

Playing through the Pain: Work-Related Musculoskeletal Disorders and Surgical Ergonomics in Orthopaedic Surgery

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INTRODUCTION:

The Centers for Disease Control defines work-related musculoskeletal disorders (WMSDs) as disorders manifesting in the nerves, muscles, tendons, joints, spinal discs, and cartilage caused / exacerbated by the work environment or nature of the work. Previous meta-analyses have characterized WMSDs among interventionists, general surgeons, and other surgical subspecialties, but orthopaedic surgeons experience unique ergonomic challenges in the operating room. The purpose of our systematic review was: 1) to estimate the career prevalence of WMSDs in orthopaedic surgeons, 2) to estimate the treatment rates associated with WMSDs in orthopaedic surgeons, 3) to estimate the disability burden of WMSDs in orthopaedic surgeons, and 4) to evaluate the scope of orthopaedic surgical ergonomic assessment and interventions.

METHODS:

A systematic review of the English-language literature from PubMed, MEDLINE, Embase, and Scopus was performed in December 2022 reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Studies that assessed WMSDs or surgical ergonomics in orthopaedic surgery were included. Studies were excluded if study populations included non-orthopaedic surgeons. The literature search yielded 5,603 abstracts, and 24 survey-based studies with 4,876 orthopaedic surgeons (mean age, 47.9 years; 81.5% male) were included for meta-analysis of WMSDs, and 19 articles were included for descriptive synthesis of ergonomic assessment (Figure 1). Outcomes were pooled by random-effects meta-analytic models.

RESULTS:

The career prevalence of WMSDs in orthopaedic surgeons was 73.5% (95% confidence interval (CI): 65.7%-81.4%) (Figure 2). By anatomical location, WMSDs were most commonly experienced in the head/neck (36.4%, 95%CI: 25.9%-46.8%), back (35.7%, 95%CI: 28.0%-43.5%), and forearm/wrist/hand (29.6%, 95%CI: 25.0%-34.3%) (Figure 3). Fifteen studies investigated the disability burden or treatment of WMSDs. Of orthopaedic surgeons reporting WMSDs, 22.8% (95% CI: 17.3%-28.3%) required a leave of absence, practice restriction or modification, or early retirement, and 53.5% (95%CI: 42.6%-64.3%) received some form of treatment (Figure 4, 5). Heterogeneity was considerable for all crude analyses (mean I2 = 91.3%). Eighteen articles included for descriptive synthesis of orthopaedic surgical ergonomics demonstrated significant biomechanical, cardiovascular, neuromuscular, and metabolic stress during procedures, which parallels physiologic stressors in athletes. Interventions to improve orthopaedic surgical ergonomics are limited, but include robotic-assistance, proper visualization aids, appropriate use of power tools, and safely minimizing lead apron use.

DISCUSSION AND CONCLUSION:

Most orthopaedic surgeons experience WMSDs, many of which go untreated and result in significant disability. The orthopaedic surgical ergonomics literature is limited. Future strategies to improve orthopaedic surgical ergonomics deserve the same rigor as athletes. This can include prospectively utilizing wearable devices for physiologic monitoring, motion capture with biomechanical modeling, workplace culture improvements, institutional wellness programs, and evidenced-based ergonomics training.

Fig. 1. PRISMA Diagram.

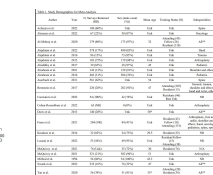
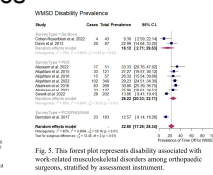
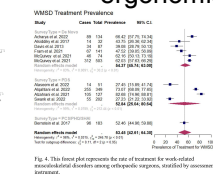
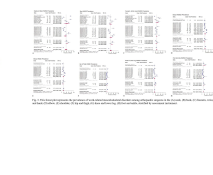
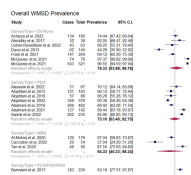
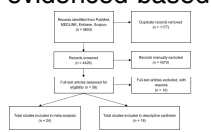


Fig. 2. This forest plot represents the overall career prevalence of work-related musculoskeletal disorders among orthopaedic surgeons stratified by assessment instrument.

Fig. 4. This forest plot represents the rate of treatment for work-related musculoskeletal disorders among orthopaedic surgeons, stratified by assessment instrument.

Fig. 5. This forest plot represents disability associated with work-related musculoskeletal disorders among orthopaedic surgeons, stratified by anatomical location.