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Preventing Work-related Musculoskeletal Injuries

Rookaya Mather, MD, FRCSC

Introduction

"... the primary focus in healthcare has been on immediate patient care rather than the long-term well-being of healthcare workers. This has often led to ergonomic considerations being overlooked." [1]

Work-related musculoskeletal disorders (WMSD) are very common among ophthalmologists. The literature suggests that anywhere from 35 to 93% of ophthalmologists experience WMSDs. These disorders and injuries predominantly affect the neck, lower back and shoulders.[2] As discussed in past issues of *Canadian Eye Care Today*, WMSDs are associated with suboptimal ergonomics related to the slit lamp and operating microscope, both of which promote the adoption of a forward head posture (FHP).

Implications and Prevention

The most prevalent WMSD affecting ophthalmologists is cervical spine disease. Over time, the repetitive loading of the spine leads to chronic and permanent degenerative changes in the C-spine.[3,4] According to the literature, WMSDs can lead to career-ending and career-interrupting injuries, reduced work productivity, surgical practice restriction, and early retirement.[5,6] Those with smaller anthropometrics, female ophthalmologists, and any ophthalmologists with a high degree of patient care and surgical volumes are at increased risk for WMSD.[5,7] Additional research is needed to develop a systems-based approach to modify WMSD risk factors in ophthalmology.

WMSD prevention requires an understanding of the contributing factors. The iceberg model is an effective representation of work-related injury in the context of "hidden" factors that lead to injury (**Figure 1**). On the surface, we see the consequences of WMSDs: time away from work, cancelled clinics and surgeries, disruption to on-call and teaching duties, and work modifications related to WMSD symptoms. What we don't see is the

contribution of underlying factors, professional culture, limitations of the healthcare system, and the equipment we use on a daily basis. Individual factors that predispose to injury include a lack of awareness of WMSDs. Cultural norms in medicine contribute to our reluctance to discuss pain and injury. As a result, ophthalmologists have not advocated for themselves or educated their peers and trainees about this threat to career longevity. Our healthcare institutions and systems have not been resourced to support physician wellbeing. The equipment and devices we use are not conducive to comfort and neutral working postures. The industry has lacked the input of ophthalmologists regarding ergonomic design engineering.

WMSD Prevention Strategies

Whether the goal is to prevent WMSDs or to facilitate a healthy and sustainable return-to-work following injury, the strategies are similar (**Figure 2**). The individual's personal efforts must be supported by the workplace and institution leadership. Ergonomic assessments and guidance from a professional ergonomist are central to injury prevention and successful return-to-work. Adoption of ergonomic accommodations and best practices enable clinicians to be productive, work with less pain and reduce injury risk. Normalizing discussion related to wellbeing and injury prevention encourages advocacy, education and collaboration with healthcare systems and industry partners to promote the health of the entire ophthalmology workforce. When developing primary or secondary WMSD prevention strategies, supportive measures that foster healthy workplaces must be part of the strategy.

Ergonomics, Injury Prevention and Return to Work after Injury: My Personal Prescription

"Ergonomics is the process of designing or arranging workplaces, products and systems so that they suit the professionals who use them. This is in sharp contrast to the typical hospital design that assumes that one size fits all." [8]

Having had some time to reflect on my own injury and return to work experience, I have conceptualized a three-step prescription for WMSD prevention.

STEP 1: Acknowledge the ergonomic challenges

STEP 2: Consult experts

STEP 3: Adopt ergonomic best practices and advocate for ergonomic improvements

STEP 1:

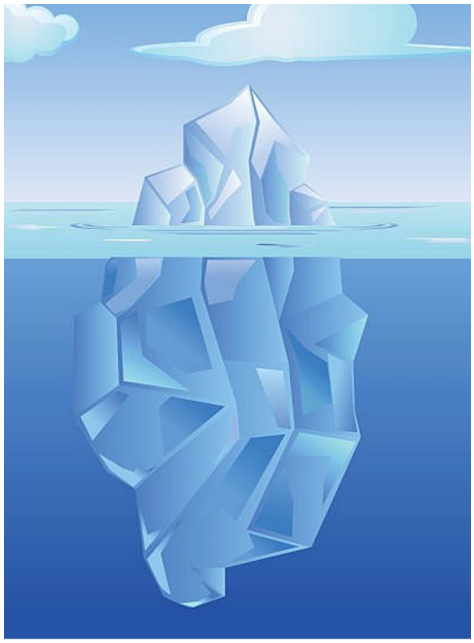
First, we need to stop accepting pain and acknowledge the ergonomic challenges inherent in ophthalmology practice. Awkward postures and discomfort associated with work tasks tend to be ignored because we are hyper-focused on efficiency. From the literature, we know this type of work ethic is not sustainable as up to 93% of us will experience WMSD. Once we acknowledge WMSD risk, we can benefit from the experts who have the knowledge and skills to help us avert injury and perform at our best.

STEP 2:

A professional ergonomist will identify high-risk postures and movements that may lead to injury. The ergonomist will recommend strategies to correct maladaptive postures and work practices. In my case, the ergonomist identified that I was adopting an extreme FHP while performing slit lamp examinations. She explained how FHP limits range of motion, leading to muscle tension and compromised strength, motor function, grip and dexterity.

With the guidance of the ergonomist, I learned how best to position myself and the patient for slit lamp examination. The ideal posture is to sit upright, as close as possible to the patient. The ergonomist suggested that I sit upright at the slit lamp first, then ask the patient sit at the edge of their chair and lean forward into the slit lamp. This scenario prevents the ophthalmologist from leaning forward to reach the oculars. The ergonomist also noted that the footrest on the patient chair extended outward and prevented my stool from getting close enough to the patient. Flipping the footrest up allows the ophthalmologist's stool to roll closer to the patient, promoting a more upright working posture.

Ergonomists provide individualized strategies to prevent injury, including postural modifications, workflow improvements and better placement of equipment in the workspace. Recommendations regarding adjustable desks and chairs, workstations, and padded elbow and wrists rests



Injury
Disability, unplanned absence(s), cancelled ORs, cancelled clinics, changes in practice profile, diminished capacity to take on extra patient volume

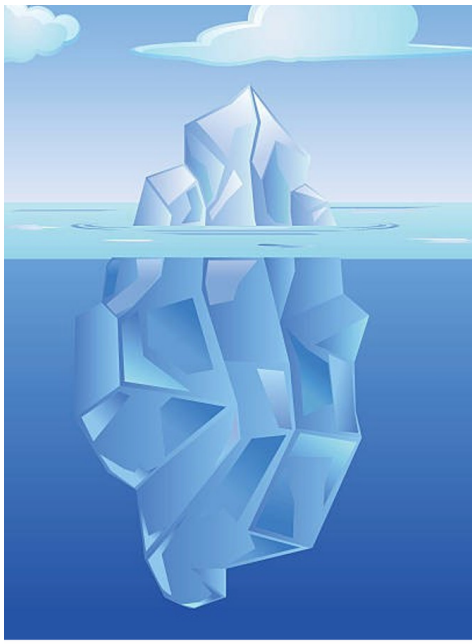
Individual Factors: lack of awareness about injury risk & prevention anthropometrics, genetic predisposition, practice profile, prior MSK injury

Medical Culture: "pain is just a part of the job", hidden curriculum discourages open discussion, lack of formal education on ergonomics & injury prevention

Healthcare System: lack of investment in ergonomic optimization, human resource shortages, wait list pressures, healthcare systems do not prioritize physician wellness

Medical Equipment And Devices: not ergonomically optimized

Figure 1. Factors leading to work-related injury; *courtesy of Rookaya Mather, MD, FRCSC.*



Return to Work & Injury Prevention

Individual Efforts: treatment, rehabilitation, graduated return to work & long-term efforts to optimize endurance & **avoid re-injury**

Culture Shift: psychological safety to discuss ergonomic challenges, workplaces that encourage gradual return to work & facilitate ergonomic accommodations & support injury prevention

Healthcare Systems: investment in ergonomic optimization & human resource planning, ergonomic accommodations for injured physicians, regular ergonomic assessments & equipment upgrades

Equipment Industry: user-centric equipment designed with input from ophthalmologists

Figure 2. Return to work and injury prevention; *courtesy of Rookaya Mather, MD, FRCSC.*

are often indicated to reduce muscle strain, fatigue and nerve compression while working.

Most hospital occupational health departments employ professional ergonomists or occupational therapists who perform ergonomic assessments of physicians and trainees at no cost. Privately hired ergonomists can be engaged by physicians to conduct such assessments in the clinic, office and the OR. The value of an ergonomic assessment is that you are assessed while you are working and interfacing with patients and equipment. You will learn how to adopt ergonomic best practices as it pertains to your own workflow and anthropometric characteristics. Ergonomist consultations are also valuable to organizations wishing to improve safety and work efficiency. The adoption of ergonomic best practices and ergonomically optimized equipment in ophthalmology can improve productivity, safety and quality of care.

Equipment specialists are experts in equipment options, accessories and modifications. These experts can determine how existing equipment can support better working postures as determined by the ergonomist. In my case, the ergonomist identified extreme FHP during slit lamp examinations. She suggested longer oculars to avoid leaning forward and craning my head to look through the eyepieces. Unfortunately, longer oculars are not available. My slit lamp representative suggested two options that would help reduce FHP: a beam splitter (**Figure 3**); or a 20-degree inclined eyepiece adaptor (**Figure 4**). Both options add approximately 5 cm to the length of the oculars, thereby reducing FHP and improving neck posture. The 20-degree inclined adaptor requires the user to raise their stool height to view through the oculars. Viewing downward through the oculars places the head and neck in a more neutral posture. The beam splitter, on the other hand, reduces FHP without inclining the oculars so one can sit without having to raise the stool height. Both of these are effective options. For the operating microscope, the biomedical equipment specialist at my hospital suggested I use longer and more adjustable oculars for surgery. He sourced and ordered adjustable oculars, which I trialed with the ergonomist present. The ergonomist determined that my posture was significantly better, and I felt more comfortable at the end of my surgery day. Finally, investing the time to adjust equipment before use can seem time-consuming and inefficient; however, the three seconds it takes to become comfortable has reduced the daily strain for me.

Physiotherapists address maladaptive postures and help develop postural awareness through physical conditioning. After injury, the goal of rehabilitation is to restore functional ability and quality of life, while "prehabilitation" involves maintaining optimal functioning and performance to prevent injury and disability. Both involve promoting neutral body posture through strength and flexibility training and stretch therapy to offset work-related musculoskeletal (MSK) strain. Targeted neck and core strengthening can help to relieve posture-related fatigue and strain by stabilizing muscles. Both rehabilitation and prehabilitation can protect career longevity and reduce the risk of (further) MSK injuries. Engaging in a 20-minute supervised resistance training program performed three times a week can reduce pain and improve performance in as little as one month. Other forms of exercise such as pilates, yoga, dance and targeted stretching can counteract maladaptive postures. As well, the literature supports adopting stretch breaks during clinic and the OR to offset muscle fatigue and pain.[9] Physiatrists and family physicians are important experts to consult, particularly when physiotherapy does not alleviate symptoms or when neurological deficits and symptoms require further referrals.

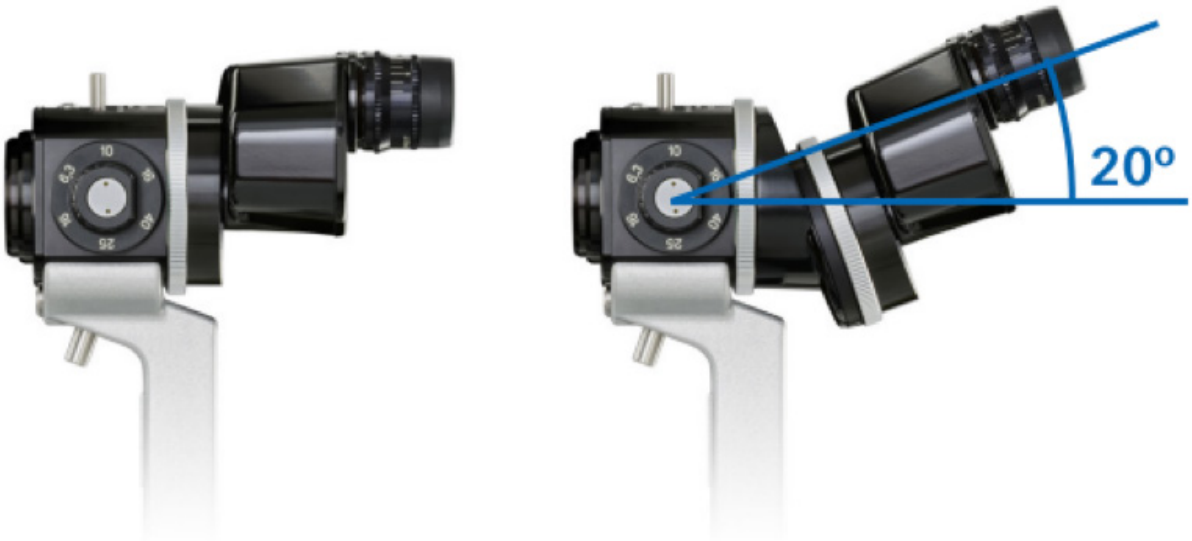
STEP 3:

Adopting ergonomic best practices includes all measures that benefit your wellbeing as you deliver the best possible patient care. Measures that increase comfort, reduce strain and fatigue include:

- Optimizing equipment and workflows
- Optimizing postures and engaging in regular physical conditioning
- Integrating ergonomic "time-out" in the OR and microbreaks to stretch between patient examinations and procedures

The process of ergonomic optimization is iterative and requires multiple trials and assessments. Even simple changes to equipment, postures and workflows may require a substantial learning curve as old habits are difficult to change. **Figure 5** presents an ergonomic guide for ophthalmologists developed by Dr. Rishi Gupta, serving as a visual cue to correct posture, move, stretch and breathe.

Figure 3. A beam splitter effectively "extends" the oculars toward the user; *photo sourced from Haag Streit USA; https://innovamed.com/products/haag-streit-50-50-beam-splitter-bq/*



Adjusting the viewing angle 20° on the slit lamp allows the physician to maintain a more natural neck position.

Figure 4. Split lamp inclined eyepiece adaptor; *photo sourced from https://products.haag-streit-usa.com/wp-content/uploads/2020/05/HS-ErgoWhitePaper.pdf*

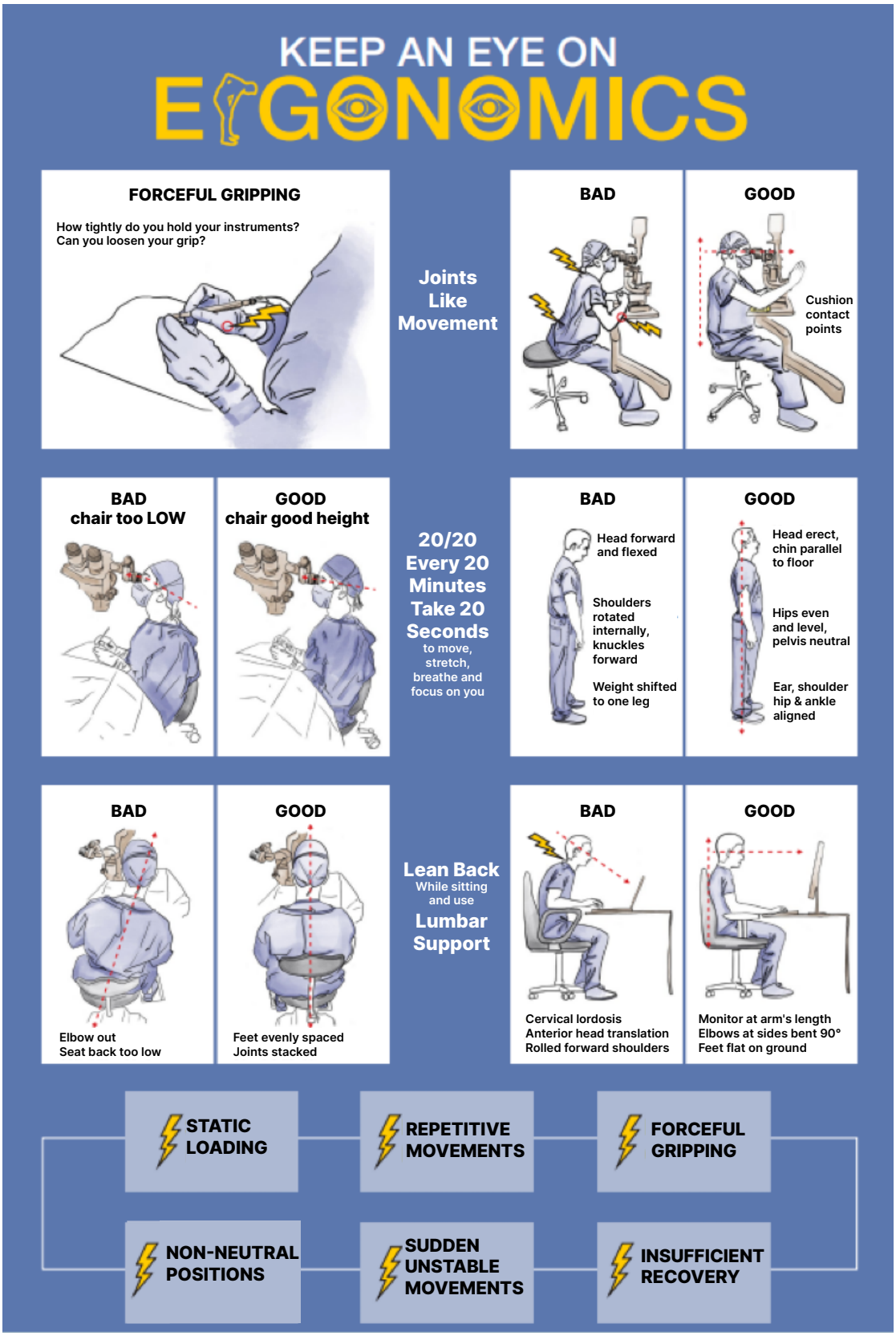


Figure 5. Ergonomic best practice guide for ophthalmologists; *courtesy of R. Rishi Gupta, MD.*

Canadian Ophthalmological Society Ergonomics Working Group

Advocating for ergonomic improvements involves engaging with colleagues, trainees, leaders and professional organizations. Raising awareness about injury risk and ergonomics is the first step in bringing about systems changes. The recently established Canadian Ophthalmological Society (COS) Ergonomics Working Group seeks to educate every Canadian ophthalmologist on ergonomics and injury prevention, as depicted above. The Ergonomics Working Group is currently developing a major initiative to promote ergonomic awareness and injury prevention at the COS conference in 2025.

Conclusion

We all can be ergonomics champions in our practices, clinical departments and professional societies to advocate for institution- and system-level ergonomic improvements to enhance quality and safety for all.

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References:

1. Keebler J, Rosen M, Salas E et al. Human factors and ergonomics in healthcare: industry demands and a path forward. The Journal of Human Factors and Ergonomics Society. 2022;64(1).
2. Kaup S, Shivalli S, Kulkarni U, et al. Ergonomic practices and musculoskeletal disorders among ophthalmologists in India: An online appraisal. Eur J Ophthalmol. 2020;30(1):196-200.
3. Nimbarte AD, Zreiqat M, Chapman M, et al. Physical risk factors for neck pain among oculoplastic surgeons. IIE Annual Conference Proceedings. 2012, 2023-11-22 2012:1-6.
4. Nimbarte A, Sivak-Callcott J, Zreiqat M, et al. Neck postures and cervical spine loading among microsurgeons operating with loupes and headlamp. IIE Transactions on Occupational Ergonomics and Human Factors. 2013 Oct.
5. Dhimitri KC, McGwin G, Jr., McNeal SF, et al. Symptoms of musculoskeletal disorders in ophthalmologists. Am J Ophthalmol. 2005 Jan;139(1):179-81.
6. Anderson CD, Makgotloe A, Koetsie K, et al. Survey of back and neck pain in South African ophthalmologists. African Vision and Eye Health. 2021; 80(1).
7. Hyer JN, Lee RM, Chowdhury HR, et al. National survey of back & neck pain amongst consultant ophthalmologists in the United Kingdom. Int Ophthalmol. 2015Dec;35(6):769-75.
8. Prolonging your Career: Why Ergonomic Design Matters for Eye Care Providers Haag Streit USA, White Paper https://products.haag-streit-usa.com/wp-content/uploads/2020/05/HS-ErgoWhitePaper.pdf
9. Hallbeck MS, Lowndes BR, Bingener J, et al. The impact of intraoperative microbreaks with exercises on surgeons: A multi-center cohort study. Appl Ergon. 2017 Apr:60:334-41.