

# Endoscopy-related musculoskeletal injuries in gastroenterology fellows



## Authors

Edward Villa<sup>1</sup>, Bashar Attar<sup>1</sup>, William Trick<sup>2</sup>, Vikram Kotwal<sup>1</sup>

## Institutions

- 1 John H Stroger Jr. Hospital of Cook County, Division of Gastroenterology and Hepatology, Chicago, Illinois, United States
- 2 John H Stroger Jr. Hospital of Cook County, Division of Internal Medicine, Chicago, Illinois, United States

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## Bibliography

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## Corresponding author

Edward Villa, MD, 235 W Van Buren St Unit 2108, Chicago, IL 60607

Phone: +1-847-668-3875

EESPEE88@GMAIL.COM

## ABSTRACT

**Background and study aims** Gastroenterologists are at high risk for work-related musculoskeletal injuries. Studies have shown that 37% to 89% of endoscopists have work-related musculoskeletal injuries. While all surveys until

now have focused on practicing endoscopists, there have been no publications assessing the prevalence of musculoskeletal injuries among gastroenterology fellows, which we sought to investigate.

**Methods** A 22-question survey about ergonomics and work-related musculoskeletal injuries was sent to 114 gastroenterology fellows in different programs across the United States in June 2016, and an additional 103 surveys were distributed at Digestive Disease Week in May 2017. Responses were collected, and data were analyzed.

**Results** A total of 156 surveys were collected. Of these, 74 fellows (47%) reported a new musculoskeletal injury related to endoscopy. Injuries occurred mostly in the first year of fellowship (85%,  $P < 0.001$ ). The most common sites of injury were the right wrist (53%), left thumb (42%), back (27%), and neck (22%). Only 26% those who had endoscopy-related musculoskeletal injuries had received training in ergonomics compared to 45% of those who did not have injury ( $P = 0.012$ ), and ergonomics training was highly desirable among respondents, particularly among those with previous injuries ( $P = 0.0030$ ).

**Conclusion** Musculoskeletal injuries related to endoscopy are very common among gastroenterology fellows, particularly during the first year of fellowship. While the overall percentage of fellows who received training in ergonomics was low, those who did receive training were less likely to report a musculoskeletal injury. There is an urgent need for ergonomics training among Gastroenterology fellows.

## Introduction

Musculoskeletal disorders account for nearly 70 million physician office visits in the United States annually, and an estimated 130 million total health care encounters, including outpatient, emergency department, and inpatient visits. The Institute of Medicine estimates of the economic burden of work-related musculoskeletal disorders (WMSDs) – as measured by compensation costs, lost wages, and lost productivity – are between \$45 billion and \$54 billion annually [1]. In addition to economic loss, these disorders also lead to decreased quality of life. Those working in nursing and healthcare facilities are especially prone to WMSDs [1]. Among physicians, endoscopists are at increased

risk for WMSDs compared to internists and other specialists who are not procedure-oriented with 37% to 89% of endoscopists reporting musculoskeletal injuries [2, 3].

Several factors influence endoscopy-related musculoskeletal pain. The most commonly reported factor is high procedure volume and prolonged duration of performing endoscopy, which leads to overuse injury from repetitive movements [4–6]. Other risk factors that have been reported are improper position during performing endoscopy and endoscopy-specific maneuvers like torqueing during colonoscopy and use of control dials [5, 7–9]. These maneuvers lead to certain endoscopy-specific injuries, such as “Colonoscopist’s Thumb,” or De-

Quervain's tenosynovitis [10, 11]. Other common sites of injuries in endoscopists are the neck, back, shoulder and elbow [6].

While the data alarmingly reveal the problems facing endoscopists in practice, little is known about musculoskeletal injuries among gastroenterology fellows. Because of the implications of musculoskeletal injuries and the potential for permanent injury, we sought to assess the prevalence of injuries among fellows to open future investigations into ergonomic-specific education that can reduce injuries.

## Methods

A 22-question survey about ergonomics and work-related musculoskeletal injuries was developed (see supplemental appendix). As there were no individual identifiers in the survey questions, the Institutional Review Board exempted it. An email with an invitation to participate in the survey was sent to 114 gastroenterology fellows in different programs across the United States in June 2016 (these were sent by the authors through their contacts in different programs). The invitation email had a web link to the survey instrument (Survey Monkey, Palo Alto, California, United States). Fellows who did not respond within a week were sent a second reminder email. Responses were collected, and the data were analyzed. An additional 103 paper surveys were distributed at Digestive Disease Week (DDW) in May of 2017 to fellows who confirmed that they had not responded to the online survey, and the data were added to the previously collected online surveys for analysis. No monetary compensation was given for participation in the survey.

### Statistical analysis

We used descriptive statistics to define the prevalence of injuries related to endoscopy. Responders were classified into two main groups: those reporting no new injury during fellowship and those reporting a new musculoskeletal injury during fellowship which was attributable to performing endoscopy. We then applied the Pearson chi-squared analysis to assess the statistical differences between these groups. Differences across groups were considered significant if the associated *P* value was less than 0.05.

## Results

Fifty-three out of 114 fellows (46%) responded to the online survey, and all 103 surveys distributed at DDW were collected. The respondents were equally distributed across the 3 years of their fellowship training (► **Table 1**, *P*=0.98). Of 156 respondents, 87 (56%) reported at least one new musculoskeletal injury sustained since the start of fellowship. Of the 87 gastroenterology fellows who reported new injuries experienced during fellowship, 74 (47% overall) reported that these injuries were related to endoscopy (► **Table 1**). When compared to those without endoscopy-related injury, those with endoscopy-related musculoskeletal injury were similar in age (*P*=0.75), gender (56% of females sustained injury compared to 42% of males, *P*=0.10), and training in endoscopic retrograde cholangiopancreatography (ERCP) (27% vs 28%, *P*=0.89) (► **Table 1**). There

was no significant difference between the groups when we compared the online respondents to those who took the paper survey.

Sixty-three (85%) reported that the new injury(ies) occurred during the first year of fellowship (► **Table 1**). The respondents cited multiple injuries sustained, including the right wrist (53%), left thumb (48%), back (31%), neck (22%), among others (► **Fig. 1**). Of the 74 fellows reporting an endoscopy-related injury, only three (4%) reported that time was missed due to that injury, but the time missed did not exceed 3 days (► **Table 2**). While 35 fellows (47%) took pain medications, only one (1%) saw a specialist for the injury sustained (► **Table 2**).

Of the 74 fellows who reported at least one injury related to endoscopy, only 19 (26%) had received ergonomics training during fellowship, whereas 37 of the 82 who did not report endoscopy-related injury (45%) had received ergonomics training (► **Table 1**), which was a statistically significant difference (*P*<0.001). 63 (85%) of those sustaining endoscopy-related injuries and 104 (67%) of overall respondents stated that they were interested in receiving ergonomics training (► **Table 1**).

## Discussion

Endoscopists are at increased risk of musculoskeletal injuries. Published data have focused on the prevalence of musculoskeletal injuries and assessing the role of ergonomics among practicing gastroenterologists. As many as 39% to 89% overall prevalence of pain or musculoskeletal injuries is reported among reporting endoscopists [2, 3, 11, 12]. However, prior to our study, prevalence of musculoskeletal injuries among gastroenterology fellows had not been reported. The results of our study reveal that among the responders, an alarming 47% of fellows admitted to at least one new endoscopy-related musculoskeletal injury sustained during fellowship, most of which (85%) occurred during the first 12 months of gastroenterology fellowship, arguably the most crucial period for learning proper techniques.

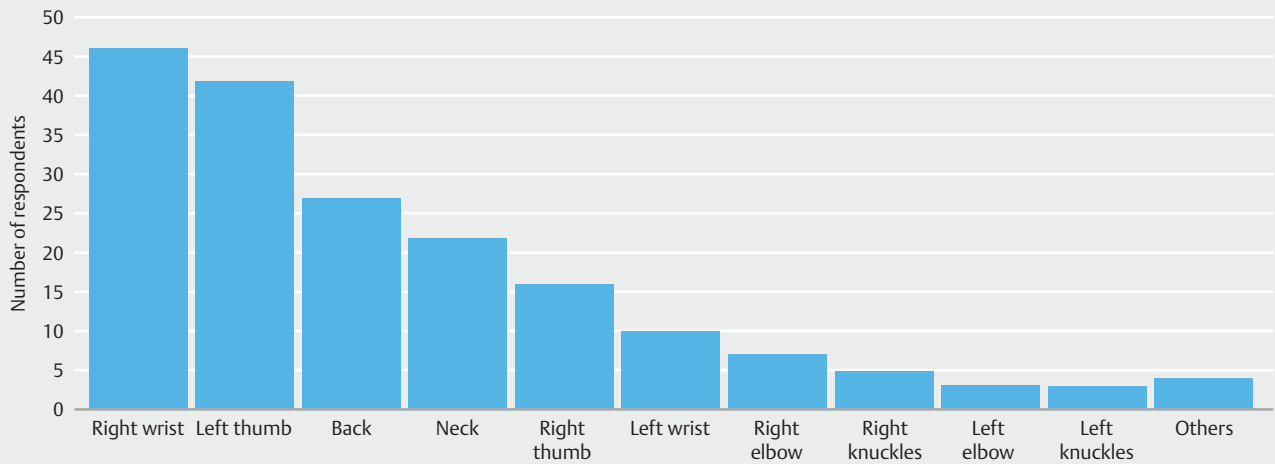
While factors influencing the development of injuries were not directly assessed in this study, based on previously published data, several factors influence endoscopy-related musculoskeletal pain. The most important factors are overuse and repetitive movements along with prolonged standing, all of which are integral parts of performing endoscopy. Previous studies have shown that performing endoscopy for more than 16 hours per week (or 20 cases) increases risk of musculoskeletal injuries [6, 12]. A considerable proportion of fellows easily exceed this threshold. This is more relevant for fellowships emphasizing clinical and procedural training with high procedural volumes rather than fellowships with more of a research focus. While there are regulations regarding work hours for house staff, including fellows, there are no procedural limitations placed by the Accreditation Council for Graduate Medical Education for gastroenterology fellows. We believe this to be an important issue worth addressing by the gastroenterology societies.

Other factors leading to injuries are improper positioning of the patient and monitor (height of the bed being too low or too high and monitor not being right in front of the endoscopist

► **Table 1** Demographic data from respondents.

Endoscopy-related MSK injury					
		Yes (total=74)	No (total=82)	Total (%)	
Age					
	25 to 30	9	15	24	$\chi^2 = 1.22$ $P = 0.75$
	31 to 35	48	51	99	
	36 to 40	16	15	31	
	41 or older	1	1	2	
Gender ( $P = 0.10$ )					
	Female	31	24	55	$\chi^2 = 2.72$ $P = 0.10$
	Male	43	58	101	
Ethnicity ( $P = 0.79$ )					
	Asian/Indian	39	44	83	$\chi^2 = 1.73$ $P = 0.79$
	White/Caucasian	23	27	50	
	Hispanic/Latino	6	4	10	
	Black/African American	5	4	9	
	Other	1	3	4	
Year in Fellowship at time of response ( $P = 0.98$ )					
	1st year	25	26	51	$\chi^2 = 0.16$ $P = 0.98$
	2nd year	24	26	50	
	3rd year	24	29	53	
	Other	1	1	2	
Timing of endoscopy-related injury					
	0–3 months	23			
	3–6 months	28			
	6–12 months	13			
	12–24 months	7			
	24–36 months	3			
ERCP experience ( $\chi^2 = 0.020$ , $P = 0.89$ )					
	Yes	20	23	43	$\chi^2 = 0.020$ $P = 0.89$
	No	54	59	113	
Ergonomics training received ( $\chi^2 = 12$ , $P < 0.001$ )					
	Yes	19	37		$\chi^2 = 12$ $P < 0.001$
	No	55	31		
	N/A	0	14		
Desire for ergonomics training ( $\chi^2 = 8.9$ , $P = 0.0030$ )					
	Yes	63	41		$\chi^2 = 8.9$ $P = 0.0030$
	No	11	24		
	N/A	0	17		

MSK, musculoskeletal injury; ERCP, endoscopic retrograde cholangiopancreatography



► **Fig. 1** Site of endoscopy-related musculoskeletal injury.

► **Table 2** Consequences of endoscopy-related musculoskeletal injuries.

Time missed due to injury		
	1 – 3 days	3
	None	71
NSAID use for injury		
	Yes	35
	No	36
	No response	3
Other treatments for pain		
	Yes	3
	▪ Splint	2
	▪ Other	1
	No	68
	No response	3
Saw specialist due to injury		
	Yes	1
	No	69
	No response	4
Modified endoscopy technique		
	Yes	48
	No	23
	No response	3
NSAID, nonsteroidal anti-inflammatory drug		

and just below eye level) or improper technique, such as excessive torquing and high pinch forces [3, 11, 12]. To avoid improper positioning, endoscopy units should consider having an “Ergonomic Timeout” prior to starting procedures to ensure proper bed height, patient position, and monitor location. To avoid improper technique, it is crucial that fellows are monitored closely and informed about these errors early during fellowship before adopting improper techniques. This is especially important given that most first-time injuries occur during the first year of fellowship.

Because there are published studies that demonstrated an increase in reported musculoskeletal injuries among gastroenterologists who practice ERCP [13], we sought to investigate whether there was similarly increased reporting of musculoskeletal injuries among gastroenterology fellows who performed ERCP during their fellowship; however, there was no statistically significant reporting of musculoskeletal injuries in those who were ERCP trained (► **Table 2**). This was possibly due to the fact that the majority of gastroenterology fellows in the United States do not have ERCP experience; that those who have ERCP experience do not have a significant case volume to experience musculoskeletal injuries; and/or that advanced or repetitive maneuvers that could lead to injuries were limited in inexperienced general gastroenterology fellows given the likelihood that attendings would take over a difficult case that would require such maneuvers.

Not surprisingly, our study demonstrated that those who reported no injuries had a statistically significantly higher reporting of ergonomics training than those who reported injuries. The lack of endoscopy-specific ergonomics education is believed to play a significant role in the overall poor compliance among endoscopists with regard to ergonomic practices [14], and our study demonstrates a willingness among the majority of fellows (67% of all responders) to address this issue by receiving ergonomics training. As such, we believe there is a need to train the instructors in applying endoscopic-specific ergonomic principles to their education of fellows and that there

is a clear role for widespread education and implementation of guidelines for best clinical practice of ergonomics [3, 14–16]. Based on our study, that training should begin at the start of fellowship.

There are certain drawbacks of our study. First, inherent to any survey is the possibility of “recall bias” among the respondents. Second, two different methods were used for data collection (survey by email and paper survey at DDW). However, we found similar results in respondents of both methods of survey. Third, our study did not assess the impact of fellows’ procedure volumes and musculoskeletal injuries; given that the respondents were from many different fellowship programs with varying procedure scheduled. Finally, our sample size is small, and we were unable to determine whether specific types of injuries were more common during different years of fellowship and which specific injuries could be prevented by training in ergonomics.

The findings of our study suggest that musculoskeletal injuries may originate as early as fellowship (especially during the first year of fellowship) and there is a need for early ergonomics training. However, further studies are needed to assess the role of ergonomics training in decreasing work-related injuries; in affecting short-term and long-term disability; in impacting procedural efficiency and productivity; and in improving quality of life for endoscopists.

### Competing interests

None

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