Ergonomics and musculoskeletal disorders among health care professionals: Prevention is better than cure

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Abstract

Medical profession is demanding and requires long working hours, lengthy procedures, and constant posturing. Musculoskeletal disorders are common among health care professionals (HCP). The commonest musculoskeletal disorders reported include pain in the neck, back, shoulders, elbows, wrists, repetitive strain disorders, nerve injuries and chronic pain disorders. It can result in reduced performance, poor quality of life and significant disability. Ergonomics is the science of adapting the job, equipment, and the humans to each other for optimal safety and productivity. If workplace of a HCP is ergonomically inadequate it will lead to musculoskeletal disorders. The main ergonomic issues include sustained postures, repetitive tasks, forceful hand exertions, use of equipment and precision requirement. In order to prevent ergonomic related injuries, there is a need to increase awareness among HCPs regarding physical fitness, correct posturing, ergonomic adjustments in equipment and environment, and early recognition of problems specific to field.

Keywords: Ergonomics, Health care professionals, Physicians, Surgeons, Musculoskeletal disorders, Posture, Pain.

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Introduction

Work related musculoskeletal disorders (WRMD) are defined as," regional impairments of muscle, tendons, nerves and joints are associated with work-related musculoskeletal trauma".[1] World health organization defines WRMD as "Health problems of the locomotor apparatus, i.e. muscles, tendons, the skeleton, cartilage, ligaments and nerves."[2] Medical profession is a demanding field with long hours, constant posturing, lengthy procedures requiring precision and perfection. These prolonged postures and forceful movements using different muscle groups including back, neck and certain small muscle groups make individuals vulnerable to different musculoskeletal disorders. These disorders are common among healthcare professionals (HCPs) especially those involved in prolonged posturing, repetitive movements, and handling instruments for prolonged periods. Musculoskeletal disorders can range from mild to severe pain and stiffness resulting in long-term disability and morbidity. These musculoskeletal disorders lead to decreased productivity, loss of work hours and poor quality of life among HCPs. WRMD are among the most common causes of absenteeism among HCPs. Musculoskeletal disorders in physicians is a global issue and have been reported among surgeons, dentists, ophthalmologists, sonologists, Eye and ENT surgeons.[3]

There is a relationship between physical demand of work and musculoskeletal disorders. Certain factors have been implicated in the pathophysiology of musculoskeletal disorders, including age, body weight, physical fitness, occupational factors and work-related demands.[5] These work-related musculoskeletal disorders can be prevented by education, postural correction, regular exercises, frequent breaks, ergonomic design of equipment and environment modification.[7]

Ergonomics is a Greek word and combination of ergo (work) and nomos (natural laws or systems) It is defined as, "The science of adapting the job and/or the equipment and the human to each other for optimal safety and productivity".[8] People are of different sizes and shapes and one size does not fit all. If a doctor's workplace is improper it is bound to cause musculoskeletal problems. If the table is too high or too low both can have consequences. Improper doctor and patient chair, abnormal postures for a long period of time especially involving neck, shoulder, back and arms, forceful repetitive exertions and holding small instruments continuously can cause multiple problems of the hand and wrist. If one can adjust the equipment, the environment and the individual working to the optimum levels keeping in view the principles of ergonomics then it will be possible to decrease work-related injuries and increase productivity.

To prevent ergonomic related injuries, we must increase awareness among doctors of ergonomic adjustments, correct posturing, physical limitations, environmental

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adaptations and early recognition of problems. We should consider ergonomic features while purchasing medical equipment. Musculoskeletal disorders represent a significant health-related burden for HCPs and can be easily prevented and corrected if ergonomics principles are understood and adopted. The objective of this review is to highlight the burden of musculoskeletal disorders among HCPs, describe the role of ergonomics and discuss prevention strategies.

Musculoskeletal Disorders Among HCPs

In a study on musculoskeletal disorders among HCPs in Saudi Arabia, the commonest musculoskeletal disorders included pain in the neck (46%), back (34%), shoulders (38%) and wrists (26%).[4] In Pakistan WRMD have been reported among nurses[6], dentists, physiotherapists and doctors. In a study of 971 HCPs from Lahore low back pain was reported by 51% of the respondents. Physicians were the most affected (66.8%). Back pain was significantly associated with age, gender, occupation, and nature of work.[9] Musculoskeletal disorders have a prevalence of up to 80% in dental professionals' and an incidence of 75.1% in sonographers in Pakistan.[9] In South African General Surgeons and Dentists from South Africa have a prevalence rate of 69.7% and incidence of 54.2% has been reported respectively.[10] Surgeons are particularly prone to developing musculoskeletal disorders and Catanzarite et al, reported prevalence of musculoskeletal disorders of 66 to 94 % for open surgeries, 73 to 100% for laparoscopic surgeries and 54 to 87% for vaginal surgeries.[11]

Ergonomics Recommendations for HCPs

Office/Clinic Modifications

Doctors spend a considerable amount of time in offices giving consultations, performing examinations and doing procedures. Some general ergonomic principles recommended for the physician's office and workplace are as follows:

1. The chair should be adjustable and with back rest. Chair height should be adjusted so that the knees and hips are flexed at 90 degrees and at the same level. Back should be supported by back rest and the popliteal area should not be compressed by the chair. Feet should be either on the footrest or in a neutral position on the ground. Ideally a revolving chair should be used to avoid repetitive twisting movements while attending the patient.

2. The height of the table should be adjusted so that the elbows lie comfortably on the table in the neutral position of 90-degree flexion and shoulder are neither drooped nor hyper abducted.

3. Monitor should be at arm length and its upper border should be at eye level or slightly below. The mouse should be within reach and while using the wrist should be in straight or neural position.

4. While using a stool for performing procedures, adjust the height of the stool so that the feet are lying flat and comfortably on the ground and avoid arching on back.

5. Do not lean on the patient sideways. Avoid bending forward and reaching and maintaining the position for prolonged period.

6. For ophthalmologists and ENT doctors, the examination equipment height should be adjusted according to the height of the doctor so that back and neck are in straight neutral position.

Postural Recommendations

There is no one single ideal posture for every HCP. One should avoid prolonged posturing to prevent injury. Certain body postures must be avoided. Prolonged posturing involving neck flexion, lateral flexion and protraction should be avoided. Frequent turning and twisting and bending of the back, excessive flexion at the wrist, elbow and knees should be avoided to prevent injuries. Neutral postures for neck, back, elbow, knee and shoulders should be adopted to reduce the chances of injury. Frequent breaks during long sittings and procedures are recommended to allow the muscles to relax.

Ergonomic Adjustment of Equipment

The equipment used by different HCPs should be adjusted according to the user. It includes adjusting the height of the chair, table, and operating table along with the use of lumbar support if required. Laparoscopic monitor positions should be adjusted so that it is 10 to 30 degrees below eye level.[12] Image should be 15 to 45 degrees below eye level and a Screen height of 160 cm is recommended.[13] For prolonged procedures two screens are recommended to avoid cervical torsion. Optimum distance from the screen should be 70 to 95 cm. Magnification should be used in precision procedures and surgeries to avoid unnecessary strain.

Exercise Interventions

Teaching HCPs exercises for general conditioning as well as specific exercises related to their job is an important intervention in injury prevention. Prevention of musculoskeletal disorders including neck and scapular muscles stretching and strengthening exercises, back strengthening exercises, hamstring stretching, etc. will help in conditioning and improve flexibility, strength and endurance to cope with work-related stresses and prevent injuries.

Ergonomics for Surgeons

1. Operating room size should be at least 37m^2 and 55m^2 for specialized procedures.
2. The Optimal operating table height should be between 70 to 80% of the elbow height of the laparoscopic surgeon. Joint excursions stay in the neutral zone and biceps brachii activity is at 15% of the maximum when holding the laparoscope.[14]
3. The operating table height should be adjusted to the height of the tallest surgeon and foot boards should be used for others.
4. For perineal area surgery the surgeon should be sitting and looking straight with table and stool height adjusted.[15]
5. Keep the feet hip width apart to avoid pelvic asymmetry and stress. Perform partial squats and stretches during prolonged surgery. Avoid prolonged static posturing.
6. Prolonged neck posturing, neck flexion more than 20 degrees, repeated neck twisting and axial rotation of more than 15 degrees should be avoided.
7. Elbows should be flexed at 90 degrees and the forearm in neutral position between supination and pronation.[13] The shoulder should be dropped and arms perpendicular to the floor. Shoulder abduction should be less than 30 degrees.
8. Post-surgery stretches of neck back and hamstrings should be performed.

Conclusion

Musculoskeletal disorders are frequent among HCPs and leads to significant morbidity. HCPs should be educated about the common preventable musculoskeletal disorders related to their specific field. They should focus on correct postures, physical fitness and ergonomic awareness in routine professional activities to avoid musculoskeletal disorders and increase productivity.

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