

ERGONOMICS IN NURSING: IMPACT ON MUSCULOSKELETAL DISORDERS A COMPREHENSIVE REVIEW

Author's Name M. Sankara Selvi¹

Affiliation:

1. Vice Principal, Annasamy Rajammal College of Nursing, Tenkasi, Tamil Nadu, India.

Corresponding Author Name & E-Mail: Sankara Selvi, sankaraselvi2024@gmail.com

ABSTRACT

Musculoskeletal disorders (MSDs) represent a significant occupational health concern among nursing professionals, with prevalence rates ranging from 40% to 95% globally. This review examines the relationship between workplace ergonomics and MSD development in nursing practice, exploring risk factors and intervention strategies. Nurses face unique ergonomic challenges including manual patient handling, prolonged standing, repetitive movements, and awkward postures. The lower back, neck, and shoulders are most commonly affected, often resulting in absenteeism, reduced work capacity, and premature career termination. Evidence demonstrates that comprehensive ergonomic interventions — including mechanical lifting devices, patient handling protocols, training programs, and organizational policy changes — can significantly reduce MSD incidence. However, implementation barriers such as inadequate staffing, time constraints, and insufficient administrative support continue to impede widespread adoption of best practices. This paper synthesizes current research on ergonomic risk factors, evaluates prevention strategies, and proposes recommendations for safer healthcare environments.

Keywords: Ergonomics, Nursing, Musculoskeletal Disorders, Occupational Health, Patient Handling, Workplace Safety

INTRODUCTION

Nursing is widely recognized as one of the most physically demanding healthcare professions, with practitioners facing numerous ergonomic hazards throughout their daily activities. The physical nature of nursing work, combined with organizational and environmental factors, creates conditions conducive to work-related musculoskeletal disorders.¹ These disorders have emerged as the leading cause of occupational injury and disability among nurses worldwide, profoundly affecting health, job satisfaction, and patient care quality.

MSDs encompass a broad range of inflammatory and degenerative conditions affecting muscles, tendons, ligaments, joints, peripheral nerves, and supporting blood vessels.² In the healthcare sector, MSD prevalence rates are significantly higher than most other industries. Studies indicate that 40%–95% of nurses experience work-related MSDs during their careers, with the lower back, neck, and shoulders most commonly affected.³ The consequences extend beyond physical discomfort — causing economic burdens through absenteeism, reduced productivity, and high workers' compensation claims.⁴

Ergonomics, defined as the scientific discipline concerned with understanding interactions among humans and other elements of a system, plays a crucial role in preventing work-related MSDs.⁵ Despite growing awareness and available evidence-based prevention strategies, implementation of comprehensive ergonomic programs remains inconsistent.⁶ This persistent gap underscores the need for continued advocacy, institutional commitment, and systematic action.

RISK FACTORS FOR MUSCULOSKELETAL DISORDERS IN NURSING

Physical and Biomechanical Risk Factors

Manual patient handling represents the most significant hazard in nursing, with tasks such as lifting, transferring, and repositioning patients who may have limited or no mobility.⁷ Patient transfers typically require forces ranging from 50 to 200 pounds, and unpredictable patient movements can substantially increase these loads, creating sudden peaks in spinal compression and shear forces. Bariatric patients present additional challenges, as rising obesity rates create greater physical demands with often inadequate equipment support.

Prolonged standing affects many nurses who spend 80% or more of twelve-hour shifts on their feet, contributing to lower extremity pain, circulatory problems, spinal compression, and overall fatigue.⁸ Awkward postures — bending over low beds, twisting, lateral reaching, or overhead work — force the musculoskeletal system into mechanical disadvantages, increasing tissue stress and accelerating

fatigue. Repetitive movements compound this risk; when performed without adequate rest, cumulative microtrauma accumulates faster than tissue repair can address, leading to chronic inflammatory conditions.

Organizational and Psychosocial Risk Factors

Inadequate staffing levels represent perhaps the most pervasive organizational risk factor, forcing nurses to care for more patients than ergonomically feasible and reducing time for safe patient handling.⁹ The predominance of twelve-hour shifts concentrates physical demands into extended periods, and cumulative fatigue impairs body mechanics and increases injury risk. Rotating shifts and night work further disrupt recovery processes.

Psychosocial factors — including high job stress, low job control, and inadequate supervisor support — have been independently associated with increased MSD prevalence.¹⁰ Inadequate ergonomic training is another critical gap; many nurses report never receiving comprehensive education on safe patient handling or assistive device use during their basic nursing education.¹¹

Environmental Risk Factors

Hospital rooms are frequently designed without adequate consideration of nursing workflow, resulting in insufficient space for safe patient handling. Room layouts that position beds against walls restrict nurse access, forcing awkward reaching angles. Insufficient availability of mechanical lifting equipment forces reliance on manual methods, while poor equipment usability further discourages adoption. Work surface heights that lack adjustability fail to accommodate the anthropometric diversity of nursing staff.

COMMON ANATOMICAL SITES AND CONSEQUENCES OF MSDS

Anatomical Distribution

The lower back is the most frequently affected region, with lumbar pain reported by 50%–80% of nurses at some point in their careers.¹² The neck and shoulders constitute the second most common site, affecting 30%–60% of practitioners,¹³ and result from sustained static postures during documentation and awkward positions during assessment. Upper extremity disorders affecting wrists, hands, and elbows occur due to repetitive fine motor tasks, while lower extremity problems relate primarily to prolonged standing.

Consequences for Nurses and Organizations

Chronic musculoskeletal pain disrupts sleep, increases risk of depression and anxiety, and reduces overall quality of life. Absenteeism is a significant outcome, with affected nurses taking more sick

leave than uninjured colleagues.¹⁴ Even when nurses continue working despite pain, presenteeism reduces productivity and cognitive performance, while many eventually modify their career paths or leave clinical practice entirely.

From an economic perspective, direct costs include workers' compensation claims ranging from \$40,000 to \$60,000 per serious back injury.¹⁵ Total costs per nursing injury can reach \$60,000–\$120,000 when including productivity losses, overtime, and recruitment expenses — far exceeding the upfront costs of prevention programs.

EVIDENCE-BASED ERGONOMIC INTERVENTIONS

Engineering Controls

Mechanical patient lifting devices — including ceiling-mounted lifts, portable floor lifts, sit-to-stand devices, and lateral transfer aids — are the cornerstone of engineering controls. Research demonstrates that comprehensive safe patient handling programs incorporating mechanical lift equipment reduce nursing injury rates by 40%–60%.¹¹ Height-adjustable beds eliminate excessive bending and awkward posturing. Ergonomically designed workstations, adjustable chairs, and proper monitor positioning support neutral postures during documentation. Motorized transport equipment reduces pushing and pulling forces throughout the clinical environment.

Administrative Controls and Training

Safe patient handling policies that mandate mechanical equipment for high-risk tasks provide institutional backing for safe practice. Patient care assignments should consider ergonomic demands alongside patient acuity. Structured work-rest schedules incorporating breaks and task variation prevent cumulative fatigue. Early injury reporting systems enable timely intervention before conditions become chronic.

Comprehensive ergonomic training must include body mechanics principles, mechanical equipment operation, patient assessment, and self-advocacy for refusing unsafe tasks. Hands-on practice, regular refresher training, and peer champions who model safe practices are essential to sustained behavior change. Research consistently shows that education alone — without environmental and organizational changes — has limited effectiveness.

Organizational Culture and Leadership

Successful ergonomic programs require visible, substantive leadership commitment — not merely rhetorical — including budget allocation for equipment and staffing, enforcement of safe policies, and supportive responses to injury reports. Multidisciplinary ergonomic committees with frontline

nurse representation can effectively identify hazards, develop tailored interventions, and monitor outcomes. A culture where nurses can report concerns and refuse unsafe tasks without fear of reprisal is a fundamental prerequisite for sustained success.

IMPLEMENTATION BARRIERS AND FUTURE DIRECTIONS

Despite robust evidence, multiple barriers impede widespread ergonomic implementation. Financial constraints limit investment in equipment and facility modifications, though injury costs invariably exceed prevention costs over time. Resistance to change is common, with staff expressing concerns about equipment speed or safety. Older facility infrastructure may complicate installation of ceiling-mounted lifts, and room space limitations restrict device maneuvering. Lack of standardized regulations reduces organizational accountability, and inadequate equipment maintenance undermines ergonomic investments.

Future research should address long-term effectiveness of ergonomic interventions beyond one-to-two-year follow-up periods, and cost-effectiveness analyses should guide resource allocation decisions. Context-specific solutions for home health, long-term care, and ambulatory settings need development, as most evidence focuses on acute care hospitals. Emerging technologies — including wearable sensors, exoskeletons, and robotic assistance — offer promising future approaches to MSD prevention that warrant investigation.

RECOMMENDATIONS AND CONCLUSION

Recommendations for Healthcare Organizations

Healthcare organizations should implement comprehensive, multilevel ergonomic programs with executive-level oversight. Key elements include: adequate resources for mechanical equipment, facility modifications, and training; safe patient handling policies prohibiting manual lifting except in emergencies; universal equipment accessibility with ceiling-mounted lifts in new construction; ergonomic facility design standards developed with frontline nurse input; adequate nurse-to-patient staffing ratios; early injury surveillance and response systems; and multidisciplinary ergonomic committees with administrative authority. Above all, organizations must cultivate a safety culture that empowers nurses to prioritize safe practice without fear.

CONCLUSION

Musculoskeletal disorders represent a preventable yet persistent occupational health crisis with profound implications for nurse well-being, healthcare quality, and workforce sustainability. Systematic implementation of ergonomic principles — through engineering controls, administrative

policies, education, and cultural change — can substantially reduce MSD incidence and severity. Mechanical lifting equipment, when universally available and consistently utilized, addresses the most significant injury risk factor, but only succeeds within a framework of adequate staffing, supportive policies, and genuine organizational commitment to worker safety.

Sufficient evidence already exists to justify immediate action. Healthcare organizations have both the ethical responsibility and practical means to create work environments that protect nurses' musculoskeletal health. By investing in comprehensive ergonomic programs, institutions reduce injury costs, improve retention and morale, and ultimately enhance the quality of care provided to patients. Nurses who dedicate their careers to caring for others deserve the protection and support that evidence-based ergonomic practice can provide.

REFERENCES

1. Yassi A, Lockhart K. Work-relatedness of low back pain in nursing personnel: a systematic review. *Int J Occup Environ Health*. 2013;19(3):223-244.
2. Punnett L, Wegman DH. Work-related musculoskeletal disorders: the epidemiologic evidence and the debate. *J Electromyogr Kinesiol*. 2004;14(1):13-23.
3. Davis KG, Kotowski SE. Prevalence of musculoskeletal disorders for nurses in hospitals, long-term care facilities, and home health care. *Hum Factors*. 2015;57(5):754-792.
4. Menzel NN, Brooks SM, Bernard TE, Nelson A. The physical workload of nursing personnel: association with musculoskeletal discomfort. *Int J Nurs Stud*. 2004;41(8):859-867.
5. International Ergonomics Association. What is ergonomics? Definition and domains of ergonomics. IEA Council. 2000.
6. Alamgir H, Yu S, Drebit S, et al. Occupational injury among full-time hospital nurses in British Columbia, Canada. *J Occup Health*. 2007;49(6):465-471.
7. Waters TR. When is it safe to manually lift a patient? *Am J Nurs*. 2007;107(8):53-59.
8. Trinkoff AM, Brady B, Nielsen K. Workplace prevention and musculoskeletal injuries in nurses. *J Nurs Adm*. 2003;33(3):153-158.
9. Alexopoulos EC, Burdorf A, Kalokerinou A. A comparative analysis on musculoskeletal disorders between Greek and Dutch nursing personnel. *Int Arch Occup Environ Health*. 2006;79(1):82-88.
10. Josephson M, Lagerstrom M, Hagberg M, Wigaeus Hjelm E. Musculoskeletal symptoms and job strain among nursing personnel: a study over a three year period. *Occup Environ Med*. 1997;54(9):681-685.



11. Nelson A, Matz M, Chen F, et al. Development and evaluation of a multifaceted ergonomics program to prevent injuries associated with patient handling tasks. *Int J Nurs Stud.* 2006;43(6):717-733.
12. Maul I, Läubli T, Klipstein A, Krueger H. Course of low back pain among nurses: a longitudinal study across eight years. *Occup Environ Med.* 2003;60(7):497-503.
13. Smith DR, Mihashi M, Adachi Y, et al. A detailed analysis of musculoskeletal disorder risk factors among Japanese nurses. *J Safety Res.* 2006;37(2):195-200.
14. Josephson M, Vingård E. Workplace factors and care seeking for low-back pain among female nursing personnel. *Scand J Work Environ Health.* 1998;24(6):465-472.
15. Lahiri S, Latif S, Punnett L, ProCare Research Team. An economic analysis of a safe resident handling program in nursing homes. *Am J Ind Med.* 2013;56(4):469-478.