Communication from the ASGE Standards of Practice Committee

GUIDELINE

ASGE American Society for Gastrointestinal Endoscopy

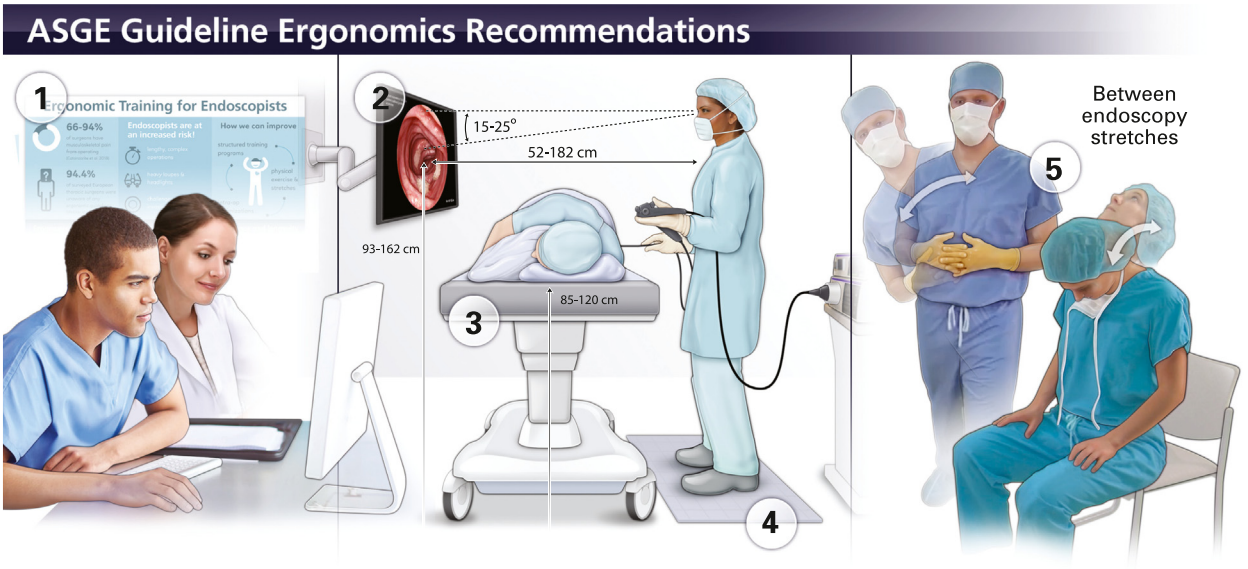
American Society for Gastrointestinal Endoscopy guideline on the role of ergonomics for prevention of endoscopy-related injury: summary and recommendations

Prepared by: ASGE STANDARDS OF PRACTICE COMMITTEE

Swati Pawa, MD, FASGE,[1] Richard S. Kwon, MD,[2] Douglas S. Fishman, MD, FAAP, FASGE,[3] Nirav C. Thosani, MD,[4] Amandeep Shergill, MD, MS,[5] Samir C. Grover, MD, MEd,[6] Mohammad Al-Haddad, MD, MSc, FASGE,[7] Stuart K. Amateau, MD, PhD, FASGE,[8] James L. Buxbaum, MD, MS, FASGE,[9] Audrey H. Calderwood, MD, MS, FASGE,[10] Jean M. Chalhoub, MD,[11] Nayantara Coelho-Prabhu, MD, FASGE,[12] Madhav Desai, MD, MPH,[13] Sherif E. Elhanafi, MD,[14] Nauzer Forbes, MD, MSc, FASGE,[15] Larissa L. Fujii-Lau, MD,[16] Divyanshoo R. Kohli, MD,[17] Jorge D. Machicado, MD, MPH,[2] Neil B. Marya, MD,[18] Wenly Ruan, MD,[4] Sunil G. Sheth, MD, FASGE,[19] Andrew C. Storm, MD,[12] Nikhil R. Thiruvengadam, MD,[20] Bashar J. Qumseya, MD, MPH, FASGE[21] (ASGE Standards of Practice Committee Chair, 2020-2023)

This document was reviewed and approved by the Governing Board of the American Society for Gastrointestinal Endoscopy.

GRAPHICAL ABSTRACT



1. The ASGE recommends ergonomic education to reduce the risk of ERI. (Strong recommendation, low quality of evidence).
2. The ASGE recommends a neutral monitor position during endoscopies to reduce the risk of ERI. (Strong recommendation, low quality of evidence).
3. The ASGE recommends the use of neutral bed height to reduce the risk of ERI. (Strong recommendation, very low quality of evidence).
4. The ASGE suggests the use of anti-fatigue mats to reduce the risk of ERI. (Conditional recommendation, very low quality of evidence).
5. 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).

This clinical practice guideline from the American Society for Gastrointestinal Endoscopy provides an evidence-based approach to strategies to prevent endoscopy-related injury (ERI) in GI endoscopists. It is accompanied by the article subtitled "Methodology and Review of Evidence," which provides a detailed account of the methodology used for the evidence review. This document was developed using the Grading of Recommendations Assessment, Development and Evaluation 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, antifatigue 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 antifatigue mats during procedures to prevent ERI. We suggest the use of ancillary devices in those with risk factors predisposing them to ERI. (Gastrointest Endosc 2023;■:1-10.)

(footnotes appear on last page of article)

This guideline document was prepared by the Standards of Practice Committee of the American Society for Gastrointestinal Endoscopy using the best available scientific evidence and considering a multitude of variables including but not limited to adverse events, patient 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 because of 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.

Sixty-one percent of gastroenterologists report spending greater than 40% of their time performing endoscopic procedures.[1] Survey-based studies reported a 39% to 89% prevalence of endoscopy-related injuries (ERIs)[2-16] 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,[1,9,12,13,16] 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.[21-29]

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 American Society for Gastrointestinal Endoscopy (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 would be challenging. However, we also recognized that ERIs are common in gastroenterologists and, as a society, it is our duty to provide meaningful and actionable guidance to our members on this very important topic.

METHODS

This document was prepared by the Standards of Practice 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 and on 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 recommendations. The GRADE approach was used to categorize recommendations as strong or conditional: "Recommend" was used for strong recommendations and

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 microbreaks and scheduled macrobreaks 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 a neutral bed height to reduce the risk of ERI. (Strong recommendation, very low quality of evidence)
5	The ASGE suggests the use of antifatigue 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 with male endoscopists.
3	Greater exposure to endoscopy procedures (time spent performing endoscopy and procedure volume) is associated with higher rates of ERIs.

ASGE, American Society for Gastrointestinal Endoscopy; *ERI*, endoscopy-related injury.

"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 3 broad categories:

1. Estimation of the rates and most common sites of ERIs.
2. Estimation of the predictors of ERI.
3. Interventions that can reduce the risk of ERI:
   a. Dedicated ergonomics education
   b. Targeted stretching microbreaks
   c. Adjustable monitors to allow work in a neutral posture
   d. Adjustable patient beds and stretchers to allow work in a neutral posture
   e. Antifatigue mats

Neutral posture is defined in the ergonomics literature as the position of the body when the muscles are in resting length and the joints are naturally aligned. This is achieved when 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 2 content experts (A.S. and S.C.G.), a GRADE methodologist (N.C.T.), Standards of Practice Committee members, and Standards of Practice Chair (B.J.Q.). For this document, there were no patient representatives because the study focused on ERI. Therefore, all panel members, who are practicing endoscopists, served as "patient representatives" on this panel.

EVIDENCE SYNTHESIS

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 accompanying article subtitled "Methodology and Review of Evidence." A summary of our final recommendations for the role of ergonomics for prevention of ERI are listed in Table 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 5227 respondents. Fourteen of 17 studies evaluated practicing gastroenterologists,[1-3,5-14,34] 1 study evaluated colorectal surgeons,[4] and 2 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% confidence interval [CI], 48.8-66.1; $I^2 = 93\%$). The most common sites of ERI were hands and fingers, back, and neck. Pooled rates of ERIs based on our meta-analysis were 35.8% (95% CI, 18.1-58.6; $I^2 = 97\%$) for hands and fingers, 35.3% (95% CI, 24.3-48; $I^2 = 92\%$) for the back, 32.6% (95% CI, 21.3-46.3; $I^2 = 93\%$) for the upper back and neck, 29.2% (95% CI, 16.3-46.7; $I^2 = 98\%$) the thumb alone, and 26.1% (95% CI, 16.9-37.9; $I^2 = 97\%$) for the neck alone.

PREDICTORS OF ERI

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

Gender of the endoscopist

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

Summary of evidence

To address the relationship of gender and ERI, we performed a systematic review and identified 8 eligible studies

that included 3355 gastroenterology respondents.[1,6,10,13,14,34] Two studies were specific to gastroenterology trainees,[17,18] and the overall rate of ERI in female endoscopists was 62.4% (96% CI, 46.7-75.9) compared with 45.5% (95% CI, 28.1-64.0) in male endoscopists. On meta-analysis, female endoscopists had higher odds of developing ERIs (odds ratio, 1.79; 95% CI, 1.35-2.38; $P < .01$; $I^2 = 64\%$).

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[13] conducted a survey study of members of the American College of Gastroenterology with 1698 respondents. On multivariable analysis, the number of hours performing endoscopy per week ($P = .009$) and the number of years in practice ($P = .022$) were found to be independent predictors of ERI.[13] Morais et al[10] surveyed 171 endoscopists in Europe and reported >15 years in practice ($P = .03$) as an independent risk factor of ERI. Ridtitid et al[1] surveyed 684 ASGE members and found that higher procedure volume (>20 endoscopies per week, $P < .001$), more endoscopy hours per week (>16 hours per week, $P < .001$), and higher total number of years performing endoscopy ($P = .004$), were associated with higher rates of ERI.

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 6 studies for inclusion.[35-40] Outcomes of interest were pain and formalized ergonomic assessments.

In a randomized trial of 15 fellows, Khan et al[35] showed that ergonomics education was associated with improved rapid entire body assessment scores compared with no training ($P < .001$). 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 nonrandomized study of 58 gastroenterology fellows, Ahmed et al[41] demonstrated that ergonomics education using a teaching video was associated with improvement in ergonomics knowledge based on pre- and post-training tests. Several other studies have reported improvement in ergonomics assessments scores.[37,39,40] Markwell et al[36] assessed the utility of individualized training by a physical therapist and showed that 63% of endoscopists reported reduction or resolution of pain.

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

The panel noted a lack of a standardized approach to ergonomics 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 ergonomics 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 recommended that all endoscopists pursue some form of ergonomics 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 3 studies for inclusion. The outcomes of interest were reduced rates of ERI and improvement in postprocedure 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 lasted from 30 seconds to 2 minutes in 1 national survey.[13] TSMBs were defined as 1.5-minute stretching breaks at 20- to 40-minute intervals throughout each procedure targeting the neck, shoulders, back, wrists, hands, knees, and ankles.[49,50] Macrobreaks were defined as scheduled breaks lasting 15 to 45 minutes and built into a day's endoscopy schedule.[13]

In a survey of 1698 gastroenterologists, taking microbreaks throughout the day was associated with lower odds of reporting ERIs (odds ratio, .69; 95% CI, .54-.87).[13] Similarly, taking longer breaks (macrobreaks) ranging from 15 to 45 minutes was associated with lower odds of reporting ERIs (odds ratio, .72; 95% CI, .92-.92), and the duration of macrobreaks was not significantly associated with ERI ($P = .50$). Two similar studies from the surgical literature showed that TSMBs were associated with improvement in postprocedure pain, physical performance, and mental focus without negatively affecting operative duration.[49,50]

While assessing the certainty of evidence, we rated down evidence for imprecision because of the 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 because surgical procedures in general often have longer procedure times compared with 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 GI endoscopy are 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 into individual schedules by endoscopists, but macrobreaks may require administrative support. The ASGE has developed educational materials on pre- and postprocedural exercises that can be easily implemented in the endoscopy unit. These are available online at ASGE's GI LEAP website.[43] An intraoperative microbreak stretch web application called OR-Stretch (available online at https://www.mayo.edu/research/labs/human-factors-engineering/or-stretch/or-stretch-pdf.) was developed by the human factors engineering laboratory at Mayo Clinic to guide surgeons through a series of sitting and standing exercises and stretches between surgeries.[51]

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 and neck posture. An ergonomic stance during endoscopy involves neutral neck and back positions without hyperextension or flexion, even weight distribution between both legs, and avoidance of knee hyperextension.[52] Monitor booms and mobile stands facilitate flexible monitor positioning.

Our search did not identify any gastroenterology studies to inform this question. However, we identified 3 published laparoscopic surgical studies assessing optimal monitor positions.[53-55] The outcomes of interest were 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.[53] Task performance was best when the monitor was directly in front (not to the right or left) of the laparoscopic surgeon.[54] 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.[55]

Extrapolating from these studies, Shergill et al[52] 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. 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.[52]

Evidence was down-rated for indirectness, because extrapolation from the 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 believed that even with a potential 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 because of ill-placed monitors.[10,20] Endoscopy units should make a concerted effort to make all monitors within their unit adjustable to accommodate individual endoscopists by matching the requirements recommended by Shergill et al.[52] 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 postures to reduce the risk of ERI.

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

Recommendation 4. The ASGE recommends the use of a 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 the gastroenterology literature pertinent to this question. Our search yielded 2 observational laparoscopic surgical studies on optimal procedure table position.[56,57] Berguer et al[56] reported that an optimal table height was between elbow height and 10 cm below elbow height. This was associated with significant improvement in the rating of discomfort. Van Veelen et al[57] demonstrated that a neutral bed height during surgery allowed the surgeon's joints to stay in neutral positions.

Shergill et al[52] 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.

The evidence for this question was down-rated for indirectness, because 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 a 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 antifatigue floor mats be used to prevent ERI?

Recommendation 5. The ASGE suggests the use of antifatigue 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.[58] Our search did not identify any published studies in the gastroenterology literature relevant to this topic, but we identified 2 studies from the surgical literature.[59,60] Haramis et al[59] conducted a randomized study of a gel mat versus no mat during laparoscopic renal surgeries (50 for each arm) performed by 18 providers. The use of floor mats was associated with less 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 hours postoperatively. Graversen et al[60] also found significant improvement in postoperative discomfort in a study of 11 urologists performing cystoscopy. Both studies involved urologic procedures; thus, the results may not be entirely applicable to GI 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 antifatigue mats outweigh any potential risks. These risks include contamination of floor mats from routine use during GI procedures. Floor mats would 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.[61] Overall, a conditional recommendation for using antifatigue mats during GI 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 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.

Hand size and ERI

We wanted to assess the relationship between hand size and ERI. Overall, data are inconsistent and could not be pooled. Our systematic review identified 4 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 a small glove size (288 respondents; ERI, 78.13%) versus a large glove size (682 respondents; ERI, 75.95%; $P = .12$).[13] Similarly, no difference in rates of ERIs were found when comparing endoscopists with extra-small, small, and medium glove sizes (855 respondents; ERI, 74.74%) versus large and extra-large glove sizes (828 respondents; ERI, 77.05%; $P = .27$).[13] Two international studies also showed similar results.[10,20] However, a 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 minutes, $P = .04$)

and an increased number of injury sites ($P = .03$) leading to a decreased number of colonoscopies performed compared with large-handed providers. In a survey study of 227 gastroenterology fellows, Cohen et al[62] found that a significant number of trainees believed their small hand size negatively impacted overall training, and 97.4% of those with a small hand size (glove size of 6.5 or less) were women.

Current possible options for those with smaller hands include 2 reusable dial adaptors, the MAJ-1072 auxiliary angle knob cover (Olympus, Tokyo, Japan) and the OE-B1 right/left assistant knob (Pentax , Tokyo, Japan). These rubber extensions are clipped to the standard right/left angulation control knob in the control body section. Once clipped on, the right/left 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. A 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.[63] With the use of this adaptor, there was a trend toward decreased procedure time for physicians with small hands; however, no significant difference was found in procedure duration or ease of procedure. The retroflexion maneuver was rated significantly easier with the adapter by all endoscopists.[63] These devices are inexpensive, easy to use, and safe and need to be processed according to manufacturer recommendations and are not disposable. Unfortunately, Olympus recently discontinued their 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.

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[64] are being evaluated in the reduction of ERIs. However, these devices are not currently available in the United States for use.

Lead apron–related ERI

A commonly reported source of ERI relates to the use of lead aprons during procedures requiring fluoroscopy (eg, ERCP, EUS-guided biliary interventions, and luminal stent placement), which places additional loads on the trunk muscles and intervertebral discs.[3,12,65] A recent study reported 222 of 1277 (22%) of those surveyed reported ERI related to GI endoscopy specifically related to the use of lead aprons. Men reported more ERI than women using lead aprons in 26.5% versus 14.3% ($P < .001$) of those affected.[13] The use of lead aprons has not been systematically studied in ERCP, but 2-piece lead aprons have been found to produce less discomfort by redistributing a portion of the weight across the hips from the upper body.[66]

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 ERIs, gender differences in type of ERI, overall rate and impact of ERIs in female gastroenterologists, and pregnancy and risk of ERI. Future studies should also investigate impact of hand size, TSMBs, optimal endoscopy schedules including micro- and macrobreaks, endoscopy room design optimization such as monitor height and bed height, and the impact of quality improvement initiatives on ergonomic practices in endoscopy. We also call on endoscopy manufacturers to improve current endoscope design to mitigate biomechanical exposures and to implement optimal endoscopy management programs. More funding to study effective ergonomic interventions and the 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.

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Abbreviations: ASGE, American Society for Gastrointestinal Endoscopy; CI, confidence interval; ERI, endoscopy-related injury; GRADE, Grading of Recommendations Assessment, Development and Evaluation; TSMB, targeted stretching microbreak.

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Current affiliations: Department of Gastroenterology, Wake Forest School of Medicine, Winston Salem, North Carolina, USA (1), Division of Gastroenterology, Michigan Medicine, University of Michigan, Ann Arbor, Michigan, USA (2), Division of Pediatric Gastroenterology, Hepatology and Nutrition, Baylor College of Medicine, Texas Children's Hospital, Houston, Texas, USA (3), Center for Interventional Gastroenterology at UTHealth, McGovern Medical School, Houston, Texas, USA (4), Division of Gastroenterology, Department of Medicine, University of San Francisco, San Francisco, California, USA (5), Division of Gastroenterology, Department of Medicine, Unity Health Toronto, St Michael's Hospital, Toronto, Ontario, Canada (6), Division of Gastroenterology and Hepatology, Indiana University School of Medicine, Indianapolis, Indiana, USA (7), Division of Gastroenterology Hepatology and Nutrition, University of Minnesota Medical Center, Minneapolis, Minnesota, USA (8), Division of Gastrointestinal and Liver Diseases, Keck School of Medicine of the University of Southern California, Los Angeles, California, USA (9), Section of Gastroenterology and Hepatology, Dartmouth-Hitchcock Medical Center, Dartmouth Geisel School of Medicine, Lebanon, New Hampshire, USA (10), Department of Gastroenterology and Internal Medicine, Staten Island University Hospital, Northwell Health, Staten Island, New York, USA (11), Department of Gastroenterology and Hepatology, Mayo Clinic, Rochester, Minnesota, USA (12), Division of Gastroenterology, Hepatology and Nutrition, University of Minnesota Medical Center, Minneapolis, Minnesota, USA (13), Division of Gastroenterology, Texas Tech University Health Sciences Center, El Paso, Texas, USA (14), Department of Medicine, Cumming School of Medicine, University of Calgary, Calgary, Alberta, Canada (15), Department of Gastroenterology, University of Hawaii, Honolulu, Hawaii, USA (16), Pancreas and Liver Clinic, Providence Sacred Heart Medical Center, Spokane, Washington, USA (17), Division of Gastroenterology and Hepatology, University of Massachusetts Medical Center, Worcester, Massachusetts, USA (18), Division of Gastroenterology, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, Massachusetts, USA (19), Division of Gastroenterology and Hepatology, Loma Linda University, Loma Linda, California, USA (20), Department of Gastroenterology, Hepatology, and Nutrition, University of Florida, Gainesville, Florida, USA (21).

Reprint requests: Bashar J. Qumseya, MD, MPH, FASGE, Department of Gastroenterology, Hepatology and Nutrition, University of Florida, PO Box 100214, 1329 SW 16th St, Ste 5251, Gainesville, FL 32610-0214.