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Does Manual Abdominal Pressure During Colonoscopy Put Endoscopy Staff and Patients at Risk?

Experiences of Endoscopy Nurses and Technicians

ABSTRACT

Endoscopy staff suffer work-related musculoskeletal disorders at a rate greater than or comparable to nurses and technicians in other subspecialities, which may be attributable to the widespread use of manual pressure and repositioning during colonoscopy. In addition to negatively impacting staff health and job performance, colonoscopy-related musculoskeletal disorder injuries may also signal potential risks to patient safety. To assess the prevalence of staff injury and perceived patient harm relating to the use of manual pressure and repositioning techniques during colonoscopy, 185 attendees of a recent national meeting of the Society of Gastroenterology Nurses and Associates were asked to recall experiencing injuries to themselves or observing injuries to other staff or patients during colonoscopy. A majority of respondents (84.9%, $n = 157$) reported either experiencing or observing staff injury, whereas 25.9% ($n = 48$) reported observing patient complications. Among respondents who perform manual repositioning and apply manual pressure during colonoscopy (57.3%, $n = 106$), 85.8% ($n = 91$) reported experiencing musculoskeletal disorders from performing these tasks; 81.1% ($n = 150$) reported no awareness of colonoscopy-specific ergonomics policies at their facility. Results highlight the relationship between the physical job requirements of endoscopy nurses and technicians, staff musculoskeletal disorders, and patient complications, and suggest that implementation of staff safety protocols may benefit patients as well as endoscopy staff.

The relationship between turnover in nursing and patient outcomes is multifaceted but also straightforward: patient outcomes are worse when higher turnover exists. A key mediating factor in this relationship is the occupational safety of nurses; turnover is higher in units where nurses experience higher rates of occupational injury (e.g., Charney & Schirmer, 2007). Nursing consistently ranks at or near the top of professions by rate of occupational injuries (Occupational Safety and Health

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Administration, n.d.). The most common type of injuries are musculoskeletal disorders (MSDs), defined as musculoskeletal system and connective tissue diseases and disorders caused by actions such as bending, reaching, twisting; overexertion, or repetitive motion; examples include sprains, strains, and tears, back pain, carpal tunnel syndrome, and hernia (Centers for Disease Control and Prevention, 2021; Dressner & Kissinger, 2018). Among hospital personnel, MSDs are largely caused by repeated manual patient handling activities including transferring, repositioning, and lifting patients (Occupational Safety and Health Administration, n.d.). MSDs are associated with high costs to employers such as absenteeism; lost productivity; and increased healthcare, disability, and worker's compensation costs. Aggregate costs associated with work-related strains and sprains among U.S. healthcare workers are approximately $2 billion each year (Harris, 2013).

MSDs occur at a similar or greater rate among endoscopy nurses and technicians compared with their counterparts in other subspecialities, which are partly attributable to typical patient handling duties that include applying manual abdominal pressure and repositioning patients during colonoscopy (Drysdale, 2011, 2013). These techniques are primarily used to address looping, a common procedural difficulty; manual pressure is deployed in approximately 60% of all colonoscopies, whereas repositioning is used in approximately 40% of procedures (Hansel, Prechel, Horn, Crowell, & DiBaise, 2009). Each task requires substantial physical exertion and endurance, especially when performed on larger or heavier patients or when manual pressure is required for a long duration. This can result in back, shoulder, or hand and wrist MSDs; one assessment estimated that the force required to apply manual pressure to the abdomen of a 260-lb patient can exceed 100 lb (Osborne, 2021). In a recent randomized controlled trial, sustaining manual pressure for more than 3 minutes was the strongest predictor of postcolonoscopy staff-reported musculoskeletal pain; this effect was magnified when patient body mass index was greater than 30 or patient waist circumference exceeded 45 inches (Crockett, Dellon, Biggers, & Ernst, 2021). In a study of 215 endoscopy nursing staff in the United States, 21% of participants missed work due to MSDs, 45% visited a doctor for work-related injuries, and 14% of respondents had undergone surgery for their injuries; similar injury and treatment patterns exist among Canadian endoscopy nursing staff (Drysdale, 2011, 2013).

Further, manual pressure and repositioning are both indirectly and directly associated with patient complications from colonoscopy. Indirectly, manual techniques are used to address looping; looping is associated with complications that range in severity from minor postprocedural pain to colonic perforation (Sherid, Samo, & Sulaim, 2013). A 2016 study found that the strongest predictor of postcolonoscopy patient pain was use of manual pressure; patients who received manual pressure were more than twice as likely to report moderate-to-severe postprocedure pain (Park et al., 2016). Additionally, emerging literature suggests that manual techniques may also pose risks to patients in their own right, which include bruising, skin tears, and splenic injury (Osborne, 2021). While rare, serious complications attributed directly to manual abdominal pressure, including a mesenteric tear and an abdominal wall hematoma requiring hospitalization, have been noted in two recently published case reports (Dixon, McDonough, & Fang, 2021; Osborne, 2021; Shacket, Gillis, & Guthrie, 2021).

The exposure of endoscopy staff to workplace injury during colonoscopy may also have broader ramifications for patient safety. Numerous studies show a relationship between patient outcomes and workplace injury among nurses, mediated by such factors as staffing ratios, scheduling, and workplace culture (Charney & Schirmer, 2007; Copanitsanou, Fotos, & Brokalaki, 2017; Hahtela et al., 2017; Lin & Liang, 2007; Taylor, 2021). Even the *perceived* risk of injury, whether merited or not, may increase nurse turnover and thus impact patient outcomes (Hayward, Bungay, Wolff, & MacDonald, 2016). As such, it is important to understand how nurses and other endoscopy staff understand the physical risks of everyday job tasks, as well as their awareness of institutional measures taken to reduce the risk of occupational injury. The primary aim of the current study was to measure the perceived incidence of staff MSDs and patient complications among endoscopy nurses; as a secondary aim, this study examined the associations between these observations and institutional ergonomic policies.

Methods

A seven-question, cross-sectional online survey was developed to explore the extent to which endoscopy nurses and technicians attribute a link between manual techniques used in colonoscopy (i.e., repositioning and abdominal pressure), occupational injuries, and patient complications following colonoscopy. Participants were asked to identify their organizational role (as either nurse, nurse manager, technician, or other staff), whether they had primary responsibility for repositioning patients during colonoscopy, their observations of colonoscopy-related injury among staff and patients, and whether an ergonomics policy relevant to colonoscopy procedures was in place at their institution (see the Supplemental Digital Content Appendix, available at: http://links.lww.com/GNJ/A94).

Participants were recruited from attendees at the Society of Gastroenterology Nurses and Associates 48th Annual Course meetings, which were conducted virtually in May 2021. All registered attendees (n = 278) were invited to participate via e-mail; survey participation was further promoted during two 15-minute "coffee break" events on the first and second days of the conference. Prospective participants were offered a $5 gift card in exchange for completing the survey. Data were collected for marketing purposes by ColoWrap, LLC, and obtained by the researchers in de-identified form through a data use agreement.

Descriptive statistics were used to assess the frequency of observed colonoscopy-related injury among staff and patients, types of patient injuries observed, and incidence of institutional ergonomics policies. Chi-square (χ^2) tests were used to test for associations between variables measuring staff injury, patient injury, and institutional ergonomic policies. This research was approved by Solutions IRB.

Results

The survey collected data from 185 participants, yielding a response rate of 66.5%. Among respondents, 74.6% (n = 138) identified themselves as nurses, 18.9% (n = 39) identified as nurse managers, and 6.5% (n = 12) identified as technicians, assistants, or unspecified other (Table 1).

Staff MSDs Attributable to Manual Pressure and Repositioning

Slightly more than half of participants (57.3%, n = 106) indicated being responsible for applying manual pressure and repositioning patients during colonoscopy (Table 1). Of these respondents, 85.8% (n = 91) reported having experienced musculoskeletal pain or injury that they attributed to pressure and repositioning. Rates of injury were similar across nurses, nurse managers, and those identifying as tech/other (86.1% vs. 80.0% vs. 100%, respectively, p = .53). A sizeable minority of participants (42.7%, n = 79) reported not being responsible for manual pressure and repositioning while assisting colonoscopy, yet 83.5% (n = 66) of these respondents nonetheless reported knowledge of a staff injury having occurred within in their unit associated with these techniques. Overall, 84.9% of respondents (n = 157) reported either experiencing or observing workplace injury that they attributed to manual maneuvers performed during colonoscopy.

Patient Harm Attributable to Manual Pressure and Repositioning

Overall, 25.9% (n = 48) of respondents reported having observed patient harm caused by manual pressure (Table 1). Reported rates were similar across roles (nurse:

TABLE 1. Summary of Descriptive Findings

Respondent Role	*n* (%)	Responsible for Manual Maneuvers During Colonoscopy, *n* (%)	Experienced Injuries to Self, *n* (%)[a]	Observed Injury to Other Staff, *n* (%)[a]	Experienced Injury to Self or Observed Injury to Other Staff, *n* (%)	Observed Harm to Patient, *n* (%)	Institution Has Ergonomic Policy, *n* (%)
Nurse	138 (74.6)	86 (62.3)	74 (86.0)	44 (84.6)	118 (85.5)	35 (25.4)	21 (15.2)
Nurse manager	35 (18.9)	15 (42.9)	12 (80.0)	16 (80.0)	28 (80.0)	9 (25.7)	9 (25.9)
Other[b]	12 (6.5)	5 (41.7)	5 (100)	6 (85.7)	11 (91.7)	4 (33.3)	5 (41.7)
Total	*185 (100)*	*106 (57.2)*	*91 (85.8)*	*66 (83.5)*	*160 (86.4)*	*48 (25.9)*	*35 (18.9)*

[a]Only respondents who reported being responsible for manual maneuvers during colonoscopy were asked whether they had personally experienced an injury during colonoscopy; only respondents who did not report experiencing an injury (whether or not responsible for manual maneuvers) were asked whether they had observed the injury of another staff member during colonoscopy.

[b]Other includes respondents who identified as technicians or assistants, or who did not specify their role.

TABLE 2. Observed Patient Injuries

	Observed patient injury (n = 52) n (%)
Abdominal pain/soreness	22 (42)
Splenic injury or rupture	9 (17)
Bruising	8 (15)
Skin tears	3 (6)
Colon perforation	2 (4)
Other injury	5 (10)
Unspecified	3 (6)

25.4%, nurse manager: 25.7%, and other: 33.3%, p = .53). Abdominal pain/soreness was the most frequently cited patient complication, comprising 42.3% (n = 22) of all patient harm reports (Table 2). Splenic injury was the second most frequently reported complication, with nine respondents (4.8% of all participants) reporting having observed a patient splenic injury or rupture that they attributed to manual pressure.

Existence of Ergonomic Policies Addressing Manual Pressure and Repositioning

Many respondents (18.9%, n = 35) indicated the existence of an ergonomics policy within their facility specifically addressing manual maneuvers during colonoscopy (Table 1). Participants identifying as other/tech/assistant were more likely to report the existence of such a policy relative to those identifying as nurses or nurse managers (41.7% vs. 15.2% vs. 25.7%, respectively, p = .04).

Relationship Between Staff Injuries and Patient Harm

Respondents who either experienced or observed staff injury within their unit were more than 2.5 times as likely to report patient harm relative to participants who neither experienced nor were aware of staff injuries caused by manual pressure and repositioning (28.7% vs. 10.7%, p = .04).

Impact of Ergonomic Policies on Staff Injuries and Patient Harm

Respondents from facilities with colonoscopy-specific ergonomics policies in place reported similar rates of having experienced or observed staff injury relative to participants from sites without such policies (85.7% vs. 84.7%, p = .87) (Table 3). There was a trend toward increased rates of having observed patient harm among participants from facilities with ergonomic policies in place, although these differences did not reach statistical significance. When this analysis was limited to only those participants that had either experienced or observed staff injury, respondents reporting the existence of a colonoscopy-specific ergonomics policy did report higher rates of having observed manual pressure-related patient harm (43.3% vs. 25.2%, p = .04).

Discussion

This study highlights the experiences and perceptions of endoscopy personnel toward the potential safety risks of manual pressure and patient repositioning during colonoscopy. The findings here suggest that manual techniques commonly employed during colonoscopy may have widespread negative impacts on the staff who perform them, and that patient harm associated with these techniques may be underrecognized.

Staff Injury

Almost 90% of respondents who apply manual pressure indicated that they have suffered one or more MSDs within the past 12 months that they attribute to this task. Healthcare workers leave their jobs for a variety of reasons, but work-related injuries may needlessly abbreviate what would otherwise be lengthy and fulfilling careers. Workplace injury may increase the likelihood that more experienced nurses will exit more physically demanding specialties and switch to less physically demanding positions (e.g., advanced practice or teaching); further, nurses who reported work-related disability or experienced extreme physical demands are more likely than their counterparts to

TABLE 3. Staff Injury and Patient Harm by Colonoscopy-Specific Ergonomics Policy

	Reported Existence of Ergonomics Policy, n (%)		
	No	Yes	p
All participants			
Experienced or observed staff injury	127 (84.7)	30 (85.7)	.87
Observed patient harm	35 (23.3)	13 (37.1)	.09
Total	150 (81.1)	35 (18.9)	–
Participants experiencing or observing staff injury			
Observed patient harm	32 (25.2)	13 (43.3)	.04

leave nursing altogether (Mazurenko, Gupte, & Shan, 2015). The fact that MSDs are one of the most common reasons for nurses leaving their position should be of particular interest to gastrointestinal physicians, whose ability to perform high-quality colonoscopy and maintain procedure volumes depends on the availability of experienced, well-trained staff. Likewise, hospital administrators tasked with hiring and retaining quality personnel should take note, particularly during a period where staffing shortages are expected to increase in the wake of the COVID-19 pandemic (Falatah, 2021).

Patient Outcomes

The data suggest that, in the recollections of endoscopy nurses and staff, there is a credible relationship between the use of manual pressure and repositioning during colonoscopy and the likelihood of patient complications such as postprocedural pain. Although postprocedural abdominal pain is typically only a minor complication, it is also the primary cause of patient visits to the emergency department (ED) following colonoscopy, and may require a full CT workup to rule out more serious complications such as intestinal perforation (Makker et al., 2021; Ranasinghe et al., 2016). The average cost per postcolonoscopy ED visit is estimated at $6,732, and increasingly these visits are not reimbursed by payers. Respondents' attribution of postprocedural pain from the use of manual repositioning and pressure are in line with findings from previous case reviews and observational studies (Makker et al., 2021; Park et al., 2016; Sato, Fujinuma, & Sakai, 2006; Sherid et al., 2013). Therefore, it is reasonable to question whether these techniques contribute to patients returning to the ED following colonoscopy. In addition, although splenic injuries are reported as very rare in the literature, these injuries may be underreported, as 4.8% of participants in the survey indicating having observed patient splenic injury, which they attributed to manual pressure.

Institutional Costs

Both staff harm and patient harm also impose institutional costs. With regard to the former, the Occupational Safety and Health Administration estimates the direct cost of work-related MSDs at approximately $15,600, with indirect costs (e.g., productivity loss, replacement employee hiring and training) of 4–10 times higher (Occupational Safety and Health Administration, 2011). Regarding the latter, even relatively minor patient complications from routine procedures such as colonoscopies may reduce patient satisfaction, which in turn increases the likelihood that patients may negatively review the practitioners and hospitals who treat them, delay or defer future colonoscopies, and/or seek further treatment elsewhere. One recent estimate of comprehensive costs and benefits for implementing a device to prevent MSDs in colonoscopies had a cost–benefit ratio of 1:4.35 and a resulting return on investment of 435% (James & Hathorn, 2023).

Intriguingly, the relationship between the adoption of ergonomic policies and observations of patient injuries is counterintuitive—namely, that respondents from institutions with ergonomics policies reported having observed patient injuries *more* frequently than their counterparts from other institutions. Although these findings fall just short of the threshold for statistical significance, they nevertheless warrant further consideration on both conceptual and methodological grounds. One possibility is that the ergonomics policies themselves may have a detrimental effect on patient safety during colonoscopy, which would suggest that ergonomics policies may have the effect of transferring risk of injury from staff to patients. However, this explanation seems unlikely given that reports of staff injuries are virtually identical across institutions with and without ergonomic policies. A more plausible explanation is that the presence of ergonomics policies may have the effect of heightening staff awareness of patient injuries relating to colonoscopy—in other words, making staff more likely to attribute patient injury to manual pressure and repositioning. This interpretation seems more in keeping with the corresponding lack of variation in reports of staff injuries between institutions that do and do not have reported ergonomics policies; relative to patient injuries, another staff member's injuries may simply be more noticeable, insofar as the latter is more likely to have immediate and palpable effects on one's own schedule and work duties.

Recommendations

In a recent position statement, the Society of Gastroenterology Nurses and Associates highlight the contribution of manual handling duties to workplace MSDs in gastroenterology nurses and technicians, and urges institutions to develop comprehensive strategies to ensure ergonomically safe workplace environments. In particular, the statement identifies a need to "eliminate manual handling activities" wherever feasible, provide safe patient handling education, and increase the use of assistive devices that reduce physical stressors on personnel (Society of Gastroenterology Nurses and Associates, Inc., 2020). Our analysis underscores the need to evaluate the uses (and limitations) of manual pressure and repositioning in colonoscopy as part of institutional ergonomic assessments. Given the potential harm to endoscopy staff and patients, there is a clear need for broader education and training to minimize risks associated with the application of

abdominal pressure and patient repositioning during colonoscopy. Training in basic principles such as "endoscope looping" as well as training in awareness of ergonomics and potential solutions to prevent injury should be provided to staff. Techniques and devices that minimize the need for manual pressure and repositioning should be included. Looping is a common reason for the use of manual techniques, and yet previous studies have shown that even experienced physicians may have difficulty in locating the precise looping configuration and site, leading to inaccurate manual pressure placement. Therefore, the use of magnetic imaging may be beneficial in both increasing the accuracy and decreasing the incidence of manual pressure application (Chen et al., 2013; Holme et al., 2011; Shah, Saunders, Brooker, & Williams, 2000). More recently, abdominal compression devices designed for colonoscopy have been shown to improve colonoscopy success rates while reducing the need for manual pressure and repositioning during colonoscopy, as well as reduce the rate of MSDs among endoscopy staff (Crockett et al., 2016, 2021; Hamade et al., 2019; Nishizawa, Suzuki, Higuchi, Ebinuma, & Toyoshima, 2019).

Limitations

The survey data presented here capture the experiences and perceptions of endoscopy staff, which are derived from—but may not always accurately reflect—clinical realities. Respondents may not have perfect recollection of the events surrounding observed injuries to colleagues or patient complications that they attribute to manual pressure and repositioning; further, recollections may be mediated by other factors such as the respondent's level of experience, procedure volume, institution-specific reporting protocols, and overall job satisfaction. Additionally, the self-reported injury data do not include information about the specific types, severity, or duration of MSDs suffered by respondents. Anecdotally, most MSDs associated with manual pressure are repetitive in nature (e.g., carpal tunnel syndrome, shoulder or back sprain/strain). In fact, the incremental nature of MSDs sustained while supporting colonoscopy may make the associated risks less apparent in day-to-day practice, and thus less likely to be addressed.

Another important limitation of the current study is that the sample does not fully represent the population of endoscopy staff; in particular, nurses and nurse managers are the bulk of respondents, whereas endoscopy technicians and assistants are underrepresented. Previous studies indicate that although colonoscopy procedures pose occupational hazards for all involved, the nature and severity of injuries is dependent upon one's role during the procedure. Further, just as patient injury may be functionally related to injuries suffered by staff performing manual pressure and repositioning, so too may the injuries sustained by nurses performing manual pressure be functionally related to the injury risks associated with endoscopic techniques.

Finally, as suggested previously, both patient injuries and institutional policies may be underreported here, as both are likely to be affected by the respondent's role within their institution and level of managerial responsibility. Institutional ergonomic policies may be underreported by nonmanagerial staff, who are the bulk of the respondents. Relatedly, as awareness of institutional ergonomics policies relating to manual colonoscopy maneuvers may increase awareness of patient injury due to colonoscopy, these findings suggest that the latter may also be underreported by respondents.

Conclusions

Given the frequency and significant impact of MSDs associated with manual pressure and repositioning among endoscopy nurses and technicians, there is a clear need for interventions to minimize these risks for both staff and patients. MSDs among endoscopy staff may be an important predictor of both turnover rates and the likelihood of patient complications, which in turn substantially impact both physicians (who rely upon the availability of experienced staff) and administrators (who must limit institutional exposure to the financial risks of staff and patient injury). This study highlights the need to increase both implementation and awareness of workplace safety standards and ergonomic policies in endoscopy practices, which may reduce the incidence of injury not only among staff but also among colonoscopy patients. Raising awareness of the problem, implementing safety and ergonomic protocols, educating physicians and staff, and allocating appropriate funds to support these measures may help reduce endoscopy staff injury and the negative effects on patients. ✪

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