Nevada Hospital Association

Safe Patient Handling and Mobility: A Toolkit for Program Development

Section 1
Understanding Safe Patient Handling and Mobility

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The ***Safe Patient Handling and Mobility: A Toolkit for Program Development*** offers comprehensive guidance and resources to assist hospitals and other healthcare organizations in establishing and sustaining effective safe patient handling and mobility (SPHM) programs.

The complete toolkit can be accessed at **https://www.nvha.net/safe-patient-handling-and-mobility-toolkit/**

Reproduction and Use of Materials

Understanding Safe Patient Handling and Mobility (SPHM)

Contents

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What is Safe Patient Handling and Mobility (SPHM)?

The principles of SPHM are founded in the science of Ergonomics.

The term ergonomics is derived from the Greek word ergos meaning "work" and nomos meaning "natural laws of" or "study of."

A globally accepted definition of ergonomics (also known as human factors) is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data, and methods to design in order to optimize human well-being and overall system performance (International Association of Ergonomics, ND).

Tools that Support Content in this Section

1a. An Introduction to SPHM in Pictures

Ergonomics when applied in the occupational setting is about designing work/management systems, physical environment, workspaces and equipment, and work processes to fit the physical and cognitive capabilities of workers with the goal of preventing worker injuries such as musculoskeletal disorders, worker error and improving work quality and operations efficiency. Work-related musculoskeletal disorders (WMSDs) are described in ***Table 1.1.***

More simply put, ergonomics is about designing work to 'fit' the person rather than expecting the person to try and adapt or 'fit' to poorly designed work.

Musculoskeletal disorders (WMSDs) caused by overexertion involve injuries related to lifting, pushing, holding, carrying, or throwing objects, and are a leading cause of disabling injury to *all* US workers. These injuries account for 21.9% of the overall national burden and cost US industry in including healthcare 12.84 billion dollars in 2020 (Liberty Mutual 2023).

Unfortunately, injuries caused by overexertion are also the leading and costliest cause of disabling injuries in the US healthcare industry.

In fact, health care workers (HCWs) suffer a higher rate of WMSDs involving days away from work than workers in many other industries including the manufacturing, construction, and agricultural sectors (Davis & Kotowski, 2015; Gomaa et al., 2015; Przybysz & Levin, 2017; Van Hoof et al., 2018).

Over the past four years, overexertion injuries with more than 5 days away from work accounted for approximately 30% of workers compensation costs and cost the healthcare industry between 1.54 and 2.06 billion dollars (Liberty Mutual, 2020-2023).

Quick Tip

Use the information provided in this section when educating senior leadership, the SPHM committee, and other employees about the scope and impact of patient handling injuries in health care.

The single greatest risk factor for overexertion injuries in HCWs is the *manual lifting, moving, and repositioning of patients, residents, or clients,* i.e., manual patient handling (NIOSH, 2023).

Manual patient handling can be defined as the transporting or supporting of a patient by hand or bodily force, including pushing, pulling, carrying, holding, and supporting of the patient or a body part (Nelson et al., 2009).

SPHM is the application of ergonomics to reduce the risk of injury to HCWs and patients (residents, clients, health care consumers) during handling and mobility tasks and to enhance the health outcomes of patients, and the financial wellbeing of health care organizations (ANA, 2021).

Evidence-based research has shown that SPHM interventions can significantly reduce overexertion injuries by replacing manual patient handling with safer methods guided by the principles of "Ergonomics" (NIOSH, 2023).

This is achieved by using a multifaceted programmatic approach that includes the use of mechanical and non-mechanical devices and ergonomics work practices to reduce the biomechanical demands on caregivers when performing patient handling and mobility tasks i.e., to design work tasks within their physical capabilities. To meet SPHM goals, these programs must include support structures and change management strategies to facilitate use of patient handling equipment and foster a culture of worker and patient safety (Matz et al., 2019).

SPHM programs and solutions are discussed later in this section.

What Does the Term SPHM Mean?

The term 'safe patient handling and movement' was 'coined' in the US, when formal efforts to prevent injuries to HCWs associated with manual lifting, repositioning, and transferring of patients began in the late 1980s. 'Safe' means to perform these tasks without injury to HCWs and patients. 'Handling' refers to lifting, lowering, pushing, pulling, carrying, or holding (e.g., part of the body) a patient by another person either using human effort or with mechanical assistance e.g., a powered floor lift.

The 2013 publication of the American Nurses Association's (ANA) Safe Patient Handling and Mobility: Interprofessional National Standards Across the Care Continuum, drove the initiative to replace the term 'movement' in SPHM with 'mobility'.

Movement is a passive concept that describes the physical effort exerted on a patient's behalf. The term mobility aligns with the current focus of using SPHM technology to actively engage the patient in mobilization related tasks with the goal of improving clinical outcomes through early and safe mobilization in the acute care setting and to assist with rehabilitation restoration and maintenance of independence in long term care (ANA, 2013; Waltrip, 2019).

In other countries such as the UK, and New Zealand, the term 'moving and handling of people' is more commonly used.

Appendix A *describes a brief history of SPHM in the US.*

What are Musculoskeletal Disorders (MSDs)?

Musculoskeletal disorders (MSD) are injuries or disorders of the musculoskeletal systems including muscles, nerves, tendons, ligaments, joints, cartilage, connective tissue, and spinal discs that can occur in the upper and lower limbs, neck, and back.

Examples of MSDs include strains and sprains, tendonitis, bursitis, carpel tunnel syndrome, and spinal disc herniation. Back injuries are the most common type of work-related MSD (WMSD) associated with manual patient handling (CDC, 2020; NIOSH 2023).

The term MSD can also refer to reports of pain or discomfort as well as injuries that are formally diagnosed by licensed health care providers.

MSDs are caused by sudden exertion or prolonged exposure to one or more physical risk factors such as overexertion, awkward postures, repetitive motion, and vibration (ANA, 2021)

MSDs caused by prolonged exposure to one or more physical risk factors are also called cumulative trauma, repetitive motion, or repetitive strain injuries.

Work-related musculoskeletal disorders (WMSDs) are conditions in which the work environment and performance of work contribute significantly to the condition; and/or the condition is made worse or persists longer due to work conditions (CDC, 2020).

There are other nonphysical risk factors that also contribute to the development of WMSDs ***(Refer to page 1-18).*** To learn more about Ergonomics and MSDs, review the resources below and references at the end of this Section.

The International Ergonomics Association (IEA)
What is Ergonomics - https://iea.cc/about/what-is-ergonomics/

Occupational Safety and Health Administration (OSHA)

- Ergonomics - https://www.osha.gov/ergonomics
- Hospital-wide Hazards Work-related Musculoskeletal Disorders
- https://www.osha.gov/etools/hospitals/hospital-wide-hazards/work-related-musculoskeletal-disorders

National Institute for Occupational Safety and Health

- Ergonomics and Musculoskeletal Disorders https://www.cdc.gov/niosh/topics/ergonomics/default.html
- Musculoskeletal Health Program https://www.cdc.gov/niosh/programs/msd/default.html

National Institutes of Health (NIH) National Library of Medicine

- Selected Health Conditions and Likelihood of Improvement with Treatment 2020. Chapter 5 - Musculoskeletal Disorders https://www.ncbi.nlm.nih.gov/books/NBK559512/

Canadian Center for Occupational Health and Safety

- Musculoskeletal Disorders https://www.ccohs.ca/topics/hazards/ergonomic/wsmd/

Table 1.1 What are Musculoskeletal Disorders (MSDs)?

Why Safe Patient Handling and Mobility Is So Important

Injury Rates Associated with Manual Patient Handling

In 2022 and 2023, Healthcare and Social Assistance had the highest number of nonfatal occupational injuries and illnesses ***(Figure 1.1)*** of all private industries (BLS, 2024).

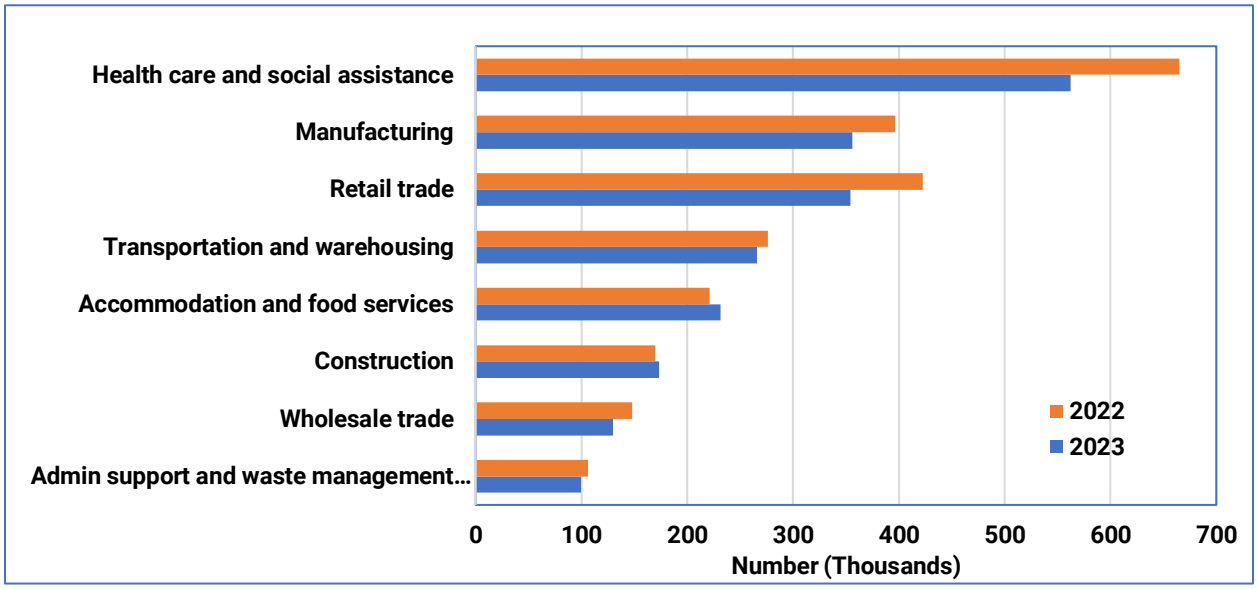


Figure 1.1 *Private Industries with highest numbers (in thousands) of nonfatal occupational injuries and illnesses in 2022 and 2023 (BLS, 2024).*[1]

Within Healthcare and Social Assistance, the 2022 injury and illness rate and the DART rate for hospitals *was over double* the rate of private industry as a whole and higher than the rates in construction and manufacturing (BLS, 2023a). The occupational injuries and illnesses DART rate for nursing and residential care facilities was *over double* that of hospitals (BLS, 2023a).

As in previous years, in 2021-2022, nursing aides and registered nurses were in the top 10 occupations with the highest number of strain and sprain injuries involving restricted activity, or job transfer ***(Figure 1.2).*** Injury rates in hospitals and nursing and residential care facilities have followed this trend for over a decade.

As discussed earlier, a significant number of injuries occurring in healthcare are work-related musculoskeletal disorders (WMSDs).

Back and shoulder injuries persist as the most frequent and costly WMSDs for nurses, aides, and allied health professionals such as physical and occupational therapists (Von der Lancken & Levenhagen, 2014).

There is evidence to indicate that the annual prevalence of low back pain in nurses has a mean of 50%, and the lifetime prevalence ranges from 35% to 90%. Recurrence rates of low back pain in nurses exceed 70% (Richardson et al., 2018; Tariq et al., 2018; Van Hoof et al., 2018).

Figure 1.2 *The Top 10 Occupations with the highest number of nonfatal occupational strain, sprain, and tear Injuries involving restricted activity, or job transfer (DART) in private industry annualized for 2021-2022 (BLS, 2023a).*

In the 2018–2019 Healthy Nurse Healthy Nation® (HNHN) survey conducted by the American Nurses Association (ANA), 58% of nurse respondents indicated they had experienced musculoskeletal pain at work during the past year (ANA, 2019). In the 2020–2021 HNHN survey, over 30% of nurse respondents considered that lifting and repositioning heavy objects, including patients, created a significant level of risk for occupational injuries (ANA, 2021). This reflects data reported in surveys conducted by ANA in 2001 and 2011 where nurses listed disabling musculoskeletal injury as a top health concern (Loeppke, 2017).

The risk of and reported rates of WMSDs to nurses are higher in some specialty care areas. For example, Clairi et al., reported that perioperative nurses suffer 62% prevalence rates of lower back WMSDs (Clairi et al., 2021).

Nursing aides (NAs) are reported to experience twice the injury rate of nurses related to patient handling (Graham & Dougherty, 2012; Gomaa et al., 2015). Over 50 percent of injuries and illnesses reported in 2020 among nursing assistants were musculoskeletal disorders (OSHA, ND). NAs incur WMSDs at more than *five times* the US national average and account for 8% of all work-related back injuries in the US (Kayser et al., 2020).

Allied health professionals such as physical therapists (PTs) and occupational therapists (OTs), emergency medical technicians and paramedics, radiology technicians, and home care and personal aides, also experience high rates of WMSDs associated with performing manual patient lifting, transferring, and mobilization tasks (AIHA, 2021; Darragh et al., 2012; Davis et al., 2021; Graham & Dougherty, 2012; Dropkin et al., 2015; Evans et al., 2019; Haines et al, 2021; Hanania et al., 2020; Harwood et al., 2016; McLean, 2018; Mc Grath et al., 2015; Quinn et al, 2016; Vieira et al., 2016).

Evidence suggests that PTs and OTs experience an annual incidence of WMSDs of 20.7%, and an annual prevalence for WMSDs of 27% or greater (Harwood et al., 2016; Morabito et al., 2021). Studies indicate that 46-91% of PTs experience an MSD at some point in their career (Chen et al., 2022; Cromie et al., 2000).

Activities such as lifting, handling, and transferring patients when performing rehabilitative interventions

are believed to contribute to increased risk of WMSDs in PTs and OTs (Campo et al., 2008; Darragh et al., 2012; Harwood et al., 2016; Mc Grath et al., 2015).

Radiology technicians also suffer from significant rates of WMSDs associated with tasks such as manually transferring patients on a spine board to and from a radiographic table, manually lifting patients to and from a wheelchair, and repositioning patients (Evans et al., 2019; Hanania et al., 2020).

Interestingly, health care *students* performing patient care tasks during clinical rotation also experience WMSDs due to manual patient handling (Almhdawi et al., 2017; Backåberg et al., 2014; Boucaut & Knobben, 2020; Morabito et al., 2021; Solomon et al., 2017).

Figures 1.3 and 1.4 show the incidence rates for nonfatal occupational injuries involving days away from work, restricted activity, or job transfer (DART) that resulted in strains, sprains or tears and injuries that occurred as a result of overexertion during tasks requiring lifting and lowering. The data represents healthcare occupations whose work involves direct patient care patient handling and mobility, private industry.

WMSDs to HCWs during the Covid – 19 Pandemic

During the pandemic, U.S. health care workers experienced a staggering 249 percent increase in injury and illness rates in 2020 as compared to 2019 (OSHA, 2022).

Although these rates reflect the significant increase in reported illness related to occupational exposure to the coronavirus (SARS-CoV-2), injuries related to workplace violence and patient handling also increased significantly. Incidence rates for sprains, strains and tears involving days away from work per 10,000 full-time workers increased 14% in hospitals and 19% in nursing and residential care facilities, mostly in nurses and nursing assistants (BLS, 2021a; BLS, 2021c)

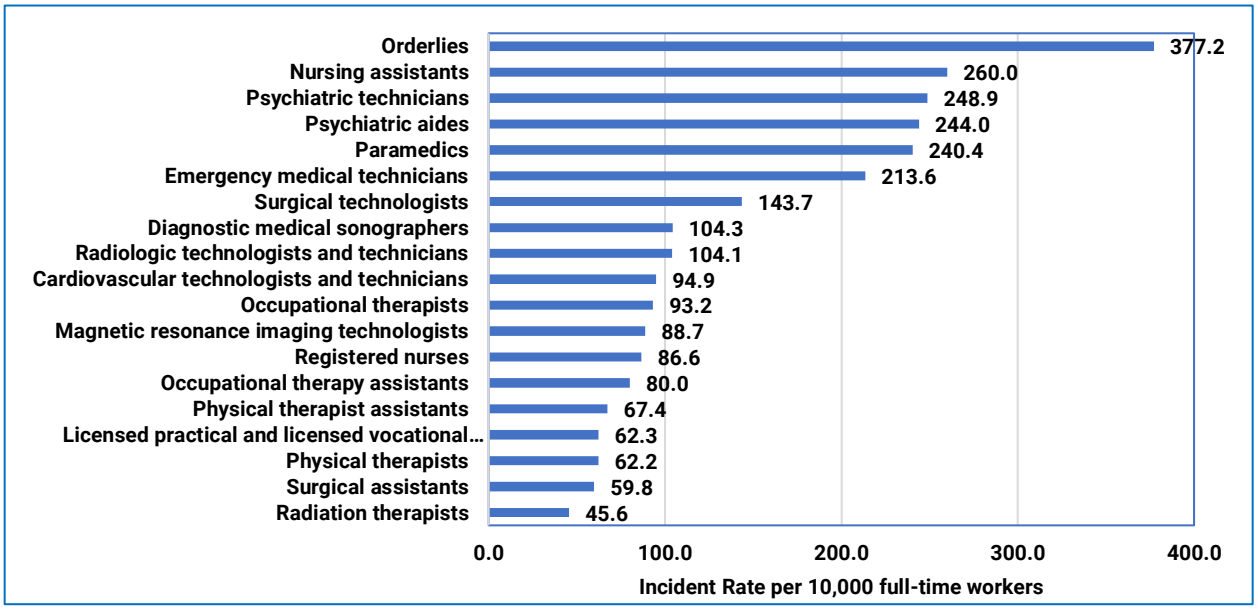


Figure 1.3 *Top 20 annualized incidence rates for nonfatal occupational sprains, strains, and tear injuries related to overexertion involving days away from work, restricted activity, or job transfer (DART) per 10,000 full-time workers for healthcare occupations whose work involves direct patient care patient handling and mobility, private industry, 2021-2022 (BLS, 2023b)*[1]

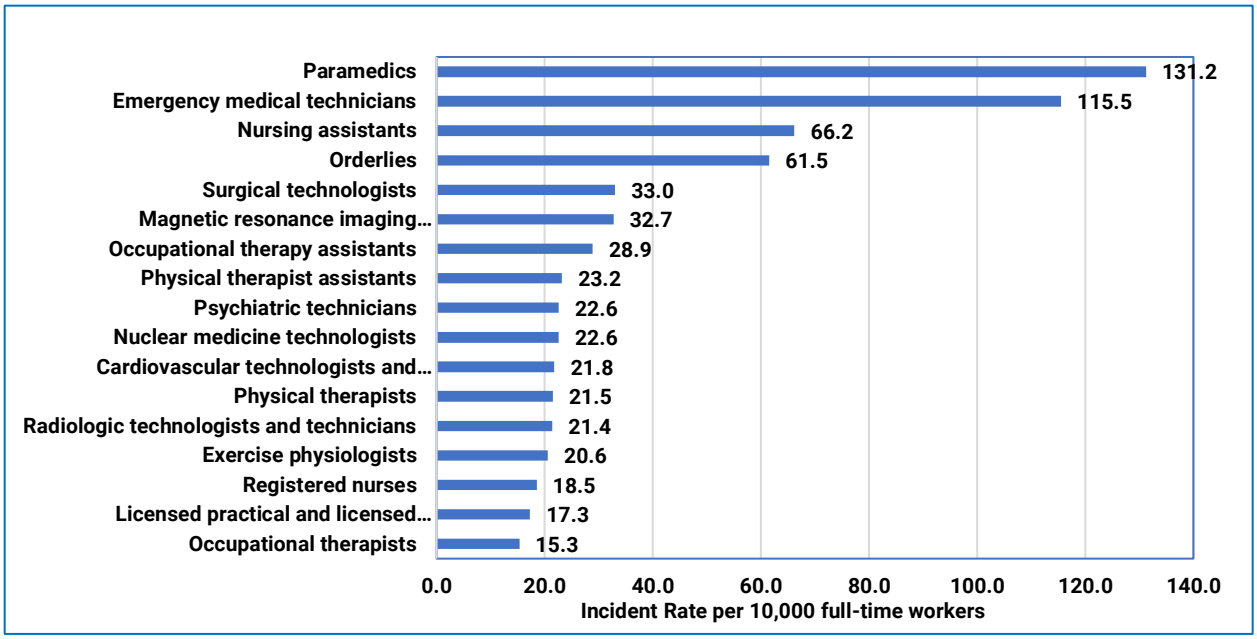


Figure 1.4 *Top 20 annualized incidence rates for nonfatal occupational injuries and illnesses involving days away from work, restricted activity, or job transfer (DART) due to lifting and lowering[2] events per 10,000 full-time workers for healthcare occupations whose work involves direct patient care patient handling and mobility, by occupation private industry, 2021-2022 (BLS, 2023c).*

1. *The incidence rates represent the number of injuries and illnesses per 100 full-time workers and were calculated as: (N/EH) x 200,000, where N = number of injuries and illnesses EH = total hours worked by all employees during the calendar year 200,000 = base for 100 equivalent full-time workers (working 40 hours per week, 50 weeks per year)*

2. Given the primary function of these health care occupations is to provide direct patient care, it is likely that these lifting- and lowering-related injuries are mostly associated with tasks involving patient handling.

Note there is no published federal occupational injury data the defines the current injury rates or types of injuries that occur because of patient handling and lifting tasks

The Cost of WMSDs Related to Manual Patient Handling

The economic, physical, psychological, and social costs of WMSDs for HCWs, health care organizations, and their patients are staggering.

Health care workers

WMSDs have a significant physical and psychological impact on the quality of life of injured HCWs. Examples include reduction in usual leisure or recreational abilities, short-and long-term ability to perform activities of daily living, frustration and anger related to the inability to practice their profession, and

anxiety regarding future employment prospects (Chu et al., 2019; Evans et al., 2019; Mc Grath et al., 2015).

WMSDs are associated with higher levels of anxiety, sleeping problems, lower levels of mental well-being and overall fatigue of workers. (de Kok et al., 2019). The comorbidity of MSDs and depression is reported to be prevalent among hospital nurses and significantly associated with working night shift or longer shifts and work–family conflict (Zhang et al., 2020).

There is early research that has found an *increase* in overall mortality and deaths from cancer, heart disease, intentional self-harm, and opioid overdoses associated with disability from work-related low back strains (Martin et al., 2020).

Health care employers

WMSDs are associated with high costs to employers such as, absenteeism, burnout, higher employee turnover, reduced workforce efficiency, and the direct costs of increased health care, disability, and workers' compensation costs. The direct and indirect (hidden) costs of WMSDs are typically more severe than the average nonfatal occupational injury or illness (CDC, 2020;Tariq et al., 2018).

In 2017, costs of overexertion-related injuries due to manual patient handling were $1.66 billion and accounted for 30.01% of the direct costs of all workers' compensation claims with more than five days away from work in the US health care industry (Liberty Mutual, 2020).

In the 2018 global insurance brokerage Aon reviewed over 230,000 closed workers compensation claims between 2012 to 2017 and concluded that patient handling claims continue to be the costliest claim type by severity. The average total cost per patient handling claim was $14,100 and for claims where payments are made, patient handling claims were amongst the most severe worker compensation claims, averaging $24,100 per claim for indemnity and medical costs (Jones et al., 2018).

The Impact of Covid-19 Pandemic on HCW Mental Health

In October 2023, the CDC reported that HCWs face burnout, harassment, and poor mental health at rates that have increased since the pandemic.

46% of HCWs reported often feeling burned out in 2022, up from 32% in 2018.

More than double the number of HCWs reported harassment at work in 2022 than in 2018.

44% of HCWs intended to look for a new job in 2022, up from 33% in 2018 (CDC, 2023).

Repositioning, managing uncooperative/aggressive patients, and transferring patients to/from a seated position the most frequently performed tasks performed that resulted in a claim with an average total cost of $20,600 to $25,400 per claim. The patient handling related events with the highest average cost of $27,700 was injuries resulting from preventing a patient from falling (ANA, 2021).

In 2020-2021 the average total incurred cost of a strain/sprain injury was $34,293 (medical and indemnity). The average cost of a lower back injury due to any cause was $39,328 and a shoulder injury $49,838. (NSC, 2023).

Indirect costs related to WMSDs, such as the costs related to replacing an injured worker either temporarily or permanently, are estimated to be 2.5-4 times the direct cost of injury, depending on the

severity (OSHA, 2013). The cost of replacing a single nurse can range from $11,000 to $103,000 (AOHP 2020; OSHA 2013; OSHA, 2013; Richardson et al., 2019).

Evidence shows that between 12%-25% of nurses and rehabilitation professionals with WMSDs request transfer away from providing bedside or client care or choose to leave the profession because of an injury or fear of an injury (Aslam et al., 2015; CDC, 2020; Grimaud, 2012; Tariq et al., 2018; Von der Lancken & Levenhagen, 2014).

Wiggerman et al., (2024), found in a recent survey of 973 HCWs, that 59.6% reported past work-related MSDs or pain. Of the HCWs who reported pain or injury, 33.3% changed roles, and only 30.9% reported workers' compensation claims. Additionally, 79.7% worked through pain or injury, which could further impair recovery and reduce job satisfaction (Wiggerman et al., 2024).

A 2024 report by NSI Nursing Solutions found that 23.8% of newly hired RNs left their positions within the first year, and first-year turnover accounted for 34.0% of all RN separations (NSI Nursing Solutions, Inc., 2024).

Additionally, data reported by Nurse.org in 2023 highlights that approximately 50% of new nurses leave the profession within their first two years, especially those who entered the workforce during the COVID-19 pandemic. Factors cited include high stress, poor support systems, and challenging work environments (Weber, 2023).

In a 2023 report from the National Council of State Boards of Nursing (NCSBN), 100,000 nurses left the workforce during the COVID-19 pandemic, and almost one-fifth of registered nurses in the US intend to leave the workforce by 2027 (NCSBN, 2023).

These figures suggest a significant increase in early-career nurse turnover compared to the 17.5% first-year and 33.5% two-year turnover rates reported in Kovner et al. (2014).

Historically, burnout has been a leading cause of the high turnover rates in nursing. However, the increased workloads experienced during the pandemic have resulted in extraordinary levels of burnout in nursing and other patient care related professions (ANA, 202; Martin et al., 2023; Rotenstein et al., 2023).

Organizational and psychosocial factors such as understaffing, high workload, and turnover, fatigue and burnout are associated with an increase in the incidence of WMSDs among nurses and nurse assistants (Bernal 2015; Han et al., 2014; Oakman & Macdonald, 2019; OSHA 2013; Vinstrup ,2020; Wåhlin et al., 2021).

The consequence of high physical and psychological demands in healthcare adversely impacts patient safety, health care organization's ability to recruit and retain HCWs and the overall future of US nursing health care workforce.

Decreasing HCW burnout, fatigue, and turnover related to high physical workloads associated with patient care tasks is more important than ever.

Despite these alarming statistics, injury rates and reported workers' compensation costs represent a *fraction* of the full cost of WMSDs associated with manual patient handling. Research indicates that as many as 50% of WMSDs go unreported by HCWs (Anderson & Oakman 2016; Capponecchia et al., 2020; Galizzi et al., 2010; Menzel, 2008). For example, one study found less than 10% of nursing home workers with prevalent lower back pain submitted a workers' compensation claim (Qin et al., 2014).

Underreporting of WMSDs and Patient Handling Injuries in Health Care

Due to the extent of underreporting of WMSDs, the magnitude of patient handling related injuries to HCWs and consequences to patient care is unknown.

Nurses frequently work while injured, which raises their risk of more serious injuries and increases the chance they may need to take leave or retire due to those injuries (Matz et al.).

The rational for underreporting of WMSDs by HCWs is not well understood (Kyung et al., 2023).

A few studies have identified common themes for underreporting occupational injuries and illness in general. These include perception of how severe the injury is e.g., if medical treatment required; uncertainty if the injury is work related; fear or concern; the reporting process takes too long and/or is too complex; lack of knowledge about how to report injuries and distrust of reporting consequences (Hansell et al, 2018; Kyung et al., 2023; Quinn et al, 2016).

A recent systematic review of research found that low wage earners, racial/ethnic minority workers, and workers who perceive a poor psychosocial work environment encounter more barriers to reporting a work-related injury or illness (Kyung et al., 2023).

A 2006 study of Veteran Health Administration workers found that peer pressure not to report and frustration with workers' compensation procedures contributed to underreporting of WMSDs. The findings also indicated that older HCWs and those with longer service together with those working in the evening and night shifts, were less likely to report (Siddharthan et al., 2006).

Overall underreporting of HCW and patient safety related incidents and events occurs in work environments that do not support reporting e.g., those with poor safety culture (Loeppke, 2017).

In addition to underreporting of WMSDs related to patient handling, inconsistencies in data collection and standardized coding of incidents related to patient handling contributes to a lack of knowledge about the frequency and severity of WMSDs in health care.

Without accurate incident data, development, and implementation of effective SPHM programs can be challenging.

SPHM program activities that can improve reporting and data collection are discussed in ***Sections 2 and 8.***

Patients

Not surprisingly, health care worker fatigue and burnout are negatively associated with poorer patient outcomes (Cho & Steege, 2021; Yellowlees & Rea, 2022).

However, WMSDs can have an indirect negative impact on the quality of care provided to patients. For example, there is some evidence to support the relationship between nurse injuries and physical discomfort and the impact on patient care (Kayser et al., 2020). In a 2014 survey, 22% of nurses reported being less friendly or engaging with their patients due to physical discomfort, and 22% also modified or limited their activity/movement on the job (Schmidt, 2014).

Overexertion and fatigue have been identified as contributing factors to medical errors in healthcare (Kiymaz, & Koc, 2018; Melnyk, et al., 2018). Overexertion and fatigue associated with repetitive manual patient handling may have an indirect effect on patient safety and contribute to burnout, especially in nurses.

Ambulation and repositioning of patients are two of the most frequently *missed nursing care* tasks in hospitals throughout the world ***(Table 1.2).*** The physical challenges associated with manually repositioning and assisting patients to ambulate may partially explain why these activities are among the nursing tasks most frequently missed (Kalisch et al., 2011). The 2018 Aon Barometer survey of health care systems found that patients with orders to be turned every two hours, were only turned 27% of the time (Jones et al., 2018).

Barriers to ambulation of patients include the nurse's perception of risk to the patients, e.g., risk of patient fall, or risk of injury to themselves if they get the patient up to walk (Doherty-King et al., 2014).

Missed nursing care is associated with nurse reports of patient falls, a leading patient safety indicator with high associated morbidity, mortality, and cost (Hessels et al., 2019).

Patients who are more physically challenging to mobilize, e.g., are immobile with high body weight and mass, and/or who are confused and agitated, may not be moved as frequently as needed if manual handling is required.

Lastly, manual patient handling can be painful, increase the risk of skin tears and bruising, and be undignified for the patient (Nelson et al., 2008).

Figure 1.5 summarizes the costs of manual patient handling.

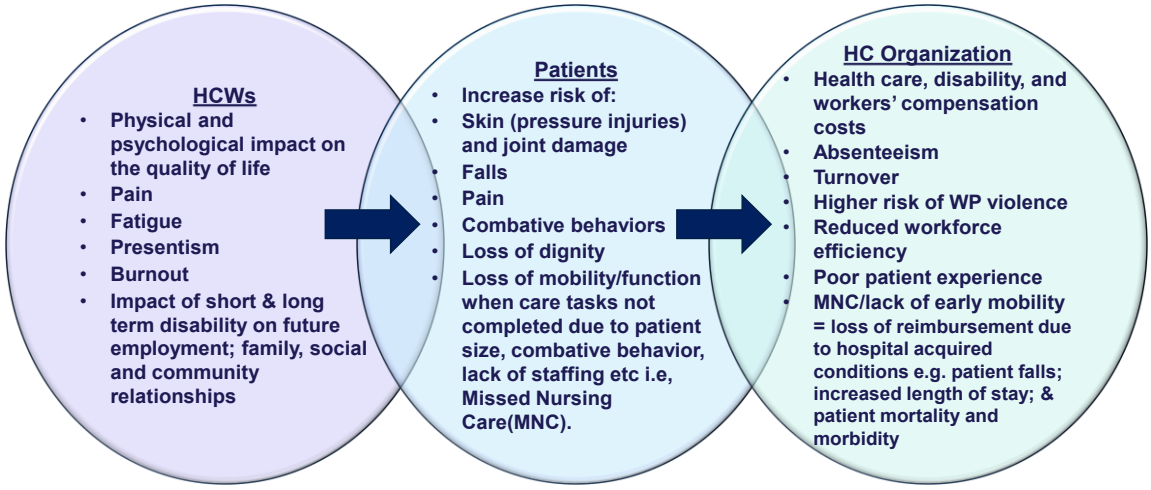


Figure 1.5 *The Cost of Manual Patient Handling***.**

Society

All of society incurs costs when hospital workers are injured or ill. When injuries lead to long-term disabilities and chronic pain, the injured worker's family, social circle, and society bear many of the expenses resulting from long-term healthcare needs and difficulty working. Even when injured workers can still find employment, disabilities can permanently reduce their income.

The reaction of the injured worker's close social circle to their disability can affect how the individual manages their condition. For example, chronic pain patients may face additional challenges if their pain is not recognized or validated by those around them due to its invisible nature (Lee et al., 2022).

As hospitals bear the cost of workplace injuries, they may pass these expenses along to patients, insurance companies, or tax-funded government services through higher rates. They may also pay part of the cost from earnings that could otherwise be reinvested to improve quality of care. When an experienced, skilled worker is injured and forced to leave the field, this requires additional investment by society to educate replacement workers (OSHA, 2013).

SPHM & Missed Nursing Care

Missed Nursing Care (MNC) is defined as any aspect of required patient care that is omitted (either in part or in whole) or delayed by nursing staff that is, nurses and nursing aides (Kalisch, 2009). Missed care is also termed care left undone, unfinished care, and implicitly rationed care (Ball & Griffiths, 2018).

Missed care constitutes a form of healthcare underuse, which, according to renowned expert in healthcare systems safety, James Reason, is the most prevalent cause of quality issues in healthcare, surpassing both overuse and misuse combined (Ball & Griffiths, 2018). MNC is a global phenomenon in nursing.

Commonly missed patient care tasks missed include:

- Ambulation
- Turning
- Patient surveillance
- Delayed or omitted medications/treatments
- Delayed or missed feedings
- Patient education
- Discharge planning
- Emotional support
- Hygiene
- Input and output documentation

(Hessels, et al., 2019, Kalisch et. al., 2012; AHRQ, 2024)

Missed nursing care can lead to deconditioning, pressure injuries (PIs), falls, and longer hospital stays due to patient immobility when repositioning and ambulation are neglected.

Other consequences can include delayed or omitted medications or treatments; complications such as atelectasis, ventilator-associated pneumonia, or other nosocomial infections; increased length of stay; and decreased patient satisfaction (AHRQ, 2024).

Thus, missed care activities are linked to reportable hospital-acquired non-compensable conditions such as pressure ulcers and falls and associated costs (Hessels, et al., 2019).

SPHM & Missed Nursing Care continued

Ball et al., found an association between nurse staffing and missed care and a subsequent association between missed care and mortality (Ball, et al., 2018).

Unfinished care is also linked to increased nursing turnover, decreased work and occupational satisfaction, and increased intent to leave (Jones, 2015; Ogboenyiya, 2019).

Studies show that MNC also occurs more frequently in units or work areas where nurses are exposed to patient and/or co-worker violence (Kim, et al., 2021; Najafi et al., 2018; Pompeii et al., 2015).

Causes of MNC are multifaceted and include lack of staff and supplies, poor use of existing staff resources, the time required to perform a nursing intervention, poor teamwork or communication problems, ineffective delegation, habit and denial (AHRQ, 2024; Bragadottir, et al., 2016; Griffiths et al., 2018; Kalisch et. al. 2014).

Unfortunately, the experience of working under time and resource pressure can unconsciously reinforce the acceptability of delaying or omitting care, leading to missed care becoming routine (AHRQ, 2024).

How is MNC related to SPHM programs?

SPHM plays a vital role in facilitating early, safe, and progressive mobility in the acute care setting with the goal of reducing patient risk of PIs, falls and length of stay etc. Thus, SPHM may also help to reduce the occurrence of 2 of the most frequently missed tasks, repositioning in bed and ambulation. The use of SPHM technology to mobilize patients has also been shown to reduce the risk of violence related injuries to staff (Collins et al., 2006; Kurowski & Ghaziri, 2019; Pihl-Thingvad et al., 2018; Risør et al., 2017).

Anecdotally, through questioning hundreds of nurses and nursing aides during SPHM training classes and direct observation over the past decade, this author concludes that patients who require additional staff to *manually* reposition and mobilize them are less likely to be moved especially towards the end of 12 hour shifts, primarily due to staff fatigue, the time needed to find help, and insufficient staffing. Missed care occurred more frequently with patients who are combative or not cooperative, and/or patients of size and/or have complex/special clinical needs.

Monitoring MNC may be a sensitive early warning system for hospitals to detect problems before hospital-acquired conditions such as falls, and PIs occur.

Evaluating MNC when measuring the impact of SPHM programs is discussed in ***Section 4.***

Interested in learning more about Missed Nursing Care? Refer to the resources and references provided in ***Section 10.***

Table 1.2 *SPHM & Missed Nursing Care.*

Why is Manual Patient Handling So Hazardous?

Physical Risk Factors

Manual patient handling tasks require HCWs to exert excessive force when lifting, pushing, and pulling, and work in extreme awkward postures such as lateral and/or forward bending, twisting of the trunk, and reaching above shoulder or head height. HCWs also maintain awkward body postures without movement for *a period of time* i.e., a static posture ***(Figure 1.6 and Table 1.3).***

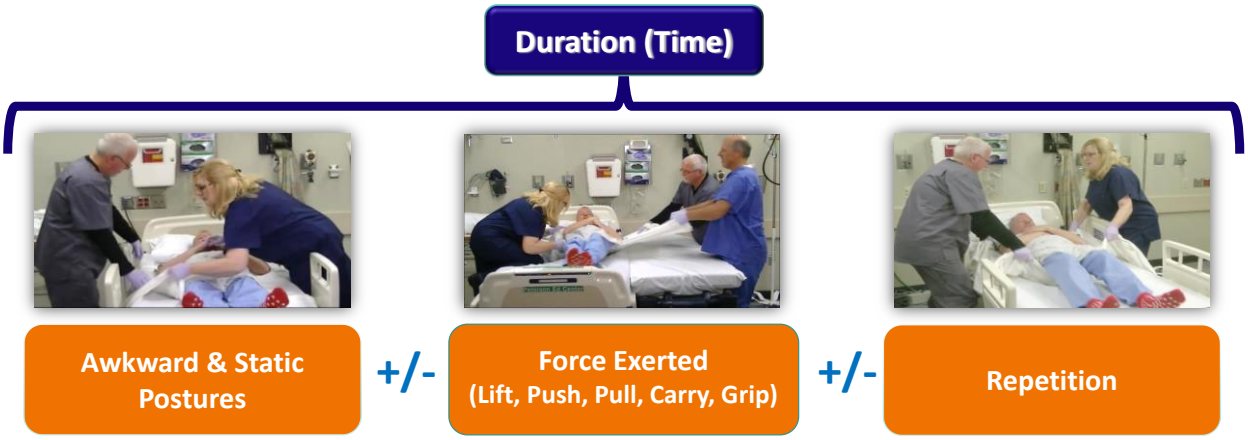


Figure 1.6 *Primary Risk Factors that Can Contribute to the Development of WMSDs Associated with Manual Patient Handling. Source: L. Enos, HumanFit, LLC. Reproduced with permission.*

Gallagher & Marras state that "forces acting on the spine as a result of exposure to patient handling activities can be broadly categorized as compressive forces (the forces acting down the long axis of the spine), shear forces (forces acting at 90° from the compressive forces defined above, in both lateral and anterior–posterior [A–P] directions), and torsional forces (rotation forces acting around the long axis of the spine)" (Gallagher & Marras, 2012). ***(Figure 1.7)***

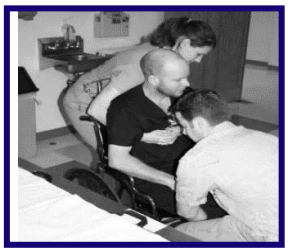
The National Institute for Occupational Safety and Health (NIOSH) suggests if a spinal compressive load at the L5/S1 level exceeds approximately 3400 N (Newtons) or 764.35 lbf, workers are at an increased risk of low back injury (Waters et al., 1993). Shear force limits are recommended not to exceed 1000 N or 224.80 lbf for occasional exposure to shear (under 100 loadings/day), and 700 N or 157.36 lbf, for frequent exposure to shear (100–1000 loadings per day) (Gallagher & Marras, 2012).

Studies have shown that tasks such as manually repositioning a patient in bed and transferring a patient between bed, chair, and commode *create high compressive and shearing forces,* or spinal loading, which exceeds recommended spinal loads thus, significantly increase the risk of low back injuries (Marras, 2008; Theilmeier et al., 2010; Gallagher & Marras, 2012; Wiggermann et al., 2021).

Even patient care activities involving activities of daily living (ADLs) i.e., bathing, feeding, and dressing, have been found to produce large cumulative spine loads (Hodder et al., 2010).

Many patient handling transfers performed by *one HCW* have been shown to consistently exceed the loading tolerance of the spine.

- **Repositioning in bed, on a stretcher or exam/ procedure table** e.g., turning and boosting a patient; raising a patient from lying to sitting in bed or at edge of bed; positioning or removing a bedpan
- **Seated transfers** e.g., to/from bed to chair, commode, wheelchair; chair to chair; wheelchair to exam table or vehicle
- **Supine transfers** e.g., to/from bed, stretcher, or procedure table
- **Lifting and holding of extremities** e.g., during wound care
- **Stabilizing patients in upright or lateral positions**
- **Repositioning in wheelchair, chair**
- **Positioning an individual of size** to access the abdominal or perineal area
- **Tasks performed with a confused or combative patient** e.g., restraining, escorting, toileting, dressing, bathing etc
- **Performing cardiopulmonary resuscitation (CPR)**



- **Standing transfers** e.g., to/from bed to commode/ chair/exam table
- **Ambulation**
- **Preventing falls/Lifting a patient from the Floor**
- **Toileting**
- **Showering and bathing** (in bed, shower chair, or trolley)
- **Repositioning patients to/from a prone position**
- **Transporting a patient in a bed, stretcher, or wheelchair**
- **Weighing a patient**
- **Changing an absorbent pad**
- **Making an occupied bed**
- **Feeding a bedridden patient**
- **Dressing or undressing a patient**
- **Applying anti-embolism stockings**
- **Tasks of rehabilitation** e.g., training patients in self-transfer, assisted standing, sitting, kneeling, stairs, repositioning patients on mats

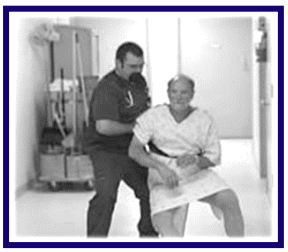


Table 1.3 *High Risk Manual Patient Handling Tasks - as Supported by Research (Callison and Nussbaum, 2012; Hignett & Crumpton, 2002; Jäger et al., 2013; Jang et a., 2007; Matz et al., 2019; Marras et al., 1999; Nelson et al., 2003; Nelson & Baptiste, 2004; Nelson, 2006; Pompeii et al., 2009; Waters et al., 2007; Zhuang et al., 1999). Source: L. Enos, HumanFit, LLC. Reproduced with permission.*

However, research shows that when two or more HCWs manually lift a patient together, the lift is uneven because of the differences in height and strength between HCWs performing the task. This uncoordinated movement and resultant postures create higher shear forces in the lower spine (Marras et al., 1999).

So, having more HCWs manually lift a patient does not necessarily reduce the risk of WMSDs.

Tasks involving *pushing and pulling* often involve high shear forces in addition to compressive force. The level of risk is dependent on the weight of the patient and the coefficient of friction between the sliding surfaces. HCWs may have to use rapid jerking motions to overcome friction in order to initiate patient movement (Waters et al., 2007; Wiggerman et al., 2021), e.g., pulling a patient up in bed or transferring a patient between two surfaces in a spine position from bed to stretcher.

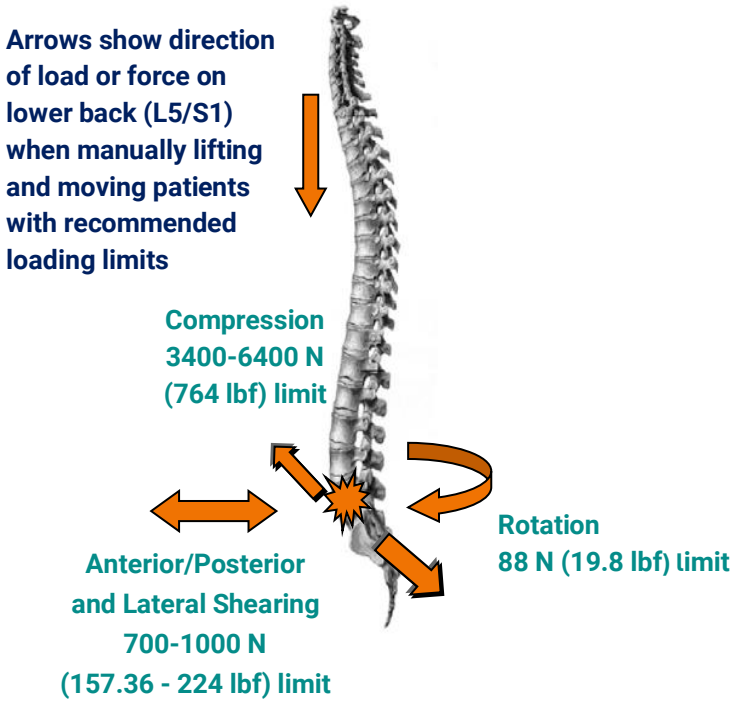


Figure 1.7 *The Direction of Forces on the Spine when Manually Lifting Patients.*

Biomechanical tolerance to shear force is much lower than tolerance to compressive force, thus creating a higher risk for back injury (McGill, 1996; Marras et al., 1999; Hoozemans et al., 2008).

Sudden, unexpected, forceful exertion**,** e.g., when patients move unpredictably during a handling task, further increases the loading on the spine (Shahvarpour et al., 2015).

Several other factors can increase the level of exertion and ensuing loading on the spine and support structures when performing manual patient handling tasks that can significantly increase the risk of WMSDs.

These include the degree of flexion and/or rotation of the HCW's spine, the distance of the HCW from the patient; applied hand force; the size, shape, and weight of the patient; the patient's physical ability to assist during a patient handling task; cognitive ability to follow instructions; restricted physical workspace; the transfer distance; and/or there are not enough staff to assist (Choi & Brings, 2016; Frey & Hignett, 2015; Galinsky et al., 2021; Matz et al., 2019; Village et al., 2005).

Table 1.4 summarizes the factors that influence the frequency, magnitude, and duration of exposure to risk factors for WMSDs associated with manual patient handling tasks.

Sudden unexpected movements and resultant muscular contractions can cause high muscular forces within the erector spinae of approximately 145-187% of one's Maximum Voluntary Contraction (MVC) leading to fatigue and possible failure of the muscles surrounding the lumbar spine (Anderson et al., 2001; McGill, 2022; Pedersen et al., 2007; Sharvarpour et al., 2015; Zhou, 2014).

This can occur when a patient goes limp during a transfer causing the HCW to lose balance and move suddenly, or when a cognitively impaired patient is unpredictable and may suddenly become combative, and resist efforts to move them.

Back injuries may be caused by lifting and handling a load that exceeds spinal load tolerance with a few repetitions or repeatedly handling a small load over a long period (Casiano et al., 2023).

Risk of WMSDs increases with repeated exposure to these physical risk factors and associated spinal loading during a work shift and for extended duration, e.g., shift after shift. Over time the tolerance limit of the spine and surrounding soft tissues decreases, especially if there is *insufficient recovery* or *rest time* from exposure to physical risk factors (Marras et al., 2014). ***(Figure 1.8)***

As muscles that support the spine become fatigued, they cannot provide optimal support of the spine which can become unstable and susceptible to injury at compressive loads as low as 88 N or 19.8 lbf (Marras et al. 2014).

This cumulative exposure to manual patient handling tasks not only leads to micro-injuries in the form of micro-tears to muscles, tendons, and ligaments, but to cumulative microfractures of the lower vertebrae which can lead to lumbar disc damage and permanent disabling injury (Davis & Jorgensen, 2005; Tariq, 1997; Waters, 2007). ***(Figure 1.9)***

HCWs often work long and unpredictable hours with few work breaks and insufficient staffing levels. These work organization-related factors can lead to increased exposure to physical risk factors, subsequently raising the chances of lower back injuries (Choi & Brings, 2016; Dennerlien et al., 2017; Ribeiro et al., 2017; Richardson et al., 2019).

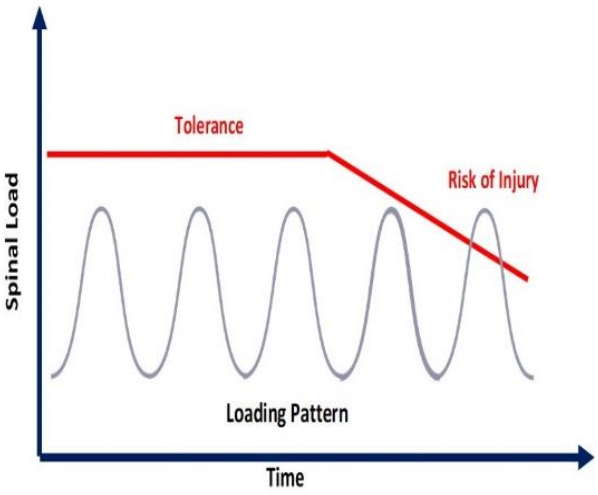


Figure 1.8 *Decreasing Tolerance to Cumulative Loading of the Spine (Marras 2008).*

Physical risk factors that contribute to the development of WMSDs – force, repetition, awkward postures, and duration – also occur in non-patient handling tasks performed by HCWs. These include carrying linen bags, moving and handling medical equipment, and pushing patients in wheelchairs or on stretchers.

Damage to the spine and intervertebral discs can accumulate over time without HCWs noticing until one event, like bending to pick up a light object, causes low back pain from final overloading (NPR, 2015).

Once a low back injury has occurred, there is a greater risk of reinjury as load tolerance of the spine and supporting structures decline (Marras etc., 2014; Tariq, 1997;).

Causative factors of low back injuries associated with manual patient handling are well studied. However, there is limited research to indicate the relationship between manual patient handling and injuries to other body regions such as the middle and upper back, shoulders, neck, and upper extremities.

Belbecka et al., found that out of five commonly performed manual patient handling tasks, stand pivot transfers from bed to chair sit-to-chair and turning a patient in bed toward the HCW, were the most demanding tasks for the shoulder (Belbecka et al., 2014).

Wiggerman et al., found that overall risk of upper extremities may increase when boosting a patient using a drawsheet. Boosting a patient weighing 170 lbs and over was found to produce high hand forces that exceeded recommended limits. It was surmised that this in turn may lead to abnormal muscle recruitment and adjacent joint movement thus increasing the risk of injury in the shoulder complex (Wiggerman et al., 2021).

Spinal Damage - A Result of Cumulative Exposure to Manual Patient Handling

Damage to the spinal discs as result of the forces described above can vary. Spinal discs may degenerate over time due to damage to vertebral endplates. The resulting scar tissue prevents blood supply with essential nutrients from flowing into the discs. Without the diffusion mechanism to receive nutrients, discs can degenerate until nerve impingement results in pain and potential disability (Marras, 2008).

Early disc degeneration can contribute to bulging or herniation of spinal discs. Because discs have no nerve supply to warn of damage and the damage progresses over time, HCWs are often unaware of the injury until symptoms such as pain occur (Nedresky et al, 2023).

Muscles supporting the spine can become fatigued when exertion occurs often or over an extended period without adequate time for recovery and are no longer able to produce energy for contraction. Muscle fibers can also be damaged from excessive loading or repetitive actions without sufficient recovery periods (Dydyk et al., 2023).

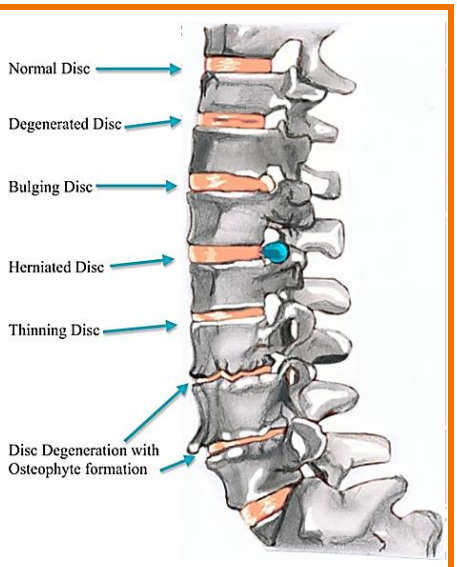


Figure 1.9 *Various Painful Disc Disorders that can Result from Years of Overexertion of the Spine. Source: New York State Dept of Health, 2016.*

Other Risk Factors that contribute to MSDs in HCWs

Recent research supports that causation of WMSDs and especially low back pain in HCWs are multifactorial and interact with one another i.e., physical workload, organizational psychosocial and individual factors (Wåhlin et al., 2021).

Therefore, for SPHM programs to successfully achieve and sustain desired goals, it is not only necessary to address the physical risk factors for WMSDs associated with patient handling tasks but to also consider other risk factors for WMSDs and how they can interact when designing, implementing and sustaining an SPHM program. ***SPHM programs are discussed later in this section.***

Oakman & Macdonald, 2019 suggest that 'a broad, systems-based framework and more holistic assessment of risk from all relevant hazards together rather than in isolation from each other' (Oakman & Macdonald, 2019). ***(Figure 1.10)***

Psychosocial Risk Factors

Psychosocial risk factors such as low social support from supervisors and/or colleagues, poor collaboration/lack of teamwork, negatively appraised leadership styles, reduced job control, time pressure, excessive workloads, hostile work environment (e.g., where bullying is allowed), and lack of clarity over role, have also been associated with an increased likelihood of WMSDs in HCWs. (Andersen et al., 2019; Bernal 2015; Graveling et al., 202; Han et al., 2014; Kim et al., 2014; Oakman & Macdonald, 2019; Sabbath, et al., 2014; Vignoli, et al., 2015; Wåhlin et al., 2021; Zare et al., 2021;).

The specific relationship between psychosocial risk factors, how they interact with physical risk factors and the degree to which they increase the risk of WMSDs is not well understood. There are various theories about how psychosocial factors contribute to the development of MSDs. These are based on physiological changes that occur when the body is exposed to psychological stressors.

Time pressure to meet work demands could increase the number of repetitive movements and facilitate awkward postures increasing biomechanical load which could lead to muscular strain (Ando et al., 2000).

Afsharian et al., surmised that "biochemical stress responses involving muscle tension, reduced blood supply, and less opportunity for muscle repair, and muscle fiber weakness increasing susceptibility to injuries" (Afsharian et al., 2023).

Perceived stress can contribute to reduced tolerance of pain and psychosocial factors can also influence the return to work of HCWs who have a WMSD (Graveling et al., 2021).

Want To Learn More?

Psychosocial Factors and How They Contribute to WMSDs

- **Bezzina, A., Austin, E., Nguyen, H., & James, C. (2023). Workplace psychosocial factors and their Association with Musculoskeletal disorders: a systematic review of Longitudinal studies. Workplace health & safety, 71(12), 578-588. https://pubmed.ncbi.nlm.nih.gov/37698343/**
- **Graveling R, Smith A & Hanson M 2021 musculoskeletal disorders: association with psychosocial risk factors at work. A literature review. European Agency of Health and Safety at Work**

  https://osha.europa.eu/sites/default/files/2021-11/MSDs_association_pshychosocial_risks_factors_at_work_report.pdf%20
- **Psychosocial factors in the prevention of work-related musculoskeletal disorders (MSDs) European Agency of Health and Safety at Work 2021 https://osha.europa.eu/sites/default/files/psychosocial-risks-infosheet-en.pdf**
- **Musculoskeletal Disorders - Psychosocial Factors, The Canadian Center for Occupational Health and Safety https://www.ccohs.ca/oshanswers/psychosocial/musculoskeletal.html**

Organizational Risk Factors

The intensified workload, exposure to trauma, and relentless understaffing during the COVID-19 pandemic have resulted in increased physical and mental burnout in HCWs that is resulting in higher rates turnover and intent to leave healthcare. Given what is known about the impact of fatigue and psychosocial risk factors and WMSDs, it is very likely the current epidemic of burnout in HCWs compounds the risk of WMSDs.

In the 'post-covid' healthcare environment there is high use and turnover of traveling nurses and other allied professionals together with the increasing use of technicians or other non-nursing personnel to perform patient care tasks within a health care system. This new 'norm' in the US healthcare system is not likely to change in the near future.

Research conducted in long-term care indicates that HCW turnover, the knowledge gaps of agency or temporary and new hire staff, in addition to the extra time needed to complete shift handover with these staff groups, can hinder safety interventions such as SPHM. (Kurowski et al., 2012).

These factors may lead to less frequent use of SPHM technology because staff may lack sufficient skills or time during a shift to use the equipment appropriately (Kurowski et al., 2012) and must be considered when developing and attempting to sustain SPHM programs.

Overall, research shows that the cumulative physical demands of manual handling and lifting of patients who cannot move independently play the *most significant* role in development of low back pain and injury (Bernal et al. 2015; Gomaa et al., 2014; Han et al., 2014; Richardson et al., 2019).

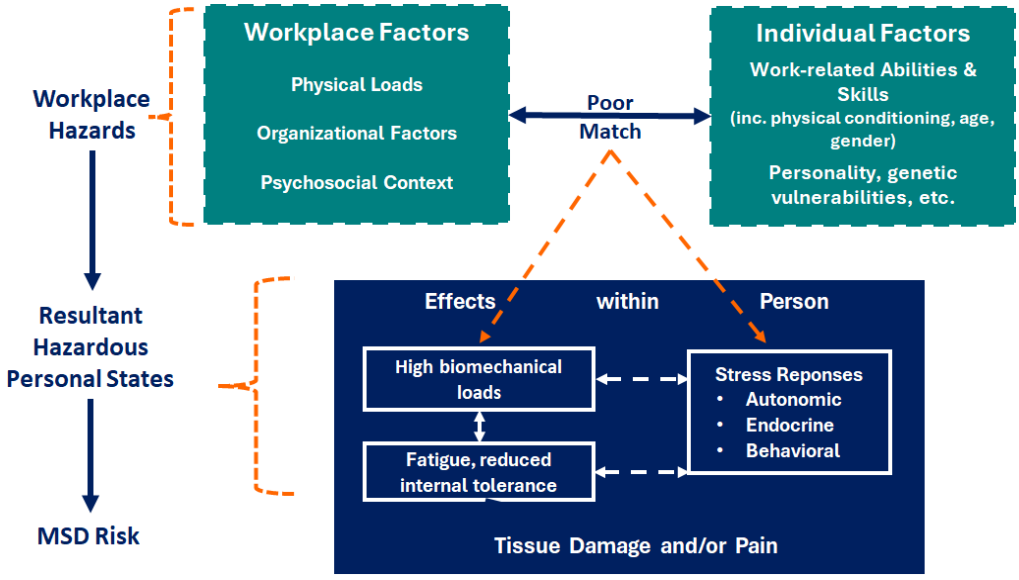


Figure 1.10 *The Overall Interrelationship Between Workplace and Individual Factors Affecting MSD Risk.*

Source: Oakman, J., Macdonald, W. The APHIRM toolkit: an evidence-based system for workplace MSD risk management. BMC Musculoskelet Disord 20, 504 (2019).
https://bmcmusculoskeletdisord.biomedcentral.com/articles/10.1186/s12891-019-2828-1

Individual Factors

In addition, there are some individual factors, as well as exposure to non-work-related physical risk factors, which may also contribute to WMSDs and can hinder the healing process after WMSDs occur (Marras et al., 2014; Marras et al., 2000). For example, the tolerance of the spine and supporting structures to withstand compressive force declines significantly with age. Starting at the age of 40 muscle mass and muscle endurance together with intervertebral disc strength begins to decline leading to less strength and mobility (Rogers, 2013). Lower compressive limits for men and women of age 60 years or more are recommended (Jäger, 2018).

Jäger also suggests that a lower safety margin is also considered for young adults of 20- 25 years of age as skeletal strength may not be fully developed. This point is interesting given the younger age of many health care students and new graduates.

Recommended spinal loading limits may also vary across individuals of different ethnicities and sexes (Hung et al., 2020).

Insufficient or poor sleep due to fatigue is a risk factor for low back pain (Vinstrup, 2020).

Physical Demands of the Task	Physical Environment	Patient	Caregiver	Psychosocial	Work Organization
• Physical effort (force) required to lift, push, pull, supporting/ holding or gripping a load • Uneven application of force e.g., between 2 HCWs • Postures (non-neutral - dynamic or static) • Cumulative workload i.e., repetitive exposure to physical risk factors within a shift and shift after shift	• Bed or worksurface height • Transfer distance • Limited/cluttered workspace • Furniture & equipment lack adjustability/ not easily moved • Coefficient of friction between the sliding surfaces e.g., floors • Thresholds/ change in floor level/ramps • Narrow doorways	• Weight • Shape/Size • Physical functioning/ ability to assist • Fall risk • Cognitive impairment (unpredictable, combative, ability to follow instructions/ level of cooperation • Fearful • Culture/ language comprehension • Fatigue • Diagnosis • Medical devices attached to patient	• The anthropometry of the care staff • Stance width and foot posture • Knowledge & experience related to SPHM technology/ work practices etc. • Previous low back injury/MSDs • Physical conditioning • Exposure to risk factors for MSDs elsewhere e.g., at other employment/ leisure • Age • Personality • Genetics	• Low job control • Reduced decision-making autonomy • Negative leadership styles • Emotional demands • Low social support by peers/ supervisors • Job dissatisfaction • Bullying/hostile work environment • Poor/ inadequate sleep/ cognitive fatigue	• Staffing & # of HCWs performing the task • Irregular & long shifts • Task pacing and variety • Lack of scheduled breaks • Exposure to manual materials handling tasks • Frequency and type of patient handling task performed

Table 1.4 *Factors that Influence the Frequency, Magnitude and Duration of Exposure to Risk Factors for WMSDs Associated with Manual Patient Handling Tasks.*

The Importance of Early Reporting of WMSDs

As previously discussed, WMSDs often develop gradually as a result of microtrauma brought about by repeated exposure to biomechanical risk factors with insufficient rest and recovery for the musculoskeletal system (OSHA 2021).

Symptoms of WMSDs such as fatigue, weakness, and dull pain are often not experienced until cellular damage to the musculoskeletal system from microtrauma has been occurring for some time. Because of the slow and progressive onset of this internal injury the condition is often ignored until symptoms become acute, often resulting in disabling injury. The slow onset of symptoms makes it more challenging for a HCW to recall a specific event that caused an injury. Thus, it is critical that HCWs report patient handling related incidents (even if there is no apparent injury) and injuries *immediately* so that treatment can be sought to improve the chances of recovery and prevent disability. ***(Figure 1.11)***

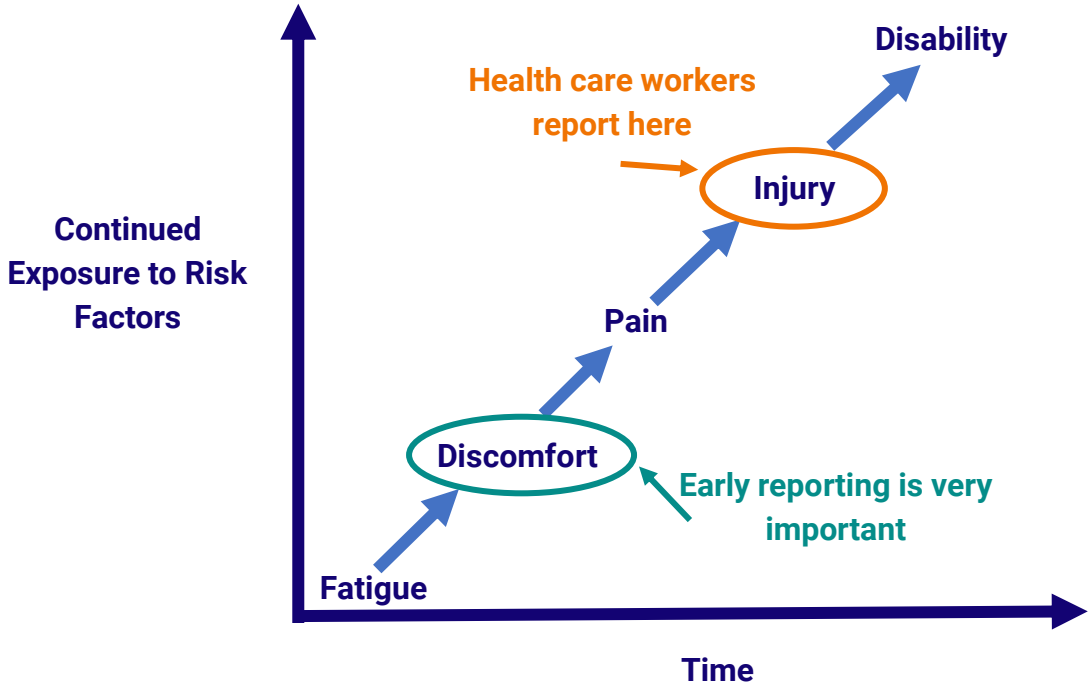


Figure 1.11 *Progression of Disability and Importance of Early Reporting of WMSDs*.

Are Traditional Methods of Addressing Patient Handling Tasks Effective?

More than 35 years of research have consistently shown that training HCWs to use 'proper' body mechanics and manual lifting techniques has failed to prevent and reduce WMSDs associated with patient handling tasks (Lavender et al., 2007; Matz et al., 2019; Martimo, et al., 2008; Warming et al., 2008).

As previously discussed, having multiple HCWs perform a manual patient handling tasks does not always reduce spinal loading enough to reduce injury risk and does not consider the impact of cumulative loading over time.

A study by Andersen et al. on over 5000 Danish HCWs found that performing just *1-2 manual patient lifts or transfers* daily increased the risk of back injury by *66%,* even after adjusting for lifestyle and work-related factors.

The risk increased when 3–10 patient lifts were performed per day and remained about the same when more than 10 lifts were performed per day. The researchers concluded that these results suggest that *any* frequency of daily transfers is a risk factor for back injury (Andersen et al., 2014).

Waters proposed that the maximum weight limit for manual patient handling is 35 lbs based on the use of the Revised NIOSH Lifting Equation (RNLE) but only if the task is *not* performed under unpredictable conditions (e.g., unexpectedly heavy loads, slips, patient combativeness, or unexpected movements) (Waters, 2007; Rogers et al., 2013). *Refer to 'How Much Patient Weight Can a HCW Lift Manually?.'*

Another traditional solution that is thought to reduce the risk of back injury when standing and transferring patients is the use of gait belts. These are a straight belt made of fabric or plastic with no handles which is placed around the patient's abdomen. Gait belts are also often promoted as a tool to control a patient's descent to the ground during a fall. However, gait belts have not been shown to reduce loads on the spine sufficiently to decrease the risk of HCW injury when performing these tasks (Marras et la., 1999; Zhuang et al., 1999; Tang et al., 2018; Rockefeller & Proctor, 2011; Miller et al., 2017).

Thus, gait belts should not be used as devices to lift patients or be relied on to reduce injury risk to HCWs when trying to control a patient descent during a fall especially with patients of size. Gait belts are intended for guidance, feedback, and steadying assist when standing and ambulating patients who can bear their own weight and have some degree of locomotion.

The excessive biomechanical and postural stress required to repeatedly lift and move patients manually creates a significantly elevated risk of injury for HCWs. The loads are too great for body mechanics to make a difference (Hu et al., 2013; Marras, 2015; Marras, 2008).

Thus, there is no safe method to manually handle patients or manually assist with patient mobilization who cannot mobilize independently or with minimal supervision or coaching.

Research supports that the most effective approach to minimize the large external loads on the spine that occur during patient handling tasks is to use mechanical lifting devices as part of a multifaceted safe patient handling and mobility program (Richarz et al., 2023).

How Much Patient Weight Can a HCW Lift Manually?

One way to illustrate how much force a HCW will exert during a shift when manually handling patients is to examine patient handling tasks completed by nurses and aides in terms of patient weight handled. In the acute care setting, repositioning a patient in bed is one of the most frequently performed tasks that is also a leading cause of low back injuries. (Callison & Nussbaum, 2012; Kotowski et al., 2013; McCoskey, 2007; Pompeii, 2009; Wiggermann et al., 2021).

In 2018, the global risk consulting company AON reported that *nearly twice* as many HCWs are injured when repositioning patients up in bed (boosting), laterally repositioning, and turning as compared to transferring patients between beds or chairs (Jones et al., 2018).

Poole Wilson et al. observed nurses in three ICUs repositioning patients an average of 35 times during a 12-hour shift. Repositioning tasks were defined as boosting and turning in bed, repositioning extremities, and repositioning a patient laterally.

The *average* number for each task per 12-hour shift was seven times of turning patient on side, eight times of repositioning patient up in bed, 19 times of repositioning extremities, and one time of repositioning patient laterally (Poole et al., 2015).

The force required to logroll (i.e., the HCW reaches over a patient and turns the patient toward them) a patient who cannot assist to turn in bed is estimated to be approximately 32% of the patient's weight (Gonzalez et al., 2009).

The average weight of US adult men and women combined is 180 lbs. (Fryar et al., 2021).

Based on the above data, an HCW who turns patients with an average weight of 180 lbs. for a total of seven times in a shift would 'handle' about *400 lbs.* of patient weight.

There is evidence to support the forces required to *boost* a patient in bed using a cotton sheet or drawsheet are *greater* than those required for turning the patient and *far exceed* the safe force limits for the spine (Wiggermann et al., 2021; Bartnik & Rice, 2013; Larson et al., 2018). However, there is no data on the force exerted as percent of patient weight when pulling or dragging the patient.

The leg of a patient with an average weight of 180 lbs. weighs approximately 31.5 lbs. (Krishnan et al., 2016; Plagenhoef et al., 1983). Thus, repositioning extremities alone could add up to handling several hundred pounds in a 12-hour shift! Given the many other manual patient handling and *materials* handling tasks that a nurse or aide may perform in a shift, it is not hard to extrapolate that they could handle the equivalent of hundreds of pounds of patient weight.

What weighs 400 lbs.?
An adult male silverback gorilla!

So, Is There a Safe Lift Limit for Manually Lifting Patients?

To keep force exerted below the recommended spinal loads (refer to *Physical Risk Factors* above), research demonstrates that the maximum weight a caregiver should manually lift is 35 lbs., but *only* if the task is performed under ideal conditions which include the following:

- The patient can follow directions and is not combative or unlikely to move suddenly during the task
- The patient is kept close to the HCW's body
- The lift is smooth and slow i.e., there are no unexpected or sudden movements
- The HCW does not have to twist
- The HCW does not have to reach with extended arms
- The shift worked is no longer than eight hours

(Waters, 2007)

In reality, few patient lifting tasks would meet these safety criteria, and few patients weigh less than 35 lbs.!

35 lbs. is approximately the weight of a typical computer task chair!

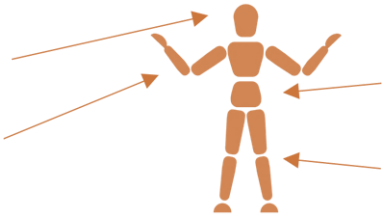
Waters (2007) provided examples of how easily the 35 lbs. weight limit is exceeded when manually handling a patient:

- If 2 HCWs are helping a patient who weighs 180 lbs. to stand from a chair and the patient can only partially assist by supporting about half of his/her own body weight, the HCWs would have to support 90 lbs. of weight. That is 45 lbs. each which exceeds the recommended 35-lb. limit.
- Even if 4 HCWs lifted or moved a patient who is unable to assist and/or bare their own body wight when standing, each HCW would support 50 lbs. which again exceeds the recommended 35-lb. limit (Waters, 2007).

The approximate weight of each body segment weigh on a patient who weighs 200 lbs. illustrated below (Krishnan et al., 2016; Plagenhoef et al., 1983; Chaffin 2006).

Head – 8% = 16 lbs.

One Arm – 5.3% = 10.6 lbs.



Whole Trunk – 54% = 108 lbs.

One Leg - 17.5% = 35 lbs.

Other recommended safe weight limits for specific patient handling tasks

- **For log-rolling or turning a patient** is 78 lbs. (35 kgs.) by 1 person and 156 lbs. (70 kgs.) by 2 persons (Waters, 2009)
- Patient handling tasks that require **static loading** of the spine and musculoskeletal system include holding a limb, supporting a patient on their side, or bending and reaching over a bed during hygiene procedures or treatment of wounds. These tasks require HCWs to use a significant amount of muscle power as they hold their body weight in one position for a period of time. Consequently, blood supply to muscles is reduced which leads to rapid muscle fatigue (Knibbe and Knibbe, 2012).

  Biomechanical guidelines that recommend safe limits for tasks requiring static postures with the goal of minimizing muscle fatigue e.g.,

  - Not working for longer than 1 minute at more than 30 degrees in a bent forward position (Knibbe and Knibbe, 2012; Knibbe et al., 2003; ISO/TR 12296:2012).
  - Not holding a patient's body part such as a leg weighing more than 7 lbs. with both hands for longer than 2 minute or more than 8 lbs. with both hands for longer than 1 minute (AORN 2021).
- There are ergonomics guidelines that define **acceptable forces for tasks involving pushing and pulling** e.g., transferring a patient in a spine position from a bed to stretcher. For tasks involving pulling forces pulling forces should not exceed 245 N at a frequency of 30 minutes for female workers (Snook, & Ciriello, 1991; Zhou & Wiggerman, 2019).

Calculating the 35 lbs. Lifting Limit

The Revised NIOSH Lifting Equation (1991) which is based on information derived from biomechanics (maintain L5/S1 compression forces below 3400 N), psychophysics (loads are acceptable to 75% of females and about 99% of males), and physiology (energy expenditure is limited to values ranging from 2.2 to 4.7 kcal/min depending on the duration and vertical distance of the lifts), was used to evaluate a safe weight limit for manual patient handling (Waters et al., 1993; Waters 2007). However, it can only be applied to a limited range of manual patient handling tasks (Waters, 2007).

SPHM and patients of size

The term 'individual or patient of size' is a more recently accepted term for obese persons and preferred over "bariatric patient" within this toolkit. Individual of size (IOS) takes into account a patient's body weight, height, and weight distribution (FGI, 2018).

An individual of size is defined as a person overweight by more than 100 lbs., with body weight greater than 300 lbs. or a body mass index (BMI) greater than 40. For safe patient handling purposes, a BMI of 30 is considered the threshold (Matz et al., 2019).

The risk of injury to HCWs significantly increases when manually lifting and mobilizing an individual/patient of size who is unable to move independently and safely. MSD risk factors such as force exerted and reach distance when performing care tasks are greater due to the patient's weight and body habitus (Choi & Brings, 2016; Cimolin et al., 2016; Davis et al., 2015; Galinsky et al., 2021; McClean et al., 2021; Réminiac et al., 2014).

From this author's experience when analyzing OSHA 300 logs and worker compensation data from several hospitals, it is observed that patients of size represent a smaller fraction of a typical hospital patient population but account for a considerable number of WMSDs to HCWs especially nurses and aides. There is little published data to reflect this finding.

The lack of rest and recovery time for the musculoskeletal system between exposure to patient handling tasks with an IOS is also a factor. Individuals of size who cannot mobilize independently, may require more HCWs to move them manually. This often means that within a shift, the same group of HCWs will perform patient handling and care tasks for an IOS, thus increasing their exposure to cumulative spinal loading.

It is important to note that one study conducted prior to the Covid-19 pandemic found that a significant number (65%) of patients admitted to the hospital for general medical conditions were overweight (34%) and obese (31%) (Hossain et al., 2018). This number has likely increased because obesity may triple the risk of hospitalization due to a COVID-19 infection (CDC, 2023).

Therefore, it is *critical* that SPHM technology is used to make care tasks safer for both HCWs and individuals/patients of size. The capacity of SPHM technology to safely lift and promote mobility for this patient population must be considered when developing a SPHM program.

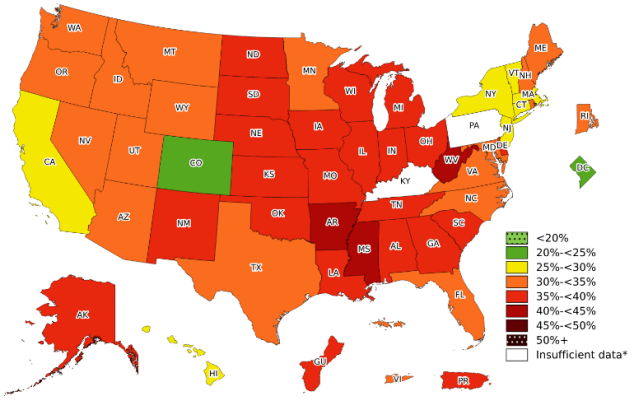
SPHM technology that can be used to lift and mobilize individuals/patients of size is discussed ***in Section 5.*** Research and resources related to the care of these patients can be found in ***Section 10.***

Obesity in the US

The national health and nutrition examination survey reported that based on data from 2017 to March 2020 the US obesity prevalence for adults aged 20 years and older was 41.9% and prevalence rate for severe obesity was 9.2%. Among children and adolescents aged 2–19 years, the prevalence of obesity was 19.7% (Stierman et al., 2021).

From 1999 –2000 through 2017–March 2020, US obesity prevalence increased from 30.5% to 41.9%. During the same time, the prevalence of severe obesity increased from 4.7% to 9.2% (Stierman et al., 2021).

Unfortunately, obesity is not just a serious health issue in the US, worldwide obesity has nearly tripled since 1975 and continues to increase (WHO, 2024).



Prevalence of Obesity Based on Self-Reported Weight and Height by State and Territory, Behavioral Risk Factor Surveillance System 2023. Source: CDC, 2024.

Obesity can be defined as "abnormal or excessive fat accumulation that presents a risk to health" (WHO, 2024). Obesity is a complex disease with many causes and factors. Once established, obesity becomes a life-long chronic disease. Obesity-related conditions include heart disease, stroke, type 2 diabetes and certain types of cancer, Sleep apnea and respiratory problems, Alzheimer's disease, depression and more. Often more than one condition (co-morbidity) is present in individuals with chronic obesity (NHLBI, 2018).

Obesity is associated with increased morbidity, increased mortality, and, subsequently, increased admittance to health care facilities (CDC 2023, Hallmark et al., 2016). The estimated annual medical cost of obesity in the United States was nearly $173 billion in 2019 dollars (CDC, 2023).

Patients with a high BMI or of greater body weight are often referred to as 'Bariatric patients.' Wikipedia defines Bariatrics as the "branch of medicine that deals with the causes, prevention, and treatment of obesity (Wikipedia, ND).

The term bariatrics was coined around 1965, from the *Greek* root bar- ("weight" as in barometer), suffix -iatr ("treatment," as in pediatrics), and suffix -ic ("pertaining to"). The field encompasses dieting, exercise and behavioral therapy approaches to weight loss, as well as pharmacotherapy and surgery. The term is also used in the medical field to refer to people of larger sizes without regard to their participation in any treatment specific to weight loss (Wikipedia, ND).

Body mass index (BMI) is a screening method for weight and is calculated by using a person's weight in kilograms divided their height in meters squared, i.e., kg/m2

A BMI over 30 kg/m^2 is considered obese and a BMI of 40 or higher is sometimes categorized as "severe" or morbid obesity (CDC, 2023). For more information about Obesity, visit the CDC Overweight webpage at https://www.cdc.gov/obesity/index.html

Legislation, Standards and Guidelines Related to SPHM

Federal Regulations

Legislative efforts to prevent WMSDs in the US began in the 1990s with the issuance of an OSHA Ergonomics Program Standard on Nov. 4, 2000. President George W. Bush and Congress repealed this standard in 2001, citing economic concerns for employers and conflicts with state workers' compensation laws (Ho, 2017).

OSHA then proceeded to address ergonomics concerns with issuance of guidelines for various industries that contain recommendations, best practices and lessons learned to prevent and control WMSDs. OSHA published the first guideline for prevention of musculoskeletal disorders in nursing homes in 2003 *(Revised March 2009)* in recognition of the need to address the high rates of WMSDs in healthcare (OSHA, 2009).

Four attempts were made in 2006, 2009, 2013 and in 2015 to pass the *Nurse and Health Care Worker Protection Act* in Congress. The goal of these bills was to require the Department of Labor to establish a standard on safe patient handling to prevent WMSDs in HCWs. However, all 4 bills failed to move out of committees.

In the United States, the Occupational Safety and Health Administration (OSHA), and the National Institute for Occupational Safety and Health (NIOSH), continue to develop guidelines to address SPHM in health care settings.

State Standards and Guidelines

In lieu of a federal standard, 10 states (CA, IL, MD, MO, MN, NJ, NY, RI, TX, and WA) have passed SPHM legislation between 2006 and 2014 in an effort to prevent patient handling injuries among HCWs. Hawaii and Ohio passed resolutions to support SPHM and in OHIO grants were provided to implement SPHM programs in long term care. However, the SPHM law in Missouri was rescinded in 2019 and Ohio's resolution grant program was repealed in 2015.

Although the nine states with existing regulations require a comprehensive SPHM program to be implemented and maintained, the scope of state laws varies.

However, there are few peer-reviewed studies that have evaluated the impact of these plans. In 2012, California passed a law that requires acute care hospitals to have a comprehensive plan to prevent patient handling injuries among employees.

Lee et al., conducted two serial cross-sectional studies in 2013 and 2016 involving statewide random samples of California registered nurses. Results showed that hospital SPHM policies and programs showed clear improvements, and a significant reduction in major musculoskeletal symptoms among workers was noted (Lee et al., 2019).

In another study, the impact of the California SPHM law on workers' compensation claims for MSDs in hospital workers was evaluated. From 2011 to 2016, the claim rate for MSDs attributed to patient handling showed a significant reduction in hospital workers, suggesting that SPH legislation played a crucial role in reducing the risk of injury among HCWs (Lee et al., 2022).

There is further evidence to support that in states with SPHM legislation patients are more likely to be mobilized with SPHM technology, and there is a decrease in WMSDs associated with patient handling (Kayser et al., 2020; Lapane et al., 2016; Lee et al., 2021; Rosebush et al., 2022; Silverstein & Schurke, 2011; Weinmeyer, 2016).

Standards and Guidance from Professional Organizations

The American Nurses Association (ANA)

In 2013, the American Nurses Association (ANA) published the *Safe Patient Handling and Mobility: Interprofessional National Standards*. The second edition of this standard was published in 2021, and details eight evidence-based standards required to implement and maintain a successful SPHM program (ANA, 2021).

1. Establish a culture of safety.
2. Implement and sustain an SPHM program.
3. Incorporate ergonomic design principles to provide a safe environment of care.
4. Select, install, and maintain safe patient handling technology.
5. Establish a system for education, training, and maintaining competence.
6. Integrate patient centered SPHM assessment, plan of care, and use of technology.
7. Include SPHM in reasonable accommodation and post-injury return to work.
8. Establish a comprehensive evaluation system.

The goal of the standards to "infuse a stronger culture of safety in health care work environments and provide a universal foundation for policies, practices, regulations and legislation to protect patients and health care workers from injury" (Powell-Cope & Rugs, 2015).

This groundbreaking document was developed by a multidisciplinary group of SPHM experts and, in lieu of federal SPHM regulation, is considered by many SPHM professionals and safety organizations as the evidence-based 'gold standard' for SPHM programs in the US (ANA, 2013; Hallmark et al., 2015).

Multifaceted Evidence-Based SPHM Programs Show Cost-Savings

In a meta review of workers' compensation claim data from 2016 and 2018, Aon, a global insurance brokerage firm, showed that health care systems using ANA SPHM standards significantly reduced the average total cost of claims.

In 2016, Aon reported a 23% reduction ($6,000 vs $7,800) for systems using the standards. Data included $2.4 billion in incurred losses across 50 states from 2005 to 2016 (Jones et al., 2016).

In 2018, Aon's analysis confirmed greater savings with a 36% reduction in cost per claim ($5,900 vs $9,200) in a larger dataset of $3.0 billion incurred losses. These findings suggest that ANA standards positively impact safety culture and effectively mitigate costs (ANA, 2021).

Appendix B provides a crosswalk to show the mapping of elements of the ANA SPHM standards to the SPHM program elements detailed in this toolkit.

Professional Associations

Several other professional associations have developed Safe Patient Handling and Mobility (SPHM) standards and guidelines for health care disciplines including the:

- American Physical Therapy Association (APTA)
- American Occupational Therapy Association (AOTA)
- Association of periOperative Nurses (AORN)
- The National Association of Orthopedic Nurses (NAON)
- Association of Occupational Health Professionals in Healthcare (AOHP)

More information about SPHM standards and guidelines from these associations can be found in ***Section 10.***

Design Standards and Guidelines related to SPHM

In recent years, federal entities and national design organizations have set standards requiring that healthcare facilities undergoing construction and renovation adhere to specific guidelines and standards to better protect HCWs and patients. These include:

The Facility Guidelines Institute (FGI)

The Facility Guidelines Institute (FGI) publishes 3 guidelines for design and construction of healthcare facilities in the US i.e., the Guidelines for Design and Construction of Hospitals; for Residential Health, Care and Support Facilities; and for Outpatient Facilities
https://www.fgiguidelines.org/guidelines/editions/

The guidelines require healthcare facilities to incorporate SPHM principles when designing new buildings, additions, and renovations of patient care and treatment areas with the goal of optimizing patient care and HCW safety. To date, 43 states have adopted these guidelines for use in their regulation of the licensing or construction of healthcare and residential care facilities. To provide architects, planners, state regulators, and healthcare organizations guidance on the rationale for, and relationship of, the physical environment with SPHM technology and practices, the FGI wrote the Patient Handling and Mobility Assessments (PHAMA) white paper in 2010. This paper was updated in 2019 and is available at no charge. It not only provides invaluable information about building design and SPHM technology but is a primer for development for SPHM programs. ***Patient Handling and Mobility Assessments: A White Paper (2nd ed. 2019) (PHAMA)*** https://www.fgiguidelines.org/resource/patient-handling-and-mobility-assessments-2nd-ed/**.**
SPHM and Health Care Design and Construction Guidelines are discussed further in ***Section 9, Table 9.5****.*

Americans With Disabilities (ADA)

Americans With Disabilities (ADA) Access to Medical Care for Individuals with Mobility Disabilities—Use of SPH Equipment in Clinics**.** Department of Health and Human Services Office for Civil Rights (HHS OCR), 2010. https://www.ada.gov/resources/medical-care-mobility/

The *Americans with Disabilities Act of 1990 (ADA)* is a federal civil rights law that prohibits discrimination against individuals with disabilities in everyday activities, including medical services.

Title II and Title III of the Americans with Disabilities Act (ADA) of the ADA requires that medical care provided in clinics (including those owned by hospitals), offices, and similar locations are accessible to patients with mobility disabilities (DOJ, 2020). This includes the use of SPHM technology such as powered floor or overhead/ceiling lifts to facilitate patient accessibility to and from exam surfaces. The Americans with Disabilities (ADA) *Access to Medical Care for Individuals with Mobility Disabilities* technical assistance guide details design requirements and use of SPHM technology in medical settings such as clinics with respect to people with mobility disabilities, which include, for example, those who use wheelchairs, scooters, walkers, crutches, or no mobility devices at all.

Did you Know?

In January 2023, the Justice Department filed a proposed consent decree with a large chain of eye care providers to resolve its lawsuit alleging that the eye care practices violated the Americans with Disabilities Act. The eye care providers must train staff on the new policy requirements and on safe transfer techniques (including use of SPHM lift technology) and pay $950,000 to patients and prospective patients who were harmed by its policies and a civil penalty of $50,000 (DOJ, 2023).

International Organization for Standardization (ISO) Standard 10535:2021 Assistive products — Hoists for the transfer of persons — Requirements and test methods

This ISO 10535 details the design and testing requirements manufacturers of patient lifts and slings should meet before their products are made available for use in any healthcare or home/community environment. In the US, ISO 10535 is recognized as a consensus standard by the Food and Drug Administration (FDA) as applied to patient lifts and slings, thus, manufacturers of such devices should at a minimum, meet ISO 10535 design and testing criteria. ***Section 5*** of this toolkit outlines the ISO 10535:2021 requirements for the design and manufacture of SPHM technology.

***ISO Standard 10535:2021 Assistive products — Hoists for the transfer of persons — Requirements and test methods*.** https://www.iso.org/standard/72711.html

CMS Recognized Accrediting Organizations

Accrediting organizations such as Det Norske Veritas (DNV), the Commission on Accreditation of Rehabilitation Facilities(CARF International) and the Joint Commission (TJC) have no specific standards related to SPHM programs.

However, the Joint Commission, through its Environment of Care standard: EC.02.06.05 #1, does require facilities that are building new structures or undergoing major renovations to use the FGI *Guidelines*, or the state construction guidelines, which are often FGI *Guidelines.* Since the FGI *Guidelines* include the PHAMA, construction should follow the PHAMA guidelines (Matz et al., 2019).

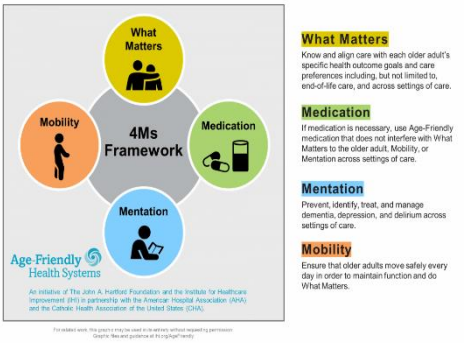
As stated in The Joint Commission EC News, August 2017 in an interview with Gary Orr, a health scientist and ergonomist at OSHA, " The Joint Commission the promotes a culture of safety in its requirements. Its hazard assessment provision requires hospitals to identify areas of risk and develop a plan to mitigate the risk. In addition, several Environment of Care standards espouse best practices that foster a safer SPHM environment." Joint Commission surveyors also look at the OSHA log and see injuries associated with patient handling as a risk," Orr notes. "Implementation of an effective SPHM program is a good way to address that risk." (TJC, 2017).

In 2012, TJC published "Improving Patient and Worker Safety: Opportunities for Synergy, Collaboration, and Innovation" which informs healthcare organizations about the risks of manual patient handling to HCWs and patients and how SPHM programs decrease these risks and facilitate safer patient care. This publication can be accessed at https://www.patientcarelink.org/the-joint-commission-improving-patient-worker-safety-opportunities-for-synergy-collaboration-innovation/

Information about the use of the CMS Durable Medical Equipment program to access SPHM technology such as floor-based patient lifts in community-based healthcare systems is discussed in ***Section 5.***

CMS Age Friendly Measure 2025 and Relationship to SPHM

Effective January 1, 2025, the Centers for Medicare & Medicaid Services (CMS) implemented a new age-friendly hospital structural measure in the CMS 2025 Inpatient Prospective Payment System (IPPS).



Hospitals that participate in the CMS Hospital Inpatient Quality Reporting Program (IQR) must report on their compliance with the measure. Hospitals that choose not to participate in the IQR program face a significant reduction in their annual Medicare payment update (The John A Hartford Foundation, 2024).

This measure focuses on five key domains to assess a hospital's commitment to delivering high-quality care for patients aged 65 and older. These domains are patient goals, medication management, frailty screening, social vulnerability, and leadership commitment.

Domain 3: Frailty Screening and Intervention, aims to screen patients for geriatric issues related to frailty including cognitive impairment/delirium, physical function/mobility, and malnutrition for the purpose of early detection and intervention where appropriate.

SPHM plays a key role in meeting the requirements of Domain 3 as related to physical function/mobility. Evidence supports the use of SPHM technology to facilitate early, safe, and progressive patient mobility and rehabilitation outcomes. The role of SPHM in early mobility programs is discussed in ***Section 5.***

A recent study by Wiggerman et al., 2024, highlights the important role of SPHM in early mobility programs. A survey of 973 HCWs 82% of whom were nurses, indicated that in early mobility programs where SPHM technology was not utilized, there was an increase in reports of pain or

CMS Age Friendly Measure 2025 and Relationship to SPHM

injury. This highlights the unfortunate possible tradeoff between patient mobility and HCW safety which could be avoided by implementing a multifaceted SPHM program (Wiggerman et al., 2024).

The Age Friendly Hospital Measure is based in part on the 4Ms Framework for age-friendly care (What Matters, Medication, Mentation and Mobility) and standards of surgical and emergency department care developed as part of JAHF-funded initiatives (The John A Hartford Foundation).

For more information:

- Medicare and Medicaid Programs and the Children's Health Insurance Program; Hospital Inpatient Prospective Payment Systems for Acute Care Hospitals and the Long-Term Care Hospital Prospective Payment System and Policy Changes and Fiscal Year 2025 Rates; Quality Programs Requirements; and Other Policy Changes. A Rule by the Centers for Medicare & Medicaid Services on 08/28/2024. https://www.federalregister.gov/documents/2024/08/28/2024-17021/medicare-and-medicaid-programs-and-the-childrens-health-insurance-program-hospital-inpatient
- Overview of Age-Friendly Hospital Measure. The John A Hartford Foundation. https://www.johnahartford.org/images/uploads/resources/Age-Friendly-Hospital-Measure-Domains-2024-Final-Rule-p-1428.pdf
- Age-Friendly Health Systems. Institute for Healthcare Improvement (IHI) https://www.ihi.org/partner/initiatives/age-friendly-health-systems

Hazard Prevention and Control - Using SPHM to Prevent Patient Handling Injuries

Effective SPHM Programs – Evidence and Outcomes for Health Care Workers, Patients and Organizations

Evidence shows that multifaceted participatory safe patient handling and mobility programs (SPHM) can be effective in reducing HCW injuries associated with patient handling and can also be beneficial for patients (Dennerlein et al., 2017; Halim, 2023; Hodgson et al., 2013; Humrickhouse & Knibbe, 2016; Jones & Eaferton, 2020; Lee & Rempel, 2020; Mayeda-Letourneau, 2014; Miller al., 2022; Nelson et al., 2006; Powell-Cope et al., 2014; Przybysz, 2017; Richarz et al., 2023; Rogers, 2013; Sorensen et al., 2016; Thomas & Thomas, 2014; Siddharthan et al., 2005; Stevens et al., 2013; Wåhlin et al., 2022; White-Heisel et al., 2017). ***(Table 1.5)***

At the core of these programs is the use of SPHM technology such as powered mobile mechanical patient lifts, ceiling-mounted or overhead lifts, and friction-reducing devices/lateral transfer aids, to safely move patients when performing patient handling tasks that expose HCWs to the risk factors for WMSDs as described previously.

The use of SPHM technology has been shown to reduce the biomechanical risk factors associated with manual patient handling to varying degrees. Powered motorized equipment such as ceiling lifts have

been shown to reduce biomechanical demands to safer levels. (Abdul et al., 2022; Bartnik et al., 2013; Dutta et al., 2012; Hwang et al., 2018; Jager et al., 2013; Koppelaar et al., 2012; Larson et al., 2018; Marras et al., 1999; Muona et al., 20; Riccoboni, et al., 2021; Richarz et al., 2022; Santaguida et al., 2002; Sivakanthan et al., 2021;Silvia et al., 2002; Vinstrup et al., 2020; Weiner et al., 2017; Wiggermann et al., 2021; Zuang et al., 1999).

However, there is less evidence to support that the use of small non-powered (non-technical) aids such as sliding sheets reduce these demands sufficiently (Freiberg, et al., 2016; Hegewald et al., 2018, Vinstrup et al., 2020).

SPHM technology is described in ***Section 5. Appendix C*** describes the development of SPHM technology over the past few decades.

Elements of Successful SPHM Programs

Research supports that SPHM programs should be designed and implemented using a system-oriented approach and include the following elements: (Adamczyk, 2018; ANA, 2021; Dennerlein et al., 2017; Hegewald et al., 2018; Huffman et al., 2014; Hurtado et al., 2018; King Jensen, 2023; Kurowski et al., 2017; McMillan et al., 2018; Olinski & Norton, 2017; Przybysz, 2017; Rugs et al., 2013; Stevens et al., 2013; Teeple et al., 2017; Totzkay, 2018; Wiggerman et al., 2024).

- Management leadership (senior and supervisory) and a safety climate that supports the use and supply of SPHM technology, program sustainability, and facilitates culture or behavioral change to promote SPHM.
- Active ongoing involvement of HCWs to facilitate and support all facets of an SPHM program.
- SPHM policies that promote minimal manual lifting and handling of patients who cannot move independently and SPHM protocols for specific patient populations e.g., bariatrics, orthopedics.
- The use of SPHM technology to safely lift, move, reposition, and transport patients, and to reduce or eliminate the risk factors for WMSDs.
- Sufficient quantity of SPHM technology that is readily accessible and is compatible with the physical, cognitive, and clinical needs of the patient; the patient handling or mobility task to be performed; the workspace the task is to be performed in; and the knowledge and skills of the caregiver.
- Defined processes for storage, cleaning, maintaining, and inspecting SPHM technology and slings with replacement plans based on lifespan of lifts, batteries, slings, etc.
- Patient-centered SPHM assessment protocols decision-making algorithms for selecting appropriate SPHM.
- Ongoing competency-based hands-on SPHM education and training.
- Facility champions (program coordinators).
- Well trained unit-based peer leaders or SPHM coaches to reinforce safe use of SPHM technology and work practices thus facilitating program effectiveness.

Elements of Successful SPHM Programs
• A well-defined and administered process for the reporting, recording, and responding to patient handling occupational injuries (incidents). • Reporting processes and culture that facilitate early reporting of injuries and effective return to work and after injury care to minimize disability. • Patient handling tasks and practices included during rounding and related periodic worker and patient safety and risk assessments. • Proactive design i.e., including SPHM in design and new construction and remodeling of health care facilities. • Periodic (at least annually) evaluation of program performance. ***Tool i*** summarizes the steps to take when designing, implementing, and evaluating a SPHM program that includes these elements.

Table 1.5 *Elements of Successful SPHM Programs.*

The use of *SPHM technology and/or training alone* has been shown to be ineffective in reducing HCW injuries (Fragala & Bailey, 2003; Hignett 2003; Kanaskie & Synder, 2018; Martimo et al., 2008; Richardson et al., 2018).

Research supports that the use of SPHM technology reduces the forces exerted on the spinal and supporting structures when manually lifting and moving patients. However, to successfully reduce the risk of WMSDs from the effect of cumulative exposure to forceful exertion, SPHM technology must be used consistently by HCWs.

Additionally, awkward postures (static and dynamic) used by HCWs when performing patient handling and care tasks are still observed even when using SPHM technology e.g., bending over a bed that is not raised to place a sling or friction reducing sheet. Reducing exposure to poor postures requires that HCWs adopt ergonomics best practices when performing their work, which requires a change in behavior or how they perform their work.

As previously discussed, the effectiveness of SPHM technology to reduce MSDS risk is also dependent on the influence of other work environment and organizational variables (Wahlen et al., 2022; Wiggerman et al., 2021).

Therefore, for SPHM programs to be successful and sustainable (i.e., for HCWs to consistently use SPHM technology and ergonomics practices), research demonstrates that the many variables that contribute to WMSDs associated with manual patient handling have to be addressed, i.e., the biomechanical, psychosocial, work organization, environmental, patient and caregiver related factors.

The extent to which psychosocial and organizational factors play a role in MSDs development and are interdependent with each other and with physical factors is not fully understood. Thus, there is limited guidance about interventions that address these factors or how to measure them within a SPHM program. However, it is likely that a well-designed SPHM program that is continuously and visibly supported by leadership and actively fosters employee involvement, could positively impact the effects of psychosocial and organizational risk factors on HCW injury and patient safety. Incorporating the program

elements listed above sends a message that the organization is committed to actively supporting HCW safety (Caponata et al., 2020; Lee & Lee, 2021; Mayeda-Letourneau, 2014).

Benefits of SPHM Programs – The Evidence Base

Health care workers

The following is a summary of the outcomes reported as a result of implementation of comprehensive SPHM programs in the US over the past 15 years: (BLS, 2018; Celona, 2014; Collins 2020; Dennerlein et al., 2017; Garg & Kapellusch, 2012; Huffman et al., 2014; Kennedy & Kopp, 2015; Kurowski et al., 2017; Matz et al., 2019; Mayeda-Letourneau, 2014; Olinski & Norton, 2017; OSHA 2013; Powell-Cope et al., 2014; Restrepo, 2013; Rugs et al., 2013; Stevens et al., 2013; Theis & Finkelstein, 2014; Thomas & Thomas, 2014; Walker, et al., 2017).

- 30%-95% decrease in the number and rates of WMSDs.
- 66%-100% decrease in severity or lost and restricted workday injury rates related to WMSDs.
- 30%-95% decrease in workers' compensation costs of WMSDs.

Increases in HCW *job satisfaction* and significant reductions in HCW *turnover* are also reported.

Initial investment for purchase of technology and implementing an SPHM program is reported to be recovered between 15 months to four years (Aslam et al., 2015; Hallmark et al., 2015; HFES, 2023).

Violence by patients against HCWs has increased significantly over the past decade with serious and sometimes deadly consequences for workers (Kurowski & Ghaziri, 2019). Use of SPHM technology such as ceiling and floor-based lifts reduces the time spent in close physical contact during a patient lift or transfer task that may agitate patients who are cognitively impaired. Consistent use of SPHM technology appears to reduce the risk of patient-initiated violence when patient care tasks are performed (Collins et al., 2006; Kurowski & Ghaziri, 2019; Pihl-Thingvad et al., 2018; Risør et al., 2017).

There is anecdotal evidence that the decrease in close physical contact with patients when using SPHM technology may also decrease the risk of *body fluid exposure*.

SPHM equipment can reduce the number of staff needed to reposition patients compared to manual repositioning, thereby also reducing the usage of personal protective equipment (PPE) and exposure to infectious disease (HFES, 2023).

Patients

It is more challenging to measure the relationship between SPHM and patient outcomes; however, there is a growing body of evidence to support that SPHM programs are beneficial to patients.

In a meta-analysis of studies that examined the association between HCW health and safety and patient outcomes, Gibson et al., reported several key findings to support the positive impact of SPHM programs that include the use of SPHM technology and policies on HCW musculoskeletal health and on patient outcomes. These include:

- Reduced risk of health-facility acquired pressure injury by up to 17%.
- Improved patient mobility by 12%.
- Improved patient comfort and safety (Garg & Kapellusch, 2012; Gibson, 2017;)

A 43%-50% decrease in pressure injuries and significant reduction in patient falls related to lift and transfer activities have been reported by some hospitals and long-term care facilities when implementing an SPHM program (Gucer et al., 2013; Kennedy, et al, 2015; Kurowski & Ghaziri, 2019; The Joint Commission, 2012; Spritzer, et al, 2015; Walden et al., 2013; Yoder et al., 2014).

There is an increasing emphasis on early mobility programs in health care because of the critical role they play in improving patient outcomes and reducing length of stay and total cost of care (HFES, 2023). Although there is need for more research to demonstrate the impact of specific SPHM related interventions on early mobility, it appears that the use of SPHM technology plays a key role in facilitating early and safe mobilization of patients (Bassett et al., 2012; Dang et al., 2022; Dickinson et al 2018; Gibson, 2017; Kayser et al., 2020; Wyatt et al., 2020). The role of SPHM in early mobility programs is discussed in ***Section 5*.**

There is evidence that the use of SPHM technology increases participation of patients in their therapeutic activities and does not have a negative impact on functional independence measure (FIM) mobility scores (Arnold et al., 2011; Campo et al., 2013; Darragh et al., 2013; Darragh et al., 2012; Mcilvane et al., 2011; Rockefeller, 2008).

Case studies in long-term care have reported that residents experience an increase in physical functioning and activity level, lower levels of depression, improved urinary continence, lower fall risk, and higher levels of alertness during the day after SPHM programs were implemented (White-Heisel et al., 2017).

Health care organizations

The benefits of fewer health care worker injuries, improved job satisfaction, and decreased employers' overall work injury costs have potentially positive long-term implications for RN retention, satisfaction, and recruitment.

Fewer patient falls, skin tears, pressure ulcers, and improved mobility and function lead to significant savings for hospitals and improve patient experience and satisfaction. This can lead to higher Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) scores or ratings, and in turn higher value-based incentives payments from the Centers for Medicare and Medicaid Services (CMS) (OSHA ,2013; CMS, 2023)

SPHM plays an integral role in the safety and health of HCWs, health care consumers and in the wellbeing of healthcare organizations. Well-designed SPHM programs not only reduce the incidence and severity and costs of health care worker injuries associated with manual handling and lifting of patients but reduce HCW turnover and facilitate improved patient outcomes (ANA, 2021).

Figure 1.12 summarizes the overall benefits of SPHM programs for HCWs, patients and healthcare organizations.

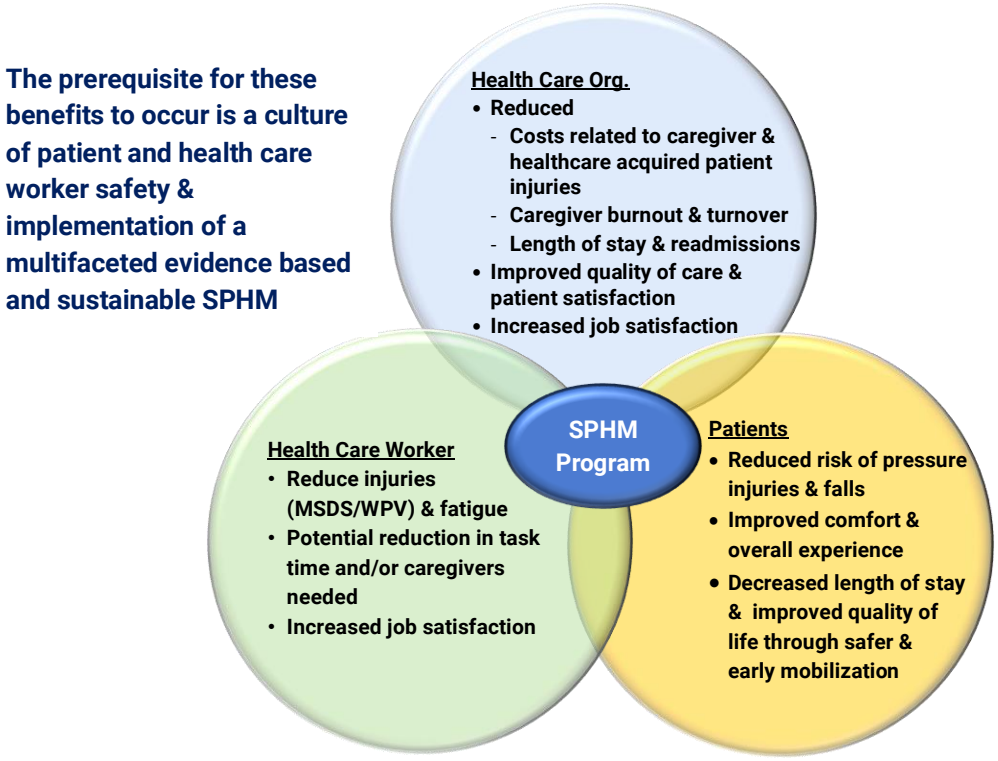


Figure 1.12 *A Summary of the Benefits and Value of SPHM Programs for Healthcare Organizations, HCWs and Patients.*

An Approach to Developing a Successful SPHM Program

The OSHA approach to management of effective occupational ergonomics, safety and health programs provides a sound framework for development of a multifaceted SPHM program that incorporates the evidence-based program components described earlier (OSHA, 2016).

The recommended OSHA program elements (listed below) are incorporated into this toolkit; however, additional elements have been added to further ensure program success and sustainably. These elements draw from the ANA SPHM standards and high reliability principles such as those detailed by the Joint Commission (TJC, 2024), Team Stepps® from the Agency for Healthcare Research and Quality (AHRQ, 2023), as well as published research, case studies, and the author's decades of experience implementing SPHM, safety, and ergonomics programs in healthcare and industry.

The following are the program components that foster a proactive and collaborative approach to preventing HCW and patient injury from manual patient handling and facilitating sustainable change.

- Management Leadership*
- Employee Participation & Engagement*
- SPHM Policy
- Program Management Organization

- Communications Structure
- Hazard Identification and Assessment*
- Hazard Control and Prevention*
- Education and Training*
- Medical Management of early symptoms of WMSDs and injuries reported by HCWs*
- Program Evaluation and Improvement*

*OSHA program components

Appendix B lists a brief description of each of the SPHM program components noted above together with the corresponding Toolkit Sections and mapping to the ANA SPHM Program Standards.

Studies show that occupational injury prevention programs are more effective and sustainable when they are multifaceted in nature, incorporated into an organization's culture and overall safety and health program, and assist to meet service delivery goals ***(Figure 1.13)***.

Continuous quality improvement principles ***(Figure 1.14)*** are used to plan, implement, evaluate, and sustain (i.e., ongoing program improvement) a multifaceted SPHM program that promotes and supports a culture of HCW and patient safety.

Implementing and sustaining a SPHM program is a journey. As program success is demonstrated to management and HCWs, SPHM becomes part of the organization's culture of safety. Over time, as the program matures and becomes integrated within the organization's practices, SPHM is considered a standard of care. Program measurements shift from reactive or lagging indicators i.e., moving from implementing hazard controls after injuries occur and using injury numbers and rates to gauge success—to proactive measures aimed at addressing risks for WMSDs *before* they arise ***(Figure 1.15)***.

Want to Learn More About How These Program Components Contribute to the Success of Safety Programs?

Useful Resources

- **Caring for Our Caregivers. Facts About Hospital Worker Safety. OSHA https://www.osha.gov/sites/default/files/1.2_Factbook_508.pdf**
- **Worker Safety in Hospitals Caring for our Caregivers Safety and Health Management Systems OSHA https://www.osha.gov/hospitals/mgmt-tools-resources**
- **Recommended Practices for Safety and Health Programs OSHA https://www.osha.gov/sites/default/files/publications/OSHA3885.pdf**
- **Burgess-Limerick, R. (2018). Participatory ergonomics: Evidence and implementation lessons. Applied ergonomics, 68, 289-293. https://www.sciencedirect.com/science/article/pii/S0003687017302740**
- **Implementing an Integrated Approach. Weaving Worker Health, Safety, and Well-being into the Fabric of Your Organization (2017). Harvard T.H. Chan School of Public Health Center for Work, Health, and Well-being https://centerforworkhealth.sph.harvard.edu/sites/default/files/10.12.17_Guidelines_Screen_post.pdf**
- **McGonagle, A. K., Essenmacher, L., Hamblin, L., Luborsky, M., Upfal, M., & Arnetz, J. (2016). Management commitment to safety, teamwork, and hospital worker injuries. Journal of hospital administration, 5(6), 46. https://pmc.ncbi.nlm.nih.gov/articles/PMC5113017/pdf/nihms822672.pdf**

Figure 1.13 *Effective, Sustainable SPHM Programs – A Systems View*

Source: Enos 2014 (adapted from Corlett, 1995, Carayon, 2012, Holden et al., 2013).

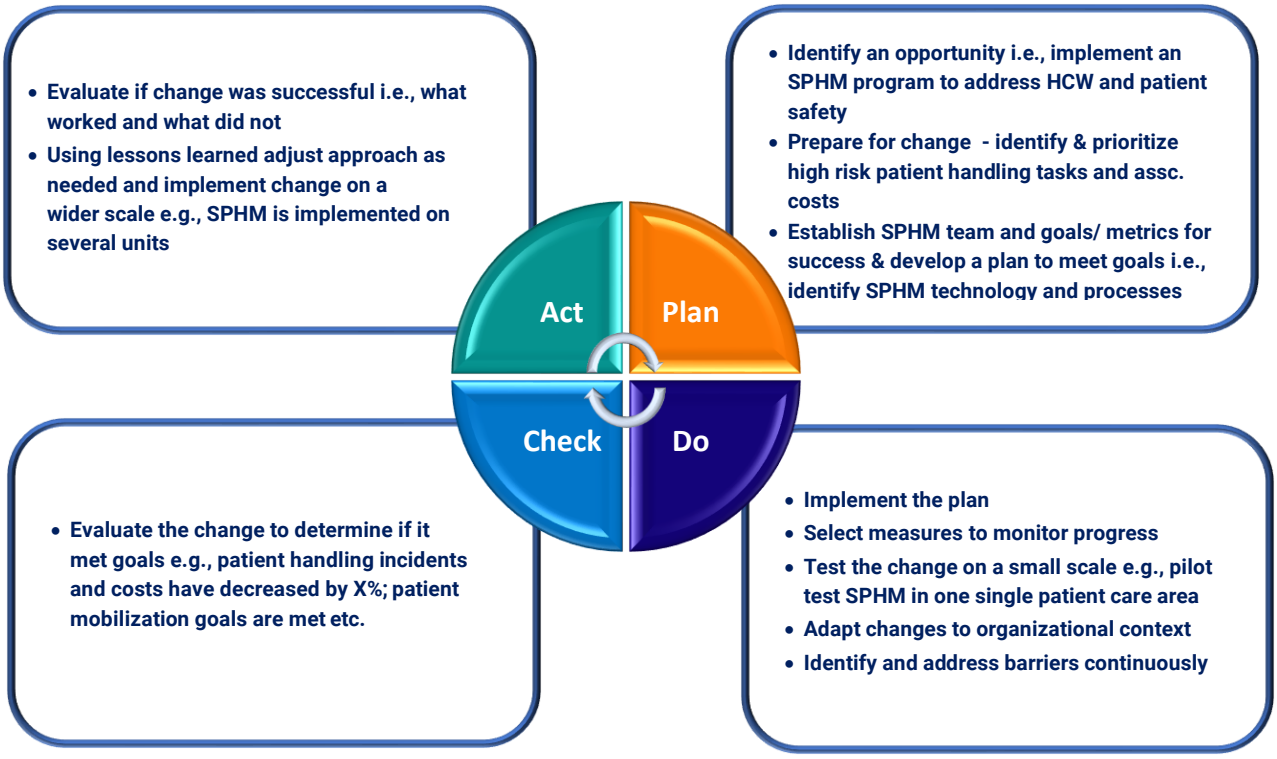


Figure 1.14 *The Plan Do Check Act (AKA The Shewhart Cycle) Approach as Applied to SPHM Programs.*

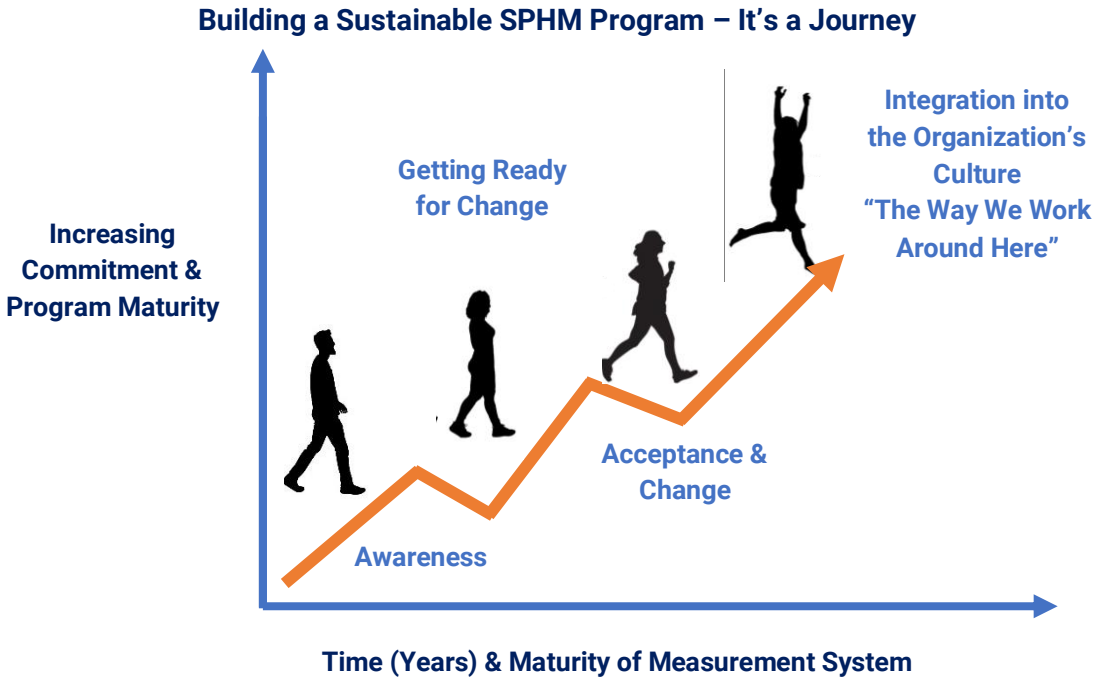


Figure 1.15 *Integrating SPHM into a Health Care Organization's Culture.*

Continuous Program Improvement

Useful Resources

- Quality Improvement Essentials Toolkit. IHI https://www.ihi.org/resources/tools/quality-improvement-essentials-toolkit
- Deming's 14 Points. University of Tennessee Health Science Center https://www.uthsc.edu/its/business-productivity-solutions/lean-uthsc/deming.php
- Endalamaw, A., Khatri, R.B., Mengistu, T.S. et al. A scoping review of continuous quality improvement in healthcare system: conceptualization, models and tools, barriers and facilitators, and impact. BMC Health Serv Res 24, 487 (2024). https://doi.org/10.1186/s12913-024-10828-0
- O'Donnell B, Gupta V. Continuous Quality Improvement. [Updated 2023 Apr 3]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK559239/

Hierarchy of SPHM Controls

The recommended approach to preventing and controlling hazards in occupational safety, health and ergonomics programs is to follow a *Hierarchy of Controls*. This includes hazard elimination/ engineering controls, administrative and work practice controls, and use of personal protective equipment (PPE).(NIOSH, 2023).

Controls to mitigate risk are categorized in order of effectiveness with elimination of the hazard being the most effective to personal protective equipment being the least effective form of control ***(Figure 1.16).***

Elimination or substitution focus on making a job task inherently safe by removing a hazard completely through a redesign process or replacing the hazard with an alternative process or equipment that does not produce a hazard.

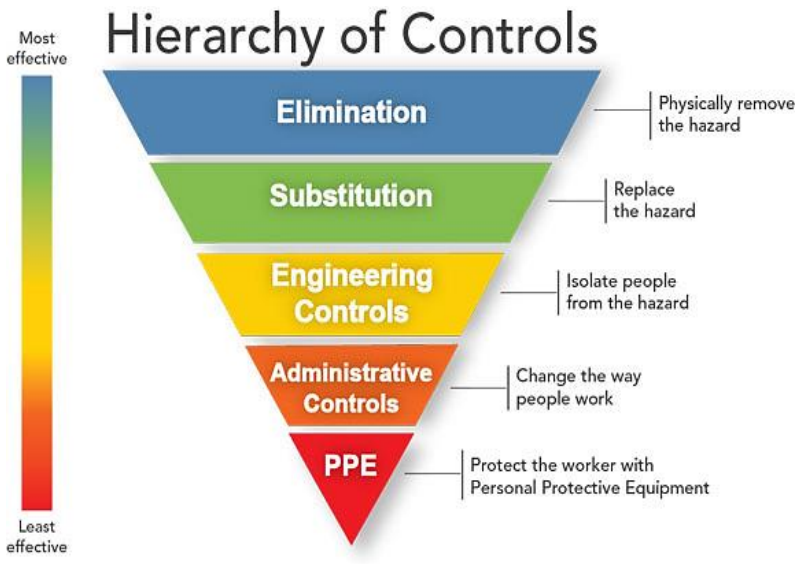
Ideally a hazard should be prevented before it occurs in the workplace and then must be addressed i.e., ensuring a hazard is not created when designing workspaces, products, equipment etc (Lyon and Popoff, 2023).

This model primarily focuses on physical hazards that occur in the workplace. It is important to note that this approach to controlling hazards should be considered in the context of the organizational culture or culture of safety within a health care organization or facility. Thus, psychosocial factors such as those that contribute to WMSDs, must also be addressed together with physical hazards (Kay and Peter, 2023).

The focus of the Hierarchy of Controls model is on what the employer should do to address occupational hazards. However, *employees* also have a responsibility per the OSHA General Duty Clause (OSHA Act 1970). That is to:

- Follow occupational safety and health rules that apply to their job
- Report any safety or health hazards to their employer
- Wear any personal protective equipment (PPE) that the employer requires
- Immediately report any workplace injury or illness
- Keep safety devices and warning signs in place, and use appropriate safeguards and equipment when exposed to hazards

It is the employer's responsibility to communicate and provide training to employees so they can meet these safety obligations in addition to providing a user-friendly non-punitive reporting system.



Source: NIOSH, 2023

Figure 1.16 *The Hierarchy of Hazard Controls***.**

SPHM Controls

Elimination and substitution are difficult when trying to prevent patient handling injuries.

Eliminating care tasks that are essential for good patient care but that pose a high risk for HCW injury, is usually not possible. However, it is still useful to discuss the potential to eliminate or substitute any tasks.

An example of *Elimination* of a high-risk task would be to eliminate bed to chair transfers by using a bed which converts into a chair configuration.

An example of *Substitution* would be replacing one type of SPHM technology with another that is more effective at reducing the level injury risk to a HCW. For instance, a mechanical overhead or ceiling lift can facilitate boosting and turning patients—along with a variety of other handling tasks—while eliminating most of the exertion required. In contrast, a friction-reducing or slippery sheet only partially reduces the force needed and is limited in its application to certain patient handling tasks.

Mechanical overhead/ceiling lifts can be substituted for powered floor lifts because they require less force to operate thus reducing injury risk (De Vito et al., 2011; Dutta et al., 2012; Lee & Rempel, 2020; Marras et al., 2009; Rice et al., 2009; Santaguida et al., 2005; Waters et al., 2012). They may also complete a wider range of patient handling tasks than a floor lift.

Incorporating SPHM and ergonomics principles into the design and construction of new building and remodeling projects in healthcare is a proactive approach to preventing hazards and is discussed in ***Section 9.***

While it can be difficult to eliminate or substitute hazards that cause WMSDs related to patient handling, engineering and administrative controls can be used effectively to reduce hazards when implemented in a comprehensive SPHM program that is supported by a culture of safety.

Examples of Controls in an SPHM Program

Engineering controls (Figure 1.17) are designed to isolate the worker from a hazard and reduce the risk of HCW injury to as low as reasonably possible. In the case of patient handling, engineering controls that can reduce the amount of force exerted by a HCW when lifting a patient include use of SPHM technology such as:

- Powered lift and transfer equipment e.g., ceiling/overhead and floor-based lifts; and sit to stand lifts; and air assist friction reducing mats
- Electric profiling beds and ergonomics hygiene equipment
- Non-powered equipment e.g., stand-assist aids and friction reducing slippery sheets

Of course, even if engineering controls (SPHM technology) are provided, HCWs must opt to use them to mitigate the risk; the option of moving a patient manually still exists. Thus, ensuring that HCWs use engineering controls requires a well-designed SPHM program with accessible technology, training on safe use, and a workplace culture that encourages technology utilization. Barriers to SPHM programs are discussed on ***page 1-47.***

Section 5 provides an overview of different types of SPHM technology and their effectiveness in reducing WMSD injury risk. ***Tool 1a*** summarizes the risk factors for patient handling-related WMSD and visually compares manual patient handling methods with safer SPHM technology.

Powered ceiling or overhead lift

Powered floor lift

Powered stand assist lift

Air assist mat transfer mat

Friction reducing device or slippery sheet

Non-powered stand assist device

Figure 1.17 *Examples of Engineering Controls i.e., SPHM Technology.*

Administrative controls do not eliminate or change a hazard, but they can, if well designed, reduce the duration, frequency, or intensity of exposure to hazards through changes in work practices. These include:

- Patient assessment and communication protocols that provide decision making guidance related to the safest way to lift and mobilize a patient ***(Refer to Section 5)***
- Use of ergonomics work practices to minimize HCW exposure to awkward postures ***(Refer to Section 5)***
- Changes in work methods or workflow to reduce risk of HCW exposure to risk factors e.g., having enough staff when moving and lifting patients of size with SPHM technology; planning patient assignments so that a nurse or aide doesn't care for the same dependent patient(s) for multiple consecutive shifts.
- Peer coaches/champions to support change in HCW behaviors so that they use SPHM technology and ergonomics work practices appropriately ***(Refer to Section 4)***
- Written SPHM policy and procedures ***(Refer to Section 4)***
- Injury reporting (non-punitive) and response including investigation protocols and corrective action to prevent reoccurrence of a similar incident ***(Refer to Section 7)***

- Education and training programs that are customized to all HCWs job responsibilities and role within the SPHM program and ensure competency-based skills are learned to facilitate safe use of SPHM technology and best work practices ***(Refer to Section 6)***
- Return to work programs for injured HCWs to facilitate retention of employees ***(Refer to Section 7)***.

Personal Protective Equipment (PPE)

If engineering and administrative strategies are not possible then PPE, the last line of defense, must be used to offer protection from hazards. PPE are items worn by workers to help reduce exposure to a hazard and thereby reduce the risk to the worker. Examples of PPE include face masks or respirators, eye protection, gloves, and gowns, ear plugs/muffs, radiology lead aprons, etc.

There is no evidence that any type of PPE such as 'back belts,' reduces the risk of injury to HCWs who are required to manually handle or mobilize patients (Rogers, 2020). However, in the not-too-distant future, *occupational exoskeleton technology* may be used as a PPE for some health care occupations to mitigate risk of injury especially in environments where the use of currently available SPHM technology is challenging or not feasible e.g., EMS and Home Care.

Administrative controls and PPE programs may be *'less expensive'* to implement than engineering controls (i.e., purchasing SPHM technology) but over the long term, can be costly to sustain and require constant monitoring or 'supervision' to ensure HCWs are trained and desired work practices and processes are followed correctly and consistently. SPHM programs require HCWs to *change* the way they deliver care. Leadership commitment of an SPHM program and supervisory support of SPHM technology use at the unit or department level together with peer support e.g., SPHM coaches/champions, are key program components to facilitate change. The principles of selecting the best SPHM controls to mitigate hazards for WMSDs are discussed in ***Section 4.***

Exoskeleton Technology

Research on exoskeletal technology in health care is growing, including its use in patient handling.

Currently exoskeletal technology is mostly used in the military and manufacturing environments to enhance the physical capabilities of soldiers and workers to perform physically demanding tasks such as manual material handling and reduce the risk of WMSDs. Exoskeletons are also used as haptic devices for training and rehabilitation (Flor-Unda et al., 2023).

Exoskeleton technology may be especially helpful in protecting HCWs in environments where SPHM technology cannot be used due to the design of the physical work environment such as emergency medical services and home care.

However, limitations of exoskeleton use must be addressed if they are to be considered as another tool to reduce patient handling related injuries to HCWs.

Currently these devices need to be custom fit for each individual worker which may hinder adoption. Devices must be lightweight, and suitable for various tasks performed by HCWs such as lifting or carrying and be easy to disinfect.

Research is limited as to whether these devices affect healing in workers recovering from WMSDs or the impact of long-term exoskeleton use near supported joints.

Health care consumer safety and experience must also be evaluated when considering the use of exoskeleton technology by HCWs (AIHA, 2023; Flor-Unda et al., 2023; Rayssiguie & Erden, 2022; Robertson et al., 2020; Turja et al., 2020; Zheng, 2020).

Barriers to Successful Implementation and Sustainability of SPHM Programs

Internal barriers or factors that hinder implementation and sustainability of successful SPHM programs in acute and long-term care are well defined.

Schoenfisch et al., defined these internal barriers as "a complex mix of patient, worker, technology, and situational/organizational factors, some of which are interdependent and dynamic in nature" (Schoenfisch et al., 2019).

A list of primary internal barriers to implementing and sustaining SPHM programs is provided in ***Table 1.6.***

Understanding these potential barriers allows you to identify those that exist in your organization and address them as you develop and implement your SPHM program.

Addressing internal barriers relies on integrating the previously mentioned components of SPHM programs into a framework that receives ongoing visible support from leadership and actively fosters employee participation program within an organization culture that embraces HCW and patient safety as interrelated and of equal significance. Refer to the *Culture of Worker and Patient Safety and the role of SPHM* on ***page 1-49.***

Implementing successful SPHM programs requires that the organization and its HCWs change the way patient care is delivered, i.e., using SPHM technology and ergonomics best practices that facilitate safer patient mobility instead of manual handling. Thus, a change-management strategy is also an essential component of planning, implementing, and sustaining an effective SPHM program.

The approach to SPHM program development described in this toolkit is designed to manage the required change, promote a culture of HCW and patient safety, and achieve acceptance of SPHM program and desired program outcomes.

Assessing organizational culture and readiness for change related to SPHM programs is discussed in ***Sections 3.*** *Change management is discussed in* ***Section 7*** *and other related resources are provided in* ***Section 10*** *of this toolkit.*

Manual Patient Handling – It's Just Part of the Job!

To ensure successful SPHM technology programs, nursing culture must address the belief that nurses should sacrifice themselves for patient handling and are at fault if an injury occurs.

Florence Nightingale viewed musculoskeletal injuries to nurses as accepted part of the job that were attributed to lack of strength and poor lifting techniques.

Isabel Hampton reinforced this notion in 1898, stating that "Occasionally the complaint is made that a nurse injured her back or strained herself in some way while moving a patient. This will generally occur because she has failed to perform the lifting properly." (Hampton, 1898).

In a recent study by Wiggerman et al., the majority of nurses surveyed reported they would manually reposition or transfer a patient weighing up to 200 lbs. Further, 30% of nurses would manually reposition, and 22% would manually laterally transfer a patient up to 300 lbs.

This reinforces the notion that nurses do not prioritize their safety together *with* the safety of their patients. As previously discussed, lifting more than 35 lbs. of patient weight manually exceeds established physical exposure guidelines for injury risk (Wiggerman et al., 2024).

SPHM Technology; Physical Environment	Organizational	Health Care Worker (HCW)	Patient
1. SPHM technology (e.g., powered lifts and slings, friction reducing devices, other assistive aids) not: • Easily/quickly accessible • Available - insufficient quantity purchased and/or internal supply chain shortages • Suitable for patient handling task/to suit patient • User-friendly for intuitive and safe use • Well maintained 2. Lack of ceiling or overhead lifts 3. Physical workspace. • SPHM technology such as floor-based lifts, does not 'fit' under beds/stretchers/around the base of chairs/ through doorways/in a small workspace e.g., bathrooms.	• Poor safety culture. • Culture that prioritizes patient safety over HCW safety • Lack of engagement /support by leadership e.g., nursing • Lack of supervisory and/or peer support at unit/dept. level to prioritize patient and HCW safety • High workload e.g., high ratio of patients to a single nurse • Understaffing • Competing demands • Lateral violence or bullying • Lack of or poorly supported SPHM policy • Lack of knowledge & skills about use of SPHM technology and protocols such as patient mobility assessments • Challenges to maintain SPHM training and practices due to high staff turnover, agency, and part-time workers. • HCWs not relieved to attend training • Perception that equipment costs too much • Lack of funding for sufficient equipment, training, or SPHM program coordinator hours • Incorrect classification of MSD injuries related to patient handling	• Place patient needs/safety first above own safety (note – prior injury not a motivator to use SPHM technology) • Belief that good body mechanics and having enough staff to perform patient handling tasks is enough • Lack of coordination of care e.g., between nursing and therapy staff about use of SPHM technology to assist in patient mobilization/Therapy staff believes that SPHM technology will hinder rehab outcomes. • Perception that the task is not dangerous e.g., technology is only needed to lift patients of size • Social pressure by co-worker (s) to perform manual lifting • Perception that using SPHM technology takes too much time • Historical knowledge of patient's ability to mobilize • Perception patient is physically capable of performing the task • Stature e.g., taller HCWs experience more back pain	• Patient ability to physically assist and cooperate/follow instructions • Patient is aggressive/ combative • Clinician conditions that preclude use of some types of SPHM technology • Emergency situations • Patient (and family) preference and/or fears about using SPHM technology/past experience • Patient motivation to be out of bed or to ambulate • A patient's urgency to use the bathroom

Table 1.6 *Internal Barriers or Factors that can Prevent Successful Implementation and/or Sustainability of SPHM Programs (not all inclusive).*

Source: (Boynton 2023; Capponechhia et al., 2020; Dennerlein et al., 2017; Harwood et al., 2016; Kanaskie & Snyder, 2018; Kayser et al., 2020; Kim et al., 2014; Kneafsey et al., 2014; Koppelaar et al., 2011; Kucera et al., 2019; Kurowski, et al., 2012; Kurowski et al., 2017; Kurowski et al., 2019; Lee & Lee, 2017; Lee & Lee, 2021; Lee, & Rempel, 2020; Mayeda-Letourneau, 2014; Noble & Sweeney, 2017; Olinksi & Norton, 2017; Park et al., 2018; Przybysz & Levin, 2017; Sampath et al 2019; Scheonfisch et al., 2011; Scheonfisch et al., 2019; Teeple et al, 2017; Vinstrup et al., 2020; Waltrip, 2019; Wiggerman et al., 2024).

Culture of Worker and Patient Safety and the Role of SPHM

The relationship between the well-being of HCWs and patient safety is globally recognized. Loeppke et al., stated "Without a safe and healthy work environment for the millions of individuals who provide care for and support the needs of patients, the core goal of ensuring patient safety is placed at risk. Healthy and safe HCWs are more likely to provide care that leads to optimized patient health and safety" (Loeppke et al., 2017).

The COVID-19 pandemic has further highlighted the urgent need to address the physical and psychological well-being of HCWs if organizations across the health care continuum are to retain and recruit sufficient numbers of HCWs to provide quality care and achieve patient safety goals (ANA, 2021; Emory et al., 2021; IHI, 2022).

However, the incorporation of HCW wellbeing as a driver that improves patient outcomes is still a relatively new concept in the US health care system. For SPHM to be implemented in health care environments across the continuum, it is *essential* that health care leaders, HCWs, and patients understand the value of SPHM to benefit both HCW and patient safety and to help retain the nursing and allied professional workforce.

The Joint Commission's publication *Improving patient and worker safety: opportunities for synergy, collaboration, and innovation* states that, "Few activities in health care link patient and worker safety more directly than lifting, transferring, repositioning, and ambulating patients."(The Joint Commission, 2012).

In the 2020 Institute for Healthcare Improvement's (IHI) *Safer Together: A National Action Plan to Advance Patient Safety,* Workforce safety is one of the four foundational areas for advancing safe and highly reliable care. https://www.ihi.org/partner/initiatives/national-steering-committee-patient-safety/national-action-plan-advance-patient-safety

In their 2022 *Implementation Resource Guide A National Action Plan to Advance Patient Safety,* IHI includes SPHM as one of the priority programs that should be implemented to address the physical and psychological safety of HCWs and foster a healthy work environment https://www.ihi.org/national-action-plan-advance-patient-safety

Incorporating SPHM into a safe, early, and progressive patient mobility and falls prevention program is an example of how SPHM can assist to benefit both HCW and patient safety.

As previously discussed, early mobility is associated with improved patient outcomes, and there is a growing evidence base that demonstrates the critical role SPHM plays in facilitating early, safe, and continuous mobilization of patients.

In fact, SPHM programs may be more successful at reducing HCW and patient injuries when specifically designed to be part of an early mobility program. The role of SPHM in facilitating successful early mobility programs is discussed further in ***Section 5.***

Although not directly researched, the application of SPHM in early mobility programs may also help to reduce the occurrence of two of the most frequently missed nursing care tasks, repositioning in bed and ambulation.

As discussed later in this toolkit, for a SPHM program to be sustainable, it *must* demonstrate its value to patient safety and health care organization goals.

Worker or patient safety programs are rarely sustainable when they are implemented using a siloed approach. Instead, a systems approach that includes collaboration across professions and departments is essential to establish SPHM as a standard of care that benefits workers, patients, and the organization.

Integrating SPHM programs with fall prevention and early mobility programs is one approach that can assist in meeting this goal ***(Refer to Section 9).***

The Current State of SPHM in the US

More than four decades of global research and published injury data have indicated that manually lifting and assisting patients with limited mobility is a significant cause of work-related injuries to HCWs across various settings in the US.

Manual patient handling significantly contributes to patient immobility, resulting in both immediate and long-term harm, including functional decline for patients. These issues also lead to considerable expenses for healthcare organizations.

Well-designed multi-faceted SPHM programs, incorporating SPHM technology such as powered lifts and stand assist devices, have been proven to reduce the incidence, severity, and costs of work-related musculoskeletal disorders (WMSDs) associated with manual patient handling. Additionally, these programs help decrease HCW turnover and enhance patient outcomes through safe, early, and continuous mobility.

However, despite the development of standards for SPHM and legislation in some states and the collaborative efforts of numerous industry, government, and academic entities to promote and integrate SPHM into US health care facilities over the past 20 years, SPHM is still not 'the norm' or considered a standard of care in many health care organizations.

In fact, after a retrospective analysis of the 2018 International Pressure Ulcer Prevalence ™ data from 642 hospitals, Kayser et al., (2020) reported that 'US acute care facilities are largely not using lifts to safely mobilize patients' (Kayser et al., 2020; Sampath et al., 2019)

There are many interdependent factors that contribute to the absence of SPHM programs in US health care facilities. These include:

- The negative impact of the pandemic on finances and staffing resources for most health care organizations in the US. This includes the effect of an unstable and transient workforce that is occurring in many job positions including management and nursing across many departments within health care facilities. These factors alone make the sustainability of any effective worker and patient safety program extremely challenging. Recent downsizing of federal occupational health and safety and health care research entities and the resources they offer to employers and the uncertainty about potential changes in CMS reimbursement rates may exacerbate these challenges.

The Current State of SPHM in the US

- Lack of national SPHM regulation, e.g., a federal standard enforced by OSHA and/or standards enforceable by accrediting bodies such as the Joint Commission, DNV and CARF. The lack of national SPHM regulation may have contributed to the patchwork approach to SPHM that is observed in health care organizations across the US.
- The lack of occupational health and safety education including SPHM, for health care students in the US. Physicians, nurses, nursing aides, allied health professionals such as physical therapists and others who will provide direct care for patients, receive education about to protect themselves against blood borne pathogens and infectious diseases during their training as students. However, education is sparse related to preventing physical and psychological injury or illness from risk factors such as, patient handling, workplace violence including bullying, stress, fatigue, and burnout.

  Most health care education programs in the US do not teach SPHM as a core curriculum element. Many schools continue to rely on teaching outdated and disproven evidence that 'proper body mechanics can prevent injuries when manually handling patients (ASPHP, 2023).

  Without exposure to SPHM techniques and training, students are at greater risk for injury during their clinical internships. Some are injured before they even graduate which increases their risk of reinjury when they enter the workforce thus jeopardizing the sustainability of the health care workforce. Insufficient SPHM training by schools also places a greater burden on healthcare organizations to provide additional training for their new HCWs.

  Given the growing demand for HCWs in the US, equipping health care students with the knowledge and skills that demonstrate SPHM is an expected *standard of practice* for patient safety and their own safety, may also provide a competitive advantage to schools when attracting and retaining students (Powell-Cope et al., 2018).

  Health care education programs *could and should* play a critical role in driving culture change to integrate worker and patient safety within health care organizations, equipping students with the knowledge and skills to ensure their health and safety and maximize the well-being of their patients (ASPHP, 2023).

  For more information review the *SPHM Education in Health Care Student Curriculum – ASPHP White Paper* https://asphp.org/wp-content/uploads/2023/09/SPHM-Curriculum-White-Paper.pdf

Information provided in this section highlights the critical need for integration of SPHM into health care settings across the continuum to protect the health and safety of HCWs and patients. This need is more urgent than ever in the post pandemic world if health care organizations are to attract and retain HCWs and offer safe, quality patient care.

Applying a systematic approach together with the strategies outlined in this toolkit, you can build a comprehensive SPHM program tailored to meet your healthcare organization's needs. This will enhance employee safety, improve patient care, and ensure continued program effectiveness within constantly changing environment.

Appendix A

A Brief History of SPHM in the US

From the early beginnings of professional nursing in Florence Nightingale's time, musculoskeletal injuries, especially from lifting patients, were believed to be an accepted part of the job. For many decades causation of back injuries in nursing was claimed to be due to the female nurse's lack of strength and poor lifting technique.

"Body Mechanics in Nursing Arts" was published in 1941 following observations that nursing students were too tired for their physical education classes after their clinical time on the wards (Monaghan, 2011). Post-World War II, early ambulation for postoperative patients increased nursing workloads due to patient instability and loss of balance. The formal concept of "body mechanics" was introduced by a physician Dr. Jesse Wright, in an article in the *American Journal of Nursing* in 1945 (Powell-Cope et al., 2008).

The Vanderbilt University School of Nursing formally incorporated body mechanics into its curriculum in 1950 to help prevent muscle strain and fatigue associated with lifting and handling patients (Monaghan, 2011). It was thought that the risk of back injuries would be reduced if nurses shifted their weight in certain ways when repositioning patients (Powell-Cope et al., 2008).

For several decades after that nurses, aides and other HCWs were taught body mechanics techniques 'to use their own body efficiently to prevent unnecessary fatigue and strain.' However, there was no evidence to support that these techniques were effective to reduce injury risk or even safe for patients (Nelson, 2006).

In the 1960s, there was some recognition that the body mechanics principles being taught such, as bending the knees and keeping the back straight, was ineffective at addressing the multiple variables that can occur during patient handling e.g., patient weight and tendency to lose balance and fall, inability to assist and combativeness, and bed height.

It wasn't until the 1970s and 80s that back injuries were validated as a leading cause of occupational injuries in the nursing population in the US and Europe (Buckle, 1986; Cohen-Mansfield et al, 1996; Snook et al., 1978) and manual lifting and transferring of patients was recognized as the most common cause of back pain (Garg, 1999). There was a realization that nurses and nursing aides typically manually lift and move patients who weigh 80-220 lbs. or more, and the ability to lift this amount of weight is beyond physical capabilities of nursing work force (Garg, 1999). Research supported that body mechanics training was not effective in reducing the incidence of low back pain (Stubbs et al. 1983).

The application of ergonomics principles and use of SPHM technology to address injuries from manual patient handling began in the 1990s. During this period, another commonly adopted method to address manual patient handling injuries in the US, was employing lift teams to reduce the physical workload for nurses.

A lift team was originally defined as "two physically fit people, competent in lifting techniques, working together to accomplish high risk client transfers" (Charney, 2009). However, although this approach was somewhat successful, it often required HCWs/lift team members to manually lift patients. Refer to ***Tool 4j*** about the Pros and Cons of using Lift Teams in SPHM programs.

OSHA also played a role in moving SPHM forward in the 1990s when they cited Beverly Enterprises Inc. (the largest nursing home chain in the US at the time) under the General Duty Clause, in 1991. They

alleged that at five of the company's 800 nursing home facilities, manual resident handling exposed employees to the hazard of injuries to the back and upper extremities. In 2002, after Beverly had appealed the citation for a decade, an agreement was reached, and Beverly had to provide SPHM technology and training to mitigate hazards associated with resident handling and lifting (OSHA 2002).

The biomechanical risk factors that cause back pain and mechanism of injury associated with manual patient handling were not well understood until the late 1990s. Research demonstrated that the physical effort required to complete manual repositioning and transfers of patients exceeded compressive and shearing forces that can be tolerated safely by the lower lumbar spine. *Refer to "Why is Manual Patient Handling So Hazardous?" in this Section.*

As the relationship between biomechanical loading of the spine during manual lifting of patients became evident, powered lift equipment was recommended to reduce the risk of WMSDs for HCWs. However, as previously described research conducted in the past 15 years indicates that other variables also contribute to WMSDs associated with patient handling such as cumulative loading of the spine and supporting structures with insufficient rest and recovery, and psychosocial factors.

Several key activities that moved SPHM forward in the US from 2000 on include (Hallmark et al., 2015; ANA 2021):

- The 'Patient Care Ergonomics Resource Guide: Safe Patient Handling and Movement' was published by the Veterans Health Administration (VHA) in 2001. This 'first of its kind' guide has since been updated to incorporate new evidence based SPHM practices developed within the VHA US wide SPHM program.
- OSHA's publication of the 'Guidelines for Nursing Homes—Ergonomics for the Prevention of Musculoskeletal Disorders' in 2003, which was updated in 2009.
- ANA's "Handle with Care" Campaign was initiated in 2004. This campaign helped to promote the use of a multi-faceted SPHM approach addressing WMSDs in nurses.
- Texas became the to pass SPHM legislation in 2005. Nine other states passed SPHM legislation and two passed resolutions to provide healthcare organizations guidance about SPHM between 2006 and 2014.
- Dr. Audrey Nelson et al. published a landmark VHA study, "Development and evaluation of a multifaceted ergonomics program to prevent injuries associated with patient handling tasks," about necessary components of effective SPHM programs in 2006.
- In 2007, research was published by Dr. Thomas Waters that detailed the amount of patient weight that could be lifted safely by a single caregiver under ideal conditions, "When is it safe to manually lift a patient?" (Waters, 2007).
- SPHM curriculum was developed and published by the Centers for Disease Control and Prevention in partnership with the NIOSH, the Veterans Health Administration, and the ANA in 2009. The curriculum was based on four years of research and testing conducted by the VHA.
- In 2010 the Facility Guidelines Institute (FGI) published the "Patient Handling and Movement Assessments (PHAMA): A White Paper" to educate design professionals about the importance of and how to integrate SPHM into design of healthcare facilities. This guide was updated in 2019 and incorporated design criteria for patients of size (bariatrics) and facilitating patient mobilization.

- "Beyond Getting Started: A Resource Guide for Implementing a Safe Patient Handling Program in the Acute Care Setting" was published in 2011 but the Association of Occupational Health Professionals (AOHP), in collaboration with OSHA. This guide was updated in 2020.
- In 2011 the Association of Safe Patient Handling Professionals (ASPHP) was formed. This non-profit membership organization initiated the SPHM Professional Certification program. This program is now managed by an independent credentialing organization, the *Certified Safe Patient Handling Professionals™ (CSPHP)*.
- In 2012, the International Organization for Standardization. Technical report (ISO TR) 12296:2012. *Ergonomics—Manual Handling of People in the Healthcare Sector was* published.
- In 2013, the American Nurses Association published the evidence-based "SPHM Interprofessional National Standards". The second edition of the standards was published in 2021. In lieu of federal SPHM legislation, these standards are considered the 'benchmark' or 'gold standard' for SPHM in the US.
- In 2014, the International Organization for Standardization (ISO) standard 10535:2006. "Hoists for the transfer of disabled persons—requirements and test methods" is recognized as a consensus standard by the Food and Drug Administration (FDA). This standard was updated in 2021 i.e., ISO 10535:2021 "Assistive products—Hoists for the transfer of disabled persons—Requirements and test methods."

Over the past decade, several other professional organizations have also worked to promote the importance of SPHM in an attempt to integrate SPHM as a standard of care throughout the healthcare continuum in the US. These efforts are described in *'Legislation, Standards and Guidelines Related to SPHM'* on ***page 1-29.***

Appendix B

SPHM Toolkit Crosswalk with the ANA SPHM Standards

The following table maps the elements of a comprehensive SPHM program described in this toolkit with the corresponding toolkit sections and the American Nurses Association (ANA) Safe Patient Handling and Mobility: Interprofessional National Standards Across the Care Continuum. 2nd edition, 2021.

SPHM program elements - OSHA NIOSH	Toolkit Section	ANA SPHM standard
1. Management Leadership • Create and sustain a culture of worker safety and health (physical and psychological) as a precondition to patient safety • Communicate ongoing commitment to a SPHM program • Define program goals and expectations • Ongoing allocation of resources to meet program goals including consistent investment in equipment, SPHM coaching, and training programs • Expect performance	**Sections 2-4, 7-9**	**1. Establish a culture of safety**
2. Worker* Participation & Engagement • Encourage employees to report safety and health concerns • Encourage workers to participate in the program i.e., in the assessment and implementation processes and the evaluation and selection of SPHM technology and processes • Involve workers in all aspects of the SPHM program • Give workers access to SPHM information • Remove barriers to participation **The term Employee Involvement is also used in this toolkit*	**Sections 2-4, 7-9**	**1. Establish a culture of safety**
3. SPHM Program Management • Program champion • Program/project manager/coordinator • Committee/Team (multidisciplinary) • Program plan (interdisciplinary) with strategic and tactical elements	**Sections 2 & 4**	**2. Implement and sustain a SPHM program**

SPHM program elements - OSHA NIOSH	Toolkit Section	ANA SPHM standard
4. Communication/Social Marketing • Identifying all stakeholders who will be affected by the SPHM program • Develop, implement, and evaluate a communications plan for the SPHM	**Section 4**	**2. Implement and sustain a SPHM program**
5. Hazard Identification and Assessment • Collect existing information about hazards associated with patient handling tasks (injury data, worker/patient surveys, gap analysis) • Inspect the workplace - Assessment of patient handling tasks, work practices, physical work environment, and patient population • Conduct incident investigations ('after action' reviews), corrective action process • Identify hazards associated with emergency and non-routine situations • Characterize the nature of identified hazards, determine the controls to be implemented, and prioritize the hazards high-risk units/areas and tasks for control	**Section 3**	**2. Implement and sustain a SPHM program**
6. Hazard Prevention and Control • Identify control options (engineering & administrative controls) • Select controls that mitigate the greatest risk of HCW injury and improve patient outcomes i.e., SPHM technology and related management of, patient mobility assessment and communication protocols, unit based coaching programs, training, and other best work practices; written SPHM policy & procedures • Develop and update a hazard control plan • Select controls to protect workers during non-routine operations and emergencies • Implement selected controls in the workplace • Follow up to confirm that controls are effective • Prevention of patient-handling related risk through design - ensure SPHM is incorporated in remodel and new build projects; changes in patient care service line and processes etc.	**Sections 4-5, 7-8**	**3. Incorporate ergonomic design principles to provide a safe environment of care** **4. Select, install, and maintain SPHM technology** **6. Integrate patient centered SPHM assessment, plan of care, and use of technology**

SPHM program elements - OSHA NIOSH	Toolkit Section	ANA SPHM Standard
7. Education and Training • Provide program awareness training • Educate workers on their specific roles and responsibilities in the SPHM program • Train workers on assessment of hazards and controls i.e., selection and use of the appropriate SPHM technology and best work practices, and procedures for reporting injuries	**Sections 4 & 6**	**5. Establish a system for education, training, and maintaining competence**
8. Medical Management of WMSDs • Medical management of early symptoms and injuries reported by HCWs • Safe early return to work programs following occupational injury	**Section 7**	**7. Include SPHM in reasonable accommodation and post-injury return to work**
9. Ongoing Program Evaluation, Improvement & Sustainability • Monitor performance and progress- evaluate success of SPHM interventions and program processes • Verify the SPHM program is implemented and is operating e.g., through HCW/patient surveys and site assessments • Correct program deficiencies and identify opportunities to improve • Plan for ongoing program sustainability	**Sections 8 & 9**	**2. Implement and sustain a SPHM program** **8. Establish a comprehensive evaluation system**

Appendix C

Development of SPHM Technology

Mechanical Patient Lifts

Patient lifts (also known as hoists) have their mechanical origins in industry and manufacturing. Although there were some efforts to develop mechanical devices to lift patients in the late 1800s ***(Figures 1 & 2)***, it was not until the 1950s that the first mobile patient lifts were invented and commercialized in the United Kingdom (UK) and United States (US).

Figure 1.
A nurse and an orderly move a patient from his bed to a bathtub with the aid of an "electric lift" in 1898.
Source: The National Library of Medicine

Figure 2.
Early version of a floor - based hoist. Date unknown.
Source: The Burns Archive

In the US, Theodore Hoyer of Oshkosh, Wisconsin, a quadriplegic, invented the 'Hoyer lift' in 1949 with his cousin, Victor Hildemann. It was an "adjustable base invalid lift" so that Hoyer could enjoy independence and mobility throughout his busy workday (Medmart, 2021).

The first wall mounted lift was installed at Headington Hill Hospital in Oxford, UK in 1954. The lift was designed and manufactured by Dr. W. Ritchie Russell, a neurologist for the United Oxford Hospitals, and an engineer, John Payne (Joerns, 2021). They went on to design and commercialize the first "Oxford" mobile patient hoist in 1955.

The Oxford and Hoyer lifts were operated by hydraulic pump, but in 1982 'The Danish Hoist' a first all-electric floor hoist operated via electric linear actuator was introduced (Mechan & Wright, 2015). Government focus on lifting and mobility equipment and services in the social sector and healthcare in Denmark and Sweden assisted designers and manufacturers in these countries to not only improve the functionality of floor lifts, but to develop first standing raising aids or sit-to-stand floor lifts and ceiling/overhead lifts (Mechan & Wright, 2015). Power floor lifts, sit-to-stand devices, and ceiling lifts have been used in US healthcare for over 20 years.

Figure 3.
Hoyer lift circa 1960
Source: Unknown

Figure 4.
Powered ceiling or overhead lift used to reposition a patient in bed

Figure 5.
Powered floor lift used to transfer a patient to/from in bed to chair

Figure 6.
Powered stand assist lift used to transfer a patient to/from in bed to chair

Repositioning Devices

The use of draw/lift sheets to reposition patients in bed first appears in the literature around the 1900s. The drawsheet is to this day often perceived to be a 'time-saver' when moving patients; it is always on the bed and ready for use, even though it requires 2 or more clinical staff for use (Mechan & Wright, 2015).

Since the 1980s a myriad of friction reducing devices (FRDs) made from a variety of materials such as plastic and nylon-based fabric have been made available for safer repositioning of patients. Over the past 20 years many published studies have shown that FRDs are significantly *more effective* in reducing injury risk to staff than a traditional cotton sheet. They also reduce the risk of injury to patients from friction and shear that occurs when patients are repositioned with drawsheets (Mechan & Wright, 2015).

The first powered air assist transfer devices were designed and manufactured in the US in the 1980s. There is some evidence that these devices have been shown to be more effective at reducing force used to reposition and transfer patients than non-rigid FRDs and rigid transfer devices such as slider boards (Hwang et al., 2018; Lloyd & Baptiste, 2006; Wiggermann et al., 2021).

Figure 7. *Drawsheet used to move patient in bed*

Figure 8. *Air assist mat used to transfer a patient from one surface to another*

Non-Powered Transfer Aids

John Thornton Posey started developing mobility 'aiding devices' in 1937 and likely introduced the first gait belt i.e., the Posey gait belt to aid mobility and ambulation activities (Vitality Medical, 2024).

These are typically a straight belt made of fabric or plastic with no handles which is placed around the patient's abdomen. Gait belts are intended for guidance, feedback, and steadying assist when standing and ambulating patients who can bear their own weight and have some degree of locomotion. However,

they are often used as lifting aids when standing and transferring a patient, and as tools to control patient descent to the ground during a fall. Gait belts have *not* been shown to reduce loads on the spine sufficiently to decrease the risk of caregiver injury when performing these tasks (Marras et al., 1999; Miller et al., 2017; Rockefeller & Proctor, 2011; Tang et al., 2018; Zhuang et al., 1999).

Many of the non-powered transfer-assistive devices that are available from various SPHM technology companies today such as, transfer boards and stand assist devices, are based on the products developed in Sweden Björn Ross and his company Romedic from 1984 -2006.

Beds

As SPHM technology has evolved during the past 30 years, so has the design of the hospital bed. Beds now have multiple features that promote patient mobility and safety such as lateral rotation and ability to convert to chair position and/or verticalization to facilitate progressive mobility of a patient into a standing position.

SPHM technology is reviewed in detail in ***Section 5.***

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