Surgery Is Physically Demanding and Associated With Multisite Musculoskeletal Pain: A Cross-Sectional Study

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Abstract
Background: Performing surgery involves well-known risk factors for developing musculoskeletal pain. Multisite musculoskeletal pain has shown to have an even higher adverse impact on the individual. We examined prevalence and intensity of multisite musculoskeletal pain in surgeons and identified characteristics associated with two or more painful body sites.

Materials and methods: Information on sociodemographic, work experience, work demands, health status, physical capacity, and prevalence and intensity of musculoskeletal pain were collected from an internet-based questionnaire in 284 surgeons. Descriptive statistics were used to report prevalence and intensity of musculoskeletal pain. A logistic regression model was conducted to assess the characteristics associated with multisite musculoskeletal pain.

Results: Musculoskeletal pain was reported by 93% of the surgeons and 77% experienced multisite pain. The reported median pain intensities ranged from 2 to 4. Multisite musculoskeletal pain was significantly associated with being a female surgeon (OR: 3.4; 95% CI: 1.5-7.4), physical work demands (OR: 1.5; 95% CI: 1.2-1.7), work ability (OR: 3.4; 95% CI: 1.6-7.0), and feeling a sense of heaviness in the head/headache (OR: 4.8; 95% CI: 2.0-11.5). In addition, 21%-40% of the surgeons who experienced multisite pain reported that pain influenced their work, leisure time, and sleep negatively.

Conclusions: The observed high prevalence of multisite musculoskeletal pain and high pain intensities adds new knowledge to the emerging literature on surgeons’ health. In addition, several characteristics, for example, work ability, were significantly associated with multiple pain sites. This is concerning as pain could ultimately shorten a surgeon’s career. Therefore, it is pertinent to develop preventive and rehabilitating strategies.

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Introduction

Surgeons have long workdays and have a physically demanding job. They are exposed to cumulative awkward postures, repetitive motions, and forceful exertions during the performance of surgery.1-3 These exposures lead to muscular strain and the development of musculoskeletal pain.4-6 Moreover, the operating room is a complex environment where the patient’s safety is first priority. Surgeons adopt operative positions based on the patient-specific situation, assisting personnel, and/or personal preferences as opposed to ergonomically guided principles and their own comfort.7-9

Musculoskeletal pain accounts for approximately 40% of all occupational diseases in Europe.9 It is considered to be a growing problem and is associated with decreased work ability and increased sickness absence as well as economic societal consequences.9-11 A recent study demonstrated that health care professionals who reported multisite musculoskeletal pain were 2.4 times more likely to report a low work ability compared with those health care professionals who did not report multisite musculoskeletal pain.12

Prior studies have found a comparatively high prevalence of musculoskeletal pain reported by surgeons (73% to 88%).1-3,13-15 However, no study has investigated the presence of multisite pain and whether specific characteristics are significantly associated with reporting multisite musculoskeletal pain. This is important given that musculoskeletal pain has been shown to influence a surgeon’s dexterity and quality of life.15-18 Multisite pain, with all things being equal, may have a greater adverse effect on surgeon health.

The present study investigated musculoskeletal pain among surgeons working in the fields of pelvic surgery (urology, colorectal surgery, and gynecology). The objectives were to quantify the prevalence and the intensity of musculoskeletal pain reported by surgeons within these specialties and further, to identify surgeon characteristics associated with reporting two or more painful body sites.

Materials and methods

This was a cross-sectional internet-based survey of surgeons who were practicing in Denmark and registered with the Danish Medical Association. We selected surgeons within the specialties of urology, abdominal surgery, and gynecology as these three specializations entail similar physical work characteristics and work demands.

Survey

A link to the survey was sent by email to all potential participants. It consisted of validated questionnaires as well as ad hoc questions specifically developed for this study. The survey package was pilot tested by three surgeons and adapted accordingly. The survey collected information about the surgeon’s sociodemographic, work experience, work demands, current health status, levels of physical capacity, and presence and intensity of musculoskeletal pain.

Musculoskeletal pain

Musculoskeletal pain in the neck, shoulders, elbows, hands, upper back, and lower back was measured using the validated Nordic Musculoskeletal Questionnaire.19 For each site, the surgeon was asked how many days during the past 3 mo they experienced pain using the response categories of: 1) 0 d, 2) 1-7 d, 3) 8-30 d, 4) more than 30 d, and 5) every day. In addition, if pain was present for one or more days, the surgeon rated his or her pain intensity for each site on an 11-point numerical rating scale, ranging from 0 (no pain) to 10 (worst possible pain) during the past 3 mo and during the past 7 d. Surgeons were also asked if their musculoskeletal pain impacted negatively on their work, leisure time activities, or sleep.

Health status

Current health status was measured by a question from the validated 36-Item Short Form Health Survey, as well as questions on health complaints within the past month, and the use of medication within the previous 3 mo. The surgeon’s general health was assessed by the question, “How do you perceive your overall health?” with the response categories of: 1) poor, 2) less well, 3) well, 4) very well, and 5) excellent.20 Because of small cell sizes, we collapsed the five categories to 1) poor/less well/well, 2) very well, and 3) excellent. Items on health complaints dealt with feelings of heaviness in the head/headaches, concentration problems, and sleep problems and were phrased: “During the past month, have you been bothered by [complaint]?” Each complaint was rated on a 5-point ordinal scale of: 1) never, 2) rarely, 3) sometimes, 4) often, and 5) very often. Because of small cell sizes, categories were dichotomized to 1) never or rarely, and 2) sometimes, often or very often. For medication usage (i.e., painkillers, sedatives, and sleeping pills), the surgeon was asked, “During the past 3 mo, have you used [medication]?” with the response categories of: 1) rarely or never, 2) one to several times a month, 3) one to several times a week, and 4) daily. For ease of interpretation and small cell sizes, the response categories were dichotomized to 1) never or rarely and 2) one to several times a mo/wk/daily.

Work experience

Information about the surgeon’s length of time in performing surgery, average total working hours per week (clinical and surgical performance), and the number of surgical procedures performed during the past year using open surgery, conventional laparoscopy, and robotic-assisted laparoscopic surgery was collected. For each surgical modality, the number of performed surgical procedures was collapsed into tertiles. The number of surgeons who had not performed the relevant modality was also assessed.

Work demands

Work demands experienced by the surgeon were assessed by validated questions about their physical work demands, work ability, and work performance. Physical work demands were
measured using the question: “How physically demanding do you perceive your current work?” and rated on a 10-point numerical rating scale, ranging from “1” (not demanding) to “10” (maximal demanding). Work ability was measured using one item from the work ability index questionnaire: “Imagine that your work ability is worth 10 points when it is the best. How many points would you give your current work ability?” The rating went from “0” (unable to work) to “10” (best work ability). Work performance was assessed by the item: “How do you perceive your overall productivity during the past 4 wk?” This item was rated on an 11-point numerical rating scale with “0” representing “the worst anyone could do” and “10” representing “the very best that top workers in a job like mine could do.” Because of a right-skewed distribution, the median: Very best10 versus everything else (0-9).

Physical capacity and levels of physical activity

The surgeon was asked to compare his or her level of cardiorespiratory fitness, muscle strength, and balance with people of the same age and gender using a 1 to 10 numerical rating scale. The value of “5” on the scale indicated that the surgeon felt their level of physical capacity was equal to their peer age and gender group. A score below or above five, implied a lower or a higher physical capacity, respectively, than their peers. Physical capacity was dichotomized into same or below average1-5 and above average6-10. As well, the surgeon was asked to rate their level of light, moderate, and vigorous physical activity during leisure time. It was measured using the question “How much time have you spent, on average, on the following activities the past year? Also include transportation to and from work and other activities”. Possible answers were within three activity categories of light intensity, moderate intensity, and vigorous intensity: less than 2 h per wk, 2-4 h per wk, more than 4 h per wk, or no such activity. The latter and less than 2 h per week were collapsed in the analysis.

Sociodemographics

The sociodemographic information collected was gender, age, height, weight, and dominant hand. Body mass index (BMI) was calculated using the self-reported measures of height and weight and was dichotomized into normal weight (BMI ≤ 25 kg/m²) and overweight (> 25 kg/m²).

Survey administration

The Danish Medical Association e-mailed an invitation to participate in the study and a link to the survey to 822 surgeons in February 2015. A reminder was e-mailed after 3 wk requesting those who did not reply to complete the survey. Data collection ended the 10th of March 2015. The survey could be completed at any time, and questions that were not completed were treated as missing data. SurveyXact was used as the platform for survey construction and on-line administration.

After receiving the completed survey, we excluded: 1) surgeons who had not performed surgeries within the past 12 mo, 2) surgeons who worked less than 25 h per wk, and 3) surgeons who had not completed the questions about musculoskeletal pain. These exclusion criteria were chosen to ensure inclusion of surgeons with a current high surgical volume.

Statistical analysis

Data were analyzed using Stata 15.1. Descriptive statistics were used to report prevalence and intensity of musculoskeletal pain for each body site for the whole group. Univariate analyses were applied to compare surgeons’ characteristics in strata of painful body sites (0-1 painful body sites versus two or more painful body sites). A backward stepwise logistic regression model was conducted to assess the characteristics associated with two or more painful body sites. We set a P-value to remove of 0.10. Variance inflation factors were calculated to examine the multicollinearity of the final model. The overall fit of the model was tested by calculating the hat and hat squared and the Hosmer Lemeshow test. Finally, the standardized residuals were plotted against the predicted values and visually examined to see if they were similar to each other. A P-value ≤ 0.05 was regarded as statistically significant.

Results

In total, 373 surgeons (60% males, 40% females) completed the survey, corresponding to a response rate of 46%. Subsequently, 89 surgeons were excluded from the analysis because they either did not respond to the questions regarding musculoskeletal pain, reported they had not performed any surgeries the past year, and/or worked less than 25 h per wk. Thus, a total of 284 were included in the final analysis. Surgeons who did not meet the inclusion criteria did not differ with regard to sex distribution, age, or BMI compared with surgeons who were included in the analysis.

The surgeons were on average 57 y old, 38% were females, and the majority (90%) were right-handed (Table 1). For type of specialty, 43% of the surgeons worked within gynecological surgery, 46% within colorectal surgery, whereas 12% was specialized within urological surgery (Table 2). Almost 70% of the surgeons were engaged in physical activity of light intensity for two or more hours per week. More than 60% of the surgeons reported their current health to be very well/excellent, and the majority of the surgeons rated their physical capacity higher than their peers (Table 3). More than one fifth of the surgeons reported using painkillers several times a week, and 40% of the surgeons reported sleeping problems sometimes or often.

Multisite musculoskeletal pain was reported by 218 surgeons (77%). Thirty-seven surgeons (13%) reported musculoskeletal pain in one body site, and 10% of the surgeons reported no pain. The neck (63%) and lower back (60%) were the most prevalent painful body sites (Fig. 1). A fourth of the surgeons who experienced pain in the neck and lower back reported feeling pain for more than 30 d within the past 3 mo. Pain when performing surgery was reported in 56%, 65%, and
28% of the surgeons performing open surgery, conventional laparoscopy, and robotic-assisted laparoscopic surgery, respectively. Lower back was reported to be the most prevalent painful body site (34%) in open surgery, the shoulders were the most prevalent painful body site (30%) in conventional laparoscopy, and in robotic-assisted laparoscopic surgery the neck was reported to be the most prevalent painful body site (23%). Conventional laparoscopy was reported by

Table 2 – Work characteristics of all surgeons and for groups stratified by number of painful body sites.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>All (n = 284)</th>
<th>0-1 painful body sites</th>
<th>≥2 painful body sites</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>% or mean (95% CI)</td>
<td>n</td>
</tr>
<tr>
<td>Weekly work hours &gt;45 h (%)</td>
<td>98</td>
<td>34.5 (29.2-40.3)</td>
<td>26</td>
</tr>
<tr>
<td>Type of specialty (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gynecology</td>
<td>121</td>
<td>42.6 (36.4-48.5)</td>
<td>21</td>
</tr>
<tr>
<td>Gastrointestinal surgery</td>
<td>130</td>
<td>45.8 (40.0-51.6)</td>
<td>38</td>
</tr>
<tr>
<td>Urological surgery</td>
<td>33</td>
<td>11.6 (8.4-15.9)</td>
<td>7</td>
</tr>
<tr>
<td>Years practicing MIS (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-5 y</td>
<td>51</td>
<td>18.0 (13.9-22.9)</td>
<td>8</td>
</tr>
<tr>
<td>6-10 y</td>
<td>63</td>
<td>22.2 (17.7-27.4)</td>
<td>17</td>
</tr>
<tr>
<td>11-15 y</td>
<td>66</td>
<td>23.2 (18.7-28.5)</td>
<td>13</td>
</tr>
<tr>
<td>16-20 y</td>
<td>48</td>
<td>16.9 (13.0-21.7)</td>
<td>12</td>
</tr>
<tr>
<td>&gt;20 y</td>
<td>56</td>
<td>19.7 (15.5-24.8)</td>
<td>16</td>
</tr>
<tr>
<td>Surgeries yearly—open surgery (median)</td>
<td>275</td>
<td>60 (25-120)</td>
<td>65</td>
</tr>
<tr>
<td>Surgeries yearly—LAP (median)</td>
<td>216</td>
<td>58 (25-120)</td>
<td>50</td>
</tr>
<tr>
<td>Surgeries yearly—RALS (median)</td>
<td>50</td>
<td>47 (24-70)</td>
<td>12</td>
</tr>
<tr>
<td>Surgeries yearly—total (median)</td>
<td>284</td>
<td>140 (72-212)</td>
<td>66</td>
</tr>
<tr>
<td>Surgeries yearly—open surgery (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 surgeries</td>
<td>9</td>
<td>3.2 (1.7-6.0)</td>
<td>1</td>
</tr>
<tr>
<td>1-40 surgeries</td>
<td>96</td>
<td>33.8 (28.5-39.5)</td>
<td>17</td>
</tr>
<tr>
<td>41-100 surgeries</td>
<td>99</td>
<td>34.9 (29.5-40.6)</td>
<td>27</td>
</tr>
<tr>
<td>100-2500 surgeries</td>
<td>80</td>
<td>28.2 (23.2-33.7)</td>
<td>21</td>
</tr>
<tr>
<td>Surgeries yearly—LAP (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 surgeries</td>
<td>68</td>
<td>23.9 (19.3-29.3)</td>
<td>16</td>
</tr>
<tr>
<td>1-36 surgeries</td>
<td>85</td>
<td>29.9 (24.9-35.5)</td>
<td>19</td>
</tr>
<tr>
<td>37-100 surgeries</td>
<td>68</td>
<td>23.9 (19.3-29.3)</td>
<td>15</td>
</tr>
<tr>
<td>101-720 surgeries</td>
<td>63</td>
<td>22.1 (17.7-27.4)</td>
<td>16</td>
</tr>
<tr>
<td>Surgeries yearly—RALS (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 surgeries</td>
<td>234</td>
<td>82.4 (77.5-86.4)</td>
<td>54</td>
</tr>
<tr>
<td>1-25 surgeries</td>
<td>20</td>
<td>7.0 (4.6-10.7)</td>
<td>5</td>
</tr>
<tr>
<td>30-50 surgeries</td>
<td>14</td>
<td>4.9 (2.9-8.2)</td>
<td>3</td>
</tr>
<tr>
<td>60-200 surgeries</td>
<td>16</td>
<td>5.6 (3.5-9.0)</td>
<td>4</td>
</tr>
</tbody>
</table>

LAP = conventional laparoscopy; MIS = minimally invasive surgery; RALS = robotic-assisted laparoscopic surgery.

*The 95% confidence interval around the proportion.

†The 25th and the 75th percentiles.
40% of the surgeons to be the surgical modality most painful to perform, followed by open surgery (33%). Almost all surgeons (91%) reported that pain did not influence the choice of surgical modality. More than half of the surgeons (55%) reported having taken action to reduce their pain. Initiatives related to ergonomics (57%), for example, changing table height, placement of screens etc. physical exercise training (30%), for example, strength training or running, performing micro-breaks during surgery (6%), or others (7%), for example, reduced number of performed operations or taking analgesic before surgery.

Almost half (47%) of the surgeons experiencing multisite musculoskeletal pain reported four or more painful body sites. When collapsing right and left side for hands, elbows, and shoulders, a total of 42 multisite pain combinations were evident. The six most common pain combinations are shown in Fig. 2. The most prevalent combination of pain was pain in the neck, shoulders, upper back, and lower back (Fig. 2A). In surgeons reporting two or more painful body sites, pain influenced negatively on work, leisure time activities, and sleep by 21%, 40%, and 27%, respectively. For surgeons reporting one painful body site, these percentages were 8%, 11%, and 3%, respectively.

In the final logistic regression model, reporting two or more painful body sites was significantly associated with being female, physical work demands, work ability, and feeling a
sense of heaviness in the head/headache (Table 4). Female surgeons were 3.4 (95% CI: 1.5-7.4) times as likely to report two or more painful body sites compared to male surgeons. A one-unit increase on the scale of physical work demands was associated with odds of 1.5 (95% CI: 1.2-1.7) of reporting two or more painful body sites. Surgeons who reported 0-9 in work ability were 3.4 (95% CI: 1.6-7.0) times more likely to report two or more painful body sites compared to those surgeons who reported 10 (very best) in work ability. Surgeons who reported that they sometimes or often felt a sense of heaviness in the head/headache during the past month were 4.8 (95% CI: 2.0-11.5) times more likely to report two or more painful body sites compared to those surgeons who never or rarely reported feeling a sense of heaviness in the head/headache.

**Discussion**

The major findings of this cross-sectional study were the high proportion of Danish surgeons (77%) who reported multisite musculoskeletal pain and a high pain intensity. Further, 21%-40% of the surgeons who experienced pain in more than one body site reported that pain influenced their work, leisure time activities, and sleep negatively. Our study also identified several characteristics (gender, physical work demands, work ability, and sense of heaviness in the head/headache) that were significantly associated with reporting multisite musculoskeletal pain.

The neck and the lower back were identified as the most prevalent painful body sites, both individually and in combination with other body sites. This is consistent with previous findings among surgeons. Prolonged repetitive movements, limited workspace, uncomfortable and exhausting postures, and high patient BMI have been identified as the most prominent factors related to bodily discomfort. This is supported by our result showing that a one-unit increase in physical work demands, on a scale from one to ten, was associated with a 50% increased risk of reporting pain in multiple body sites. The fact that 77% of the surgeons reported two or more painful body sites is alarming. Multisite musculoskeletal pain has been shown to reduce work ability and may potentially shorten the career as an active surgeon and increase the risk for long-term sickness absence. Recently, a study revealed that 23% of surgeons with musculoskeletal pain had taken time off work due to pain and that 44% had undergone physiotherapy, osteopathy, or chiropractic treatment. Another study found that 38% of the respondents used medication and/or therapy to reduce their musculoskeletal pain and that 27% required work leave due to musculoskeletal pain. In our study, 40% of the surgeons reported using painkillers several times a month and 22% reported a weekly/daily use. Although it is unknown to which extent the analgesic use was related to surgically induced pain, the high proportion of surgeons using weekly to daily painkillers and undergoing pain-relieving therapy is alarming from a societal perspective.

The operating room is a complex work environment with intensive psychological and physiological challenges combined with a constant awareness of patient safety. Further, most surgeons are unaware of ergonomic principles in surgery and do not pay attention to their own health during surgery. In a study by Park et al., 40% of the surgeons reported that they disregard their physical complaints, and another study showed that 36% of the surgeons reported to work through pain, as they consider pain to be part of the job. In addition, several studies have reported that performing surgery caused or worsened the surgeons’ musculoskeletal pain and that it even affected their surgical
The pain intensities reported by the surgeons in this study were high, even compared with other professions known to have a high prevalence of musculoskeletal pain. For most body sites, surgeons reported a pain intensity of three or more which has been used as a clinically relevant cutoff defining a pain case in an occupationally active population. The lack of surgeons’ ergonomic awareness in the operating room is likely to contribute to the observed high rate of bodily pain. Greater ergonomic awareness is essential for being able to alleviate musculoskeletal pain in surgeons.

Gender has previously been recognized as an important factor for developing musculoskeletal pain with a more than two-fold increased risk for female surgeons compared with male surgeons. This increased risk could be due to a gender difference in perception of complaints or coping strategies in dealing with occupational stressors. Alternatively, female surgeons could have a higher relative exposure because of their ergonomic disadvantage in the operating room as they are generally shorter, have less upper body strength, and have to adjust to surgical instruments usually designed for the larger male hand. With a likely increase in female surgeons in the future, these differences should be investigated more quantitatively. Robotic-assisted laparoscopic surgery may offer ergonomic advantages, but we were

**Table 4** — Final regression model of surgeons’ characteristics associated with multisite pain.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>OR</th>
<th>95% CI</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>3.4</td>
<td>1.5 - 7.4</td>
<td>0.002</td>
</tr>
<tr>
<td>Physical work demands</td>
<td>1.5</td>
<td>1.2 - 1.7</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Work ability (score 0-9)</td>
<td>3.4</td>
<td>1.6 - 7.0</td>
<td>0.001</td>
</tr>
<tr>
<td>Heaviness/headache (sometimes or often)</td>
<td>4.8</td>
<td>2.0 - 11.5</td>
<td>0.001</td>
</tr>
<tr>
<td>Painkillers (several times a mo/wk/daily)</td>
<td>2.6</td>
<td>1.2 - 5.9</td>
<td>0.063</td>
</tr>
<tr>
<td>Cardiorespiratory fitness (same/below)</td>
<td>0.5</td>
<td>0.3 - 1.1</td>
<td>0.087</td>
</tr>
</tbody>
</table>

OR = odds ratio; 95% CI = 95% confidence interval around the odds ratio.

*P* ≤ 0.05.
unable to explore this hypothesis in the present study, given too few surgeons who used this surgical modality.

Studies have described a high level of ergonomic and mental stress among surgeons performing minimally invasive surgery compared to open procedures. The surgeons in the present study reported open surgery as the most common procedure, but this is likely to change due to the rapid increase in minimally invasive surgery. Those surgeons who performed both techniques reported the laparoscopic approach to be the most painful procedure. Thus, the high prevalence and intensity of pain may become even higher with the increased use of minimally invasive surgery. A recent study using surface electromyography found robotic-assisted laparoscopic surgery to be less demanding compared with conventional laparoscopy. As the number of surgeons performing all three surgical procedures is too low in the present study, we were not able to evaluate the impact of robotic-assisted laparoscopic surgery on musculoskeletal pain.

Initiatives to alleviate surgeons’ discomfort have been suggested, such as change of posture and microbreaks during surgery, reduction of time in the operating room, and a reduction in the overall caseload. However, the latter two solutions may result in reduced productivity which could be critical with the increased demand for surgical services. An initiative that has been successful in other professions is the implementation of physical exercise training. Our results showed that the surgeons rated themselves above their peers in relation to their physical capacity. Likewise, the surgeons reported engaging in mainly light and moderate intensity physical activity. Surprisingly, no significant association was evident between level of physical capacity or intensity physical activity. Strengthening the most exposed muscles during surgery may reduce the relative activity that were being performed. Even as little as 2 min of daily exercises for the neck and shoulders demonstrated reduced pain and increased muscle strength. Factors shown to be important for the implementation of such initiatives are that they are initiated by the management and have a participatory approach. Thus, the authors advocate that similar approaches are investigated among surgeons.

This study presents several strengths. We have used validated questionnaires in combination with designated questions on work ability and productivity, which are areas of significant importance for the medical profession. In addition, we present data on both the prevalence and the intensity of pain which enables us to compare with other professions. The low response rate is the main limitation. This may have induced a selection bias with surgeons experiencing musculoskeletal pain being more likely to respond. However, the response rate was higher than average for this profession, and if we recalculate the pain prevalence by imputing no pain for all of the surgeons who did not respond, the prevalence of pain (33%) would still be high. This is higher than European workers, who report a 24.7% prevalence of backache and a 23% prevalence of neck and shoulder pain. In the present study, the mean age is comparatively high, 57 y. Unfortunately, we do not have any information about the age of nonresponders. Correspondingly, we do not know if and why our survey was more appealing to surgeons of higher age. The higher age of the participating surgeons in the present study may be due to specifically Danish societal factors such as high age at education start, long maternity leave for both females and males, etc. These factors that hinder a direct comparison to other nationalities. Another Danish study including gynecological surgeons reported a mean age of 52 y, whereas international studies reported a mean age of 44-47 y. However, in our sample, we did not find any association between age and pain. We cannot preclude this is due to our sample size and the variation within our sample, and the literature shows conflicting results in this regard. This may present an important question for future research.

In conclusion, our findings of a high prevalence of multisite musculoskeletal pain and a high pain intensity add new knowledge to the emerging literature on musculoskeletal pain in surgeons. We identified several characteristics that were associated with multiple pain sites and, in particular, work ability may be of concern with regard to surgeons’ future surgical career. It seems pertinent to develop preventive and rehabilitating strategies.

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Authors’ contributions: T.D., K.S., P.T.J., and O.M. designed the study concept. T.D. and E.B. did the statistical analyses. All authors have made substantial contributions to the interpretation of data. All authors were involved in drafting the article, revising it critically for important intellectual content, and have given final approval of the version to be published.

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Disclosure

The authors reported no proprietary or commercial interest in any product mentioned or concept discussed in this article.

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*Note: The above text is a sample of the extracted content, and it may not represent the full context or accuracy of the original document.*


