Ergonomic Risk and Musculoskeletal Injury Among Otolaryngology Trainees: A Systematic Review

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Background & Objective

Work-related musculoskeletal symptoms are common among practicing otolaryngologists[1] and have also been documented during residency.[2,3] Trainees perform procedures involving prolonged static posture, cervical flexion, and constrained operating-room positioning, often before developing consistent ergonomic habits. We systematically examined musculoskeletal symptoms, ergonomic risk, and assessment methods among otolaryngology residents and fellows.

Methods

Following PRISMA guidance, we searched PubMed, Embase, Scopus, Web of Science, and Cochrane on July 25, 2025. Studies were eligible if they evaluated ergonomic risk, posture, or musculoskeletal symptoms in otolaryngology residents or fellows. Mixed trainee–attending cohorts were included; attending-only studies were excluded. Two reviewers independently screened records, and risk of bias was assessed using design-specific Joanna Briggs Institute checklists. Random-effects meta-analyses pooled trainee-specific symptom prevalence separately for each body region.

Study Selection

Of 1,243 records identified, 35 articles met inclusion criteria: 31 primary studies and four reviews. The primary studies represented 2,595 participants, including 651 identifiable otolaryngology trainees (see Fig 1). Twelve studies did not report enough subgroup detail to determine their exact number of trainees.

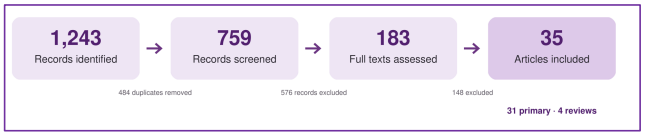


Figure 1. Study selection.
Abbreviated summary of the PRISMA screening process. Only eligible trainee-specific data from primary studies were used in meta-analysis.

Results

MUSCULOSKELETAL SYMPTOMS: Neck symptoms had the highest pooled prevalence at 73% (95% CI, 62%–82%; five studies). Lower back symptoms affected 55% (45%–64%; four studies) and shoulder symptoms 53% (38%–68%; three studies). Estimates for all nine regions appear in the heat map shown in Fig 2. Heterogeneity was substantial for neck, lower back, and shoulder symptoms (I^2 = 74%, 64%, and 79%, respectively).

HOW ERGONOMIC RISK WAS MEASURED: Assessment varied across the 31 primary studies. Subjective-only methods were most common (16 studies), while seven used objective measures alone, and eight used both (Fig 3). Investigator-developed questionnaires predominated (16 studies), and sensors (10) were the most common objective modality. None of the studies using Rapid Upper Limb Assessment (RULA) or Rapid Entire Body Assessment (REBA) reported outcomes for trainees entirely independently from attending participants.

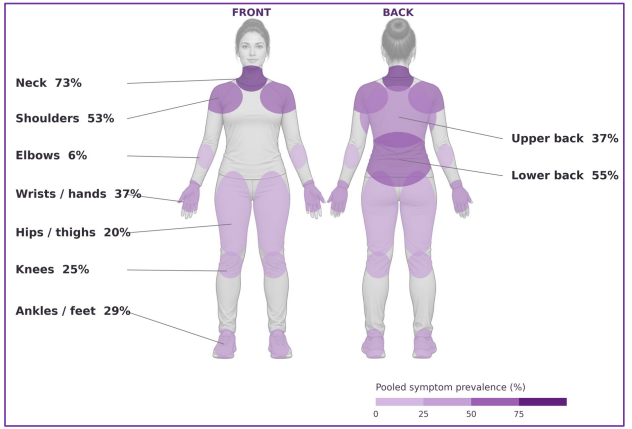


Figure 2. Pooled prevalence of musculoskeletal symptoms by body region among otolaryngology trainees.
Color intensity represents the pooled prevalence from separate random-effects meta-analyses of nine anatomical regions. Each regional estimate includes data from 2–5 studies. Participants could report symptoms in multiple regions; percentages are therefore not mutually exclusive and should not be summed. The illustrative human figures were generated with OpenAI's image-generation tool; the prevalence overlays, labels, and legend were created from the authors' meta-analysis results.



Figure 3. Assessment approaches and methods in the 31 primary studies. Each study appears once in the upper panel. In the lower panel, some studies used multiple methods/instruments.

Discussion

Several small studies suggest that ergonomic risk can be modified: just-in-time teaching improved back posture during temporal bone drilling,[4] seated positioning lowered RULA scores during adenotonsillectomy,[5] and anti-fatigue mats reduced postoperative discomfort during prolonged head and neck procedures.[6] Across the 31 primary studies, 23 were rated low risk of bias and eight moderate risk; none were rated high risk.

Limitations & Conclusion

Symptom definitions ranged from temporary operative discomfort to persistent pain. Many studies combined trainees and attendings without reporting separate trainee results, and relatively few supplied comparable data for pooling. The burden of neck, lower back, and shoulder symptoms is already evident during training, but current evidence cannot establish which interventions prevent long-term injury. Standardized, trainee-specific measurement and prospective intervention studies are needed.

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Disclaimer: The views expressed in this presentation are those of the authors and do not reflect official policy of the Department of Defense or the U.S. Government.

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