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Manual patient handling in the healthcare setting: a scoping review

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Abstract

Background Manual patient handling is the most frequently reported risk factor for work related musculoskeletal disorders in healthcare. Patient handling tasks are routinely performed manually without assistive devices and can create awkward postures and high loads for nurses and allied health professionals (AHPs). However, AHPs, notably physiotherapists, also utilize therapeutic handling to facilitate patient movement during rehabilitation.

Objectives To comprehensively map the literature surrounding manual patient handling (without assistive devices) by healthcare practitioners.

Methods AMED, CINAHL, MEDLINE, SPORTDiscus, and EMBASE databases were searched. Grey literature was sourced from Google Scholar, EThOS, Open Grey, Health and Safety Executive, National Institute for Occupational Safety and Health and Work Safe Australia. Literature published in English between 2002 and 2021 was included.

Results Forty-nine records were included: 36 primary research studies, 1 systematic review and 12 'other' including narrative and government reports. Primary research was predominantly observational cross-sectional (n = 21). The most common settings included laboratories (n = 13) and hospitals (n = 13). Seven research questions were identified, with patient handling practices (n = 13) the most common. Nurses formed the largest practitioner population (n = 13) and patients were often simulated (n = 12). Common outcomes included tasks performed (n = 13) and physical demands during patient handling (n = 13).

Conclusion and implications of key findings This comprehensive scoping review identified that most research was observational, investigating nurses in hospitals or laboratories. More research on manual patient handling by AHPs and investigation of the biomechanics involved in therapeutic handling is needed. Further qualitative research would allow for greater understanding of manual patient handling practices within healthcare.

Contribution of the paper

- Much of the research remains observational cross-sectional, investigating patient handling tasks, movement and loading in laboratory settings. Although, the number of studies being performed in hospital settings has increased recently to equal the number performed in controlled laboratory environments.
- Manual handling has been identified as a significant biomechanical factor in development of WRMSD, however, this scoping review identified a lack of literature investigating the relationship between the effect of staff training on incidence of WRMSD.
- This review identified a need for more qualitative research related to moving and handling of patients, to facilitate a deeper understanding of the topic.

Keywords: Allied health personnel; Delivery of health care; Lifting; Moving and lifting patients; Musculoskeletal diseases; Posture

Background

Healthcare practitioners routinely assist patients through manual handling across tasks including transferring from bed to chair, personal care tasks, repositioning or rolling in

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bed, and walking [1]. Nursing staff, support workers, physiotherapists and occupational therapists are among the healthcare practitioners (HCPs) involved with assisting patients within healthcare [1–3]. Work-related musculoskeletal disorders (WRMSDs) are multifactorial, they have a whole range of personal, psychosocial, environmental and biomechanical contributing factors. Psychological behaviours have been highlighted as an important aspects to consider together with biomechanical factors in relation to pain. Unclear messages relating to movement, as a result of uncertainty in the literature, are suggested to result in damaging behaviours such as hypervigilance, fear-avoidance and catastrophising [4–6]. Biomechanically, patient handling is frequently documented as the largest risk factor for WRMSDs within HCPs, with low back pain one of the most common complaints [4].

In the UK it is reported that 9.5 million working days are lost to WRMSDs each year with a financial burden of £400 million per annum to the United Kingdom's (UK) National Health Service (NHS) [7]. The United States (US) reported the cost of healthcare workers' related compensation losses as $2 billion per annum [8], with Australia reporting the cost of serious workplace injuries (1 week or more off work) as A$14 million within healthcare settings [9]. Investigation of the prevalence of WRMSD within HCPs internationally has reported rates ranging from 28% to 96% in nursing and allied health populations [9,10]. One-year prevalence of WRMSDs within physiotherapists has been reported as 58–67%, with therapeutic handling identified as an associated risk factor [11,12]. However, there is a lack of evidence investigating the risk of injury related to a flexed lifting posture [13].

Legislation on manual patient handling and associated training varies across geographical locations. Staff involved in patient handling within the NHS are required to complete annual online theory and in-person training sessions to learn recommended moving and handling principles to reduce their risk of injury [3]. Within the US, safe patient handling and mobility (SPHM) programs have been implemented in 11 states. These programs aim to improve safety of HCPs by encouraging the use of assistive devices during patient handling [14]. The majority of states, however, have not implemented SPHM programs [14].

Lifting aids and equipment can be used to improve safety of manual patient handling through decreasing the loading experienced by HCPs [14]. There are situations, however, that require nurses and AHPs to manually facilitate patient movement [1]. For example, assistive devices often require use of a sling where placement and removal can be a physically demanding task, involving moving and rolling of the patient. These patient movement tasks are completed manually by HCPs as there are no mechanical devices to aid with these steps [2]. In addition, AHPs, notably physiotherapists use therapeutic handling to aid a patient's rehabilitation. Therapeutic handling is when therapists use their own body in "guiding, facilitating, manipulating or providing resistance" to the patient [3]. The therapist will manually move and handle the patient to achieve therapeutic benefit [3].

Given the growing body of literature investigating manual patient handling undertaken without the use of assistive devices, this scoping review aimed to map that literature and identify gaps for future research. Further research could benefit HCPs by providing a more comprehensive understanding of manual patient handling. Patient handling techniques could then be improved to reduce risk of injury to HCPs. Manual patient handling in this scoping review was defined as any patient handling task that was completed without the use of an assistive aid including assisting with transfers, moving patients for care tasks or dressing, and placing of slings or sheets under patients. This scoping review forms the first step in a programme of research on manual patient handling.

A preliminary search of MEDLINE, CINAHL, JBI Evidence Synthesis, Open Science Framework, Cochrane library and PROSPERO did not identify any published or in-progress scoping or systematic reviews on the topic.

Review questions

The objective of this scoping review was to map what information sources were available relating to manual patient handling in healthcare without assistive devices. Two broad review questions related to the primary research identified by the scoping review were: 1) What is the current evidence-base on moving and handling of patients by healthcare practitioners? and 2) What primary research has been conducted on moving and handling of patients by healthcare practitioners? In particular we wanted to answer the following further sub-questions: what questions has the research addressed?; which populations has the research been conducted on?; which settings has the research been conducted in?; which aspects of patient moving and handling have been explored?; and which outcome measures/techniques/technologies have been used?

Methods

This scoping review was conducted in accordance with JBI guidance for scoping reviews [15] and followed an a priori registered open access protocol [16]. The full inclusion and exclusion criteria for the scoping review are outlined in Table 1. Qualified and unqualified staff were included as in some geographical locations (e.g., UK) both staff groups are required to undertake manual handling training and perform patient handling. Literature from any setting was included where it involved HCPs manually assisting patients (real or simulated by healthy volunteers) for tasks or transfers, including in laboratory settings. Guidelines for moving and handling differ across geographical locations. We included literature from any of the

Table 1
Inclusion criteria for scoping review.

	Inclusion Criteria	Exclusion Criteria
Participants	– Qualified or unqualified healthcare staff – Healthcare staff who are involved with manual patient handling tasks (e.g. nurses, AHPs and support staff within nursing and allied health) –Over 18 years of age	Patient handling performed by: – Students –Healthy volunteers (considered where these participants formed less than 50% of sample size and results presented separately from staff)
Concept	Manual patient handling by HCPs in: – Healthcare settings – Laboratory settings Legislation for correct patient handling	Literature solely focused on using mechanical devices (e.g. hoists, standaids) Literature solely investigating epidemiology or prevalence of WRMSD
Context	Any healthcare setting where manual patient handling is performed Laboratory settings included where the research objectives could be addressed Literature from highly developed nations (as per HDI)	
Type of Source	Primary research of any type: – quantitative, qualitative, mixed methods Literature reviews of any type: – Narrative texts, systematic reviews, scoping reviews Conference abstracts if research questions could be answered from abstract Guidelines/legislation around manual patient handling Opinion and text pieces Educational resources for HCPs	Protocols only

62 very highly developed nations as defined by the Human development Index (HDI) [17] to ensure the findings would be relevant to the UK context.

Search strategy

The search strategy aimed to locate published and unpublished primary literature, systematic reviews, text and opinion articles and educational resources. An initial limited search of AMED (EBSCOhost), CINAHL (EBSCOhost) and MEDLINE (PubMed) was undertaken using the keywords (TX moving and handling OR TX manual handling) AND (MH nurse OR TX nurs* OR TX physiotherap* OR TX allied health*). The text words contained in the titles and abstracts of relevant articles, and the index terms used to describe the articles were used to develop a full search strategy. The search strategy, including all identified keywords and index terms, was adapted for each included information source and a second comprehensive search was undertaken on 12th August 2020, and updated on 10th November 2021. Literature published in English from 2002 was included, as the influential Manual Handling Operations regulations 1992 was amended in 2002 [18]. The databases that were searched included: AMED, CINAHL, MEDLINE, SPORTDiscus (all via EBSCOhost) and EMBASE (via Ovid). Sources of unpublished and grey literature included: Google Scholar, EThOS, Open Grey, Health and Safety Executive (HSE), National Institute for Occupational Safety and Health (NIOSH), Safe Work Australia, Canadian Centre for Occupational Health and Safety, and Worksafe New Zealand. The full search strategy is provided in supplementary material.

Source of evidence selection

Following the searches, all identified records were collated and uploaded into Covidence (v2477; Veritas Health Innovation, Melbourne, Australia) and duplicates removed. Titles and abstracts were initially screened independently by three reviewers (KJ, KC, AP) against the inclusion criteria for the scoping review. Good agreement was found after 10% title and abstract screening. As this scoping review formed part of a doctoral research programme, after good agreement was established, one researcher (KJ) conducted the remainder of title and abstract screening. Three reviewers (KJ, KC, AP) were initially involved in full-text screening, however after good agreement was found following 30% of the screening, one reviewer (KJ) completed full-text screening. Regular review and discussion with the review team was maintained throughout evidence selection. Full-text records that did not meet the inclusion criteria were excluded, and reasons for exclusion are provided in supplementary material.

Data extraction

Following JBI methodological guidance, a charting table was created to record key information from the included records. The information extracted is presented in the supplementary material. Data were initially extracted independently from 10% of the included articles by two reviewers (KJ, KC), extractions were consistent, therefore, one reviewer (KJ) completed the remaining data extraction with regular team consultation. Authors of articles were

contacted to request missing or additional data where required; at the time of writing no authors have responded.

Different study types of the included records were charted. The study types included observational cross-sectional, observational cohort, pilot, and qualitative. Observational cross-sectional research included data collected at one point in time, with observational cohort data collected over a period of time. Pilot studies were defined as such by study authors and included feasibility studies and a number of studies where the type was not clearly defined (pilot-undefined).

Data analysis and presentation

Search results and included records are summarized in a PRISMA flow diagram [19] (Fig. 1). Summaries of data from all included literature are displayed in Table 2. Previously reported research and populations investigated are grouped into umbrella terms and displayed in tables. Research questions, settings and outcome measures are displayed graphically. A narrative summary accompanies each of the displayed results. The findings are reported aligned to the two research questions. The first broad review question included all the literature (n = 49), the second broad review question included primary research only (n = 36).

Results

Study inclusion

Initial screening of databases retrieved 8638 records, with an additional 31 records identified from grey sources. Following removal of duplicates, 6956 records remained for title and abstract screening. Of these, 430 records proceeded to full text screening. Forty-nine records met the inclusion criteria and are included in the review (Fig. 1).

Characteristics of included studies

A summary of general characteristics of all included records are reported in Table 3. The scoping review included 49 records; one systematic review, 36 primary research studies and 12 other evidence types. The systematic review, published in the US in 2010, included 19 articles and aimed to investigate the effectiveness of health and safety interventions on WRMSDs [18]. The most frequent primary research study design found in this scoping review was observational (n = 24) [2,21–41]. Most of the primary research was published in the US (n = 12) [2,20,24,28,34,41,42,44,46,49,52,53] followed by Canada.

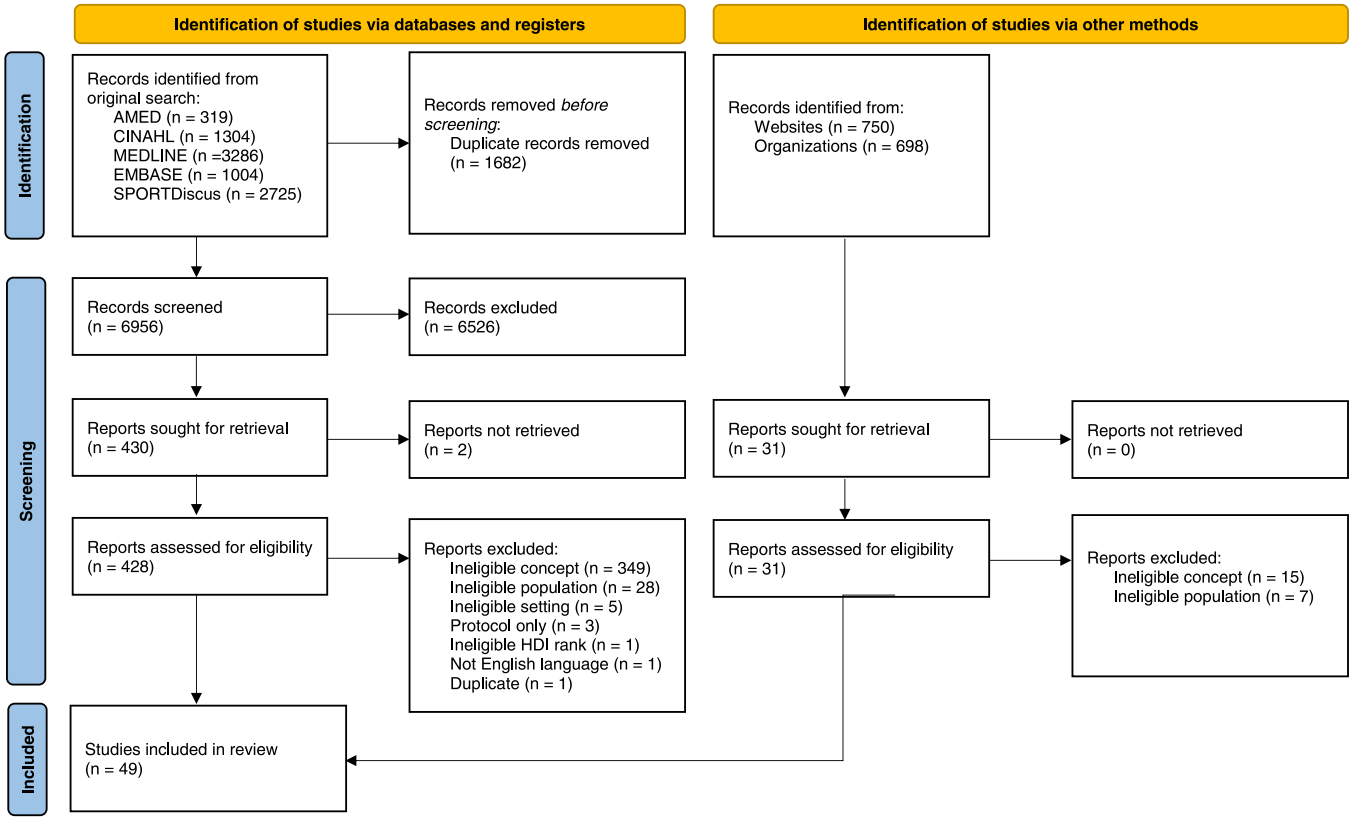

Fig. 1. Search results and study selection and inclusion process [16].

Table 2
Summary of included literatureKey: NR – Not reported, MSK - musculoskeletal.

Author, Year, Country of origin	Aims/purpose	Study type	Setting	Participant profession	Participant age, gender, years experience, description and sample size	Patient population	Outcomes: Domain. Measurement tool
Systematic reviews							
[17] Tullar, 2010, US	Do occupational safety and health interventions in health care settings have an effect on musculoskeletal health status?	Systematic review	NA	NA	NA, 19 studies included	NA	Effects of interventions in healthcare settings on MSK health. Evidence quality appraisal and data extraction and synthesis
Observational							
[2] Baptiste, 2011, US	To objectively determine the physical demands of patient transfer tasks performed by nurses	Observational cross-sectional	Laboratory	Caregiver	age NR, all male, years exp NR, caregiver represented by 1 male (approx. 6 feet tall and 200lbs), sample size 1	3 mannequins of 3 different weights	Peak force and total impulse. tri-axial load cells
[18] Brusco, 2007, Australia	To develop and implement an allied health OH&S package, based on a risk assessment model, which incorporated clinicians' clinical judgement to minimize manual handling risks, while maximizing the therapeutic benefits for the patient	Observational - cohort	Hospital	5 Physiotherapists, 5 Occupational therapists, manual handling coordinator, allied health assistant	age NR, gender NR, years experience NR, description NA, 200	All health/social care patients	Training completion, MSK injury incidence rate. Staff attendance rates, staff evaluation, incidence rate of injury
[19] Cantarella, 2020, Italy	To validate the effectiveness of MAPO method (Movement and Assistance of Hospital Patient) after the introduction of some changes to improve assessment objectivity	Observational cohort, multi-centre study	Hospital	Health and safety professionals, caregivers	< 35 = 141, 35–44 = 593, 44–54 = 801, > 55 = 463, majority female, 0–9 = 287, 10–19 = 697, 20–29 = 642, > 30 = 372, 1998 participants	Various inpatient	Incidence of back pain, risk exposure. BORG scale, staff training. MAPO risk assessment
[20] Carneiro, 2015, Portugal	To identify the main risk factors of WRMSDs for home care nurses and to perform an objective assessment of the risk for these professionals	Observational cross-sectional	Other	Home care nurses	age NR, gender NR, years experience NR, description NA, 5	Home care patients	Risk of WRMSDs. Video footage, photographs
[21] Chen, 2014, US	How are nursing work activities distributed over a 12 h day shift? And how does heart rate level differ across nursing work activities?	Observational cross-sectional	Hospital	Nurses	43.4 (SD 8.8), gender NR, 10.6 (SD 6.1), staff nurses, 8	Telemetry unit patients	Heart rate, nursing activities. Heart rate monitor, observation

Table 2 (*Continued*)

Author, Year, Country of origin	Aims/purpose	Study type	Setting	Participant profession	Participant age, gender, years experience, description and sample size	Patient population	Outcomes: Domain. Measurement tool
[22] Hodder, 2010, Canada	To chronicle trunk posture and work tasks of long-term healthcare professionals	Observational cross-sectional	Care home	Personal support workers	46.7 (SD 8.6), All female, all 19.5 (SD 9.3) observed 13.3 (SD 8.6), description NA, 27	Long term care residents	Trunk kinematics and tasks performed. Inclinometer and observation
[23] Hodder, 2010, Canada	To quantify the postural changes that occur with Back Injury Prevention Program (BIPP)	Observational cross-sectional	Laboratory	Nurses, untrained volunteers	41.6 (SD 10.2), All female, 11.3 (SD 9.5), Completed BIPP training in last 2 years, 12 untrained 10 nurses	Healthy volunteer patient (175 cm 81 kg, varying levels of passiveness, weight bearing and following of verbal cues	Muscle activity, 3D thoracolumbar kinematics. EMG, lumbar motion monitor
[24] Holmes, 2010, Canada	To evaluate peak and cumulative lumbar spine loads experienced by personal support workers	Observational cross-sectional	Care home	Personal support workers	47.2 (SD 9.4), All female, 19.6 (SD 9.3), description NA, 20	Long term care patients	Trunk posture, activities completed by each PSW. Observation, inclinometer
[25] Howard, 2013, US	1. To compare the muscle activity of 5 muscle groups of the back, shoulder, and upper extremity between 4 bed-to-wheelchair transfer types. Comparisons are made across the transfer as a whole and between the common components of the transfers. 2. To compare the duration of the components (tasks) of each transfer type	Observational cross-sectional	Laboratory	1 Occupational therapist, 1 physiotherapist	55 (SD1), All female, 19.5 (SD 13.5), description NA, 2	Volunteer patients simulating varied levels of physical ability	Bilateral muscular effort, duration of task. EMG, video recording
[26] Hye-Knudsen, 2004, Denmark	To investigate the kinematics of the thoracolumbar spine during commonly used patient handling tasks	Observational cross-sectional	Laboratory	Health care workers	43, All female, 19, description NA, 10	Stroke patient, left sided paralysis	Kinematic data, muscle activity. Lumbar motion monitor, EMG, triaxial electrogoniometer
[27] Jordan, 2011, Germany	To perform a detailed investigation on the load of the lumbar spine during manual patient handling	Observational cross-sectional	Laboratory	Health care workers	age NR, All female, Years experience NR, professionally experienced healthcare workers, 2	Two healthcare workers alternating as simulated partially cooperating patient	Load at IVD L5-S1, considering for posture and action force data. OPTOTRAK

Table 2 (*Continued*)

Author, Year, Country of origin	Aims/purpose	Study type	Setting	Participant profession	Participant age, gender, years experience, description and sample size	Patient population	Outcomes: Domain. Measurement tool
[28] Kang, 2013, Republic of Korea	To investigate the effects of the application of postural taping on the kinematics of the lumbar spine, pelvis, and hips, EMG activity of the erector spinae, and RPE in the low back during patient transfer in physical therapists with chronic LBP	Observational cross-sectional	Laboratory	Physiotherapists	30.68 (SD 4.23), All male, years experience NR, chronic LBP, 19	Healthy volunteer simulated patients	Peak angle and ROM of lumbo-pelvic-hip complex, muscle activity, RPE. VICON motion capture system, EMG, Borg scale
[29] Kim, 2014, Republic of Korea	To analyze, through ergonomic analyses, those motions most used by radiological technologists that cause musculoskeletal disorders	Observational cross-sectional	Hospital	Radiological technologist	age NR, gender NR, > 5 years experience, description NA, 7	NR	Working postures. Video footage, REBA, RULA, NLE, SI
[30] Kjellberg, 2003, Sweden	To explore the work technique applied by nursing personnel in patient transfer tasks and to determine whether different personal factors were associated with work technique	Observational cross-sectional	Hospital	Nurses, enrolled nurses	35 (SD 10), Majority female, 11 (SD 8.7), mix of participants with and without low-back, neck, shoulder pain, 102	Three healthy women simulated patients	Work technique score, personal factors. Video recordings, observation, questionnaire
[31] Kurowski, 2014, US	To obtain a comprehensive analysis of the physical workload of clinical staff in long-term care facilities, before and after a safe resident handling program (SRHP)	Observational cohort	Care home	Nurse, nursing assistants	age NR, Majority female, 3.03–6.44, description NA, 58–123	Nursing home residents	Average compressive forces on the spine, body postures, manual handling frequencies, biomechanical index. Observation, physical workload index
[32] Kyriakidis, 2021, Denmark	The purpose of our study was to investigate which organizational levels and factors determine the number of resident handlings in eldercare	Observational cross-sectional	Care home	Eldercare workers	Day shift = 44.4 (SD 10.8), night shift = 47.3 (SD 11), majority female, 15.1 (SD 11.1), 619 staff	Nursing home residents	Factors affecting number of patient handling. Staff seniority level, personal factors, number of patient handling incidences per shift

Table 2 (*Continued*)

Author, Year, Country of origin	Aims/purpose	Study type	Setting	Participant profession	Participant age, gender, years experience, description and sample size	Patient population	Outcomes: Domain. Measurement tool
[33] Larouche, 2019, Canada	To create an overall risk index that takes account of several aspects of risk, such as awkward postures recorded by a dosimeter, a lifting index, perceived exertion and duration of the task, and to compare the risk associated with patient transfers in total assistance mode observed in real work situations and assigned to three families of transfers	Observational cross-sectional	Other	Paramedics	35 (SD 10), Majority male, 11 (SD 11), description NA, 45	Various	3D angular movements of their back, lifting index, overall risk index. Camcorder, observation, posture dosimeter
[34] Larouche, 2019, Canada	To identify factors that may favor or inhibit the application of safe patient handling principles by paramedics performing full-body transfers of patients from a chair to a stretcher	Observational cross-sectional	Other	Paramedics	31 (SD 9), Majority male, 8 (SD 9), description NA, 32	Various	Work activity analysis, difficulty of various tasks in the intervention, patient handling methods. Observation, video footage, semi-structured interview
[35] Maekawa, 2009, Japan	To quantify the load on the lumbar region, predict the risk, prevent LBP, and use information in education, based on nursing techniques learned in nursing basic education and nursing modality carried out in clinical experience	Observational cross-sectional	Laboratory	Nurses	30 s, All female years experience NR, description NA, 2	Nursing staff volunteers	Twist angle of lumbar spine, muscle activity. Goniometer, EMG
[36] Skotte, 2008, Denmark	To investigate the low back load during repositioning of patients in bed and to assess the influence of patient's weight and disability	Observational cross-sectional	Laboratory	Health care workers	46 (SD 9), All female, 5–30 years, description NA, 9	Volunteer patients, 1 paraplegic with the rest otherwise healthy volunteers simulating hemiplegia, paraplegia and near paralysis	Net torque, compression and shear forces at L4/5, ground reaction forces, reaction force of thighs on the bed. Digitized video, force platforms, force transducers
[37] Skotte, 2002, Denmark	To investigate the low back-loading during common patient-handling tasks	Observational cross-sectional	Laboratory	Health care workers	43 (SD 8.7), All female, 19 (range 6–26), no special education of training on patient handling technique, 10	Stroke patient, male, 53 years old, 88 kg, left sided weakness	L4/L5 net moment, compression, shear forces, muscle activity, RPE, ground and bed reaction forces. EMG, Borg scale, video recording, force platforms, force transducers

Table 2 (*Continued*)

Author, Year, Country of origin	Aims/purpose	Study type	Setting	Participant profession	Participant age, gender, years experience, description and sample size	Patient population	Outcomes: Domain. Measurement tool
[38] Stringer, 2014, US	To investigate the influence that experience in performing manual patient transfers has on the ability to rate the assistance level required during a patient transfer	Observational cross-sectional	Laboratory	Occupational therapist, physical therapist, occupational therapy students,physiotherapy students	50.5 (range 40–56), Majority female, 26.1 (range 15–32), description NA, 23	Volunteer patients	Ground reaction forces of participant and patient, perceived level of assistance the patient required after each picot transfer. Force plates, VAS
[39] Theis, 2014, US	To evaluate the effectiveness of a safe patient handling program (STEPS) at an impatient rehabilitation unit in reducing injury due to patient transfers	Observational cohort	Hospital	Nurses, therapy staff	62.7 (SD 16.4), Equal split, years experience NR, description NA, 55	Inpatient rehabilitation patients	Injury rates pre and post training. Assessment forms
[40] Vieira, 2009, Canada	To quantify physical demands of frequent nursing tasks and provide evidence-based recommendations to increase low back safety	Observational cross-sectional	Laboratory	Nurses	Orthopaedic 35 (SD 7) Intensive care 34 (SD 9), All female, years experience NR, description NA, 36	Same nursing participants simulating patients	Lumbar ROM, motion during nursing tasks, L5/S1 compression and shear forces estimated, sufficient torso strength estimated. Electrogoniometer, perpendicular marker photogrammetry
Pilot studies							
[41] Arias, 2017, US	To characterize the physical load of trunk flexion and physical activity of patient care unit (PCA) workers	Pilot - undefined	Hospital	Nurses, patient care assistants	42 (SD 13), Majority female, Years experience NA, description NA, 50	Thoracic intensive care, orthopedic, burn and trauma, cardiac and cardiac step down patients	Physical activity, trunk flexion. Accelerometer, tri-axial accelerometer
[42] Fiedler, 2012, Canada	To determine the feasibility of documenting all job-related nursing tasks performed during a typical shift in a hospital setting using video	Pilot - feasibility	Hospital	Nurses	40.6 (SD 13.3), 13.6 (SD 11.2), description NA, 10	Intensive care unit, inpatient rehabilitation, complex continuing care unit, acute care unit, outpatient surgery, ambulatory care	Patient handling tasks. Camcorder, observation
[43] Fragala, 2011, US	To quantify and objectively measure the risk reduction achieved with the gravity assist feature	Pilot - undefined	Laboratory	Caregivers	age NR, gender NR, years experience NR, description NR, sample NR	200 lb mannequin	Total force, peak force, total work, slope of the force curve. Force transducer
[44] Garzillo, 2020, Italy	To propose an MPH training model involving interdisciplinary aspects	Pilot - undefined	Hospital	Healthcare workers	men 49.4 (SD 7.2) women 45.9 (SD 8.8), equal split of gender, 24.6 (SD 8.1), 52 staff members	Various inpatient	Risk assessing tasks, staff training, effort required for tasks. Questionnaire, multidisciplinary training program, BORG scale

Table 2 (*Continued*)

Author, Year, Country of origin	Aims/purpose	Study type	Setting	Participant profession	Participant age, gender, years experience, description and sample size	Patient population	Outcomes: Domain. Measurement tool
[45] Newton, 2020, Australia	To ascertain the incidence of Australian private practice sonographers moving patients unassisted and determine what training these sonographers have in order to appropriately perform these procedures	Pilot - undefined	Other - sonography clinics	Sonographers	age NR, gender NR, < 5 = 24, 6–10 = 6, 11–20 = 4, > 21 = 1, 35 respondents	Outpatient	Incidences of manual assistance of patients, level of training. Survey
Qualitative							
[46] de Ruiter, 2011 US	To identify patient-handling practices in clinical practice	Qualitative	Hospital	Registered nurse, nursing assistant	age: < 24 = 7 24–36 = 13 40–59 = 9 60 + =3, Majority female, < 1 = 3 1–3 = 9 4–10 = 10 11–20 = 7 21 + =3	Neurology and rehabilitation patients	Patient handling practices and nurses' judgment of these practices, observation of caregivers and interviews
[47] Osborne, 2021, Australia	To investigate emergency nurses' beliefs and experiences with patient handling in the emergency department	Qualitative - phenomenological	Hospital	Nurses	age NR, majority female, mean 3.9 years (range 1–27), 40 participants	ED patients	Experiences of patient handling. Focus group interviews
[48] Wangbad, 2009, Sweden	To describe nurses aids' experiences of physical strain during person transfer tasks as dementia care units	Qualitative	Hospital	Nurses aids	43 (range 26–64), All female, 15 (range 2–31), description NA, 16	Dementia patients	Experiences, apprehensions, person transfer tasks. Focus groups
Survey							
[49] McKoskey, 2007, US	To describe patient-handling demands in inpatient units during a 24-hour period at a military health care facility	Survey	Hospital	Nurses, licensed practical nurses, nursing assistants, and nursing students	35 (SD 10.7), Majority female, Median 6 (range 0.5–38), description NA, 283	Military inpatients	Nature and impact of patient-handling tasks relative to a variety of nursing care units, patient characteristics, and transfer equipment. 24-hour population survey
Conference abstract							
[50] Lavender, 2016, US	To measure the compression and shear loads on the spine that are experienced as slings are (1) placed under patients prior to lifting, and (2) removed at the completion of the transfer	Conference abstract - repeated measures study	Laboratory	Nurses	age NR, gender NR, years experience NR, description NA, 12	simulated patients, 54 kg and 100 kg	Muscle activity, lumbar spine compression, shear forces. EMG, digitized video
[51] Nikolajsen, 2015, Denmark	To document and describe how manual patient handling may be carried out as part of everyday practice	Conference abstract - Mixed methods	Other	Health care providers	age NR, gender NR, years experience NR, description NA, 56	Various	Manual patient handling activities. Field notes and observation.

Table 2 (*Continued*)

Author, Year, Country of origin	Aims/purpose	Study type	Setting	Participant profession	Participant age, gender, years experience, description and sample size	Patient population	Outcomes: Domain. Measurement tool
[52] Wade, 2017, UK	To investigate healthcare staff perceptions surrounding manual handling and patient handling related injuries	Conference abstract - ethnographic study	Community	Physiotherapists, occupational therapists	age NR, gender NR, years experience NR, 8 participants for observation, 6 for interviews	Community	Manual patient handling factors, challenges/benefits, perceptions of training. Observation, focus groups
Other literature							
[53] Apple, 2021, US	To review published research and describe the ergonomic challenges of working in the OR	Other, narrative review	NA	NA	all NA	Peri-operative patients	Ergonomic challenges, safety recommendations. Data from literature
[54] Haney, 2003, US	To review various physical stressors as they relate to the capacity of the human body during handling (lifting, transferring, moving, and walking) of residents	Other, narrative review	NA	NA	all NA	NA	Force and repetition,dynamic lifting, posture, risk management, push/pull forces, philosophy of care. Data from literature
[55] Hignett, 2007, UK	To review the implementation of EU Health and Safety Directive on Manual Handling (90/269/EEC) for patient handling in 9 European countries and gather expert opinion on the residual problems (barriers) to safer patient handling	Other, Narrative summary of government statistics and expert opinion from a panel of manual handling experts	NA	NA	all NA	All health/social care patients	Implementation of the EU manual handling directive, expert opinions. European of National Government statistics, expert opinion.
[56] Johnstone, 2020, UK	To discuss WRMSDs within Nursing focusing on legislation, regulations and risk-assessment	Other, narrative review	NA	NA	all NA	All health/social care patients	WRMSD in nursing related to moving and handling. Information from legislation and guidance materials
[57] Rinds, 2008, UK	To consider the importance of safe manual handling, risk assessment, the law and useful equipment designed to aid the care worker	Other, Narrative summary of law and guidance in manual handling in healthcare	NA	NA	all NA	All health/social care patients	Safety during manual patient handling. Information and evidence from laws and guidance.
[58] Tofts, 2012, UK	To explain the legislation related to moving and handling, with particular application to community nurses	Other, Narrative summary of legislation surrounding moving and handling in the community	NA	NA	all NA	All community patients	Legislation surrounding moving and handling. Information from health and safety publications

Table 2 (*Continued*)

Author, Year, Country of origin	Aims/purpose	Study type	Setting	Participant profession	Participant age, gender, years experience, description and sample size	Patient population	Outcomes: Domain. Measurement tool
[59] Vatwani, 2017, US	To provide practical information and instruction for caregivers assisting individuals experiencing difficulty performing bed mobility tasks	Other, Educational short article	NA	NA	all NA	All health/social care patients	Educational resources.
[60] Waters, 2007, US	To describe high-risk patient handling tasks performed frequently in critical care units, delineate the physical demands associated with each task, identify technologic solutions, and outline useful tips for making each task safer	Other, Ergonomic task force identified tasks with high risk for MSK disorders	Hospital	Nurses, nurse managers	all NR	NR	Critical care tasks that are high force, awkward posture, repetitive loading. Observation.
[61] Waters, 2011, US	To determine the best practices for safe lateral patient transfers	Other, Ergonomic tool for positioning	NA	NA	all NA	All health/social care patients	Ergonomic tool development. Risk assessment tools.
[62] Waters, 2011, US	To determine the best practices for safe positioning and repositioning of the supine patient	Other, Ergonomic tool for positioning	NA	NA	all NA	All health/social care patients	Safety during supine patient handling. Risk assessment tools.
[63] Weiner, 2015, Israel	To present current research about the risk factors, prevention strategies, and assistive devices that could reduce work-related musculoskeletal disorders caused by repositioning patients in bed	Other, Narrative summary	NA	NA	all NA	All health/social care patients	Association between WRMSDs and repositioning patients in bed, risk factors for WRMSD during patient repositioning in bed. Published literature and data.
[64] Weinmeyer, 2016, US	Laws and programs to address the problem of nursing-specific musculoskeletal injuries.	Other, Narrative summary of laws and programs for safe patient handling for health care workers	NA	NA	all NA	All health/social care patients	Working conditions leading to injuries, patient handling related injuries, barriers to safe patient handling. Published laws, programs.

Table 3
Overview of reports included in scoping review (n = 49) by study type, year of publication, country of origin and sample size of number of studies included presented as a percentage of total included reports.

Research – Type of study included (n = 37)		**Other – Type of literature included (n = 12)**	
Observational cross-sectional	20 (41%)	Narrative summaries of legislation or statistics	8 (16%)
Observational cohort	4 (8%)	Ergonomic tool	2 (4%)
Pilot – undefined	4 (8%)	Task force	1 (2%)
Conference abstract	3 (6%)	Educational page	1 (2%)
Qualitative	3 (6%)		
Pilot – feasibility	1 (2%)		
Survey	1 (2%)		
Systematic review	1 (2%)		
Year of publication		**Year of publication**	
2017–2021	9 (18%)	2017–2021	3 (6%)
2012–2016	11 (22%)	2012–2016	3 (6%)
2007–2011	14 (29%)	2007–2011	5 (10%)
2002–2006	3 (6%)	2002–2006	1 (2%)
Country of origin		**Country of origin**	
United States	12 (24%)	United States	7 (14%)
Canada	7 (14%)	United Kingdom	4 (8%)
Denmark	5 (10%)	Israel	1 (2%)
Australia	3 (6%)		
Sweden	2 (4%)		
Republic of Korea	2 (4%)		
Italy	2 (4%)		
Portugal	1 (2%)		
Japan	1 (2%)		
Germany	1 (2%)		
United Kingdom	1 (2%)		
Sample size and number of included studies			
< 10	10 (20%)		
10–19	9 (18%)		
20–29	2 (4%)		
30–39	4 (8%)		
40–49	4 (8%)		
> 50	9 (18%)		
Range	1–1998		
Median	23		
Interquartile range	41.5		
Systematic review	19		

Narrative literature

The 'other' literature included narrative text (n = 8) [56–61,66,67] and educational pieces (n = 4) [62–65]. Narrative texts described legislation, directives and previous research and were largely published in the US (n = 7). Additionally, narrative texts and opinion pieces provided education materials and guidance for improving manual patient handling in settings ranging from the community to operating theatres.

The following sections of the scoping review are focused on the primary research identified (n = 36) in order to address the review sub-questions.

Questions addressed by primary research

Aims and objectives of the included primary research were reviewed and multiple research questions were identified, with some comprising sub-questions. The research questions included: 1) physical demands during manual patient handling (n = 13) [2,22,24,28,31,34,36,41,43,44,47,51,52]; 2) patient handling practices and tasks performed (n = 13) [24,25,27,32–36,45,48,49,52,54]; 3) improving safety of patient handling (n = 7) [21,26,34,42,43,46,47]; 4) risk assessment of patient handling tasks (n = 8 [21–23,32,36–38,46]); 5) investigation of kinetics (loading) experienced by the HCP (n = 7) [2,27,30,38–40,53]; 6) investigation of kinematics (joint motion) (n = 7) [25,26,29,31,32,36,44]; and 7) personal factors affecting patient handling (n = 9) [31,33,35,37,39,41,50,51,55].

Populations

The summary of populations included in the review is displayed in Table 4. The largest staff population included in the review was nursing, with many studies investigating both qualified and unqualified staff (n = 9)

Table 4
Healthcare staff groups, age, gender, years of experience and patient populations included in research (n = 36).

Nursing	
Registered nurses	14 (39%)
Healthcare workers	13 (36%)
Nursing assistants	4 (11%)
Allied Health	
Physiotherapists	5 (14%)
Occupational therapists	4 (11%)
Paramedics	2 (5%)
Allied health assistants	1 (3%)
Therapy staff	1 (3%)
Radiological technologists	1 (3%)
Other	
Manual handling coordinators	1 (3%)
Health and safety professional	1 (3%)
Age range	
< 20–30	1 (3%)
31–40	9 (25%)
41–50	14 (39%)
51–60	4 (11%)
> 61	2 (5%)
Gender	
All female	2 (5%)
Majority female	15 (42%)
All male	2 (5%)
Majority male	6 (17%)
Equal split	2 (5%)
Years of experience	
< 1	1 (3%)
2–5	6 (17%)
6–10	7 (19%)
11–15	12 (33%)
16–20	9 (25%)
> 20	7 (19%)
Patient population	
Simulated by volunteers	12 (33%)
Inpatient	11 (31%)
Care home	4 (11%)
Community	4 (11%)
Mannequins	2 (5%)
Unspecified	2 (5%)
Outpatient	1 (3%)

[21,25,33,34,41,42,44,49,52]. There was substantial heterogeneity in terminology for staff populations across studies limiting the accuracy of extraction. Physiotherapists were investigated in 5 of the included primary research [21,28,31,41,55]. Most participants were aged between 31 and 50 years and typically comprised all-female or majority female cohorts. The most common patient population included in primary research were volunteer simulated patients (n = 12) [26,28–31,33,38–41,43,53].

Settings

Laboratory (n = 13) [2,26,28–31,38–41,43,46,53] and hospital (n = 13) [21,22,24,32,33,42,44,46,47,49–52] settings were the most common settings used in primary research. Investigations into kinetics and kinematics were most frequently performed in laboratory settings with observation of patient handling practices investigated more frequently in hospital settings.

Aspects of manual patient handling

Relevant information was extracted to address the seven specific research questions of the scoping review and are presented in Table 5. A broad range of aspects were investigated within each research question. Investigating the tasks performed and estimation of spinal forces were some of the most frequently identified aspects in the primary research. Personal factors largely investigated practitioners experiences, perceptions and how staff and patient factors impact patient handling practices.

Outcome measures

Outcome measures were separated into measurement domains and tools, with the measurement tools grouped according to the domain they were used to measure, and are displayed proportionately in Fig. 2. Physical demands and tasks performed were the most frequently investigated domains. Kinematics showed the most variation in measurement tool. Two primary research studies investigated staff training and its effect on incidence of reported WRMSD [21,42]. One study quantified the risk of WRMSD with associated with nursing tasks by using ergonomic assessment tools [22]. A table of all included outcomes and references are included in the supplementary materials. Within primary research published in the last 5 years there has been an increase in use of qualitative measurement methods, especially to investigate practitioner perceptions and experiences.

Table 5
Summary of aspects of included literature.

Question	Aspect
Physical demands	Trunk position/loading [40,41]
	Fatiguing/straining tasks for HCPs [2,31,48]
	Potential solution for demanding tasks [2,48]
	Muscular effort [25]
	Perceived exertion[19,33,44,49]
	Level of assistance provided by HCPs [38,44]
	Heart rate [21]
Patient handling practices	Tasks performed by HCPs [21,24,32,42,45,46,49,51]
	Time taken for tasks [29,42,46,49]
	Staff positioning [21,29]
	Number of staff used [23,49]
	Patient factors (e.g. weight) [23,49]
	Ergonomic assessment [29–31]
Improving safety	Staff training [18,22,39,44]
	Identification of high risk tasks [40]
Risk assessment	Creation of staff training package [18]
	Risk assessing tasks [19,20,29,33,34]
	Risk reduction measurement [43]
	Risk prediction [35]
Kinetics	Estimation of spinal forces [2,24,27,35–37,50]
	Ground reaction forces [27,36]
	Action forces at hands/thighs [27]
Kinematics	Trunk movement during patient handling [23,26,33,41]
	Effect of training on trunk movement [22]
	Effect of taping on trunk movement [28]
	Analysis of full body postures [29]
Personal factors	Impact of patient factors (e.g. weight/level of disability) [36,48]
	Staff knowledge and impact on patient handling [48]
	Staff age, gender, experience level and impact on patient handling [28,30,32,38]
	Physical constraints experienced [34]
	Experiences of patient handling [47,48]
	Perceptions of moving and handling [44,46,52]

Discussion

In this scoping review, the literature on manual patient handling in healthcare was identified and examined, providing a comprehensive map. This allowed for a focus on manual patient handling tasks that require manual assistance from HCPs or involve therapeutic handling. The literature comprised a range of records with a variety of outcome measurement tools. Primary research studies incorporated a variety of outcome tools to address their specific research question.

Research

This scoping review included 49 records, of which only one was a systematic review published in 2010. This suggests a need for further robust evidence synthesis, which can inform practice within healthcare. As will be highlighted further in the discussion, potential systematic reviews for which there may be adequate evidence include HCPs movement during manual patient handling tasks. The most common study design was observational cross-sectional. These studies are generally time efficient and inexpensive to perform and allow for investigation of multiple outcomes [68]. Observational studies, however, are generally unable to establish cause and effect and may identify a range of spurious factors that would lead to ineffective interventions if developed [68]. Further well-designed research

Fig. 2. Outcome measures from the primary research (n = 36) separated into measurement tools (outer ring) and the domain that they were used to collect data for (inner ring)(size of sections based on relative count for each measurement tool). Key: LMM – Lumbar motion monitor; Posture D – Posture dosimeter; TG – Tri-axial goniometer; TA – Tri-axial accelerometer; PWI – Physical workload index; TLC – Tri-axial load cells; Erg Assessment – Ergonomic assessment; 24-h – 24-h Survey.

including therapeutic handling, handler movement and handler perceptions is required to better establish the factors that increase risk of injury and to provide appropriate targets for interventions.

The evidence base investigating AHPs is small in comparison to nurses. Nursing forms the largest occupational group within healthcare globally [69] and a high rate of WRMSDs has been found within the profession [70]. However, AHPs perform many of the same tasks, in addition to therapeutic handling to aid patients' rehabilitation. Therapeutic handling can be manually intensive with little research exploring how these tasks are performed, how manually intensive they are, and the potential risks associated with performing them regularly. Within the five included records that investigated physiotherapists, three investigated patient transfers with only one investigating therapeutic handling.

This scoping review found that it is more common to explore which tasks are performed during manual patient handling than to investigate how they are performed and their burden through exploration of biomechanics including the joint angles and internal forces experienced. Research conducted more recently investigated personal factors, experiences and perceptions of patient handling with a variety of observational and qualitative methods. Many studies used healthy volunteers as simulated patients, especially in laboratory-based research. Volunteers enable laboratory investigations to occur where more detailed measurements can be made, but may lack ecological validity where they do not accurately represent patients with physical or cognitive deficits. There is a lack of research conducted within outpatient and community settings, where healthcare practitioners need to adapt their practice to each patient's environment and the equipment they have available [61], and this needs to be addressed. Research conducted outside a laboratory environment can provide a more realistic and comprehensive account of the movements involved. However, there is less control over variables with a risk of losing some of the precision laboratory settings can provide. A limitation of research in clinical settings, especially for

kinematic analysis, is the lack of access to gold-standard measurement tools such as Vicon or OPTOTRAK [71]. Instead, research frequently used 2-D video, photographs and inclinometers. On balance, the findings from this scoping review identify there is a need for both research with the tools and control of the laboratory as well as the naturalistic setting of hospitals and the community.

Narrative literature

The remaining literature sources included within this scoping review mostly comprised narrative summaries of legislation and government statistics. The legislation surrounding moving and handling in the UK was last updated in 2002. NHS staff involved in moving and handling are required to complete training following principles of safe manual handling, however, the evidence behind the training is unclear [72]. In addition, there is no specific AHP training for correct moving and handling of patients in a therapeutic manner.

Literature originating from the US has a focus on SPHM programs with an emphasis placed on using assistive devices to aid manual patient handling. Programs based on assistance devices are not found universally across the US, however, with HCPs still required to manually move and handle patients for certain tasks or movements.

Gaps in the literature

Few studies have focused on AHPs performing manual patient handling despite these staff groups being likely to be involved with therapeutic handling practices which are manually intensive. There are no current guidelines or formal training provided to AHPs within the UK for correct therapeutic handling, and this review found no evidence that such training occurs in other geographical locations. This is therefore a priority area for future research. Despite manual handling being identified as a significant factor involved in development of WRMSD, a lack of research was identified within this scoping review.

The records identified in this scoping review demonstrate that there is a lack of detailed measurement of manual patient handling in healthcare settings with real patients, with many articles measuring trunk position or using video or photos for full body analysis. Measuring patient handling in laboratory settings is more accurate via access to 3D motion analysis systems. However, these often involve simulated patients and thus may not accurately reflect how healthcare practitioners move and handle real patients in the healthcare environment. Technology used to collect data in healthcare settings does not allow for the recording accuracy of laboratory-based systems, however, due to recent advances in technology this is an area that could now be explored further.

Few studies qualitatively assessed moving and handling of patients in healthcare. Ethnographic research and further investigation into perceptions and experiences of patient handling could allow for improvement of staff training and guidance to reduce risk of injury.

Of the records included in this scoping review, one primary research study was conducted within the UK. More research is required internationally, and especially in the UK, to inform this local context and to allow relevant evidence to help guide and improve staff training content or methods of teaching to reduce the risk of injury on HCPs.

Strengths and limitations

This scoping review followed a comprehensive search strategy and protocol that was reviewed by an experienced research team with previous experience in scoping reviews. There remains the possibility that some relevant articles were not included which is also likely to be the case as the search was restricted to the English language. The methodological quality of literature included in this scoping review was not assessed in keeping with methodological guidance for scoping reviews where the aim was to map the available literature rather than to assess its quality or the implication of study findings. Most of the included research was conducted in the US and Canada, therefore there may be difficulty with generalizing findings to other healthcare contexts.

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Conflicts of interest

The authors declare no conflict of interest.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.physio.2023.06.003.

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