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Evaluation of musculoskeletal symptoms among physicians performing ultrasound

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Abstract

Aim of the study: Owing to its wide availability, relatively low cost and lack of negative effect on the patient, ultrasound has become the most commonly and readily used imaging modality. However, scanning for increasingly long periods of time on a given day and in a given week tends to negatively affect sonographers' health, primarily resulting with the overuse of the musculoskeletal system, as multiple muscles and joints are engaged during scanning. This research has been aimed at evaluating the prevalence and type of musculoskeletal symptoms among diagnostic medical sonographers, as well as identifying their professional profile. **Material and method:** The study covered 553 sonographers who responded to an online survey comprising 27 questions, including branching questions allowing to provide more detailed information depending on the answers given, as well as open questions. The survey was geared towards identifying the type and frequency of the experienced symptoms, and determining additional contributing factors. **Results:** 83% of the respondents have experienced work-related musculoskeletal disorders (WRMSD). The study presents the detailed characteristics of the symptoms experienced by sonographers in their work, and their professional profile. **Conclusions:** A majority of physicians performing ultrasound experience musculoskeletal pain. Deeper analysis of the underlying causes and potential correlations with given contributing factors (variables) that could be effectively addressed may facilitate introduction of some preventive measures and occupational hygiene rules in the field of ultrasound diagnostics, as well as help to implement interventions aimed at relieving the experienced symptoms and improving the health of the examining specialists.

Introduction

Sonography has become one of the most readily and commonly used imaging modalities. As it is so widely used by both radiologists and physicians of other specialties, it has come to be known as the “visual stethoscope of the 21st century”⁽¹⁾. Depending on the health system in a given country, ultrasound (US) is performed by physicians or ultrasound technicians, whereby the results need to be later interpreted by the treating physician. In Poland, ultrasound is performed by physicians, in a variety of clinical settings ranging from the comfort of their practices, to portable bedside stations in hospital departments, to operating rooms and ambulances. Over the years, ultrasound devices and trans-

ducers have decreased in size and weight while at the same time increasing in the comfort of use. Nonetheless, they continue to require performing given manual movements in order to obtain satisfying images of given organs or tissues. Long-term work in this capacity leads to functional overuse of the musculoskeletal system, resulting in pain and discomfort. The adverse contributing factors include i.a. recurring asymmetrical overuse of given muscle groups, unnatural posture, abnormal position of the spine. The overuse results in work-related musculoskeletal disorders (WRMSD), a health issue that seems to be much more prevalent among diagnostic medical sonographers than in other professional groups. The prevalence of WRMSD in the total population of workers in the European Union was in 2010 estimated

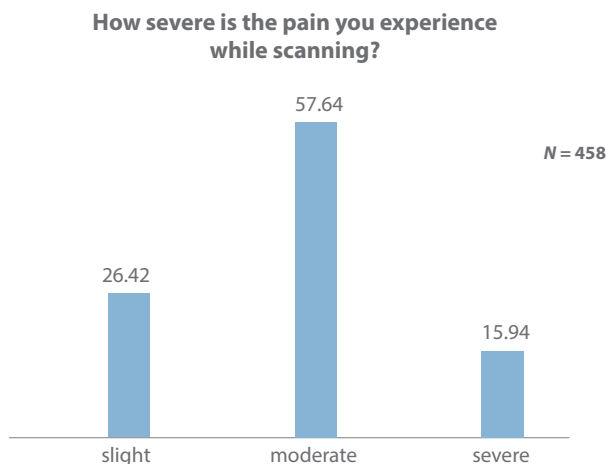


Fig. 1. Severity of reported pain

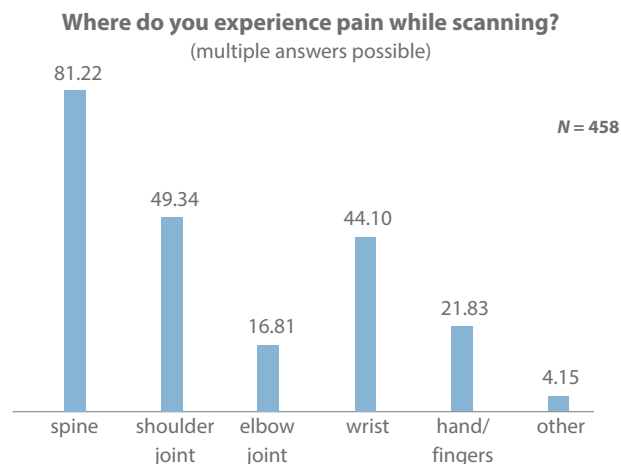


Fig. 2. Location of reported pain

at approximately 60%⁽²⁾, with the available data indicating the prevalence rate among sonographers to be significantly higher. One of the largest studies on this issue, carried out in Canada and the United States on a sample of 2963 respondents, demonstrated the WRMSD prevalence to be as high as 90%⁽³⁾. The relevant data for Polish physicians performing ultrasound diagnostics are scarce. Reports from 2005 concerning specialists performing echocardiography showed 70% of the sonographers to scan in back pain, 32% – wrist pain, and 20% – shoulder pain⁽⁴⁾.

The number of ultrasound scans performed in Poland has been steadily rising. In 1997, the estimates by the Polish Ultrasound Society indicated approximately 5 million examinations annually, whereas by 2009 the number had gone up to 13.5 million, amounting to over 15 million per year in 2015⁽⁵⁾. The popularity of sonography and its current advancements urge a current analysis of the situation of physicians performing ultrasound in Poland.

This study has been aimed at evaluating the prevalence and type of musculoskeletal symptoms among diagnostic

medical sonographers. We have also attempted to pinpoint the professional profile of Polish physicians performing ultrasound.

Material and method

The studied group comprised 553 physicians of various specialties performing ultrasound in Poland. The frame of participants used for the survey included email addresses shared courtesy of the Polish Ultrasound Society and the Roztocze School of Ultrasound, as well as personal contacts of the authors of this study. The research was executed over a period of 8 months, from October 2015 to May 2016. The anonymous online survey (ankieta.interaktywnie.com) comprised 27 questions, including branching questions (conditional branching) to facilitate more detailed information depending on the answers given, as well as open questions. The survey was aimed at pinpointing the type and the prevalence of symptoms, and identifying additional contributing factors. The questionnaire also included questions pertaining to the respondents' profes-

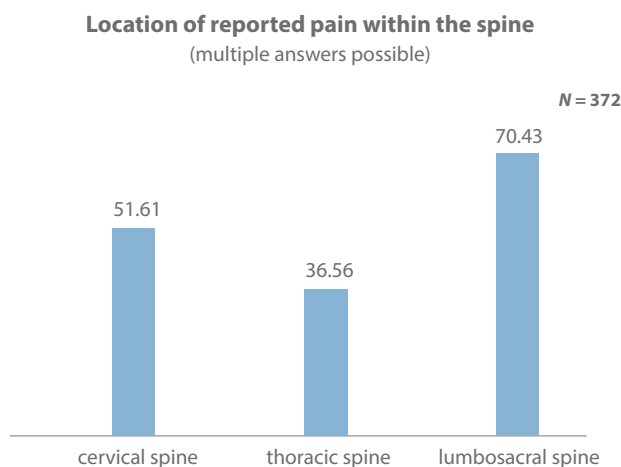


Fig. 3. Location of reported pain within the spine

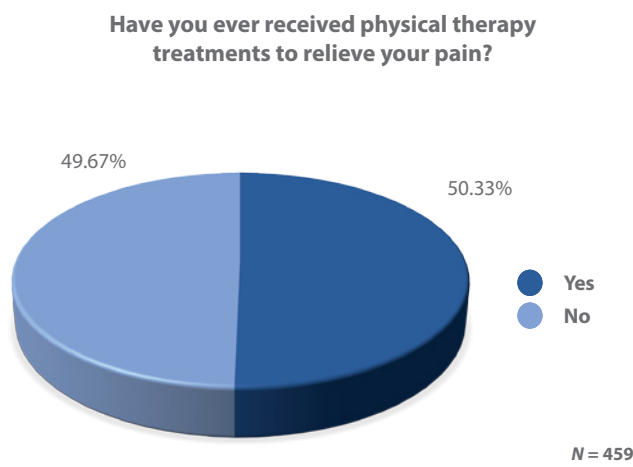


Fig. 4. Use of physical therapy treatments

Have you had to receive medication to relieve your pain?

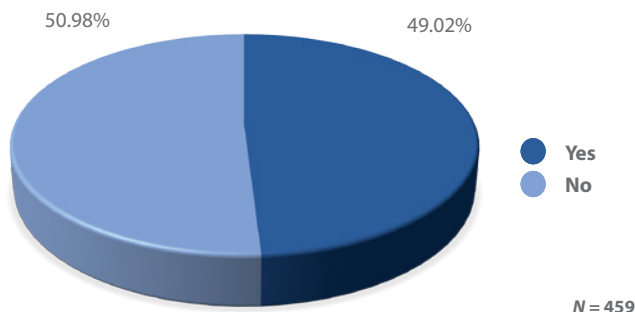


Fig. 5. Use of medication

Have you had to take time off work or limit the time working because of the pain experienced while scanning?

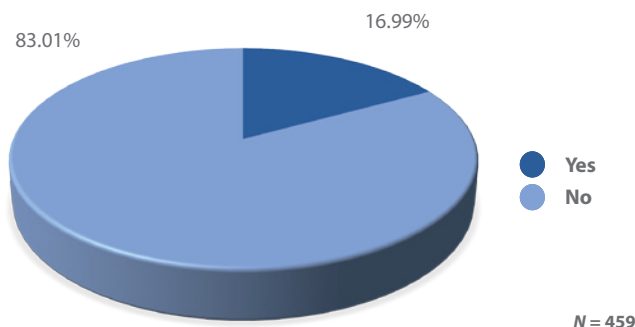


Fig. 6. Time off work

sional profile. The results have been presented in the form of aggregated statistical data.

Results

83% of the participants responded affirmatively to the survey’s primary question, namely “Have you ever experienced musculoskeletal pain while scanning?”. The diagram in Figure 1 shows their subjective perception of symptom severity. The most common sites for pain included the spine (81%), shoulder (49%) and wrist (44%) (Fig. 2). Within the spine, the most vulnerable location appeared to be the lumbosacral region (Fig. 3). To deal with the symptoms, half (50%) of the participants of the study used physical therapy treatments (Fig. 4), and 49% received medication (Fig. 5). Nearly 17% of the respondents occasionally had to take time off work (Fig. 6) because of the experienced pain. Time away from work typically lasted over a week (Fig. 7).

The participants also answered questions related to prevention of the symptoms. Only 13% of the physicians covered

by the study had received any education on how to prevent WRMSD (Fig. 8). As little as 7% applied the information received in their day-to-day work (Fig. 9). Over 68% of the specialists declared they never took breaks while working (Fig. 10).

The collected data enabled us also to create the professional profile of the “typical Polish physician performing ultrasound”, based on the most frequent responses provided to questions concerning personal and professional characteristics (Fig. 11 and 12).

Discussion

Overuse of the musculoskeletal system and the resulting health issues are a serious problem among diagnostic medical sonographers. Depending on the source, the prevalence of such symptoms in physicians performing ultrasound ranges from 81% to 90%, which is very high^(3,6). The cited studies covered large respondent samples, e.g. the study by Evans et al. included 2963 participants.

How long were you away from work because of pain experienced while scanning?

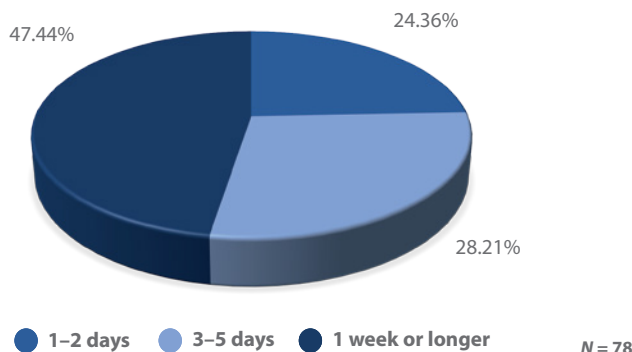


Fig. 7. Length of time taken off work

Have you been provided education on individual ergonomic adjustments of equipment in the workplace?

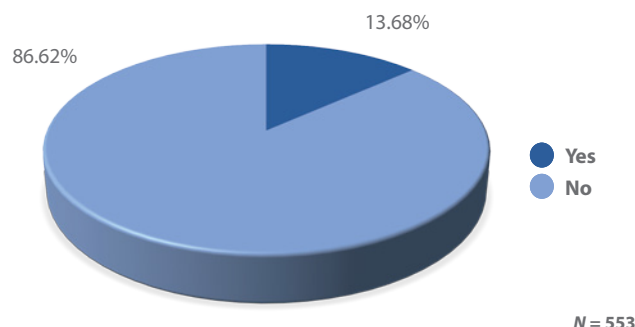


Fig. 8. Received education

Have you sought any sources of information on how to prevent musculoskeletal injuries and overuse in your work?

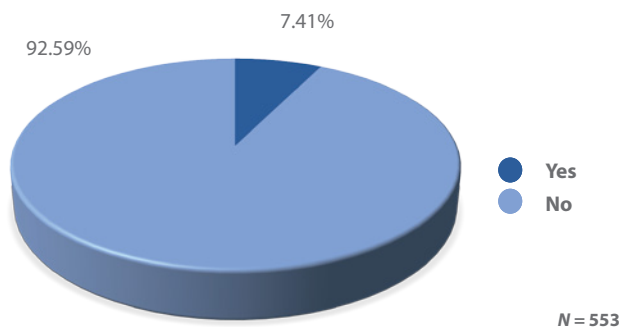


Fig. 9. Use of information related to preventing musculoskeletal pain

Do you take breaks while working?

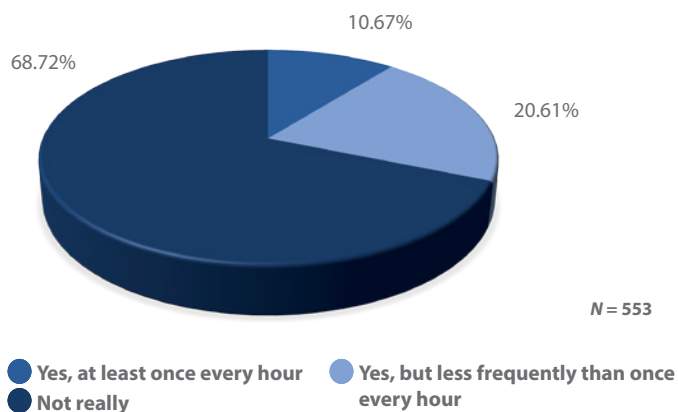


Fig. 10. Breaks taken during work

In Poland, no extensive research aimed at evaluating the actual scale of the problem has so far been executed. As far as we are aware, ours is the first study investigating the prevalence of musculoskeletal symptoms among Polish physicians performing ultrasound. Our results have demonstrated that, consistently with the previously existing foreign reports, a vast majority of the respondents (458 out of 553, i.e. 83%) experienced work-related musculoskeletal pain. Back (spinal) pain was identified as the most common problem. Approximately 50% of the participants relied on medication and physical therapy treatments to relieve their symptoms. Nearly 17% of the practitioners were occasionally forced by their symptoms to take time off work, for periods that tended to be longer than one week.

The study has shown musculoskeletal overuse to be a serious and very common problem among Polish physicians

performing ultrasound. Interestingly, there seems to be a low awareness of the problem, as a large majority of the practitioners did not receive any education on the ergonomics and prophylaxis of musculoskeletal overuse, nor sought to educate themselves in this respect on their own (e.g. by reading up on the subject). Moreover, most of the surveyed sonographers did not take breaks even when scanning for many consecutive hours on a given day, thus clearly aggravating their symptoms. Oftentimes, optimization of the workplace and assuming a correct scanning posture is enough to considerably curb the negative impact (Fig. 13 and 14).

The relative lack of preventive measures and adequate knowledge among physicians who perform ultrasound has lead us to the conclusion that their situation could be improved, if only by providing relevant trainings and increas-

What are the personal characteristics of a typical Polish ultrasound practitioner?

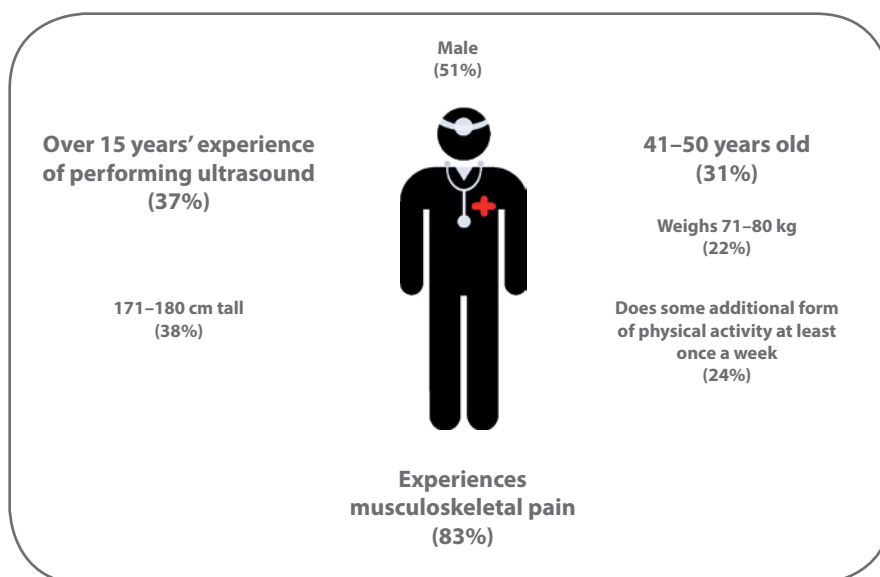


Fig. 11. Personal characteristics of Polish physicians performing ultrasound

What is the professional profile of a typical physician performing ultrasound?

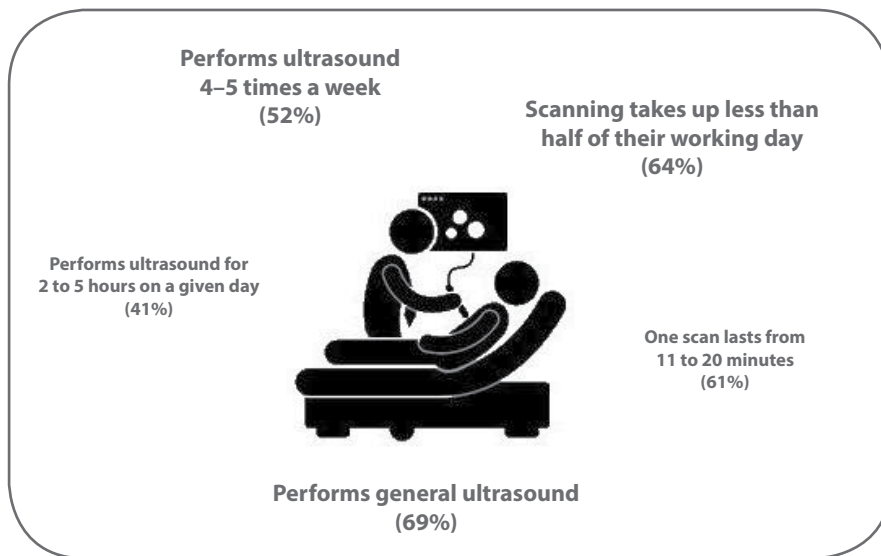


Fig. 12. Professional profile of Polish ultrasound practitioners

ing health awareness in this respect. The results obtained in our study appear to be consistent with the reports found in the literature of the subject, indicating a wide prevalence of WRMSD among physicians performing ultrasound, with some of the reports indicating the prevalence to be as high as 98%⁽⁷⁾. In the Polish group of respondents, spinal pain was the most commonly reported symptom (81%), whereas studies by other authors^(3,6) showed the shoulder joint to be the most prevalent problematic loca-

tion (whilst specifying the back as the second most prevalent site). Our survey was executed online for its clear merits (it is simple, quick and easy to distribute, thus readily accessible for wide samples of participants), but this solution is not without certain disadvantages. For instance, this mode of distribution precludes the possibility of asking additional questions, limits the interviewers' control over external circumstances, and makes it difficult to determine the answers' reliability. The studied group comprised



Fig. 13. Incorrect scanning posture. Red arrows – the sonographer's distance from the patient is too far, dotted line – unnatural spine curvature



Fig. 14. Correct scanning posture. Dotted line – natural spine position promoting natural spine curvature

practitioners of various medical specialties, some of them performing other activities with a possible impact on the musculoskeletal system (e.g. surgical procedures). It is difficult to evaluate the potential effect of other factors on the disorders present. Also, it is difficult to compare the Polish results with foreign reports, due to the different professional profile of diagnostic medical sonographers in various countries. For instance, American sonographers tend to be radiological technicians specializing in a given type of ultrasound exams (e.g. cardiac ultrasound), rather than physicians. In Poland, ultrasound is performed by physicians and surgeons, who are not a uniform group, as they come from different professional backgrounds and specialties. Many possible factors contributing to the occurrence and aggravation of musculoskeletal disorders definitely require more thorough analysis to gain a deeper understanding of the problem. Constructing physical/mechanical exposure indices based on the amount of time spent scanning, the number and type of performed scans, and analysis of their impact on the musculoskeletal symptoms would be helpful. This study is the first step towards this goal, as it has highlighted the scale of the problem among Polish sonographers.

Conclusions

The research we have executed has demonstrated musculoskeletal symptoms to affect a vast majority of physi-

cians performing ultrasound. The most common sites for overuse, discomfort and pain include the spine and the shoulder joint, with the symptoms typically handled with medication and physical therapy treatments, yet sometimes also requiring time taken off work. The results of the study highlight the need for increasing the level of occupational hygiene awareness, knowledge of the ergonomics of ultrasound examinations, and prophylaxis of musculoskeletal system overuse. Due to the wide prevalence of work-related musculoskeletal disorders and their consequences, a deeper understanding of their underlying causes should be gained. Further analysis is required to identify the contributing factors that may be effectively addressed, followed by implementation of adequate protective measures.

Conflict of interests

The authors do not declare any financial or personal links to other persons or organizations that could adversely affect the content of this publication or claim rights thereto.

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