

AORN Guideline for Safe Patient Handling and Movement
Evidence Table

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
1	Lebni JY, Azar FE, Sharma M, et al. Factors affecting occupational hazards among operating room personnel at hospitals affiliated in western Iran: a cross-sectional study. <i>J Public Health</i> . 2021;29(5):1225-1232.	Nonexperimental	435 operating room personnel/Iran	n/a	n/a	occupational hazards	Ergonomic hazards were responsible for the most significant occupational injuries in operating room personnel.	IIIB
2	Landford WN, Ngaage LM, Lee E, et al. Occupational exposures in the operating room: are surgeons well-equipped? <i>PLoS One</i> . 2021;16(7):e0253785.	Nonexperimental	183 attending surgeon and surgical trainees/Maryland	n/a	n/a	exposure of and training for OR-specific hazards	Although surgeon safety is not a domain in residency training, standardized efforts to educate and change the culture of safety in residency programs is warranted. Our study demonstrates a disparity between trainees and attendings with a recommendation to provide formal training to trainees independent of their anticipated risk of exposure.	IIIC
3	Rypicz t, Karniej P, Witczak I, Kolcz A. Evaluation of the occurrence of work-related musculoskeletal pain among anesthesiology, intensive care, and surgical nurses: an observational and descriptive study. <i>Nurs Health Sci</i> . 2020;22(4):1056-1064.	Nonexperimental	136 anesthesia, intensive care, surgery nurses/Poland	n/a	n/a	n/a	Of the study sample participants, 85% reported musculoskeletal pain in more than one location. Nurses experience multiple musculoskeletal pain episodes, most frequently occurring in the back. Preventive measures are critical to improve workplace ergonomics.	IIIB
4	Jeyakumar AK, Segaran F. Prevalence and risk factors of low back pain and disability index among operating room nurses. <i>J Perioper Nurs</i> . 2018;31(3):21-24.	Nonexperimental	250 OR nurses/single site, India	n/a	n/a	Prevalence of lower back pain (LBP) among OR nurses working in a developing country	Of the study sample participants, 84% of OR nurses reported experiencing LBP at least once during the past year.	IIIC
5	Madrid BP, Glanzner CH. The work of the nursing team in the operating room and the health-related damages. <i>Rev Gaucha Enferm</i> . 2021;42(spe): e20200087.	Nonexperimental	160 nursing workers/University hospital, Brazil	n/a	n/a	psychological and social damage using the Work-Related Damage Assessment Scale	The work performed in the operating room by the nursing team can lead to physical, psychological, and social consequences.	IIIC
6	Waters TR. Introduction to ergonomics for healthcare workers. <i>Rehabil Nurs</i> . 2010;35(5):185-191.	Expert Opinion	n/a	n/a	n/a	n/a	An overview of ergonomics including what it is, how it can be used to help design safe work, and why all healthcare workers and administrators should know and understand how excessive work demands can lead to increased risk of work related MSDs.	VB
7	Safe Patient Handling and Mobility: Interprofessional National Standards Across the Care Continuum. 2nd ed. Silver Spring, MD: American Nurses Association; 2021.	Expert Opinion	n/a	n/a	n/a	n/a	Provides interprofessional standards for safe patient handling and mobility across the healthcare continuum.	VA
8	Safe patient handling. Occupational Safety and Health Administration. Accessed October 16, 2023. https://www.osha.gov/healthcare/safe-patient-handling	Expert Opinion	n/a	n/a	n/a	n/a	Provides background on work-related musculoskeletal injuries, ergonomic solutions, and resources.	VA
9	Safe patient handling and mobility (SPHM). The National Institute for Occupational Safety and Health. Reviewed March 9, 2023. Accessed October 16, 2023. https://www.cdc.gov/niosh/topics/safepatient/	Expert Opinion	n/a	n/a	n/a	n/a	Provides expert opinion regarding best practices for safe patient handling and mobility. Manual lifting should be eliminated. Provides information on SPHM legislation.	VA
10	Monaco MGL, Carta A, Tamhid T, Porru S. Anti-X apron wearing and musculoskeletal problems among healthcare workers: a systematic scoping review. <i>Int J Environ Res Public Health</i> . 2020;17(16):5877.	Literature Review	healthcare workers who wear anti-x aprons (ie, lead aprons)	n/a	n/a	musculoskeletal disorders	The use of anti-x aprons, along with awkward postures and non-ergonomic working conditions, could be associated with the onset of musculoskeletal disorders. However, additional research is needed to measure the association.	VB

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11	Nourollahi M, Afshari D, Dianat I. Awkward trunk postures and their relationship with low back pain in hospital nurses. <i>Work</i> . 2018;59(3):317-323.	Nonexperimental	80 hospital nurses/Iran	n/a		duration of exposure to awkward trunk postures	prevalence of lower back pain Lower back pain prevalence among hospital nurses was 72%. Duration of exposure to awkward trunk postures was significantly associated with lower back pain.	IIIB
12	Zahiri HR, Addo A, Park AE. Musculoskeletal disorders in minimally invasive surgery. <i>Adv Surg</i> . 2019;53:209-220.	Literature Review	n/a	n/a	n/a	n/a	A collaboration between surgeons and operating room staff members is necessary to enhance ergonomic design and reduce injury during minimally invasive surgery.	VA
13	Coenen P, Parry S, Willenberg L, et al. Associations of prolonged standing with musculoskeletal symptoms—a systematic review of laboratory studies. <i>Gait Posture</i> . 2017;58:310-318.	Systematic Review	26 studies focusing on prolonged standing and musculoskeletal symptoms	n/a	n/a	n/a	Evidence suggests a detrimental association of prolonged standing with low back and lower extremity symptoms.	IIIB
14	Muthukrishnan R, Maqbool Ahmad J. Ergonomic risk factors and risk exposure level of nursing tasks: association with work-related musculoskeletal disorders in nurses. <i>Eur J Physiotherapy</i> . 2021;23(4):248-253.	Nonexperimental	68 nurses/United Arab Emirates	n/a	n/a	work related musculoskeletal disorders and risk exposure levels	Ergonomic factors are significantly associated with risk of exposure to work related musculoskeletal disorders. Patient handling and repositioning were categorized as medium risk level tasks. This highlights the importance of focusing on these factors to reduce risk to nurses.	IIIB
15	Clari M, Godono A, Garzaro G, et al. Prevalence of musculoskeletal disorders among perioperative nurses: a systematic review and META-analysis. <i>BMC Musculoskelet Disord</i> . 2021;22:226.	Systematic Review w/ Meta-Analysis	22 studies	n/a	n/a	prevalence of work-related musculoskeletal disorders in perioperative nurses	Work-related musculoskeletal disorders represent a high prevalence issue among perioperative nurses. Lower back disorders were most frequently reported. Perioperative nurses, in general, are steadily exposed to both physical and temporal risk factors. Further studies should be addressed to identify specific interventions aimed at reducing the burden of WRMSDs including ergonomic education and physical rehabilitation.	IIIB
16	Virkkunen T, Husu P, Tokola K, Parkkari J, Kankaanpää M. Depressive symptoms are associated with decreased quality of life and work ability in currently working health care workers with recurrent low back pain. <i>J Occup Environ Med</i> . 2022;64(9):782-787.	Nonexperimental	219 health care workers with recurrent low back pain/Finland	n/a	n/a	depression, quality of life, work ability	Depressive symptoms were associated with decreased mental quality of life and decreased work ability in health care workers with recurrent low back pain.	IIIB
17	Zhang Y, ElGhaziri M, Nasuti S, Duffy JF. The comorbidity of musculoskeletal disorders and depression: associations with working conditions among hospital nurses. <i>Workplace Health Saf</i> . 2020;68(7):346-354.	Nonexperimental	397 hospital nurses/single site, Massachusetts	n/a	n/a	musculoskeletal disorders, depressive symptoms, and subjective working conditions	The comorbidity of musculoskeletal disorders and depression among nurses was associated with work-family conflict.	IIIB
18	Employer-reported workplace injuries and illnesses - 2020. Bureau of Labor Statistics, U.S. Department of Labor [news release]. Washington, DC; Bureau of Labor Statistics; November 3, 2021. Accessed October 16, 2023. https://www.bls.gov/news.release/archives/osh_1103202	Expert Opinion	n/a	n/a	n/a	Injury and illness report for 2019 and 2020.	Provides national statistics for injury and illness reporting.	VA
19	Schröder C, Nienhaus A. Intervertebral disc disease of the lumbar spine in health personnel with occupational exposure to patient handling—a systematic literature review and meta-analysis. <i>Int J Environ Res Public Health</i> . 2020;17(13):4832.	Systematic Review w/ Meta-Analysis	5 articles in meta-analysis	n/a	n/a	lumbar disc disease occurrence	Nurses have an increased occurrence of lumbar disc disease compared to office workers. It occurs more often in nurses who have been employed for greater than ten years.	IIIC

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20	Scott KA, Fisher GG, Barón AE, Tompa E, Stallones L, DiGuiseppi C. Same-level fall injuries in US workplaces by age group, gender, and industry. <i>Am J Ind Med.</i> 2018;61(2):111-119.	Nonexperimental	Data from the Bureau of Labor and Statistics Survey of Occupational Injuries and Illnesses in 2015 representing 230,000 private	n/a	n/a	same-level fall injury rates	Same-level fall injury incidence rates are highest among workers aged 65 years and older in the healthcare and social assistance sector.	IIIB
21	Scott KA, Fisher GG, Barón AE, Tompa E, Stallones L, DiGuiseppi C. The associations between falls, fall injuries, and labor market outcomes among U.S. workers 65 years and older. <i>J Occup Environ Med.</i> 2018;60(10):943-953.	Nonexperimental	4,165 workers 65 and older participating in the Health and Retirement Study/United States	n/a	n/a	falls and health-related work limitations	Falls, both noninjurious and injurious, are associated with subsequent health-related work limitation among workers aged 65 years and older.	IIIB
22	del Mar Martí-Ejarque M, Guiu Lázaro G, Juncal RC, Pérez Paredes S, Díez-García C. Occupational diseases and perceived health in operating room nurses: a multicenter cross-sectional observational study. <i>Inquiry.</i> 2021;58:1-8.	Nonexperimental	331 operating room nurses and hospital nurses/multi-center, Spain	n/a	hospitalization nurses	impact of working environment of OR nurses on health	Operating room nurses reported experiencing significantly more dermatitis and musculoskeletal disease compared to ward nurses.	IIIB
23	Shergill AK, Rempel D, Barr A, et al. Biomechanical risk factors associated with distal upper extremity musculoskeletal disorders in endoscopists performing colonoscopy. <i>Gastrointest Endosc.</i> 2021;93(3):704-711.e3.	Quasi-experimental	12 endoscopists/California	use of endoscope support device during endoscopy	n/a	Thumb pinch forces, wrist extensor muscle activity	Thumb pinch forces and time spent in forceful pinch indicate high-risk exposures during colonoscopy. Left wrist extensor muscle activity exceeded established thresholds with the greatest risk occurring during insertion. An endoscope support device reduced loads to the left wrist extensors.	IIB
24	Stucky CCH, Cromwell KD, Voss RK, et al. Surgeon symptoms, strain, and selections: systematic review and meta-analysis of surgical ergonomics. <i>Ann Med Surg (Lond).</i> 2018;27:1-8.	Systematic Review w/ Meta-Analysis	40 studies	n/a	n/a	musculoskeletal symptoms among surgeons	MIS surgeons are significantly more likely to experience musculoskeletal symptoms than those performing open surgery and that most surgeons who experience work-related symptoms are unlikely to seek medical attention. Also, reported that surgeons do not utilize many of the interventions available to improve surgical ergonomics due to lack of education.	IIIA
25	Vaisbuch Y, Aaron KA, Moore JM, et al. Ergonomic hazards in otolaryngology. <i>Laryngoscope.</i> 2019;129(2):370-376.	Nonexperimental	48 otolaryngology surgeons/single institution, California	n/a	n/a	reported musculoskeletal discomfort and ergonomic hazards during surgery	Of the study participants, 72.9% reported significant musculoskeletal discomfort during surgery. Otolaryngology surgeons had a low rate of reported training in ergonomics with high levels of musculoskeletal strain, but with good access to ergonomic equipment.	IIIB
26	Vajapey SP, Li M, Glassman AH. Occupational hazards of orthopaedic surgery and adult reconstruction: a cross-sectional study. <i>J Orthop.</i> 2021;25:23-30.	Nonexperimental	66 orthopedic surgeons/single institution, Ohio	n/a	n/a	reported occupational hazards	Greater than 80% of orthopedic surgeon study participants experienced occupational hazards including musculoskeletal disorders.	IIIB
27	Tolu S, Basaran B. Work-related musculoskeletal disorders in anesthesiologists: a cross-sectional study on prevalence and risk factors. <i>Ann Med Res.</i> 2019;26(7):1406-1414.	Nonexperimental	123 anesthesiologists/Turkey	n/a	n/a	work related musculoskeletal disorders	Anesthesia providers experience work-related musculoskeletal disorders associated with ergonomics in the operating room.	IIIC
28	Apple B, Letvak S. Ergonomic Challenges in the Perioperative Setting. <i>AORN J.</i> 2021;113(4):339-348.	Literature Review	n/a	n/a	n/a	n/a	Perioperative team members should understand the many unique ergonomic risk factors and the potential impact on health and safety. Additional research should focus on ergonomic issues specific to perioperative nurses.	VA
29	Petersen C, ed. AORN Guidance Statement: Safe Patient Handling and Movement in the Perioperative Setting. Denver, CO: AORN; 2007.	Expert Opinion	n/a	n/a	n/a	n/a	Expert panel report and development of ergonomic tools to address the several high-risk ergonomic tasks in the perioperative setting.	VB

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30	Position Statement on Elimination of Manual Patient Handling to Prevent Work-Related Musculoskeletal Disorders. Washington, DC: American Nurses Association (ANA); 2008.	Position Statement	n/a	n/a	n/a	n/a	Position statement articulating the professional nurse's role in patient handling and the importance of prevention of work-related musculoskeletal disorders.	IVB
31	de Castro AB. Handle with Care: the American Nurses Association's campaign to address work-related musculoskeletal disorders. Orthop Nurs. 2006;25(6):356-365.	Literature Review	n/a	n/a	n/a	n/a	Highlights the historical issues related to the problem of work-related musculoskeletal disorders in nurses.	VB
32	Proposed AORN position statements for consideration by House of Delegates: Ergonomically healthy workplace practices. AORN J. 2006;83(1):119-122.	Position Statement	n/a	n/a	n/a	n/a	Original AORN position statement highlighting the historic perspective of work-related musculoskeletal injuries in perioperative nurses. This document served as a basis for the guidance statement and then the guideline for practice.	IVB
33	Position Statement Safe Patient Handling and Mobility in the Orthopaedic Setting. National Association of Orthopaedic Nurses (NAON). 2021. Accessed October 23, 2023. https://www.orthonurse.org/Portals/0/Safe%20Patient%20Handling%20and%20Mobility%20Position%20Statement.pdf	Position Statement	n/a	n/a	n/a	n/a	Position statement on safe patient handling and mobility in the orthopedic setting.	IVB
34	Patient positioning and manual handling. Australian College of Operating Room Nurses (ACORN). Accessed October 24, 2023. https://www.acorn.org.au/content.cfm?page_id=1870431&module=DOCUMENTS&leca=1272&current_category_code=23757	Position Statement	n/a	n/a	n/a	n/a	Position statement to provide direction and promote safety of staff and patient during manual lifting in the perioperative setting.	IVB
35	Position Statement: Safe Patient Handling. Association of Occupational Health Professionals in Healthcare (AOHP) Accessed October 24, 2023. https://aohp.org/aohp/Portals/0/aohp%20position%20statements%202020.pdf	Position Statement	n/a	n/a	n/a	n/a	Provides position statement of standards of practice for occupational health professionals in healthcare.	IVB
36	Waters T, Collins J, Galinsky T, Caruso C. NIOSH research efforts to prevent musculoskeletal disorders in the healthcare industry. Orthop Nurs. 2006;25(6):380-389.	Expert Opinion	n/a	n/a	n/a	n/a	NIOSH has developed a comprehensive program of research aimed at preventing MSDs with work-related exposures due to patient handling; and slips, trips, and falls. Implementation of this research may significantly reduce injuries and illnesses for healthcare workers.	VB
37	Beyond Getting Started: A Resource Guide for Implementing a Safe Patient Handling Program in the Acute Care Setting. 4th ed. Warrendale, PA: AOHP Alliance; 2020.	Expert Opinion	n/a	n/a	n/a	n/a	Provides expert opinion regarding best practices for implementing a safe patient handling and mobility program.	VB
38	Teeple E, Collins JE, Shrestha S, Dennerlein JT, Losina E, Katz JN. Outcomes of safe patient handling and mobilization programs: A meta-analysis. Work. 2017;58(2):173-184.	Systematic Review w/ Meta-Analysis	27 articles from 44 sites	SPHM program	n/a	healthcare worker injury	SPHM programs appear to be highly effective in reducing injuries. More research is needed to identify the most effective interventions for different patient care levels.	IIB

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39	Lee C, Knight SW, Smith SL, Nagle DJ, DeVries L. Safe Patient Handling and Mobility Development and Implementation of a Large-Scale Education Program. Crit Care Nurs Q. 2018;41(3):253-263.	Organizational Experience	Large academic medical center, 3706 nurses and nursing assistants/Michigan	SPHM program	n/a	Patient safety and nursing staff injury related to patient handling/mobility	The development and implementation of the educational program for SPHM was valuable and beneficial to keeping not only the patients safe but also the nursing staff safe during patient movement.	VA
40	Jones DM, Eagerton G. Reducing preventable injuries through the safe patient handling and mobility program bundle. Int J SPHM. 2020;10(4):134-139.	Organizational Experience	1 medical unit; 27 employees/Birmingham Veterans Affairs Healthcare System, Alabama	SPHM program	n/a	SPHM injuries	After the implementation of a bundled SPHM program, the hospital unit realized a decrease in SPHM related injuries.	VB
41	Adamczyk MA. Reducing Intensive Care Unit Staff Musculoskeletal Injuries With Implementation of a Safe Patient Handling and Mobility Program. Crit Care Nurs Q. 2018;41(3):264-271.	Organizational Experience	20-bed medical intensive care unit/Michigan, United States	implementation of SPHM initiative	n/a	work-related injuries	The implementation of an SPHM initiative resulted in a reduction in work-related injured	VB
42	Dennerlein JT, O'Day ET, Mulloy DF, et al. Lifting and exertion injuries decrease after implementation of an integrated hospital-wide safe patient handling and mobilisation programme. Occup Environ Med. 2017;74(5):336-343.	Quasi-experimental	1832 direct patient care workers/survey, MA	SPHM program	no SPHM program	worker injury and work practices	The implementation of a system wide SPHM program that includes a commitment from leadership can decrease worker injury (ie, lifting and exertion injuries) and improve work practices.	IIB
43	Sabbath EL, Yang J, Dennerlein JT, Boden LI, Hashimoto D, Sorensen G. Paradoxical Impact of a Patient-Handling Intervention on Injury Rate Disparity Among Hospital Workers. Am J Public Health. 2019;109(4):618-625.	Quasi-experimental	2,149 nurses and PCAs (intervention), 2,348 nurses and PCAs (comparison)/Boston	multifaceted safe patient handling program including equipment installation, process to ensure working/laundered equipment, education/training	no program	occupational injury stratified by wage and occupational grade	The implementation of a multifaceted safe patient handling program results in an overall decrease in occupational injury. However, there may be disparities between high-wage and low-wage workers, where low-wage workers are negatively impacted. Quality analysis of programs should include evaluation to minimize disparities.	IIB
44	Dykes PC, Curtin-Bowen M, Lipsitz S, et al. Cost of Inpatient Falls and Cost-Benefit Analysis of Implementation of an Evidence-Based Fall Prevention Program. JAMA Health Forum. 2023;4(1):e225125.	Organizational Experience	900,635 patients/ two hospital systems, NY and MA	Falls TIPS Program	n/a	Cost of inpatient falls and falls rate	The economic evaluation found the average cost of an inpatient fall to be \$64,526. The implementation of the Falls TIPS program resulted in a reduction in falls and a cost savings of \$22 million over five years.	VA
45	Lee S, Lee JH, Harrison R. Safe patient handling legislation and musculoskeletal disorders among California healthcare workers: Analysis of workers' compensation data, 2007-2016. Am J Ind Med. 2022;65(7):589-603.	Nonexperimental	199,547 workers' compensation claims/California	safe patient handling legislation	n/a	patient handling injuries	Safe patient handling legislation resulted in a significant reduction in patient handling injury claims among hospital workers in California.	IIIB
46	Schall MC,Jr, Sesek RF, Cavuoto LA. Barriers to the Adoption of Wearable Sensors in the Workplace: A Survey of Occupational Safety and Health Professionals. Hum Factors. 2018;60(3):351-362.	Nonexperimental	952 respondents	n/a	n/a	barriers to the adoption of wearable sensors in the workplace.	The broad adoption of wearable technologies appears to depend largely on the scientific community's ability to successfully address the identified barriers.	IIIC
47	Schall MC, Chen H, Cavuoto L. Wearable inertial sensors for objective kinematic assessments: A brief overview. Journal of Occupational and Environmental Hygiene. 2022;19(9):501-508	Expert Opinion	n/a	n/a	n/a	n/a	Provides a review of wearable inertial sensors for objective kinematic assessment in the workplace.	VB
48	Guideline for sharps safety. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2023:945-968.	Guideline	n/a	n/a	n/a	n/a	Provides clinical recommendations for sharps safety in perioperative practice.	IVA

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49	Guideline for positioning the patient. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2023:701-750.	Guideline	n/a	n/a	n/a	n/a	Provides clinical recommendations for positioning the perioperative patient.	IVA
50	Guideline for prevention of perioperative pressure injury. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2023:751-776.	Guideline	n/a	n/a	n/a	n/a	Provides clinical recommendations for prevention of pressure injuries in the perioperative patient.	IVA
51	Guideline for preoperative patient skin antisepsis. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2023:619-676.	Guideline	n/a	n/a	n/a	n/a	Provides clinical recommendations for preoperative skin antisepsis for the perioperative patient.	IVA
52	Noble NL, Sweeney NL. Barriers to the use of assistive devices in patient handling. <i>Workplace Health Saf.</i> 2018;66(1):41-48.	Nonexperimental	107 nursing staff members/single site, Virginia	n/a	n/a	barriers to using assistive devices for patient transfers	Time constraints, difficult patient handling situations, understaffing, inaccessibility of equipment were identified as barriers to using assistive devices for patient transfers.	IIIB
53	Lee S, Lee JH. Safe patient handling behaviors and lift use among hospital nurses: A cross-sectional study. <i>Int J Nurs Stud.</i> 2017;74:53-60.	Nonexperimental	221 hospital nurses/California	n/a	n/a	organizational safety climate, patient lift use	Organizational safety practices and safety culture are critical to promoting safe work practices for patient handling injury prevention. Ensuring patient lift equipment is available increases use.	IIIB
54	Sparer EH, Boden LI, Sorensen G, et al. The relationship between organizational policies and practices and work limitations among hospital patient care workers. <i>Am J Ind Med.</i> 2018;61(8):691-698.	Nonexperimental	1,277 nurses and patient care associates/two teaching hospitals, Boston	organizational policies and practices	n/a	work limitations	Workplace organizational policies and practices that promote positive and supportive environments, and that include improvements in ergonomics and a focus on a people-oriented culture may reduce work limitations.	IIIB
55	McLinton SS, Afsharian A, Dollard MF, Tuckey MR. The dynamic interplay of physical and psychosocial safety climates in frontline healthcare. <i>Stress Health.</i> 2019;35(5):650-664.	Nonexperimental	436 nurses, medical doctors, allied health, and management/administrative staff/Australia	n/a	physical safety climate and psychosocial safety climate	workplace health and safety	The dynamic interplay of both the physical safety climate and psychosocial safety climate predict workplace health and safety. Both factors are important as indicators of safety.	IIIB
56	Hurtado DA, Heinonen GA, Dumet LM, Greenspan SA. Early career nurses with fewer supportive peers for safe patient handling are likely to quit. <i>Int Nurs Rev.</i> 2018;65(4):596-600.	Nonexperimental	35 RNs and CNAs from ICUs and Medical-Surgical Units/Oregon	n/a	peer support for safe patient handling	likelihood of quitting within the first year of hire	This study suggests an association between lower co-worker support for safe patient handling and higher risk of turnover. Further research should establish whether increasing peer safety support on a hospital unit may reduce nurse turnover during the first year of employment.	IIIB
57	Tei-Tominaga M, Nakanishi M. The Influence of Supportive and Ethical Work Environments on Work-Related Accidents, Injuries, and Serious Psychological Distress among Hospital Nurses. <i>Int J Environ Res Public Health.</i> 2018;15(2):240.	Nonexperimental	822 hospital nurses/Japan	n/a	n/a	work-related injury and serious psychological distress	Nurses working in a supportive and ethical work environment experienced fewer work-related injuries.	IIIB
58	Sabbath EL, Boden LI, Williams JA, Hashimoto D, Hopcia K, Sorensen G. Obscured by administrative data? Racial disparities in occupational injury. <i>Scand J Work Environ Health.</i> 2017;43(2):155-162.	Nonexperimental	1,568 hospital patient care workers (nurses and patient care associates)/two hospitals, Boston	n/a	n/a	self-reported occupational injury compared to administrative data on occupational injury	Organizations should be aware of barriers to self-reporting of occupational injuries, as underreporting could lead to inaccurate administrative data collection. Organizations using inaccurate administrative data may not address racial disparities.	IIIB
59	Guideline for team communication. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2023:1153-1184.	Guideline	n/a	n/a	n/a	n/a	Provides recommendations for team communication in the perioperative environment.	IVA

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60	Matz MW, Celona J, Martin M, McCoskey K, Nelson GG. Patient Handling and Mobility Assessments: A White Paper. 2nd ed. Facilities Guideline Institute. Accessed October 12, 2023. https://www.fgiguilines.org/wp-content/uploads/2022/10/Patient-Handling-and-Mobility-Assessments.pdf	Consensus	n/a	n/a	n/a	n/a	Provides consensus standards for SPHM facility assesment and facility design when planning for a SPHM program.	VA
61	Dykes PC, Burns Z, Adelman J, et al. Evaluation of a patient-centered fall-prevention tool kit to reduce falls and injuries: a nonrandomized controlled trial. JAMA Netw Open. 2020;3(11):e2025889.	Quasi-experimental	37,231 patients/3 academic medical centers, MA & MY	hospital fall prevention program: Fall TIPS Toolkit	n/a	falls and fall-related patient injury	In this nonrandomized controlled trial, implementation of a nurse-led, patient-centered fall-prevention tool kit was associated with reduced rates of falls and injurious falls.	IIA
62	Kanaskie ML, Snyder C. Nurses and nursing assistants decision-making regarding use of safe patient handling and mobility technology: a qualitative study. Appl Nurs Res. 2018;39:141-147.	Qualitative	14 RNs and 11 NAs/single center, PA	n/a	n/a	decision-making regarding the use of SPHM technology	interprofessional collaboration is a critical component within a SPHM program to promote the use of SPHM technology among nurses and nursing assistants.	IIIB
63	Gusenius TM, Decker MM, Weidemann AG. Using shared governance to achieve a culture change in safe patient handling. Int J Orthop Trauma Nurs. 2018;31:35-39.	Organizational Experience	two orthopedic specialty inpatient units/MN	education/training, peer-coaching, policy	n/a	use of ceiling lifts for SPH	The survey results demonstrated an increase use of ceiling lifts for SPH after implemenatation of a shared governance model to improve the culture of safe patient handling.	VA
64	Waters T, Putz-Anderson V, Garg A. Applications Manual for the Revised NIOSH Lifting Equation. September 2021. Centers for Disease Control and Prevention. Accessed October 23, 2023. https://stacks.cdc.gov/view/cdc/110725	Expert Opinion	n/a	n/a	n/a	n/a	Provides information about the application of the revised NIOSH lifting equation.	VA
65	Waters TR, Nelson A, Proctor C. Patient handling tasks with high risk for musculoskeletal disorders in critical care. Crit Care Nurs Clin North Am. 2007;19(2):131-143.	Literature Review	n/a	n/a	n/a	n/a	No nurse is free from the risk of injury when moving patients. The article describes high-risk patient handling tasks, delineates the physical demands associated with each task, identifies physical demands associated with each task, identifies technological solutions, and outlines safety tips for making each task safer.	VB
66	Lunde LK, Koch M, Merkus SL, Knardahl S, Waersted M, Veiersted KB. Associations of objectively measured forward bending at work with low-back pain intensity: a 2-year follow-up of construction and healthcare workers. Occup Environ Med. 2019;76(9):660-667.	Nonexperimental	125 workers (healthcare and construction)/Norway	objective measure using accelerometer for 3-4 consecutive days recording forward bending.	n/a	reported lower back pain intensity	In healthcare workers, exposure to $\geq 30^\circ$ forward bending at work was associated with a change in lower back pain intensity over time. Although the change in lower back pain intensity changed, almost 50% of healthcare participants reported lower back pain over the duration of the study.	IIIB
67	Dockrell S, Hurley G. Moving and handling care of bariatric patients: a survey of clinical nurse managers. J Res Nurs. 2021;26(3):194-204.	Nonexperimental	132 clinical nurse managers in acute care settings/survey, multi-center, Ireland	n/a	n/a	Barriers to moving and handling bariatric patients, accessibility and ownership of bariatric equipment, and protocols and guidelines for care.	Hospitals need policies to enhance the handling care for patients with obesity. Bariatric equipment should be available and accessible when needed. Traning and education should be provided.	IIIB

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REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
68	Lee SJ, Kang KJ, Lee JH. Safe patient handling legislation and changes in programs, practices, perceptions, and experience of musculoskeletal disorders by hospital characteristics: a repeated crosssectional survey study. <i>Int J Nurs Stud.</i> 2021;113:103791.	Nonexperimental	535 nurses (survey)/California	safe patient handling legislation	surveys conducted in 2013 and 2016	safe patient handling policies	The findings indicate overall improvements of safe patient handling programs in California hospitals after the passage of safe patient handling legislation. Positive changes appear to be greater among teaching, non-profit, and rural hospitals. However, greater positive changes in safe patient handling programs shown in certain hospital characteristics were not necessarily linked to more improvements in nurses' safe work practices and experiences of musculoskeletal symptoms or injuries.	IIIB
69	Marshall, Lisa, Villeneuve, Joanne and Grenier, Sylvain. Effectiveness of a multifactorial ergonomic intervention and exercise conditioning kinesiology program for subsequent work related musculoskeletal disorder prevention 2018	Quasi-experimental	163 nursing personnel with work-related musculoskeletal disorders/Canada	multifactorial interventions: ceiling lift installation, no-lift policy, education, and kinesiology program	no kinesiology program	subsequent work related musculoskeletal disorder rates	Referral and adherence to the multifactorial program that includes kinesiology reduced subsequent work related musculoskeletal disorder rates.	IIB
70	OSHA Act of 1970 [General Duty Clause] 1970	Regulatory	n/a	n/a	n/a	n/a	OSHA regulations related to employer duty to provide a place of employment that is free from recognizable hazards.	n/a
71	Safe patient handling equipment. Occupational Safety and Health Administration. Accessed October 23, 2023. https://www.osha.gov/hospitals/patient-handling-equipment	Expert Opinion	n/a	n/a	n/a	n/a	Provides OSHA resources for safe patient handling equipment.	VB
72	Prevention through design program. National Institute for Occupational Safety and Health. Accessed October 23, 2023. https://www.cdc.gov/niosh/programs/ptdesign/default.html#:~:text=The%20Prevention%20through%20Design%20(PtD),effective%20way%20to%20protect%20workers	Expert Opinion	n/a	n/a	n/a	n/a	The Prevention through Design Program seeks to prevent or reduce occupational injuries, illnesses, and fatalities through the inclusion of prevention considerations in all designs that impact workers.	VB
73	Guideline for design and maintenance of the surgical suite. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2023:87-118.	Guideline	n/a	n/a	n/a	n/a	Provides recommendations for design and maintenance of the surgical suite.	IVA
74	Safe Patient Handling and Mobility (SPHM) Technology. Coverage & Space Recommendations. U.S. Department of Veterans Affairs (VA). 2016. Accessed October 23, 2023. https://www.publichealth.va.gov/docs/employeehealth/pt_hdlg_design equip_coverage_space_recs.pdf	Expert Opinion	n/a	n/a	n/a	n/a	Provides direction in determining design, installation, and storage requirements for SPHM technology that is used to handle and mobilize patients and residents in new and existing construction.	VB
75	Galinsky T, Deter L, Krieg E, et al. Safe patient handling and mobility (SPHM) for increasingly bariatric patient populations: factors related to caregivers' self-reported pain and injury. <i>Appl Ergon.</i> 2021;91:103300.	Nonexperimental	134 workers/5 VA Medical Centers	n/a	n/a	injury	The study revealed lower odds of injury when there was sufficient time to use SPHM equipment, lower odds of upper extremity pain with increased availability of bariatric equipment and with higher safety climate ratings. Higher back pain was associated with more frequent bariatric patient handling.	IIIA

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76	Bariatric Safe Patient Handling and Mobility Guidebook: A Resource Guide for Care of Persons of Size. St Louis, MO: VHA Center for Engineering & Occupational Safety and Health (CEOSH); 2015. Accessed October 23, 2023. https://www.asphp.org/wp-content/uploads/2011/05/Baraiatrice-SPHM-guidebook-care-of-Person-of-Size.pdf	Expert Opinion	n/a	n/a	n/a	n/a	Provides expert opinion regarding best practices for safe patient handling and mobility of the bariatric patient.	VB
77	Aljohani WA, Pascua GP. Impacts of manual handling training and lifting devices on risks of back pain among nurses: an integrative literature review. Nurse Media J Nurs. 2019;9(2):210-230.	Literature Review	n/a	n/a	n/a	n/a	Manual handling training and use of lifting equipment can assist in preventing lower back pain in nurses.	VB
78	Healthcare Recipient Sling and Lift Hanger Bar Compatibility Guidelines. The American Association for Safe Patient Handling and Movement (AASPHM). 2016. Accessed October 23, 2023. https://asphp.org/wp-content/uploads/2011/05/AASPHM-Sling-Hanger-Bar-Guidelines-2016.pdf	Expert Opinion	n/a	n/a	n/a	n/a	Provides information and recommendations regarding the compatibility of patient slings and lift hanger bars.	VB
79	Waters TR, Dick R, Lowe B, Werren D, Parsons K. Ergonomic assessment of floor-based and overhead lifts. Am J Safe Patient Handl Mov. 2012;2(4):119-113.	Nonexperimental	Single female operator performing all the simulated patient handling tasks	n/a	n/a	Operating hand forces and resulting biomechanical spinal loading for overhead mounted lifts versus floor based lifts across various floor surfaces and patient weight conditions.	Floor based lifts exceeded recommended exposure limits for pushing and pulling for may of the floor/weight conditions. The overhead mounted lifts did not. Overhead lifts should be used when possible.	IIIB
80	Rice MS, Woolley SM, Waters TR. Comparison of required operating forces between floor-based and overhead-mounted patient lifting devices. Ergonomics. 2009;52(1):112-120.	Quasi-experimental	18 male and female volunteer participants as simulated patients and 1 operator	floor-based full body patient lifting device	overhead-mounted full body patient lifting device	Push, pull, and rotational force required to move a simulated patient	This study found that the forces required during push, pull and particularly rotation movements are significantly less when using an overhead-mounted lift compared to using floor-based lifts.	IIC
81	Lee S, Rempel D. Comparison of lift use, perceptions, and musculoskeletal symptoms between ceiling lifts and floor-based lifts in patient handling. Appl Ergon. 2020;82:102954.	Nonexperimental	389 registered nurses who use mechanical lifting devices/California	n/a	n/a	reported work-related musculoskeletal symptoms	The findings suggest that ceiling lifts are superior to floor-based lifts in multiple aspects, including better acceptance and use by nurses in patient handling, as well as being associated with reduced musculoskeletal symptoms, particularly in the low back and shoulders.	IIIC
82	Pompeii LA, Lipscomb HJ, Schoenfisch AL, Dement JM. Musculoskeletal injuries resulting from patient handling tasks among hospital workers. Am J Ind Med. 2009;52(7):571-578.	Nonexperimental	2,849 musculoskeletal injuries in hospital workers who engaged in patient handling activities/multi-site, North Carolina	n/a	n/a	factors associated with injuries	Permanent mechanical lift equipment (ie, ceiling lifts) could reduce the risk of some injuries related to patient handling tasks.	IIIB

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83	Andersen LL, Vinstrup J, Villadsen E, Jay K, Jakobsen MD. Physical and psychosocial work environmental risk factors for back injury among healthcare workers: prospective cohort study. <i>Int J Environ Res Public Health</i> . 2019;16(22):4528.	Nonexperimental	2,080 healthcare workers (nurses, medical doctors, physical therapist, other) from 314 different departments/Denmark	n/a	n/a	back injury during patient transfer	Higher numbers of patient transfers, poor collaboration, and inavailability of assistive devices are associated with back injury among healthcare workers. Fostering a collaborative work environment, ensuring availability of assistive devices, and reducing the number of daily patient transfers can help prevent back injury among healthcare workers.	IIIB
84	Lee S, Faucett J, Gillen M, Krause N. Musculoskeletal pain among critical-care nurses by availability and use of patient lifting equipment: an analysis of cross-sectional survey data. <i>Int J Nurs Stud</i> . 2013;50(12):1648-1657.	Nonexperimental	361 critical care nurses	n/a	n/a	Low back pain, neck and shoulder pain, lift availability, lift use, physical and psychosocial job factors	Greater availability and use of lifts were associated with less musculoskeletal pain. The findings suggest that for lift interventions to be effective, lifts must be readily available when needed and removal of barriers to using lifts.	IIIB
85	Guideline for environmental cleaning. In: <i>Guidelines for Perioperative Practice</i> . Denver, CO: AORN, Inc; 2023:181-212.	Guideline	n/a	n/a	n/a	n/a	Provides recommendations for environmental cleaning in the perioperative environment.	IVA
86	van't Veen A, van der Zee A, Nelson J, Speelberg B, Kluytmans JA, Buiting AG. Outbreak of infection with a multidrug resistant <i>Klebsiella pneumoniae</i> strain associated with contaminated roll boards in operating rooms. <i>J Clin Microbiol</i> . 2005;43(10):4961-4967.	Nonexperimental	21 ICU patients	n/a	ICU patients positive for multidrug resistant <i>Klebsiella pneumoniae</i> (MRKP) N=7 and unmatched controls of ICU patients N=14	Positive culture of MRKP	Cultures in the OR revealed that the contamination of the roll boards used to transfer patients from the bed to the OR table was with multidrug resistant <i>Klebsiella pneumoniae</i> . Two ORs played a significant role in the transmission of multidrug resistant <i>Klebsiella pneumoniae</i> strain between 7 ICU patients during the outbreak with 4 fatalities.	IIIB
87	Zheng L, Hawke AL, Evans K. Critical review on applications and roles of exoskeletons in patient handling. <i>Int J Ind Ergon</i> . 2022;89:103290.	Literature Review	n/a	n/a	n/a	n/a	Exoskeleton technology for SPHM is emerging and continues to be developed for specific patient handling tasks. Exoskeleton technology may play a complementary role to existing SPHM programs.	VA
88	Liu S, Hemming D, Luo RB, et al. Solving the surgeon ergonomic crisis with surgical exosuit. <i>Surg Endosc</i> . 2018;32(1):236-244.	RCT	20 surgeons	upper body exosuit	no exosuit	pain, fatigue	The participants who used the exosuit reported significantly less shoulder pain than those in the control group. However, some participants who used the exosuit also reported increased lower back pain. The exosuit is a promising solution to reduce shoulder pain, although additional research is needed.	IB
89	Cha JS, Monfared S, Stefanidis D, Nussbaum MA, Yu D. Supporting surgical teams: identifying needs and barriers for exoskeleton implementation in the operating room. <i>Hum Factors</i> . 2020;62(3):377-390.	Qualitative	14 surgical team members/United States	n/a	n/a	usability of the exoskeleton in the surgical setting during a simulated task	Exoskeletons may prove to be useful in the surgical setting, although barriers such as maintenance and safety may influence adoption. Additional research is needed.	IIIB
90	Dorion D, Darveau S. Do micropauses prevent surgeon's fatigue and loss of accuracy associated with prolonged surgery? An experimental prospective study. <i>Ann Surg</i> . 2013;257(2):256-259.	Quasi-experimental	16 surgeons	micropauses	no micropauses	Muscle fatigue and loss of accuracy	Micropauses of 20 seconds every 20 minutes significantly improved strength, precision, and fatigue associated with operations over 2 hours. The micropauses improved surgeon comfort and potentially in the long term chronic pain and disability.	IIB

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91	Luger T, Bonsch R, Seibt R, Krämer B, Rieger MA, Steinhilber B. Intraoperative active and passive breaks during minimally invasive surgery influence upper extremity physical strain and physical stress response—a controlled, randomized cross-over, laboratory trial. <i>Surg Endosc.</i> 2023;37(8):5975-5988.	RCT	21 surgeons	2.5 minute passive (standing rest) or active (targeted stretching and mobilization exercises) breaks	no breaks	muscular activity and fatigue, posture, heart rate variability	Intraoperative work breaks, whether passive or active, may counteract shoulder muscular fatigue and increase heart rate variability. This tendency may play a role in a reduced risk for developing work-related musculoskeletal disorders and acute physical stress responses.	IIB
92	Kim JS, Chen W, Grunwaldt L, Losee JE, Bise C, Schuster L. Musculoskeletal pain survey outcomes in cleft surgeons and orthodontists. <i>Cleft Palate Craniofac J.</i> 2021;58(2):222-229.	Nonexperimental	83 cleft palate and orthodontic surgeons	n/a	n/a	musculoskeletal pain	Musculoskeletal pain was reported by 89.8% of the respondents. Cleft palate and orthodontic surgeons experience musculoskeletal pain.	IIIC
93	Waters T, Baptiste A, Short M, Plante-Mallon L, Nelson A. AORN Ergonomic Tool 1: Lateral transfer of a patient from a stretcher to an OR bed. <i>AORN J.</i> 2011;93(3):334-339.	Expert Opinion	n/a	n/a	n/a	n/a	Lateral transfer of a surgical patient from a stretcher to the OR bed is a frequently performed task that presents risk factors for development of MSDs particularly lower back and shoulder injuries.	VB
94	Prielipp RC, Weinkauff JL, Esser TM, Thomas BJ, Warner MA. Falls from the O.R. or procedure table. <i>Anesth Analg.</i> 2017;125(3):846-851.	Case Report	n/a	n/a	n/a	n/a	The goal of the review and mini case reports was to inform anesthesia and perioperative personnel about the common patient, provider, and environmental risk factors that may contribute to falls and to suggest strategies to minimize the risks.	VA
95	Feil M. Dislodged gastrointestinal tubes: prevention, recognition, and treatment. <i>J Patient Saf.</i> 2017;14:9-16.	Nonexperimental	1310 gastrostomy tube events/PA	n/a	n/a	Impact and safety associated with accidental dislodgement of gastrointestinal tubes	Accidental dislodgement of gastrointestinal tubes is associated with increased cost and issues of patient safety.	IIIC
96	Moureau N. Impact and safety associated with accidental dislodgement of vascular access devices: a survey of professions, settings, and devices. <i>JAVA.</i> 2018;23(4):203-215.	Nonexperimental	1561 clinicians/	n/a	n/a	Impact and safety associated with accidental dislodgement of vascular access devices.	Accidental dislodgement of vascular access devices is associated with increased cost and issues of patient safety.	IIIB
97	Alperovitch-Najenson D, Weiner C, Ribak J, Kalichman L. Sliding sheet use in nursing practice: an intervention study. <i>Workplace Health Saf.</i> 2020;68(4):171-181.	Quasi-experimental	61 female nurses and 15 female nursing assistants/Israel	sliding sheet use for moving bedridden patients	n/a	work-related injuries, perceived workload, burnout, job satisfaction	Using sliding sheets to reposition bedridden patients resulted in decreased pain and disability, and increased job satisfaction among nurses and nursing assistants. The use of sliding sheets should be encouraged as an alternative to the traditional cotton draw sheet.	IIB
98	Kotowski SE, Davis KG, Marras WS. Effectiveness of friction-reducing patient-handling devices on reducing lumbosacral spine loads in nurses: a controlled laboratory simulation study. <i>Int J SPHM.</i> 2019;9(2):77-89.	Quasi-experimental	16 healthy registered nurses, physical therapists, physical therapy aides/Cincinnati, OH	simulated repositioning and lateral transfer tasks	six assistive transfer devices and two patient sizes ("small" 61.4 kg female and "large" 100 kg male)	spinal loads; self-reported perception of comfort and exertion	Disposable and reusable air-assisted transfer devices demonstrated reduced 3-dimensional spinal loads and resulted in lower ratings of discomfort and exertion compared to the draw sheet, slide board, dual friction-reducing sheets, and friction-reducing covered board devices. Both repositioning and lateral transfer tasks place the worker at risk of injury, therefore air-assisted devices should be used.	IIA

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99	Hwang J, Kuppam VA, Chodraju SSR, Chen J, Kim JH. Commercially available friction-reducing patient-transfer devices reduce biomechanical stresses on caregivers' upper extremities and low back. Hum Factors. 2019;61(7):1125-1140.	Quasi-experimental	20 caregivers /DeKalb, IL	slide board, air-assisted transfer device, repositioning sheet	draw sheet	biomechanical stress, mock patient head acceleration, perceived usability	The air-assisted transfer device consistently demonstrated the lowest biomechanical stresses, the lowest patient head acceleration, and was most preferred by study participants. The slide board and air-assisted device can reduce injury to staff and patients.	IIA
100	Waters T, Short M, Lloyd J, et al. AORN Ergonomic Tool 2: Positioning and repositioning the supine patient on the OR bed. AORN J. 2011;93(4):445-449.	Expert Opinion	n/a	n/a	n/a	n/a	The extended reach and excessive weight lifted during patient positioning require the use of large muscle forces. These forces are large enough to cause damage to the spinal tissues, which could result in severe low-back or shoulder pain and lead to permanent disability.	VB
101	Waters T, Spera P, Petersen C, Nelson A, Hernandez E, Applegarth S. AORN Ergonomic Tool 3: Lifting and holding the patient's legs, arms, and head while prepping. AORN J. 2011;93(5):589-592.	Expert Opinion	n/a	n/a	n/a	n/a	Prepping patient limbs often require the person performing the prep to lift and hold the body part for prolonged periods.	VB
102	Hughes NL, Nelson A, Matz MW, Lloyd J. AORN Ergonomic Tool 4: Solutions for prolonged standing in perioperative settings. AORN J. 2011;93(6):767-774.	Expert Opinion	n/a	n/a	n/a	n/a	Ergonomic tool that presents solutions for prolonged standing perioperative settings.	VB
103	Waters TR, Dick RB. Evidence of health risks associated with prolonged standing at work and intervention effectiveness. Rehabil Nurs. 2015;40(3):148-165.	Literature Review	n/a	n/a	n/a	n/a	Use of interventions and following suggested guidelines on hours of standing from governmental and professional organizations should reduce the health risks of prolonged standing.	VA
104	Anderson J, Williams AE, Nester C. Musculoskeletal disorders, foot health and footwear choice in occupations involving prolonged standing. Int J Ind Ergon. 2021;81:103079.	Nonexperimental	147 surgical workers who were standing for prolonged periods/UK	n/a	n/a	footwear and work-related musculoskeletal disorders	Footwear comfort, footwear fit, and footwear choice are among factors reported to be related to work-related musculoskeletal disorders.	IIIC
105	Orr R, Maupin D, Palmer R, Canetti EFD, Simas V, Schram B. The impact of footwear on occupational task performance and musculoskeletal injury risk: a scoping review to inform tactical footwear. Int J Environ Res Public Health. 2022;19(17):10703.	Literature Review	50 articles reviewing occupational footwear	n/a	n/a	occupational task performance and musculoskeletal injury risk	Additional research is needed to better understand properties of footwear that influence task performance and injury risk.	VA
106	Vieira, E.R.; Brunt, D. Does wearing unstable shoes reduce low back pain and disability in nurses? A randomized controlled pilot study. Clin. Rehabil. 2016, 30, 167–173.	RCT	20 nurses with back pain/single institution Florida	wearing unstable shoes for one month	not wearing unstable shoes	lower back pain	Wearing unstable shoes (ie, shoes with rounded soles that require the wearer to use stabilizing ankle muscles for balance) reduced lower back pain.	IC
107	Tojo, M.; Yamaguchi, S.; Amano, N.; Ito, A.; Futono, M.; Sato, Y.; Naka, T.; Kimura, S.; Sadamasu, A.; Akagi, R.; et al. Prevalence and associated factors of foot and ankle pain among nurses at a university hospital in Japan: A cross-sectional study. J. Occup. Health 2018, 60, 132–139.	Nonexperimental	636 nurses (questionnaire)/single center, Japan	wearing any of five types of commercial nursing shoes available in Japan at work	n/a	shoe comfort and foot/ankle pain	Foot and ankle pain was common in nurses working in Japan. Shoe comfort was associated with foot and ankle pain.	IIIA
108	Rosati MV, Sacco C, Mastrantonio A, et al. Prevalence of chronic venous pathology in healthcare workers and the role of upright standing. Int Angiol. 2019;38(3):201-210.	Nonexperimental	173 healthcare workers/Italy	n/a	n/a	chronic venous disease prevalence	Chronic venous disease was greater among nurses compared to auxiliary and administrative healthcare staff, and was greater among female workers compared to males. Standing was a major risk factor for chronic venous disease.	IIIB

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109	Spera P, Lloyd JD, Hernandez E, et al. AORN Ergonomic Tool 5: Tissue retraction in the perioperative setting. AORN J. 2011;94(1):54-58.	Expert Opinion	n/a	n/a	n/a	n/a	Provides expert opinion on applying ergonomic safety to tissue retraction.	VB
110	Waters T, Baptiste A, Short M, Plante-Mallon L, Nelson A. AORN Ergonomic Tool 6: Lifting and carrying supplies and equipment in the perioperative setting. AORN J. 2011;94(2):173-179.	Expert Opinion	n/a	n/a	n/a	n/a	The extended reach and high weight limits involved in lifting supplies require the use of large muscle forces. These forces are large enough to cause damage to the spinal tissues, which could result in severe low-back or shoulder pain and lead to permanent disability.	VB
111	NIOSH lifting equation app: NLE calc. National Institute for Occupational Safety and Health. Accessed October 23, 2023. https://www.cdc.gov/niosh/topics/ergonomics/nlecalc.html	Expert Opinion	n/a	n/a	n/a	n/a	Provides users an app to assist with lift calculations according to the revised NIOSH lifting equation.	VB
112	Guideline for sterilization. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2023:1057-1086.	Guideline	n/a	n/a	n/a	n/a	Provides recommendations for sterilization in the perioperative setting.	IVA
113	Gallagher S, Sesek RF, Schall MC Jr, Huangfu R. Development and validation of an easy-to-use risk assessment tool for cumulative low back loading: the Lifting Fatigue Failure Tool (LIFFT). Appl Ergon. 2017;63:142-150.	Nonexperimental	n/a	n/a	n/a	validation of the LIFFT equation to estimate cumulative low back loading	The Lifting Fatigue Failure Tool (LIFFT) equation is a valid tool to assess risk for cumulative low back loading.	IIIA
114	Waters T, Lloyd JD, Hernandez E, Nelson A. AORN Ergonomic Tool 7: Pushing, pulling, and moving equipment on wheels. AORN J. 2011;94(3):254-260.	Expert Opinion	n/a	n/a	n/a	n/a	Pushing and pulling can create high spinal shear forces that could result in injury and potential disability for OR personnel.	VB
115	Garg A, Waters T, Kapellusch J, Karwowski W. Psychophysical basis for maximum pushing and pulling forces: a review and recommendations. Int J Ind Ergon. 2014;44(2):281-291.	Literature Review	n/a	n/a	n/a	n/a	It is unclear whether pushing or pulling is favored. Also, it is unclear what is the optimal handle heights for pushing and pulling.	VA
116	Ergonomic Guidelines for Manual Material Handling. National Institute for Occupational Safety and Health. Accessed October 23, 2023. https://www.cdc.gov/niosh/docs/2007-131/default.html	Expert Opinion	n/a	n/a	n/a	n/a	Provides information about ergonomics in manual material handling.	VB
117	Preventing Falls in Hospitals: A Toolkit for Improving Quality of Care. Agency for Healthcare Research and Quality. Accessed October 23, 2023. https://www.ahrq.gov/patient-safety/settings/hospital/fallprevention/toolkit/index.html	Expert Opinion	n/a	n/a	n/a	n/a	Provides a comprehensive toolkit for fall prevention and quality improvement.	VA
118	Tan J, Krishnan S, Vacanti JC, et al. Patient falls in the operating room setting: an analysis of reported safety events. J Healthc Risk Manag. 2022;42(1):9-14.	Qualitative	8337 perioperative patient safety reports (2014-2020)/single hospital, Boston, MA	n/a	n/a	patient falls and severity	Safety data reporting revealed factors, such as ambulation, that led to patient falls in the perioperative setting. Patient falls can be prevented with multifaceted strategies.	IIIB

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119	Hill AM, Jacques A, Chandler AM, Richey PA, Mion LC, Shorr RI. In-hospital sequelae of injurious falls in 24 medical/surgical units in four hospitals in the United States. <i>Joint Comm J Qual Patient Saf.</i> 2019;45(2):91-97.	Nonexperimental	1,033 patients who fell during hospitalization/4 hospitals, TN	n/a	n/a	Length of stay (LOS)	Injurious falls independently predict serious adverse outcomes for older patients admitted to the hospital. Patients who sustain an injurious fall have a significantly longer hospital LOS and are significantly less likely discharged directly to home.	IIIB
120	Vacario de Quadros DV, Müller de Magalhães AM, Wachs P, Severo IM, Tavares JP, Dal Pai D. Modeling of adult patient falls and the repercussions to Nursing as a second victim. <i>Rev Lat Am Enfermagem.</i> 2022;30:e3617.	Qualitative	447 falls--adult hospitalized patient; 21 nurses and nursing technicians/Brazil	n/a	n/a	Modality of patient falls and caregiver impact	Nursing professionals involved in the care of a patient who fell experience feelings of guilt, fear and anguish.	IIIB
121	Busch IM, Moretti F, Purgato M, Barbuí C, Wu AW, Rimondini M. Psychological and psychosomatic symptoms of second victims of adverse events: a systematic review and meta-analysis. <i>J Patient Saf.</i> 2020;16(2):e61-e74.	Systematic Review w/ Meta-Analysis	information from 11,649 healthcare providers involved in adverse events	n/a	n/a	psychological burden	Second victims report a high prevalence and wide range of psychological symptoms. More than two-thirds of providers reported troubling memories, anxiety, anger, remorse, and distress. Preventive and therapeutic programs should aim to decrease second victims' emotional distress.	IIIB
122	Schoberer D, Breimaier HE, Zuschnegg J, Findling T, Schaffer S, Archan T. Fall prevention in hospitals and nursing homes: clinical practice guideline. <i>Worldviews Evid Based Nurs.</i> 2022;19(2):86-93.	Guideline	n/a	n/a	n/a	n/a	Provides guidance on reducing patient falls in hospital and long term care settings.	VB
123	Dolan H, Slebodnik M, Taylor-Piliae R. Older adults' perceptions of their fall risk in the hospital: an integrative review. <i>J Clin Nurs.</i> 2022;31(17-18):2418-2436.	Systematic Review	22 studies	n/a	n/a	n/a	Older hospitalized adults could be at higher risk of falls especially when they perceive a low risk compared to an assessment of high risk. Patient perception of fall risk should be assessed as part of the fall risk assessment.	IIIA
124	Haddad YK, Luo F, Bergen G, Legha JK, Atherly A. Special report from the CDC: antidepressant subclass use and fall risk in community dwelling older Americans. <i>J Safety Res.</i> 2021;76:332-340.	Nonexperimental	8,742 community-dwelling older adults taking antidepressant-medication	n/a	n/a	Self-reported falls	SSRI and SNRI are associated with increased risk of falling.	IIIB
125	Kim YJ, Choi K, Cho SH, Kim SJ. Validity of the Morse Fall Scale and the Johns Hopkins Fall Risk Assessment Tool for fall risk assessment in an acute care setting. <i>J Clin Nurs.</i> 2022;31(23-24):3584-3594.	Nonexperimental	Analysis of 56,498 acute care patient records	n/a	n/a	Predictive validity of fall risk assessment	The Johns Hopkins Fall Risk Assessment Tool more accurately reflects acute changes in conditions related to fall risk after admission.	IIIA
126	Poe SS, Dawson PB, Cvach M, et al. The Johns Hopkins Fall Risk Assessment Tool: a study of reliability and validity. <i>J Nurs Care Qual.</i> 2018;33(1):10-19.	Nonexperimental	1299 adult inpatients, single center	n/a	n/a	Reliability and validity of the JHFRAT	The JHFRAT was found to be a reliable fall risk screening measure in the study population. Predictive validity showed high sensitivity with low specificity.	IIIB
127	Assessment: Timed Up & Go (TUG). Centers for Disease Control and Prevention. Accessed October 24, 2023. https://www.cdc.gov/steady/pdf/TUG_test-print.pdf	Expert Opinion	n/a	n/a	n/a	n/a	The Timed Up & Go tool assesses patient mobility.	VA
128	Boynton T, Kumpar D, VanGilder C. The Bedside Mobility Assessment Tool 2.0. <i>Am Nurse J.</i> 2020;15(7):18-22.	Literature Review	n/a	n/a	n/a	n/a	Reviews mobility assessment tools.	VA
129	Soubra R, Chkeir A, Novella JL. A systematic review of thirty-one assessment tests to evaluate mobility in older adults. <i>Biomed Res Int.</i> 2019:1354362.	Literature Review	61 studies focusing on mobility assessments	n/a	n/a	n/a	Provides a review of mobility assessment tools in healthy elderly people.	VA

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REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
130	Strini V, Schiavolin R, Prendin A. Fall risk assessment scales: a systematic literature review. Nurs Rep. 2021;11(2):430-443.	Literature Review	115 studies focusing on fall risk assessments	n/a	n/a	n/a	Due to the multidimensional nature of falling risk, there is no "ideal" tool that can be used in any context or that performs a perfect risk assessment. For this reason, a simultaneous application of multiple tools is recommended, and a direct and in-depth analysis by the healthcare professional is essential.	VA
131	Falls. PSNet: Patient Safety Network. September 7, 2019. Accessed October 23, 2023. https://psnet.ahrq.gov/primer/falls	Expert Opinion	n/a	n/a	n/a	n/a	Provides expert opinion regarding fall prevention.	VA
132	Oh-Park M, Doan T, Dohle C, Vermiglio-Kohn V, Abdou A. Technology utilization in fall prevention. Am J Phys Med Rehabil. 2021;100(1):92-99.	Literature Review	n/a	n/a	n/a	n/a	Technology-based applications in the area of fall prevention, including predictive and prescriptive analytics, video monitoring and alarms, wearable sensors, exergame and virtual reality, and robotics, are being introduced to healthcare settings and are demonstrating positive patient outcomes. However, additional research is needed.	VA
133	29 CFR 1630: Regulations to implement the equal employment provisions of the Americans with Disabilities Act. Code of Federal Regulations. Accessed October 23, 2023. https://www.ecfr.gov/current/title-29/subtitle-B/chapter-XIV/part-1630	Regulatory	n/a	n/a	n/a	n/a	Regulations to implement the equal employment provisions of the ADA.	n/a
134	2011 ANA Health and Safety Survey. American Nurses Association. Accessed October 23, 2023. https://www.nursingworld.org/practice-policy/work-environment/health-safety/health-safetysurvey/	Expert Opinion	n/a	n/a	n/a	n/a	A survey report of 4,614 nurses in 2011 from the ANA about concerns about health and safety in work environments.	VB
135	King A, Campbell J, James C, Duff J. A workplace stretching program for the prevention of musculoskeletal disorders in perioperative staff: a mixed methods implementation study. J Perioper Nurs. 2020;33(4):e1-10.	Quasi-experimental	42 perioperative staff members/Australia	workplace stretching program	n/a	musculoskeletal disorders, discomfort, sick leave, incidents, and compensation claims in perioperative staff	Perioperative departments should consider implementing a workplace stretching program to complement existing work and safety initiatives	IIB
136	Soler-Font M, Ramada JM, van Zon SKR, et al. Multifaceted intervention for the prevention and management of musculoskeletal pain in nursing staff: results of a cluster randomized controlled trial. PLoS One. 2019;14(11):e0225198.	RCT	473 nurses and nursing aides with musculoskeletal pain/two hospitals, Italy	three components: participatory ergonomics, health promotion activities, and case management; in addition to usual occupational health care	usual occupational health care	musculoskeletal pain, sickness absence, work functioning	A multifaceted intervention that includes participatory ergonomics, health promotion activities, and case management was effective in reducing neck, shoulder, and upper back pain in nurses and nursing aides with musculoskeletal pain.	IB

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137	Lopes SA, Vannucchi BP, Demarzo M, Cunha ÂGJ, do Patrocínio Tenório Nunes M. Effectiveness of a mindfulness-based intervention in the management of musculoskeletal pain in nursing workers. <i>Pain Manag Nurs.</i> 2019;20(1):32-38.	Quasi-experimental	64 female nursing technicians with musculoskeletal pain/Brazil	adapted mindfulness program	n/a	musculoskeletal symptoms, anxiety, depression, pain catastrophizing, self-compassion, perception of quality of life	The implementation of an adapted mindfulness program contributed to a sustained reduction in painful symptoms and improved quality of life.	IIB
138	Skamagki G, King A, Duncan M, Wåhlin C. A systematic review on workplace interventions to manage chronic musculoskeletal conditions. <i>Physiother Res Int.</i> 2018;23(4):e1738.	Systematic Review	12 RCT studies/healthcare workers, laboratory techs, industrial workers, office workers	interventions focused on management of chronic musculoskeletal conditions	n/a	pain, functional status, work ability index, health status, work status, absenteeism	Implementation of a multicomponent workplace intervention may be useful for the management of chronic musculoskeletal conditions.	IB
139	Richardson A, McNoe B, Derrett S, Harcombe H. Interventions to prevent and reduce the impact of musculoskeletal injuries among nurses: a systematic review. <i>Int J Nurs Stud.</i> 2018;82:58-67.	Systematic Review	20 studies	n/a	n/a	interventions effective at reducing or preventing musculoskeletal injuries	Additional research is needed to better understand interventions effective at reducing or preventing musculoskeletal injuries.	IIB
140	Abdollahi T, Pedram Razi S, Pahlevan D, et al. Effect of an ergonomics educational program on musculoskeletal disorders in nursing staff working in the operating room: a quasi-randomized controlled clinical trial. <i>Int J Environ Res Public Health.</i> 2020;17(19):7333.	Quasi-experimental	74 operating room nurses/Iran	ergonomics educational program	n/a	musculoskeletal disorders	An educational program intervention specific to ergonomics decreases frequency of MSD in operating room nurses.	IIA
141	Netto E, Titi RH. Systematic review on educational interventional studies in reducing work-related injuries among healthcare workers. <i>Int J Public Health Clin Sci.</i> 2018;5(4):1-11.	Literature Review	10 studies	education programs	n/a	work related injury	The evidence suggests that work related injuries could be prevented with educational programs.	VB
142	Aljabri D, Vaughn A, Austin M, et al. An investigation of healthcare worker perception of their workplace safety and incidence of injury. <i>Workplace Health Saf.</i> 2020;68(5):214-225.	Nonexperimental	32,327 healthcare employees, survey/Ohio	n/a	n/a	occupational injury	Organizations should focus on improving the safety climate to decrease occupational injury, especially for those who provide direct patient care.	IIIB
143	Lopez-Jeng C, Eberth SD. Improving hospital safety culture for falls prevention through interdisciplinary health education. <i>Health Promot Pract.</i> 2020;21(6):918-925.	Organizational Experience	Critical access hospital/Michigan	falls prevention education using the Five A's change model	n/a	AHRQ Hospital Survey on Patient Safety Culture survey results	Safe patient handling education using the Five A's change model can improve safety culture.	VB
144	Seabury SA, Terp S, Boden LI. Racial and ethnic differences in the frequency of workplace injuries and prevalence of work-related disability. <i>Health Aff (Millwood).</i> 2017;36(2):266-273.	Nonexperimental	11,632,466 respondents from the American Community Survey and 198,308 respondents from the Survey of Income and Program Participation/United States	n/a	different racial and ethnic groups in the United States	work-related injury rates	Disparities in economic opportunities in the United States result in minorities working in more hazardous jobs. As a result, non-Hispanic black and Hispanic workers are more likely to experience a work-related injury.	IIIB

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145	Gomaa A, Groenewold MR, Vanoli K, Nowlin S, Marovich S. Why surveillance informatics is an integral part of a safe patient handling program: occupational injuries due to patient handling and movement in 116 US hospitals, Occupational Health Safety Network, 2012-2016. J Assoc Occup Health Pro Healthc. 2020;40(3):16-25.	Nonexperimental	Injury data from 116 hospitals/US	n/a	n/a	OSHA recordable injury events	Collecting and analyzing information about injuries related to SPHM is integral to a successful program.	IIIB
146	29 CFR 1904: Recording and reporting occupational injuries and illnesses. Code of Federal Regulations. Accessed October 23, 2023. https://www.ecfr.gov/current/title-29/subtitle-B/chapter-XVII/part-1904	Regulatory	n/a	n/a	n/a	n/a	Provides federal regulation rule regarding recording and reporting of occupational injuries and illnesses to OSHA.	n/a
147	MSD assessment. Occupational Safety and Health Administration. Accessed October 23, 2023. https://www.osha.gov/hospitals/msd-assessment	Expert Opinion	n/a	n/a	n/a	n/a	Provides recommendations for reviewing facility data about work related MSD occurrences involving patient handling.	VA
148	Safe patient handling [tools & resources]. Occupational Safety and Health Administration. Accessed October 23, 2023. https://www.osha.gov/hospitals/patient-handling/	Expert Opinion	n/a	n/a	n/a	n/a	Provides tools for safe patient handling programs.	VA