

MUSCULOSKELETAL DISORDERS IN THE HEALTHCARE SECTOR

1. Introduction

In the European Union (EU), the healthcare sector covers approximately 10 % of total employment (1), including work at hospitals, at healthcare facilities and in home and community care. More than three-quarters of the workers are women. While the sector employs nurses, nurses' aides, assistants, physicians, therapists, technicians, service workers, office workers and other groups, the present discussion paper will focus on the most significant job groups in terms of taking care of patients (nurses, nurses' aides, and social and healthcare assistants).

With the prospect of an increased care burden due to a relative increase in the number of elderly citizens across the EU (2–4), combined with the challenge of recruiting a sufficient number of healthcare workers (1), the EU is likely to suffer from an increased lack of healthcare workers in the future. As life expectancy increases in the population, the average age of the workforce also increases (5). With increasing age, the ability to perform physically demanding work — e.g. handling and transferring patients — becomes increasingly difficult due to a natural loss of muscle strength and physical fitness (6). Thus, a triple challenge will face the healthcare sector:

- an increased care burden;
- recruitment challenges;
- an ageing workforce.

Focusing on good working conditions is vital both for the reputation of the sector — and thereby for the ability to recruit young people into this type of education and employment — and for maintaining good work ability among workers throughout the entire working life.

Musculoskeletal disorders (MSDs) are a significant health challenge for workers with physically demanding work and can lead to a loss of work ability, absenteeism and early involuntary exit from the labour market (7). In some cases, a specific diagnosis such as osteoarthritis, disc herniation or carpal tunnel syndrome can be used to classify the disorder. However, the majority of MSDs are non-specific — e.g. pain in the low back, neck, shoulder, arms or legs. As pain intensity increases, the risk of long-term sickness absence equally increases in healthcare workers (8). The pain may build up over time or occur suddenly as an accident, e.g. during a patient transfer (9,10). While pain can also be fluctuating, the pain is more likely to reoccur after an initial episode (11,12). Thus, preventing MSDs should be a priority. However, pain can have several causes, and even young people entering the healthcare sector can develop MSDs (13). Regardless of the cause of MSDs, performing physically demanding work when having pain is highly difficult (14,15). Effective management of MSDs in workplaces through work accommodation and the use of assistive devices is therefore necessary. A combined effort focusing on the following factors is necessary to avoid the loss of work ability and early involuntary exit from the healthcare sector due to MSDs:

- preventing MSDs;
- reducing MSDs;
- managing MSDs.

Research-based knowledge about risk factors and effective workplace interventions is vital in this regard.

This discussion paper aims to review the existing literature on MSD risk factors and effective interventions in healthcare workplaces. The literature included will mainly be from European countries to ensure its relevance for EU working cultures and practices, although good-practice examples and research from other parts of the world will be included when necessary.

- Chapter 2 provides an overview of MSDs in the healthcare sector in the EU, drawing on data from the European Working Conditions Survey (EWCS) (2015) and the European Survey of

Enterprises on New and Emerging Risks (ESENER) (2014 and 2019) in addition to country-specific examples.

- Chapter 3 reviews risk factors for developing MSDs and related consequences (sickness absence and early labour market exit), based on large-scale observational studies following thousands of healthcare workers over time. Knowledge from biomechanical laboratory studies is also included where appropriate. The risk factors cover (1) physical workload, (2) organisational and psychosocial factors and (3) individual factors.
- Chapter 4 reviews and discusses effective interventions for preventing, reducing and managing MSDs in healthcare workplaces, based on randomised controlled trials (often short-term studies) and good-practice case examples in which healthcare workplaces have successfully implemented and sustained such interventions for years.

2. Size of the problem

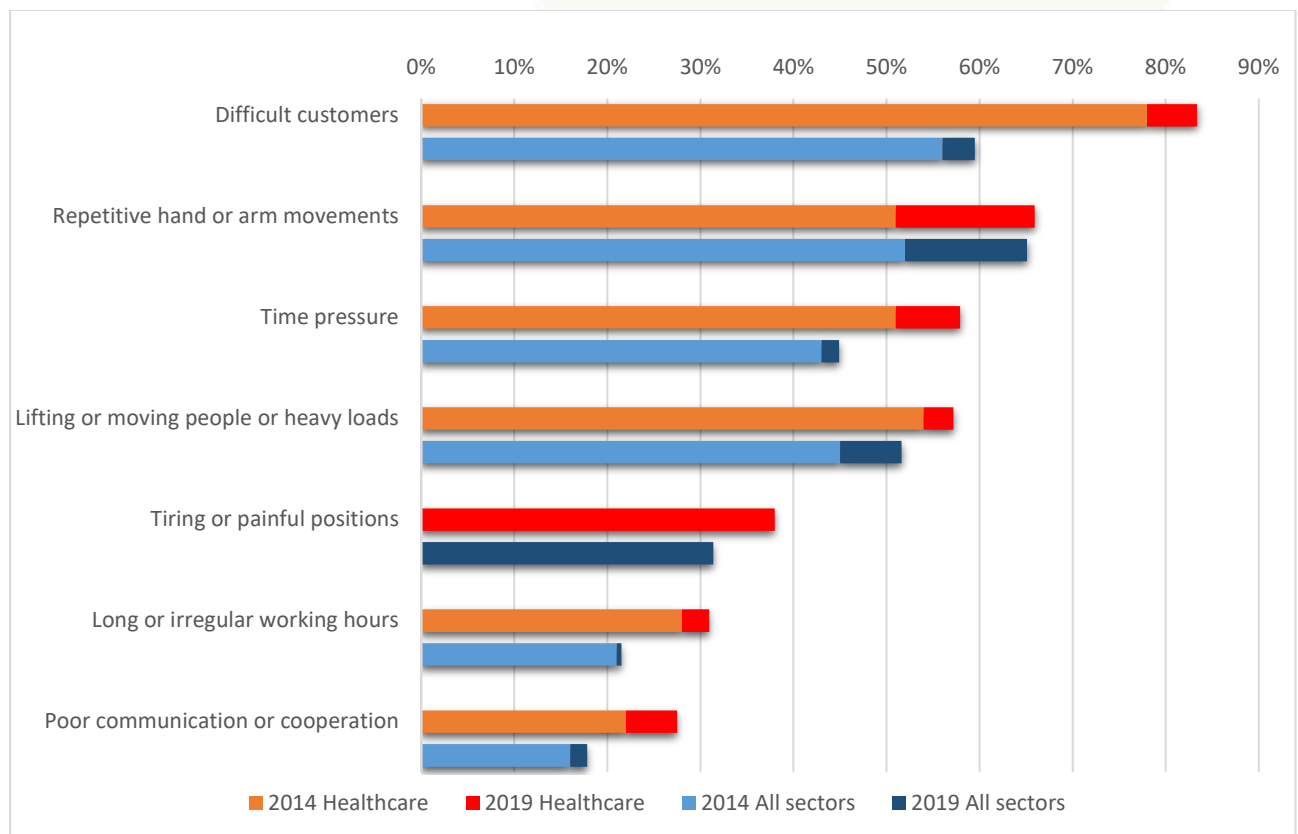
Worldwide during the last 30 years, low-back pain has been the leading cause of years lived with disability in both women and men (16). MSDs are a comprehensive challenge across the EU, not only for individual workers but also in terms of high costs for workplaces and societies (17). ESENER and the EWCS provide up-to-date knowledge about risk factors in the work environment and on MSDs in different occupational sectors across the EU. Such data can be complemented with administrative data, national registers on sick leave and data from epidemiological studies.

Reporting of risk factors for MSDs

In ESENER-3 (2019), 45,420 establishments in 33 countries (the EU-27 and Iceland, North Macedonia, Norway, Serbia, Switzerland and the UK), across all sectors and employing at least five people, were surveyed about safety and health in their workplaces (18). According to this comprehensive survey, risk factors are reported more frequently in the healthcare sector ('Human health and social work activities') than in other sectors as a whole, and the majority of risk factors increased in the healthcare sector from 2014 to 2019 (Figure 1). Lifting or moving people or heavy loads, repetitive hand or arm movements and tiring or painful positions are physical risk factors of MSDs among healthcare workers. Furthermore, psychosocial risk factors — which indirectly influence MSDs — are also reported more frequently in the healthcare sector than in other sectors, in particular in terms of demanding customers, time pressure, long or irregular working hours and poor communication or cooperation.

Other studies have confirmed the high physical workload of healthcare workers. For example, the Cultural and Psychosocial Influences on Disability Study (CUPID), spanning 47 occupations in 18 countries from six continents, reported that nurses had the highest prevalence of heavy manual lifting compared with other occupations in 94 % of the countries (19).

Figure 1. Risk factors for MSDs present in the healthcare sector ('Human health and social work activities') in 2014 and 2019 compared with all sectors in the EU-27



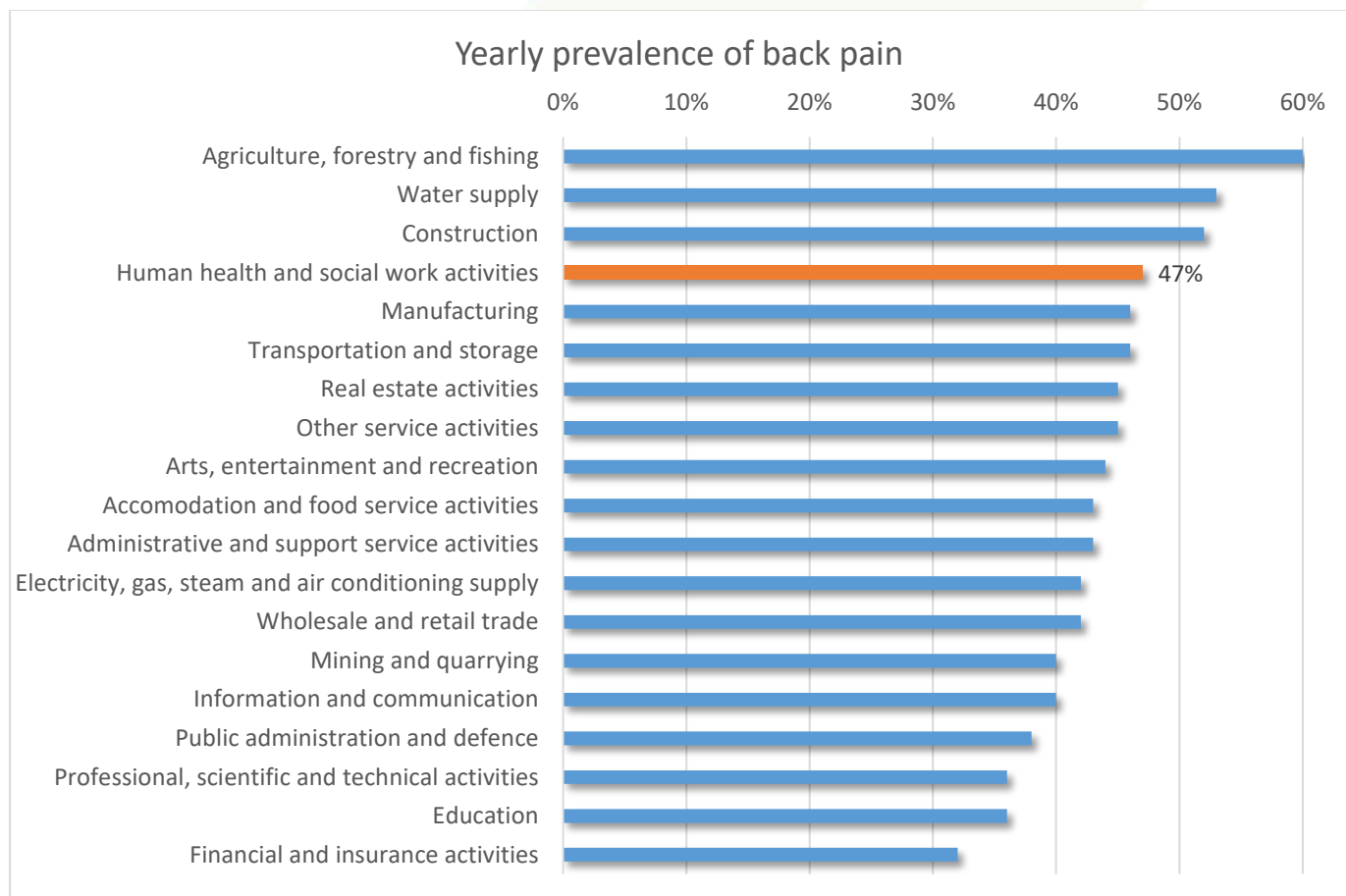
Base: all establishments in the EU-27, ESENER-2 (2014) and ESENER-3 (2019).

Note: 'Tiring or painful positions' was measured differently in 2014 and is therefore included only for 2019.

Prevalence of MSDs

Based on the EWCS (20), sectors characterised by physically demanding occupations generally have a higher prevalence of MSDs than sectors characterised by occupations with seated work. The healthcare sector is no exception. Based on the EWCS, 47 % of the workers in human health and social work activities experienced back pain (Figure 2) and 46 % experienced upper limb pain in the past 12 months (17). It has to be noted that further segregated information highlighting human health work activities only is not available.

Figure 2. Percentage of workers reporting backache in the past 12 months, by sector (NACE rev.2), EU-28, 2015



Based on the sixth EWCS (2015). Figure adapted from (17).

Likewise, a literature review from 2015 showed that MSDs are a widespread problem among nurses working at hospitals, at elderly care facilities, and in home and social care (21). Country-specific data do not change the overall picture that MSDs are more prevalent in physically demanding occupations. The Danish Working Environment & Health study from 2018 with 39,000 workers showed that 37 % of nurses and 46 % of social and healthcare assistants experienced musculoskeletal pain (any type) every week (22). In comparison, 32.5 % of employees in the general working population of Denmark experienced such pains.

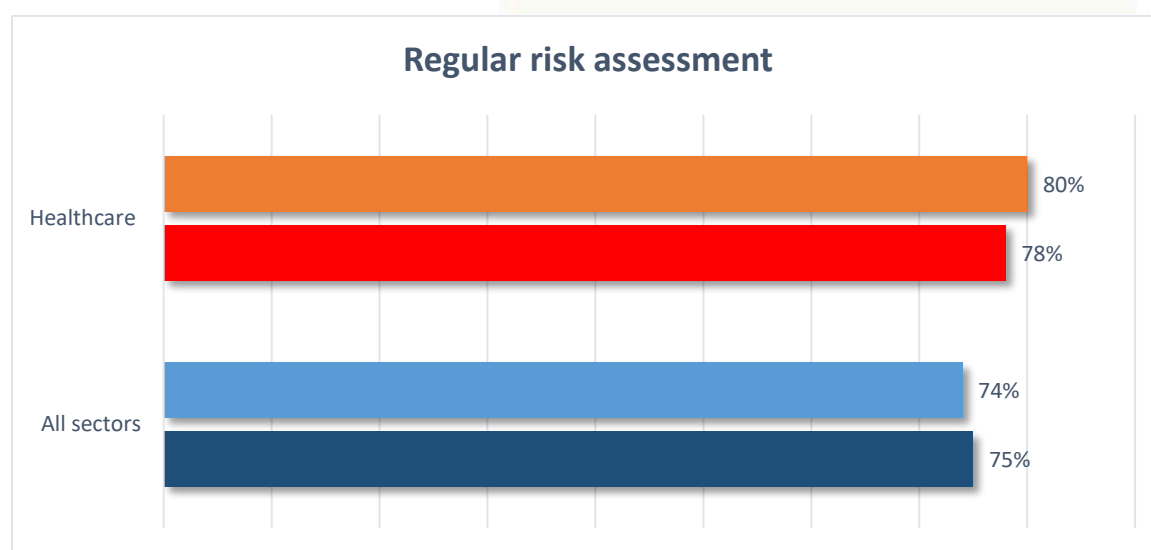
Risk assessment

The European Framework Directive on Safety and Health at Work (Directive 89/391 EEC) guarantees minimum safety and health requirements throughout the EU, while individual Member States are allowed to establish more stringent measures. At the core of this approach is the fact that employers should perform regular risk assessments. Comprehensive guidelines can be found in previous publications (23,24) and are summarised in these cyclic steps:

1. identify hazards and workers at risk;
2. evaluate and prioritise risks;
3. decide on preventive actions;
4. take action through preventive and protective measures;
5. monitor and review the risk assessment at regular intervals.

According to ESENER-2 and ESENER-3, risk assessments are not being conducted regularly in all workplaces. The data show that regular risk assessments are performed in at about three out of four establishments in the EU-27 (Figure 3). In addition, several difficulties in addressing safety and health across the EU-27 exist. While the complexity of legal obligations is the most common barrier, a noteworthy increase in a 'lack of time or staff' occurred in the healthcare sector from 2014 (29 %) to 2019 (41 %) (Table 1). This finding coincides with the perceived increase in time pressure in the same period (Figure 1). Focusing on safety and health at work can be difficult when resources are scarce. Without adequate resources directed towards the healthcare sector, this may lead to further challenges with safety and health in the years to come.

Figure 3. Percentage of establishments in the EU-27 that carried out a regular risk assessment in the healthcare sector ('Human health and social work activities') in 2014 (orange) and 2019 (red) compared with all sectors in 2014 (blue) and 2019 (dark blue)



Base: all establishments in the EU-27, ESENER-2 (2014) and ESENER-3 (2019).

Table 1. Percentage of establishments in the EU-27 that experienced difficulties in addressing safety and health in the healthcare sector ('Human health and social work activities') compared with all sectors

	Healthcare		All sectors	
	2014	2019	2014	2019
The complexity of legal obligations	40 %	46 %	42 %	41 %
The paperwork	31 %	34 %	31 %	31 %
A lack of time or staff	29 %	41 %	27 %	33 %
A lack of money	26 %	26 %	24 %	19 %
A lack of awareness among staff	19 %	20 %	19 %	19 %
A lack of expertise or specialist support	13 %	15 %	14 %	14 %
A lack of awareness among management	13 %	13 %	13 %	12 %

Base: all establishments in the EU-27, ESENER-2 (2014) and ESENER-3 (2019).

3. Risk factors for MSDs and related consequences in the healthcare sector

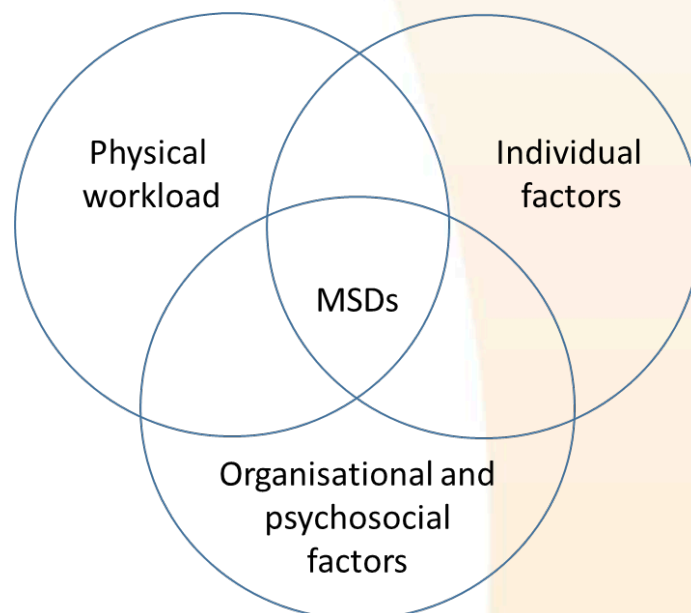
The following section reviews risk factors for MSDs and related consequences for healthcare workers based on scientific literature. The section reviews evidence from large-scale observational studies following thousands of healthcare workers over time and adds knowledge from cross-sectional studies and biomechanical laboratory studies where relevant.

For healthcare workers, handling and transferring patients or citizens is a frequent and physically demanding work task. Numerous research studies across the different occupational healthcare sectors have documented high physical work demands as a risk factor for developing MSDs (7). Among the different types of work tasks, patient handling is the most substantial risk factor for low-back pain in nursing personnel (25), even among newly educated healthcare workers (26). A higher number of daily patient transfers increases the risk of a back injury, for healthcare workers both at hospitals (27) and in home and community care (9). Thus, risk assessments should pay particular attention to patient handling and transfer, as these are the riskiest work tasks for healthcare workers. The following sections will focus mainly on modifiable risk factors at the workplace level, although, for many of these, adequate resources are required to make the necessary changes.

The MSD risk factors are grouped in the following three clusters that can interact with each other (Figure 4):

1. physical workload;
2. organisational and psychosocial factors;
3. individual factors.

Figure 4. The interacting factors influencing the risk of MSDs: (1) physical workload, (2) organisational and psychosocial factors and (3) individual factors



Physical workload

Physical exertion during patient handling and transfer

A high level of physical exertion during work is the most comprehensively documented risk factor for developing poor health. Perceived physical exertion during patient handling and transfer reflects the balance between physical work demands and the capacity of the worker. The work demands are influenced by how well the work is organised, how many healthcare workers are available and the availability and use of proper assistive devices. The capacity of the worker relates to multiple elements. These elements include skills and knowledge in transferring and handling patients, as well as the physical capability of the worker. Thus, perceived physical exertion captures the sum of these factors.

In the healthcare sector, studies with thousands of workers show that high physical exertion during patient handling and transfer increases the risk of:

- developing chronic low-back and knee pain in workers without prior pain (28);
- sickness absence (29,30);
- disability pension (31).

An exposure–response association exists, i.e. a higher level of physical exertion during patient handling increases, step-by-step, the risk of developing poor health (28). Furthermore, healthcare workers who have already developed MSDs have a poorer prognosis for recovering from their pain when the work is physically strenuous (32).

Thus, high physical exertion during patient handling and transfer is a comprehensively documented risk factor that can easily be included in the risk assessment.

A way to assess this is to ask the healthcare worker to rate the level of perceived physical exertion (32), e.g. on a scale from light to very strenuous, both during patient transfers in general and for specific patients. As a general rule of thumb, the work should not be strenuous (i.e. should not be heavy). The evaluation can be made for:

- the individual worker, by asking about physical exertion in general during patient transfers;
- the department or work unit, by averaging the responses of all workers at each unit;
- specific patients, by averaging the responses of several workers for the specific patient.

In this way, the risk assessment can better determine which preventive measures should be taken on, namely at which of the following levels:

- the individual level — e.g. skills, assistive devices, physical fitness;
- the group level — e.g. working conditions, type of unit, organisational factors;
- the patient level — e.g. special assistive devices or more healthcare workers working at once.

As a stand-alone factor, perceived physical exertion does not reveal the underlying risk factors and is therefore primarily relevant as a starting point of the risk assessment. The following sections will deal with crucial underlying risk factors that are modifiable in terms of reducing physical exertion during patient handling and transfers.

Ergonomic factors and handling technique

The National Institute for Occupational Safety and Health (NIOSH, US) recommends that the peak compression force of the low back should not exceed 3,400 newtons during work. Biomechanical studies performed in laboratory settings show that many different patient-handling situations exceed this safety limit (33–35), especially situations where the healthcare workers manually attempt to lift or move the patient and work situations with a bent or twisted back (34,35), e.g. transferring, repositioning, turning, moving and elevating the patient manually.

Cohort studies involving thousands of healthcare workers have confirmed these laboratory findings. Thus, frequent forward bending combined with lifting increases the risk of developing chronic low-back pain among healthcare workers without prior low-back pain (36). Patient-handling tasks that involve reaching, pushing and pulling also increase the risk of developing neck and shoulder pain (37). In comparison, work with an upright back does not seem to be a risk factor for low-back pain (36).

Patient characteristics

A review from 2015, primarily based on cross-sectional studies, found that patient handling and transfer of obese patients is a risk factor for MSDs (38). Biomechanical studies have confirmed that the characteristics of the patient markedly influence the load on the low back (34). Overweight patients increase the load on the low back in an exposure–response fashion, i.e. the more overweight the patient, the higher the load. Likewise, patients with different levels of physical disability also increase the load on the low back. A common trait of these situations is that the healthcare worker has to use a higher physical effort to handle the patient, which induces a higher load on the musculoskeletal system. Thus, using appropriate handling techniques with the necessary assistive devices and mobilising the patient's resources is crucial in these situations. Having more healthcare workers working at the same time can also be necessary.

Assistive devices

While delicate patient-handling and transfer situations, e.g. for elderly, obese or disabled patients, and a high number of patient transfers are inherent parts of daily work for many healthcare workers across the EU, a proper handling technique with consistent use of assistive devices can help mitigate part of the excessive risk. Biomechanical studies performed in a laboratory setting — and more recently also during field measurements at hospitals — show that proper use of assistive devices is an efficient way to reduce the load on the low back during patient handling and transfer (33–35). Likewise, cohort studies with several thousands of healthcare workers show that the consistent use of assistive devices reduces the risk of sustaining a back injury to almost half among healthcare workers with daily patient-transfer tasks (9). However, the risk assessment should take into consideration not only the availability of assistive devices but also the healthcare workers' skills in using these and whether the built design of the facility allows for their proper use, e.g. having sufficient workspace for positioning a lift.

Number of patient transfers

The daily number of patient transfers is also a risk factor for MSDs, i.e. a higher number of patients leads to a higher risk of MSDs. Thus, the risk factors related to each patient-handling and transfer situation will accumulate with a higher number of patients. Studies in elderly care situations (39) and hospitals (27) have documented the number of daily patient transfers as a potent risk factor for developing chronic low-back pain and acute back injuries. Thus, a risk assessment should also take into consideration whether individual workers transfer an excessive number of patients and whether the number of transfers can be distributed better between the workers to allow sufficient recovery and breaks during the workday.

Organisational and psychosocial factors

While the physical workload is the most substantial direct risk factor for MSDs, especially for low-back pain and back injury, psychosocial and organisational factors also contribute. These factors contribute mainly indirectly to MSDs through increased physical work demands.

Social capital

Social capital can be understood as informal networks in the workplace — characterised by shared norms, values and understandings — that are reflected in trust and good cooperation between colleagues in a team, between different teams and between colleagues and their leaders (40). Thus, social capital reflects social resources in the workplace. A large French study with more than 2,000 nurses from seven hospitals found that a low level of shared values about work between colleagues and a lack of support from the administration was a risk factor for MSDs in the upper body (41). A Norwegian study with more than 3,000 nurses' aides found that a lack of support to do the work and an unpleasant and stressful culture increased the risk of low-back pain and of sickness absence due to low-back pain (42). Likewise, a Danish study with more than 2,000 healthcare workers from 314 departments at 17 hospitals found that poor cooperation between colleagues led to a three-fold increase in the risk of sustaining a back injury during patient transfers (27). Thus, weak social capital can lead to unsafe patient handling and transfer, resulting in an increased risk of MSDs.

Resources and organisational factors

A lack of resources and inadequate organisation of the work can lead to time pressures for healthcare workers. Time pressure can indirectly influence MSDs through a higher physical workload. Too many patients per worker creates time pressure, and the highest levels of MSDs are seen at hospitals with a high 'patient load' in terms of the patients per healthcare worker ratio (43,44). Time pressure, in terms of a high work pace with many patients, has a direct influence on the level of physical exertion during work (45). Healthcare workers also rate time pressure as the most critical barrier for not using the appropriate assistive devices during patient transfers (46). This double-effect — i.e. a high number of patient-handling tasks and transfers combined with insufficient use of assistive devices — leads to an elevated risk of MSDs.

In addition, a study from the US showed that long working hours, overtime, weekend work, work during time off (while sick, on days off or without breaks) were significant risk factors for MSDs in nurses (47). This finding could not be explained by psychological factors but was caused mainly by higher accumulated physical work demands. Likewise, a systematic review from 2012 concluded that high job demands and demanding work schedules were substantial risk factors for upper body MSDs in healthcare workers (48).

Shift work is an inherent condition of working in the healthcare sector. Studies from Norway and Australia have shown that shift work increases — although only slightly — the risk of low-back pain and related sickness absence in nurses' aides and nurses (42,49).

Organisational changes

Organisational changes with reorganisation, downsizing and lay-offs are often a consequence of budget cuts. While mostly studied in relation to work-related psychological and social issues, organisational changes may indirectly influence the risk of MSDs. In a Norwegian study, nurses experienced less job satisfaction and an increased risk of burnout after two comprehensive rounds of reorganisation and downsizing (50). A Finnish study with a mixed population of municipal workers — which also included nurses — found that major downsizing led to increased MSDs as well as MSD-related sickness absence (51). These negative consequences of downsizing were mainly driven by increased physical work demands, particularly in women and workers with lower income (51). Thus, nurses, nurses' aides and social and healthcare assistants are especially prone to increased physical workload, and thus MSDs, due to downsizing.

Other psychosocial factors

Other work-related psychosocial factors can also influence the risk of MSDs. Studies from France found that increased upper body MSDs in healthcare workers were associated with an imbalance between the effort of work and subsequent reward for the work and with workers over-committed to work (52,53). A systematic review from 2014, based mainly on cross-sectional studies, also found that an effort–reward imbalance was associated with MSDs (54). In this regard, strong leadership is essential to balance the efforts of workers and to provide recognition of their work.

A Danish study showed that low influence at work increases the risk of developing chronic low-back pain in healthcare workers without prior low-back pain (55). This finding underscores the importance of a participatory approach where workers influence the planning of work rather than solely a top-down approach.

Individual factors

While physical workload is the most substantial direct risk factor for MSDs, individual factors also contribute.

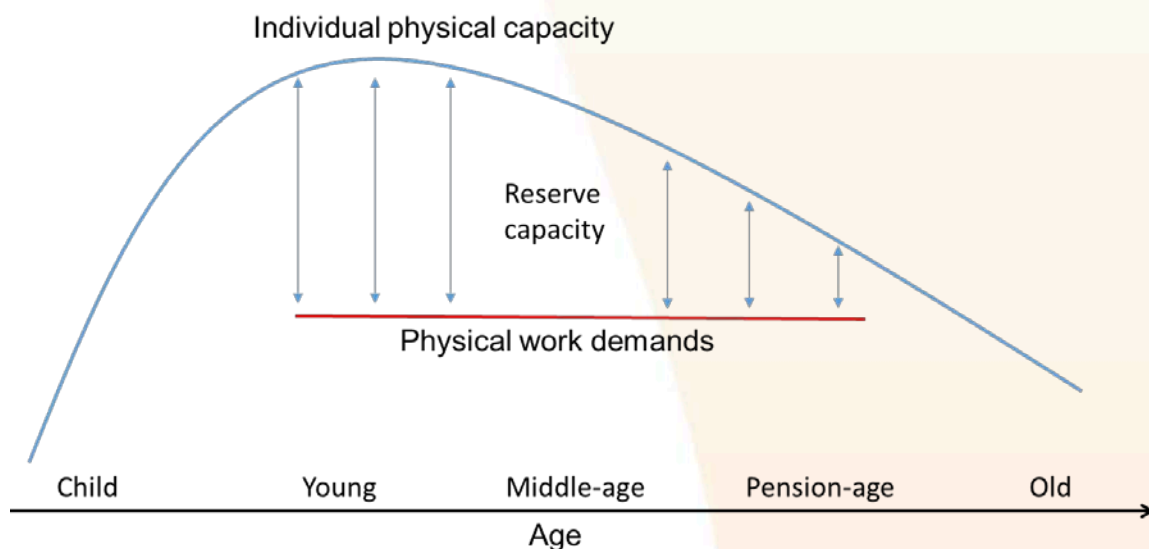
Age

From the age of around 40 years, individual physical capacity (muscle strength and cardiovascular fitness) declines 1 % or more per year (6,56). Thus, from the age of 40 to 60 years, healthcare workers lose at least 20 % of their physical capacity. If the physical work demands remain the same, then the relative physical workload — i.e. physical workload relative to individual physical capacity — will

increase. In other words, the reserve capacity will gradually diminish, making the physical work tasks increasingly more strenuous as age progresses (Figure 5). Furthermore, cumulative exposure from years of high physical work demands contributes to ‘wear and tear’ of the body and increases the risk of involuntary early exit from the labour market (57). Thus, the health consequences of high physical work demands can be more severe for older than for younger healthcare workers. A Danish study followed 4,699 healthcare workers for 11 years and found that high physical exertion during patient handling and transfer is a risk factor for disability pension, i.e. a complete loss of work ability due to poor health, but only among older workers. The mean age of the older healthcare workers was 53 years at the beginning and 64 years at the end of the research study (31).

In response to increased life expectancy, most EU Member States are gradually increasing the state pension age. The state pension age of around 63–67 years in most EU Member States today is expected to increase further during the next decade. With increasing age, there is not only an inherent loss of physical capacity but also an increased risk of chronic disease. The combination of natural age-related changes, chronic disease and years of cumulative exposure makes physically demanding work even more challenging for older healthcare workers. This calls for accommodation of work demands to better balance physical work demands with the capacity of older workers.

Figure 5. Individual physical capacity over time and reserve capacity (the difference between individual physical capacity and physical work demands) in relation to constant physical work demands.



Lifestyle

A Danish study showed that low muscle strength and endurance increases the risk of developing low-back pain in healthcare without prior pain (58). Another Danish study showed that poor sleep, which may be caused by stress or other factors, is also a risk factor for developing low-back pain in healthcare workers without prior low-back pain (59).

Psychological factors

A Danish study found that a high level of fear avoidance — i.e. avoiding certain physical activities due to a fear of pain — is a risk factor for sickness absence in newly educated healthcare workers with low-back pain (60). Likewise, an Australian study showed that nurses with a high level of pain catastrophising — i.e. a negative cognitive-affective response to actual or anticipated pain — have more sickness absence days (61). Thus, psychological factors can worsen the consequences of MSDs, in terms of leading to sickness absence.

Studies from Spain and Denmark have also shown that poor mental health and depressive symptoms in healthcare workers are risk factors for MSDs in general and for low-back pain (62,63).

4. Protective approaches

While Chapter 3 of this paper dealt with risk factors, this chapter will review and discuss what works in practice. Working with effective changes in healthcare workplaces requires knowledge, economic resources, a change of organisational culture and continued effort. Knowledge-based high-quality research is a good starting point. Randomised controlled trials are considered the 'gold standard' design of intervention studies. However, this design cannot stand alone, as such research is often short term and performed with limited resources, and the risk of implementation failure is high and often not adequately assessed and described in research reports (64). Thus, successful long-term case studies are also needed to demonstrate what works in practice.

Patient-handling training

In addition to proper use of assistive devices, mobilising the patient's resources — to whatever extent is possible — is a brilliant way to reduce physical workload and benefits not only the healthcare worker but also the patient. Patients who are bedbound for prolonged periods inherently lose muscle mass and physical function, but mobilising the patient can help minimise these losses.

The hierarchy of patient-handling and transfer techniques can be summarised as follows:

- Mobilise the patient's resources, as this will markedly reduce the physical workload and do good for the patient's mobility.
- Use technical lifting devices — e.g. a ceiling lift — that minimises the physical workload.
- Pull, push or roll (never lift) the patient with proper technique and using appropriate assistive devices — e.g. a sliding sheet — to reduce the physical workload.

For further details on patient-handling techniques, see EU-OSHA's *E-fact 28* (65).

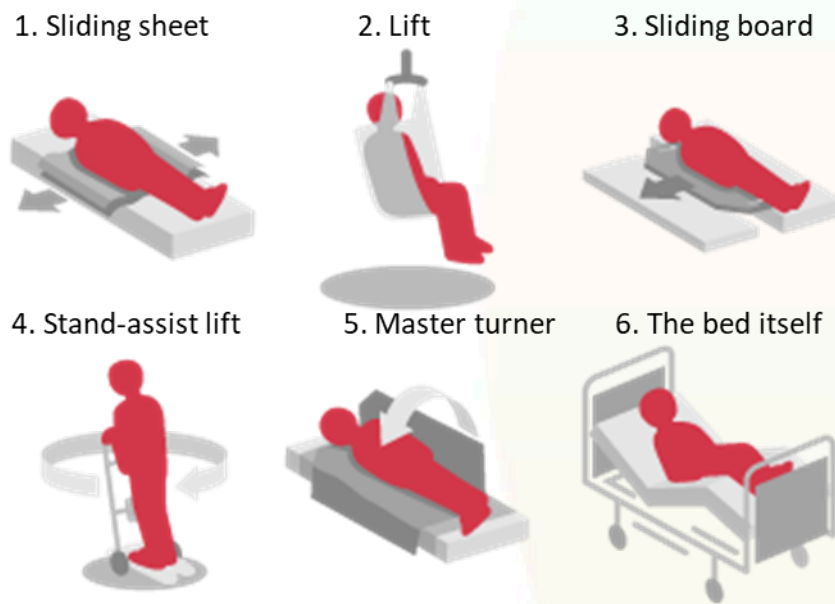
Evidence from systematic reviews shows that interventions with patient-handling training alone are not sufficient to prevent MSDs and back injury in healthcare workers (64,66–68). Thus, patient-handling training should be thought of as an element of the complete package.

Assistive devices

Systematic reviews of workplace interventions have documented the importance of assistive devices. A comprehensive systematic review including one randomised trial and 10 controlled before-and-after studies found that workplace interventions that included technical patient-handling equipment reduced the risk of musculoskeletal injury claims by more than 20 % (69). Another review of workplace interventions and cohort studies showed only a slight reduction of low-back pain prevalence (from 41.9 % to 40.5 %) and of MSD injury claims (from 5.8 to 5.6 per 100 work-years) when introducing lifting devices for patient transfer. However, experimental simulation of the same data showed that these numbers could be reduced to 31.4 % and 4.3 per 100 work-years, respectively, in the case of the complete elimination of manual patient transfer (70). Cohort studies show similar potentials for injury reduction, e.g. the consistent use of assistive devices over 1 year reduced the risk of sudden back injury by about 40 % among Danish healthcare workers (9). This finding underscores the importance of proper implementation of these initiatives in healthcare workplaces. Thus, merely providing assistive devices is not enough. Instead, there should be a constant and continued focus on using the available assistive devices and using them correctly.

A recent study among 2,000 healthcare workers at Danish hospitals found that a sliding sheet was lacking in 30 % of patient-transfer cases where an acute back injury occurred (27). Thus, consistent availability and use of even the most basic assistive devices is an integral part of safe patient handling. Figure 6 illustrates the main types of assistive devices.

Figure 6. Main types of assistive devices for patient handling and transfer. Illustrations are reused with permission (71)



While systematic reviews pool evidence from across many different studies and countries, individual intervention studies also reveal exciting findings. A 1-year intervention study from Denmark found that purchasing new assistive devices for patient handling combined with training of the nursing staff resulted in more positive attitudes towards patient-handling equipment and increased use of specific patient-handling equipment. However, no immediate effect on MSDs could be documented (72). A Canadian randomised study showed that a ‘no strenuous lifting’ programme — which combined patient-transfer training with the increased availability of assistive devices — reduced fatigue and physical demands, although injury rates remained unchanged (73). Thus, these protective initiatives do not always lead to an immediate reduction of MSDs, which may discourage some healthcare workplaces from continuing preventive efforts. However, as several underlying causes of MSDs exist, a continued focus on improving the underlying factors should be prioritised instead of a sole focus on pain and injury. As discussed in the following section, improvement in MSDs will follow — although often in the long term — when working towards improving the underlying factors.

Organisational safety culture

Organisational cultural changes take time, and this is equally applicable to safety culture. A systematic review based on 27 long-term workplace intervention studies investigated the effect of a ‘safe patient handling programme’ on musculoskeletal injuries in healthcare workers (74). The core of this programme is to eliminate manual lifting by ensuring adequate lifting devices, education, training and lift teams, and fostering a safety culture in the organisation. In one of the studies included, the implementation of assistive devices combined with a comprehensive ergonomics programme reduced patient-handling injuries by 60 %, lost workdays by 87 % and workers’ compensation costs by 91 % during a 3- to 5-year follow-up period (75). Across the different studies included in the systematic review, the safe patient-handling programme reduced the prevalence of injuries by about half (74). Importantly, the programme was especially effective in high-risk departments, i.e. intensive care units, where patients require substantial assistance (74).

The beneficial effects of safe patient-handling programmes improved over time, which highlights the importance of a long-term and continued effort to make the necessary cultural changes. Another long-term cohort study from the US — published after the systematic review — demonstrated that positive changes could be maintained for many years after implementing a safe patient-handling programme (76).

An important lesson learned from the long-term intervention studies is that purchasing assistive devices alone does not guarantee success. This should be combined with working towards an influential safety culture involving all stakeholders, including managers, workers, and safety and health personnel. ‘Vision Zero’ is a useful concept to build a strong organisational culture with high social capital and a collective vision of preventing accidents and continuously improving safety, health and wellbeing (77,78). The idea of this is to change stakeholders’ mindset, assumptions, values and beliefs, which influence how people behave in organisations, towards a shared vision of zero harm in the workplace. Thus, inspiration from Vision Zero can be a good starting point for improving organisational safety culture.

Worker participation

Workers have detailed knowledge of their work and often good ideas about how to make it safer. Nevertheless, workers alone may not have the resources or mandate to make actual changes. A participatory approach involving all stakeholders — with the practical experience of workers at the core — can be an effective way forward. A large randomised control trial involving 27 departments from five hospitals in Denmark investigated the effect of a participatory approach in improving the use of assistive devices (46). The participatory approach consisted of two workshops of 2 hours with healthcare workers and managers from each department, as well as safety and health staff from the hospital. The participants first identified barriers and solutions for the better use of assistive devices and then developed department-specific action plans. The workers provided their practical experience and suggestions, the safety and health staff provided their professional knowledge and the managers evaluated whether the necessary resources were available or could be obtained. After 1 year, the general use of assistive devices — measured with accelerometers attached to the assistive devices — increased.

Furthermore, communication and guidance improved as a result of the intervention. However, these positive changes were not of a sufficient magnitude to lead to an immediate reduction of MSDs. Nevertheless, this minimal intervention consisting of only two workshops of 2 hours shows promising potential for participatory approaches as part of collective safety and health efforts.

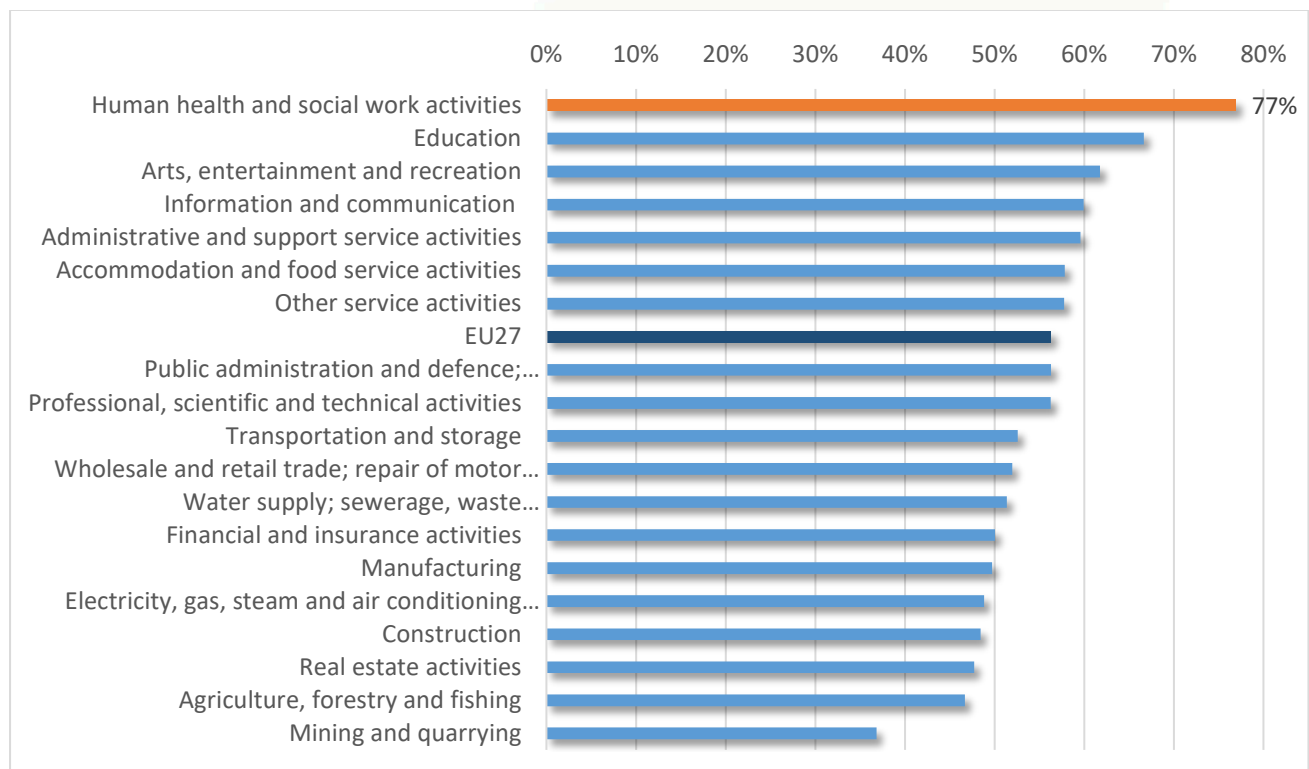
Based on ESENER, many establishments in the healthcare sector (‘Human health and social work activities’) have ensured employee representation in terms of work councils, trade union representation, safety and health committees, and safety and health representatives (Table 2). Furthermore, the healthcare sector ranks highest in terms of employee involvement concerning psychosocial risks (Figure 7). Thus, the healthcare sector has a strong foundation on which to build further worker participation to improve safety and health concerning MSD risk factors. EU-OSHA’s *Worker participation in Occupational Safety and Health — a practical guide* (79) provides further information for readers.

Table 2. Percentage of establishments in the healthcare sector (‘Human health and social work activities’) compared with all sectors in the EU-27 that report having different types of employee representation

	Healthcare		All sectors	
	2014	2019	2014	2019
Work council	36 %	37 %	25 %	24 %
Trade union representation	33 %	36 %	20 %	18 %
Safety and health committee	33 %	38 %	20 %	22 %
Safety and health representative	64 %	65 %	56 %	57 %

Base: all establishments in the EU-27, ESENER-2 (2014) and ESENER-3 (2019).

Figure 7. Percentage of establishments in different sectors of the EU-27 reporting that employees have a role in the design and set-up of measures to deal with psychosocial risks



Base: all establishments in the EU-27 and ESENER-3 (2019).

Lifelong learning and skill mix

The *State of Health in the EU: Companion Report 2019* highlights the skill mix as a novel way of making the entire healthcare system more resilient to future challenges (80). In essence, it builds on broadening the skills, through re-education or on-the-job training, of the different job groups. Experience from Poland shows that this type of role changing could, for example, involve nurses prescribing medicine that medical doctors would otherwise do or paramedics performing medical emergency services and healthcare services (81).

From the perspective of reducing physical workload, this idea can be taken further. For example, office workers in healthcare workplaces may receive on-site training to obtain the necessary skills to assist in performing safe patient transfers. In addition to reducing the physical workload of healthcare workers, such a skill mix may also benefit workers who are otherwise sedentary during the entire workday. Current physical activity recommendations of the EU Member States suggest a minimum of 60 minutes of physical activity per day (82), which may be challenging to reach in a sedentary job. Mapping the different skills and work demands of the different job groups in the workplace can be a good starting point to consider the potential for a skill mix between those with physically demanding work and those with sedentary work. Rotating existing healthcare workers between departments with high and low physical work demands may also be a way to lighten the load for those at the highest risk, e.g. those working at intensive care units. While task shifts may not be without challenges, it is something to consider in the broader perspective of workplace safety and health.

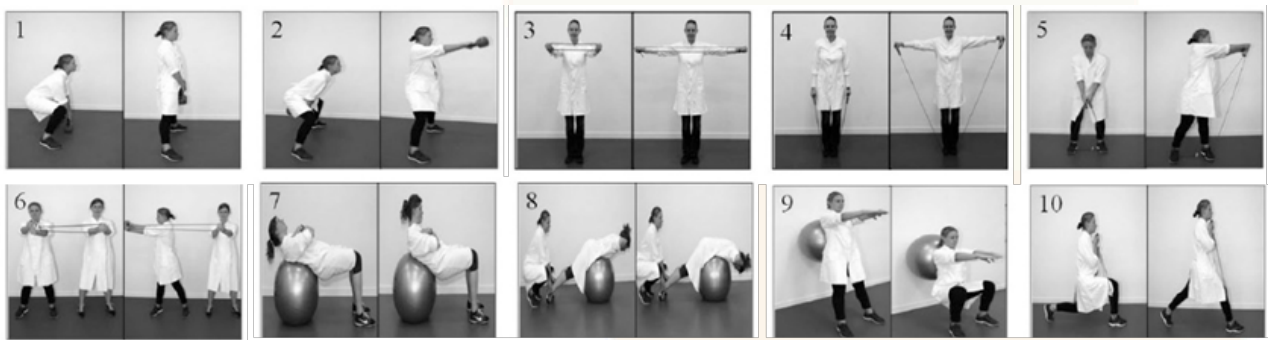
Integration of a healthy lifestyle with work

Work and lifestyle are often discussed as two different concepts. However, promoting good health through the workplace can be a win-win situation for workers, employers and society. A common misconception is that people with physically demanding work — including healthcare workers — are sufficiently physically active during work and therefore have no need for additional physical exercise. However, the types of physical activity during work, e.g. walking, standing, lifting and transferring patients, do not confer the benefits of targeted physical exercise in terms of intensity, frequency and

volume of muscle contraction to stimulate gains in muscle strength and cardiovascular fitness. People in their 50s who have performed physically demanding work during most of their working life have less muscle strength than those with less demanding work (83).

During recent years, research studies have investigated the potential for health promotion — and in particular, physical exercise — in healthcare workplaces. A 10-week randomised study from Denmark showed that strength training with coaching at the hospital (nurses and nurses' aides) for up to 50 minutes a week could be an effective way to reduce and prevent pain in the low back, neck and shoulders (84), prevent the loss of work ability (85) and decrease physical exertion during work (86). The exercise was performed during working hours in the workplace together with colleagues and focused on strengthening the muscles of the leg, back, neck and shoulders (Figure 8).

Figure 8. Strength-training exercises used in a workplace intervention: (1) kettlebell deadlift, (2) kettlebell swing, (3) reverse flyer with an elastic band, (4) arm raise with an elastic band, (5) golf swing with an elastic band, (6) trunk rotation with an elastic band, (7) abdominal crunch on a Swiss ball, (8) back extension on a Swiss ball, (9) squat and (10) lunge using an elastic band. Photos are reused with permission (86)



In another randomised study from Denmark, a combination of strength training and aerobic training for a total of 150 minutes per week for 3 months reduced general pain to about half in nurses and nurses' aides working in nursing homes and home care (87). In a study from Spain, 9 weeks of strength training performed at a hospital reduced musculoskeletal pain and improved work ability and physical function among hospital porters (88). Likewise, a 15-week workplace intervention from Norway showed that both strength training and aerobic training reduced MSDs in hospital workers (nurses, as well as laboratory, administration and cleaning department staff) (89). However, the differences between the exercise groups and the control group were minor after 7 months, indicating challenges with long-term maintenance.

Overall, physical exercise in the workplace is, at least in the short term, effective in reducing and preventing MSDs. Exercise programmes, including strength training, are particularly effective (90). By contrast, when healthcare workers are encouraged to perform physical exercise at home, adherence is low and inefficient in terms of preventing and reducing MSDs (84).

Furthermore, physical exercise performed together with colleagues helps to strengthen the social capital in terms of improved collaboration between colleagues (40). However, the effects go further. A randomised study from Finland showed that physical exercise reduces work-related fear avoidance, i.e. avoiding certain work activities due to a fear of pain (91). Thus, physical exercise performed together with colleagues in the workplace can have a positive influence on physical, social and psychological factors, which are all related to MSDs.

While randomised studies of physical exercise in the workplace show positive effects on MSDs, few long-term studies exist. Thus, based on randomised studies, it is unknown whether such initiatives can be adequately maintained over time. In a long-term case study from Denmark, mandatory physical exercise in the workplace was introduced for all employees in home-care settings and nursing homes by The Health and Care Administration of the City of Copenhagen in 2013 (92 + personal communication). The approach is that workers do strengthening physical exercises together with colleagues for about 35 minutes per week either in one session or in several smaller bouts during the week. After 7 years, this effort is still ongoing thanks to a high strategic focus from the Health and Safety

Board of the municipality. The majority of the workers (67–75 %) experience less back and neck pain, and workers report high satisfaction with the programme.

Furthermore, the employees participate in physical exercise on average two times per week. Thus, long-term adherence to physical exercise in the workplace is possible. Joint physical exercise in the workplace should, therefore, be considered as part of safety and health efforts in the healthcare sector.

Managing chronic MSDs in the workplace

Research from Germany and Hungary has evaluated the effectiveness of ‘back schools’ for nurses with chronic low-back pain (93–96). The basic concept of these programmes is to build individual resilience by providing education about back pain and safe patient handling. Overall, such programmes can help reduce low-back pain and improve patient-transfer technique.

However, the German study reported the programme to be less effective for nurses working with geriatric patients and in intensive care units, i.e. in units where patients require additional assistance. Likewise, a Danish cohort study showed reduced recovery from chronic low-back pain among healthcare workers with high physical work demands compared with those with lower physical demands (32). Another Danish study found that the combination of MSDs and high physical work demands is especially detrimental to work ability (97). Thus, back schools alone may not be sufficient to reduce low-back pain in healthcare workers with high physical work demands. Workplaces should therefore also have strategies to manage MSDs, e.g. temporarily reducing the physical work demands for workers with existing MSDs. A healthcare worker with intense pain may have to perform tasks other than transferring patients for a while (see the concept of skill mix). As pain is invisible, this requires building a no-blame culture where managers and workers can talk openly about these issues.

Low-tech wearable devices

A randomised study from the Netherlands showed that lumbar support (a device worn under the clothes) could provide — at least temporary — low-back pain relief for healthcare workers in home-care settings (98). Another randomised study from the US found that unstable shoes provided short-term low-back pain relief in nurses (99). The authors of the study suggested that the instability imposed by the shoes requires constant postural adjustments and thereby trains the core muscles to better stabilise the low back. As such devices are low in cost and easy to implement, healthcare workplaces may consider offering these to workers with chronic low-back pain.

Intervention overload

As a final note, healthcare workplaces should be aware that any intervention requires resources, not only for the workplace but also in terms of motivational and mental efforts for the individual worker to engage in many new initiatives at once. Randomised intervention studies from France, Denmark, Belgium and Norway that combine many intervention elements at once — e.g. physical exercise, diet, education, ergonomics, cognitive therapy and stress management — have sometimes (100), but far from always, been useful for MSDs in healthcare workers (101–105). Thus, introducing many initiatives at once may lead to ‘intervention overload’, suffering from poor implementation of each intervention element. While high ambitions and a multifaceted strategy concerning safety and health are good, gradual implementation of the intervention elements that go along with the changes in organisational culture is recommended.

5. Conclusions

MSDs remain a challenge in the healthcare sector. This paper reviewed the existing literature on MSD risk factors and effective interventions. Looking into the future, the healthcare sector of the EU is likely to face a triple challenge of an increased care burden, recruitment challenges and an ageing workforce. However, an orchestrated effort focusing on preventing, reducing and managing MSDs may tip the scale in favour of more healthy workplaces, inducing a positive cycle of higher recruitment into the sector and better retainment of the existing workforce.

Chapter 2 gave an overview of the size of the problem and documented that physical and psychosocial risk factors for MSDs are prevalent in the healthcare sector. Based on ESENER-2 and ESENER-3, the

majority of MSD risk factors increased from 2014 to 2019, highlighting the need for preventive actions. Although more than three out of four establishments in the healthcare sector of the EU-27 perform regular risk assessments, many experience trouble in addressing safety and health. A lack of time and staff is a significant barrier that increased from 29 % to 41 % from 2014 to 2019. This development highlights the growing pressure in the healthcare sector. The provision of adequate resources is necessary to ensure the safety and health of workers in the sector now and in the future.

Chapter 3 dealt with risk factors for MSDs. High physical work demands are the most substantial direct risk factor for MSDs in the healthcare sector. However, underneath this lies important indirect organisational and psychosocial risk factors. Some of these factors are modifiable at the workplace level, such as working towards improved social capital and employee participation. Others depend on economic resources to ensure an adequate number of healthcare workers and appropriate assistive devices and are therefore dependent on political priorities. Finally, due to the growing number of older workers and the increasing state pension age in most EU Member States, the accommodation of physical work demands is essential. The natural loss of physical capacity and the increased risk of chronic disease with age, combined with years of cumulative exposure, make physically demanding work more challenging to perform for older healthcare workers.

Chapter 4 concerned protective approaches, i.e. what can be done in practice. The availability and proper use of assistive devices are critical protective factors for MSDs in the healthcare sector. However, merely providing assistive devices is not adequate. Workplaces should strive towards building a robust organisational safety culture, where worker participation and lifelong learning become inherent parts of the culture. Furthermore, physical exercise in the workplace goes beyond traditional safety and health efforts but can — under the right circumstances — be a useful tool for preventing and reducing MSDs. Finally, the gradual implementation of new initiatives is recommended to avoid intervention overload and implementation failure. Together, these factors will lay the foundation for preventing, reducing and managing MSDs in the healthcare workplaces of the EU Member States.

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