13%) vs. large glove size (682 respondents, ERI 75.95% $p = 0.12$).[13] Similarly, there was no difference in rate of ERI when comparing endoscopists with extra-small, small, and medium glove sizes (855 respondents, ERI 74.74%) vs. large and extra-large glove sizes (828 respondents, ERI 77.05% $p = 0.27$).[13] Two international studies also showed similar results.[10,20] However, a more recent study[19] measuring procedural and anthropometric factors associated with ERI showed small-handed endoscopists (small and medium glove size) had longer colonoscope insertion times (9.4 vs. 8.2 min, p = 0.04) and an increased number of injury sites (p = 0.03) leading to performance of decreased number of colonoscopies compared to large handed providers. In a

survey study[63] of 227 GI fellows, Cohen et al. found that a significant number of trainees felt that their small hand size negatively impacted overall training and 97.4% of those with a small hand

Current possible options for those with smaller hands include two endoscope manufacturer companies, Olympus and Pentax, manufacture reusable dial adaptors -- the MAJ-1072 Auxiliary angle knob cover and the OE-B1 Pentax Right/Left Assistant Knob, respectively. These rubber extensions are clipped to the standard R/L angulation control knob in the control body section. Once clipped on, the R/L angulation knob can be more easily reached and manipulated by users with smaller hands. These types of devices may be of interest to gastroenterologists with smaller hands**.** An unpublished pilot study evaluated the use of an angulation dial adaptor for hand spans (defined as the thumb to the fifth digit) less than 19 cm.[64] With the use of this adaptor, there was a trend towards decreased procedure time for physicians with small hands; however, there was no significant difference in procedure duration or ease of procedure. The retroflexion maneuver was rated significantly easier with the adapter by all endoscopists.[64] These devices are inexpensive, easy to use, and safe. These devices need to be processed according to manufacturer recommendations and are not disposable.

Unfortunately, Olympus recently discontinued this device without notice.

Despite the very low quality of evidence, the panel acknowledged the importance of making this device available in the endoscopy unit as an option for those endoscopists with smaller hands. The panelists also discussed the need to dispel any stigma that may be attached to using

such assist devices. We advocate for more funding for the development of such devices or improvement of endoscope design to reduce the risk of ERI.

ii. Use of load reduction devices to reduce and prevent ERI

The effectiveness of load reduction devices such as the endoscope support stand[25] and the antigravity arm[65] are being evaluated in the reduction of ERI. However, these devices are not currently available in the US for use.

iii. Lead apron related ERI

A commonly reported source of ERI relates to the use of lead aprons during procedures requiring fluoroscopy (e.g. ERCP, EUS guided biliary interventions, and luminal stent placement), which places additional loads on the trunk muscles and intervertebral discs.[3,12,66] A recent study reported 222 of 1277 (22%) of those surveyed reported ERI related to gastrointestinal endoscopy, specifically related to the use of lead aprons. Men reported more ERI than women using lead aprons in 26.5% vs. 14.3% ($p<.001$) of those affected.[13] The use of lead aprons has not been systematically studied in endoscopic retrograde cholangiopancreatography (ERCP), but two-piece lead aprons have been found to produce less discomfort by redistributing a portion of the weight across the hips from the upper body.[67]

Endoscope maintenance programs

All endoscopy units should have a robust endoscope maintenance program to identify suboptimally performing endoscopes.[21] This can protect against the usual wear and tear, which

can cause the endoscope to become less responsive to maneuvers over time, requiring endoscopists to expend greater forces for the same task, thereby increasing risk of ERI.

FUTURE DIRECTIONS

Questions remain about risk factors and mechanisms for ERI, gender differences in type of ERI, overall rate and impact of ERI in female gastroenterologists as well as pregnancy and risk of ERI. Future studies should also investigate impact of hand size, TSMBs, optimal endoscopy schedules including micro- and macro breaks, endoscopy room design optimization such as monitor height and bed height, as well as impact of quality improvement initiatives on ergonomic practices in endoscopy. We also call upon endoscopy manufacturers to improve current endoscope design to mitigate biomechanical exposures as well as implement optimal endoscopy management programs. More funding to study effective ergonomic interventions and impact on reducing risk of ERI is needed.

GUIDELINE UPDATE

ASGE guidelines are reviewed for updates approximately every 5 years, or if new data may influence a recommendation. Updates follow the same ASGE guideline development process.

Table 1. Summary of recommendations and findings

Recommendations	
1	*The ASGE recommends ergonomics education to reduce the risk of ERI. (Strong recommendation, very low quality of evidence).*
2	*The ASGE suggests that GI endoscopists take micro breaks and scheduled macro breaks to reduce the risk of ERI. (Conditional recommendation, very low quality of evidence).*
3	*The ASGE recommends a neutral monitor position during endoscopies to reduce the risk of ERI. (Strong recommendation, very low quality of evidence).*
4	*The ASGE recommends the use of neutral bed height to reduce the risk of ERI. (Strong recommendation, very low quality of evidence).*
5	*The ASGE suggests the use of anti-fatigue mats to reduce the risk of ERI. (Conditional recommendation, very low quality of evidence).*
Findings	
1	*Endoscopists report high rates of ERI.*
2	*Female endoscopists are at higher risk of ERI compared to male endoscopists.*
3	*Greater exposure to endoscopy procedures (time spent performing endoscopy and procedure volume) is associated with higher rates of ERIs.*

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