European Agency for Safety and Health at Work

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Current and emerging issues in the healthcare sector, including home and community care

European Risk Observatory Report

European Agency for Safety and Health at Work

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Executive summary

The European health care sector has a critical role to play in the achievement of the goals of the Europe 2020 strategy by contributing to the overall health and well-being of the workforce and society as a whole. In addition, the health and social care sector is also an important employer, whose significance is likely to grow in the context of demographic change. As a result, healthcare employers are not only affected by trends towards an ageing population in terms of the rising demand this places on service delivery, but also in the context of emerging labour market shortages resulting from declining birth rates. By 2030, the population of working age in the European Union (EU) could be reduced from the present 303 million to 280 million. This has implications not only for potential growth and the sustainability of pensions, but also for the funding of the health and social care sector and for the recruitment of workers to provide these services. Although demand for care workers and staff shortages are expected to grow, research shows that the sector often offers poor working conditions and remuneration compared to sectors requiring equivalent levels of skills and training. This has already led to significant mobility of workers within and outside the EU, and could serve to exacerbate skills shortages in the future.

The health and social care sector is one of the largest sectors in Europe, employing around 10 % of workers in the EU, with women accounting for 77 % of the workforce. A significant proportion of healthcare workers are employed in hospitals; however, they can also be found in other workplaces, including nursing and care homes, medical practices and in other health-related activity areas.

This state-of-the-art report considers the occupational safety and health (OSH) issues in the health and social care sector in the EU Member States. The activities associated with healthcare in institutions such as hospitals and nursing homes, as well as those activities undertaken in patients' own homes, have been explored. Workers employed in the healthcare sector have to deal with a wide range of activities and environments that pose a threat to their health and put them at risk of occupational disease or work-related accidents. Many of the settings in which healthcare workers carry out their jobs and the multiplicity of tasks they perform when, for example, delivering frontline care for the physically or mentally impaired, handling patients or providing cleaning services, can present a **great variety of hazards. Healthcare workers are exposed to a large number of concomitant risks such as:**

- biological risks, such as infections caused by needlestick injuries and other communicable diseases;
- chemical risks, including from drugs used in the treatment of cancer and from disinfectants;
- physical risks, such as from ionising radiation;
- ergonomic risks, for example, during patient handling; and
- psychosocial risks, including violence and shift work.

The combination of these diverse risks makes healthcare a high-risk sector for workers.

In addition to the well-known hazards, there are several new developments and trends that the health and social care sector in Europe have to face, and these have resulted in a number of new OSH challenges that need to be addressed and overcome. These include demographic, epidemiological, social, technological and cultural trends within EU countries that have an impact on existing care patterns. Examples include increasing shortages of healthcare professionals; an ageing healthcare workforce with insufficient new recruits to replace those who are retiring; the emergence of new healthcare patterns to tackle multiple chronic conditions; the growing use of technologies requiring new skill mixes; and imbalances in skill levels and working patterns. These changes have an impact on the working conditions and ultimately on the well-being and safety of healthcare workers.

The main objective of this report is to explore and gain an overview of current and emerging OSH risks and issues in the healthcare sector, including home and community care, in the EU. The report focuses on the question: ***What are the current and emerging OSH risks and issues for healthcare professionals and how will these issues affect the safety and health of healthcare workers and influence the overall service that they provide?***

While trying to answer this question, the report explored the following issues in detail:

- The main differences in healthcare systems across Europe, highlighting any current developments.
- The main categories of healthcare professionals in the healthcare sector in Europe.

- The main demographic, societal and technological trends and changes that have an impact on OSH in the healthcare sector across Europe.
- The main risks associated with activities undertaken and with the working environment for healthcare professionals, including non-professionals in home care. The impact of these risks on the work and the services provided by these care professionals is analysed.
- Identification of the healthcare professionals most at risk.
- The emergence of new risks across Europe based on the contextual changes and current risks and analysing the impact they could have on the work of and the service provided by healthcare professionals.

The importance of home and community care has been emphasised in the report and the following aspects have been taken into consideration:

- The differences between the categories of home care workers across Europe. How do training, salaries and working conditions vary in different Member States?
- How home care work is organised across Europe, identifying current structures (public, mixed or private) and the foreseen future challenges for home care workers.
- The level of protection that informal or unregistered homecare workers receive, and if there have been any changes in the way the OSH of homecare workers is managed since the implementation of ILO Convention No 189.
- The OSH risks that workers providing home care are exposed to and how these differ from those faced by other healthcare professionals.

Two main activities were used to gain information to answer the research questions:

1. desk-based research (literature search); and
2. a request from EU-OSHA (European Agency for Safety and Health) to its national focal points (questionnaire).

Desk-based research was used to assess the literature published throughout the EU on healthcare infrastructure, trends, OSH risks and their impact on the work of and the service provided by care providers. The information and data reviewed in the report were sourced from well-known organisations such as the International Labour Organisation (ILO) and the European Commission, experts, structured databases (for example EU statistical databases) and databases of peer-reviewed journals (such as Scopus, ScienceDirect, PubMed). In addition, Google was used to identify any other relevant information.

A questionnaire was designed to gather information from individual EU countries at national level via EU-OSHA'S national focal points. The focus of the questionnaire was to identify current and emerging OSH risks at national level. The majority of the responses came from representatives of national labour inspectorates, ministries with OSH responsibilities, OSH institutes, worker organisations and the healthcare sector. In general, the respondents had more than five years of OSH experience in fields such as safety, ergonomics, occupational medicine or psychology. In total, 21 questionnaires were received from 16 countries: Albania, Belgium, Cyprus, the Czech Republic, Estonia, France, Hungary, Ireland, Italy, Latvia, Lithuania, the Netherlands, Slovakia, Sweden, Switzerland and the United Kingdom.

The information from and findings of the desk-based study have been integrated with the data from the questionnaire.

What are the main differences in healthcare systems in Europe (northern, southern, western and eastern) and what are the current developments?

There is a wide variety of healthcare systems in Europe. Most of them are undergoing a process of reform, influenced by developments in several areas, for example changes in evidence-based medicine, cost reduction, quality management, the ageing population (increased focus on integrated care), increased focus on health promotion and prevention, and changes in information and communication technology (ICT) (in the clinical and management areas). Comparing healthcare systems and the impact they have on the OSH of their workers is very difficult because of the lack of up-to-date and comparable data. In addition, most healthcare indicators identified in the review are quality related and

not very objective. Financing mechanisms differ between countries; however, there is no clear relationship between these mechanisms and efficiency. Although one could argue that the performance of a healthcare system (for example in terms of the efficiency, quality and safety of care services) and the OSH of its workers are interrelated, no studies were identified that focused specifically on the relationship between these characteristics and indicators on OSH. In the absence of any available data, an attempt has been made to try to identify any trends, strengths or weaknesses in the various systems that would have an overall influence on the OSH of healthcare professionals.

Across Europe, healthcare is barely managing to cover its costs. Not only are the methods of raising funds to cover costs inadequate, but, of even greater concern, the costs themselves are set to soar. The overriding concerns of Europe's healthcare sector are finding ways to balance budgets and restraining spending. Unless that is done, the funds to pay for healthcare will soon fall short under either of the systems in operation in Europe. For example:

- In the Beveridge system, the healthcare ministry must battle with other policy areas for its share of tax revenue. In addition, demographic changes will lead to an increased burden on tax revenues both quantitative (increased number of old people) and qualitative (more expensive healthcare services and technology).
- In the Bismarck system, because of demographic changes, the system needs to support a steadily increasing number of retirees who no longer pay into it. In addition, financial cutbacks by companies, caused by the economic crisis, have led to a steep climb in the unemployment rate and, as a result, fewer employees are contributing to the system.

This future healthcare funding crisis is also linked to the ageing of the population, the parallel rise in chronic disease and the rising cost of medical technologies, factors which are interlinked.

Healthcare restructuring and changes in the delivery of patient services will naturally affect the work environment. Work-related injuries, violence in the workplace and stress on the job are interrelated aspects of work conditions that are sensitive to both internal changes (such as staff cutbacks) and external changes. Healthcare workers' safety and health have implications for patient care and costs because staff turnover and lost work days affect continuity of care and availability of trained staff. Healthcare professionals will want to help people in need, but the sheer logistics of expanded care delivery, the current and growing shortage of personnel, and the limited resources available in already overloaded healthcare systems will result in:

- Distribution shortfalls, leading to a continued inability to meet local demand for healthcare.
- Disproportionate ratios of healthcare professionals to patients, leading to doctors and nurses working extended shifts of more than 12 hours. With a diminished workforce, maintaining sufficient ratios to ensure the required level of care will be difficult. For example, nurses working longer shifts are more likely to experience burnout and job dissatisfaction while at the same time not being able to provide the level of service that they would like to.
- An increase in lone working. This becomes a concern when workers have to undertake manual handling operations or interact with patients or family members with a known history of violent or aggressive behaviour.
- Higher expectations and unrealistic demands. Doctors and nurses will be rushed, with insufficient time to be able to provide good care.
- A need for higher intensity of care. As more patients suffer from chronic diseases, there will be an increase in the number of additional care hours required to ensure good-quality care.
- An increase in the need for home care, leading to more healthcare professionals working away from traditional institutions. Those professionals who have to go into a patient's home are more at risk of verbal and physical abuse.

Without a strong and growing workforce operating under better working conditions, the OSH of healthcare professionals will not improve and nor will the quality of care that they provide. Working in healthcare is difficult with adequate personnel; it will be much more so with the anticipated shortfall of workers. Increased work-related stress will affect and aggravate the mental and emotional health of these workers. There will be heavier workloads, which will be seen to increase dramatically as more patients enter healthcare systems across Europe. With a reduced workforce, this will overwhelm already overstressed medical professionals. The need for staff members to do more paperwork, again linked to

projected shortages of staff, will reduce the time spent with patients, and this is seen as a burden on the workforce, who would much rather have direct patient care hours.

What are the main categories of workers and healthcare professionals in the sector in Europe and what are the developments in the labour market?

The healthcare sector incorporates several subsectors dedicated to providing healthcare services and products. The United Nations (UN) International Standard Industrial Classification categorises human health and social care activities as the provision of health and social work activities. The activities are wide-ranging, from healthcare provided by trained medical professionals in hospitals and other facilities to residential care activities that involve some healthcare activities to social work activities that do not involve healthcare professionals at all. Many people also work indirectly for the healthcare sector, including those employed in industries and services supporting it, for example, the pharmaceutical industry, the medical device industry, health insurance, health research, eHealth, occupational health and spas. These workers who are indirectly employed in the sector are excluded from this report.

The employment trend observed in the health and social care sector will continue, but at the same time reductions in healthcare expenditure are being made in EU countries. Countries face different human resources challenges and needs; however, some general challenges can be identified, including the need for information systems to monitor the labour market for healthcare workers and the need to address workers' needs for new skills through the promotion of training and lifelong learning. Since effective healthcare systems and the provision of quality healthcare depend on the performance of an adequately educated, skilled and motivated workforce, maintaining proper working conditions is important.

Overall, there is an increasing trend towards more community-based care and therefore an increasing demand for home care workers. The group of home care workers is not made up of one specific profession and might include informal carers and domestic workers. Informal care-givers, migrant workers and domestic workers are vulnerable groups; in general, they have less favourable working conditions and less social security and they receive lower wages. The introduction of ILO Convention No 189 aims to ensure the effective protection of domestic workers. Unfavourable working conditions are among the reasons for current staff shortages in home care. These shortages are expected to increase. The results of the questionnaire answered by OSH experts revealed that home care workers are less protected by OSH legislation than those working in health institutions.

What are the main risks in the work and the work environment of healthcare professionals (including home care workers)?

To get an overview of the main risks in the healthcare sector, available data at EU level were collected and analysed including the European Working Conditions Survey (EWCS) and the European Union Labour Force Survey (LFS). These statistics produced show that:

- Health and social care workers have the fourth-highest rate of serious work-related health problems in the previous 12 months, just behind industries such as manufacturing and construction. The highest proportion of occupational diseases was found in the sectors 'manufacturing' (38 %), 'construction' (13 %), 'wholesale retail trade, repair' (7 %), and 'health and social work' (5 %).
- Women in the health and social work sector were more likely to have had one or more than one accident or to have suffered from an occupational disease than women working in other sectors.
- According to the Fifth European Working Conditions Survey, exposure to biological and chemical risks is most prevalent in the healthcare sector, where doctors and nurses frequently have to handle infectious materials as well as the chemicals that are used to disinfect instruments and the workplace.
- For posture-related risks, the healthcare sector is in fifth position, after construction, agriculture, industry, and wholesale, retail, food and accommodation, according to the EWCS.
- Work-related stress, violence and harassment are recognised as major challenges to occupational safety and health. All of these psychosocial risks are of greatest concern in health and social work, followed by education and public administration.

EU-OSHA's European Survey of Enterprises on New and Emerging Risks (ESENER) also provided relevant information on risk management activities in the healthcare sector and the results showed that issues such as sickness absence and psychosocial risks are of major concern. These results showed that:

- For applying risk assessment or similar measures, health and social work is just above the EU average but behind sectors such as construction and manufacturing.
- The level of sickness absence monitoring in the health and social work sector is the highest in the EU.
- The health and social work sector is the sector with the highest concern regarding work-related stress, and violence or threat of violence.

Based on the statistics collected, the literature reviewed and responses to the questionnaire, the following risks were considered to be relatively high in the healthcare sector and have been examined in more detail:

Risks	Literature review	Responses to questionnaire
Biological	▪ bloodborne pathogens ▪ airborne pathogens ▪ contact diseases	▪ Exposure to biological agents ▪ Contact with specific agents for example: Pseudomonas, legionella, tuberculosis, hepatitis or HIV ▪ Sharp injuries ▪ Lack of vaccination programmes ▪ Overcrowded hospitals ▪ Change in Biocidal products Directive
Chemical	▪ Exposure to chemicals used in healthcare settings, for a variety of reasons, for example to treat patients (medications and anaesthetic agents); in laboratory work; or to clean, disinfect and sterilise surfaces and supplies (cleaners/disinfectants). In some situations, drugs or other medications used to treat patients can have unintended consequences for workers who are exposed to them when preparing and administering solutions or are exposed to the off-gassing during anaesthesia and aerosolised breathing treatments	▪ Contact with specific chemicals for example: carcinogenic drugs and cytostatics, nanomaterials, disinfectants, anaesthetic gases and radioactive materials. ▪ Allergies ▪ Home care work ▪ Lack of training
Safety risks	▪ Noise ▪ Radiation (ionising and non-ionising) ▪ Slip trips and falls	▪ Slip, trips and falls ▪ Equipment safety (use of failure) ▪ Specific exposure to physical risks for example x-rays or radiation
Ergonomic risk	▪ Lifting ▪ Pushing	▪ Lack of training

Risks	Literature review	Responses to questionnaire
	▪ Awkward positions ▪ Repeated movements ▪ Prolonged standing and sitting	▪ Bad ergonomic design and unavailable /unsuitable equipment ▪ Shift towards home care ▪ High workloads increasing risks of musculoskeletal disorders.
Psychosocial risks	▪ Working hours ▪ Drug abuse ▪ Emotional demands ▪ Stress- and burnout-related factors ▪ Violence and bullying	▪ High workload and time pressures resulting in stress ▪ Lack of control over work ▪ Poor organisational climate ▪ Language difficulties, lack of optimal working times ▪ Emotional events ▪ Economic crisis ▪ Lone working ▪ Violence and harassment ▪ Multitasking.

Home care specific risks

The home care setting is a challenging work environment in terms of home care workers' safety for a number of reasons. First, residential settings may present household-related hazards, such as poor indoor air quality or toxic substances that are associated with numerous negative health effects. Second, many of the same well defined hazards related to healthcare in clinical settings, such as spread of infections, development of resistant organisms and medication errors, are also found in home care settings. Third, home care may be delivered under conditions that are not controlled. Fourth, healthcare providers may have limited training or expertise in the area of patient safety and often have little or no direct supervision. Finally, risk management is especially problematic in home care because each home is, in essence, a 'worksite', yet all the necessary healthcare workplace protections, for both workers and patients, may not be in place or readily available. For these reasons, controlling hazards in home care can be difficult.

There are many common risk factors for healthcare workers in institutional settings and for home care workers. However, home care may represent a particular safety challenge for care workers travelling between, and working in, patients' homes. Injuries resulting from road traffic accidents, overexertion (and repetitive movements) when assisting patients, and slips, trips and falls inside and outside their homes are the main causes of lost working time among care workers. Other causes of accidents and diseases among care workers include exposure to hazardous chemicals (caustic, irritant, toxic or allergenic substances), being struck by objects, assaults and violent acts or behaviour. In addition, home care workers may be exposed to infectious diseases (e.g. hepatitis, HIV, flu, TB, measles and chickenpox) when providing direct client care, such as dressing or bathing, or cleaning and cooking for, infected clients. Various working conditions may also lead to mental or emotional fatigue in care workers. Dealing with clients and family members who may be stressed and difficult to work with and working independently in unfamiliar and uncontrolled situations are examples of situations that may cause stress to these workers.

The main risks identified for home care workers in the literature review and in the responses to the questionnaire included:

Ergonomic risks:

- Rooms in patients' homes are often small or crowded. About 40–48 % of a home healthcare worker's time may be spent in poor posture combinations, including bent forward and twisted postures, which are associated with shoulder, neck and back problems. Inadequate space to shower/bath the client results in ergonomic and manual-handling risks.

- The most important problem in patients' homes is non-adjustable beds (problems with the bed's height, width, and placement). Patients' homes usually do not have equipment to help with transfers; normal aids and equipment generally found in hospitals will not be available in patients' homes.
- Home healthcare workers frequently endure long periods of standing or walking.
- Heavy lifting, lifting in awkward postures and lifting without assistance are significant predictors of permanent work disability in home healthcare workers. Work-related musculoskeletal disorders caused by transferring patients to and from bed or helping patients to walk or stand are a major problem in the home healthcare industry (specific risks in this area include changes in client mobility that require excess exertion by the worker, the use of inappropriate equipment, having inadequate space to move the patient and not having help in lifting the patient). In 2007, sprains and strains were the most common lost-work-time injuries to home healthcare workers and, in comparison with other workers, home care workers take more frequent sickness leave as a result of work-related musculoskeletal symptoms.
- Providing help with activities of daily living (dressing, eating, walking and toileting) may be connected with a risk of musculoskeletal disorders because of the weight of the patient.

Physical risks:

- The physical environment inside the home: good housekeeping is an important factor in maintaining a safe work area for home care workers. Many home care workers are injured because they trip, stumble or step on objects in their way. Adequate lighting must be available to enable staff to work safely. Furthermore, if a home is cluttered and poorly lit, it may be difficult to leave quickly in the event of an emergency or an attack on a home care worker.
- Oxygen is both a prescribed treatment and a fire hazard. Fires can occur unexpectedly and smoking is the most frequent cause of house fires.
- Very often, clients' homes are not adapted to care workers' needs. A Spanish study involving 500 patients' homes concluded that only 6.5 % had adjustable articulated beds and only 16.1 % had adaptable showers; globally, only 12.9 % of homes surveyed had adequate conditions to meet care workers' needs and to enable them to work in a healthy and safe manner.
- The physical environment outside the home: the physical environment may present hazards; slips, trips and falls inside and outside the home are frequent causes of accidents to home care workers. Pavements, particularly uneven ones, steps, wooden ramps covered with water, ice, snow, leaves or moss, items left on pavements and pathways, and poor lighting represent other hazards that may be responsible for accidents outside the home. In addition, when a care worker goes outside with a client, the risks for the carer and client may be far greater than when the carer is outside alone.

Safety risks:

- Slip, trips and falls: accidents may be caused by, for example, walkways, wet floors or wet carpeting (less controllable circumstances).
- Driving to patients' homes: road traffic accidents are one of the most frequent causes of occupational accidents in home care workers and the most important cause of fatal accidents. Such hazard and risk can be minimised by, for example, wearing a seatbelt, checking tyres for wear and tear, attending to vehicle maintenance, reducing speed and distractions, being particularly cautious at intersections and not driving while sleepy or under the influence of alcohol or other drugs.
- Burns and scalds: people working in home care settings are often exposed to hazards that may cause burns, for example hot water, kettles, electrical appliances and chemicals. Burns are most commonly caused by exposure to flames, hot objects, hot liquids, chemicals or radiation. Scalds are caused by contact with wet heat, such as boiling water or steam.

Biological and chemical risks:

- Unsanitary conditions are a special concern, since the ease with which infectious disease spreads within a household is well documented and various procedures in home care can present a risk of

infection. Cross-contamination, such as the transfer of pathogens through direct and indirect contact with contaminated inanimate objects, can place home care workers at risk. Unsanitary homes may also harbour pests, including rodents, lice, scabies and termites.

- Household laundry is also a concern because it has been shown to be a route for the spread of disease. For example, the spread of *Staphylococcus aureus* via laundry has been documented. A review on domestic hygiene noted that changes in household laundry practices — such as lower temperatures, less use of household bleach and use of lower volumes of water — had an adverse impact on laundry hygiene in general. These changes could place home care patients and workers at increased risk of infection (Gershon, *et al*., 2007).
- The patient's health condition: home care workers may come into contact with infectious diseases such as hepatitis, HIV, flu, TB, measles and chickenpox. Most bloodborne occupational infections occur through injuries from sharps contaminated with blood, resulting from accidents or unsafe practices.
- Mismanagement of medical waste may also be a cause for concern in the home care environment because it can be a source of pathogenic microbes.
- Home care workers may be at risk from animal bites or injury caused by animals
- Exposure to sharp equipment: home healthcare workers are responsible for the use and disposal of any sharps. Patients and their families often do not dispose of sharps appropriately (contaminated sharps may be left around the home or in wastebaskets), which is one of the main risk factors for workers. Furthermore, syringes and lancets are often left uncovered in various places in the home.
- Another area of concern is the reuse of certain single-use disposable items. For example, it has been reported that many diabetes patients repeatedly reuse insulin syringes, without disinfection, until the needle is no longer sharp. Similarly, in the home care setting, drainage bags may be disinfected and reused, a practice that rarely occurs in hospitals.
- Lack of water: home healthcare workers may encounter homes without running water or with poor-quality water.
- Domestic duties may expose workers to chemicals: chemical exposure risks increase in the home care environment because the correct procedure for handling chemicals is not always possible. In addition, many home care workers do not always know what kind of medications the patient is taking or the consequences of exposure to them.

Psychosocial risks:

- There may be a mismatch between the assistance required by the client and that available from the care worker.
- No supervisor: home care workers' work is not directly supervised; they generally work alone, they may travel through unsafe neighbourhoods, and they may have to face alcohol or drug abusers, family arguments, dangerous dogs or heavy traffic. Some studies suggest that they may have more on-the-job stress than teachers or childcare workers, as they have reported having less control over and being less stimulated by their work. Home healthcare workers took the most long-term sickness leave (30 days or more per year) and had the second highest frequency of absenteeism.
- The dangerous behaviour of people outside the home: the home may be in a high-crime or unsafe area or an isolated location. In such locations, healthcare workers may be at risk of assaults. The presence of gangs, drug abusers or alcohol abusers may pose an increased risk of work-related assault**.**
- Family members and visitors (violence): violence to care workers may result from patients and occasionally from hostile family members and visitors who feel stressed, disturbed, frustrated, vulnerable or out of control. Family members may become argumentative because of their frustration with the client's condition or the care arrangements.

What are the main demographic, societal and technological trends and changes that have an impact on OSH in the healthcare sector across Europe?

Recent decades have seen significant technological advances in the workplace, which, together with rapid globalisation, have transformed work for many throughout the world. The effects of such changes on OSH in the healthcare sector have also been significant. In some cases, more traditional hazards and risks have been reduced or eliminated, but new technologies have also created new risks. At the same time, many workers are exposed to 'new' risks emerging from changing patterns of work, for example increased pressures to meet the demands of modern working life. Workforce age profiles are also changing, as is the gender balance in many workplaces. These changes in employment patterns have created evident risks that were either less prevalent or less obvious previously.

There are several trends and changes that have an impact on the workforce and therefore on the OSH of workers in the healthcare sector. The main trends and changes in Europe found in the literature review and supported by the questionnaire responses included:

- demographic changes (ageing of the patient population and workforce);
- changes in family patterns (declining availability informal care);
- lifestyle factors (chronic diseases such as obesity);
- higher number of workers with a chronic disease;
- migration and employment mobility (multicultural and multilingual workforce);
- economic crisis (lack of investment);
- new technologies and innovations (biotechnologies, nanotechnologies, robotics, virtual reality, developments in ICT);
- globalisation and economic crisis (restructuring, job insecurity, work intensification, decreasing quality of care, more people receiving less care, increase in the number of vulnerable patients);
- greater patient mobility; and
- different working conditions for workers crossing borders.

Ageing population: A common trend in nearly all the European countries is the ageing of the population. The number of elderly people (aged 65 and over) is projected to almost double over the next 50 years, from 87 million in 2010 to 152.7 million in 2060. With more people needing care the demand for healthcare will increase dramatically. A discrepancy between demand and availability of care jobs is quickly becoming a problematic trend.

Ageing workforce: The large numbers of workers who will retire within the next 10 to 20 years will drastically shrink the EU's healthcare workforce. In 2009, about 30 % of all doctors in the EU were over 55 years of age, and by 2020 more than 60,000, or 3.2 %, of all European doctors are expected to retire annually. Based on data collected by some Member States, the average age of nurses employed today is between 41 and 45, with not enough young recruits coming through the system to replace those who leave. Employment in the healthcare sector is increasing particularly among older workers and the number of physicians is mainly increasing in the older age groups. Older workers are in general exposed to many of the same workplace hazards as other workers. The most prevalent events leading to job-related injuries or fatalities are falls, assaults, harmful exposures and transportation incidents. Older workers often suffer from more severe injuries than those suffered by younger workers. Older workers who receive a workplace injury may require longer recovery periods than their younger counterparts.

Changes in family patterns: In particular the fact that older people increasingly do not live with their children under one roof any more, as well as the increase in female employment and families in which both parents work, will lead to the decline of informal care provided within the family and to an increased demand for formal care. As a result of many changes occurring to the family structure, the elderly cannot rely on their family members for support to the extent that they have done in the past. One of the reasons for this is migration. People, who migrate for an increased salary or for employment, often leave behind their older parents and, in some cases, even their children. Because of the instability of families and the tendency for women to develop professional careers, the elderly will need more formal care in the future. In contrast to the consequences of ageing on healthcare, which are well anticipated, the impact of these other demographic and social changes on future healthcare needs and related healthcare costs have not really been explored and require further investigation and research and development activities (European Commission, 2009a).

Changes in lifestyle: It is not only age-related illnesses that are a factor contributing to changes in demand for healthcare. So-called civilisation illnesses, caused by changes in nutritional habits, unhealthy diets, smoking, alcohol and drug consumption and lack of physical activity, will lead to an increased demand for care of patients with, for example, obesity, diabetes or coronary heart disease. These lifestyle-related diseases have been recognised as one of the main causes of avoidable illness.

Migration and workforce mobility: Healthcare worker migration has been increasing worldwide over the past decades, especially from lower income countries with already fragile healthcare systems. Over the last 30 years, the number of migrant healthcare workers increased by more than 5 % per year in many European countries. A positive consequence of this workforce mobility is that it creates an opportunity to increase occupational and personal qualifications for the migrating staff. However, a negative consequence of this activity is the inability of countries with low incomes to protect inhabitants' rights to proper healthcare, since qualified staff leave the country. Maintaining patient and worker safety can be an additional challenge in multicultural and multilingual working environments. The situations of these workers, including culture-specific perceptions and attitudes concerning work and occupational risks, must be taken into account when it comes to safety and health and related research.

Cross-border healthcare: This has become a more prominent phenomenon in the EU. The growth in 'imports' and 'exports' of patients together with other stakeholders and services has been fuelled by a number of factors. Technological advances in information systems and communication allow patients or third-party purchasers of healthcare to seek out quality treatment at lower cost and/or more immediately from healthcare providers in other countries. Increases in the portability of health cover, as a result of regional arrangements with regard to public health insurance systems or developments in the private insurance market, are also further increasing patient mobility. Patient mobility in Europe may see further growth as a result of an EU directive adopted in 2011 which supports patients in exercising their right to cross-border healthcare and promotes cooperation between healthcare systems - Directive 2011/24/EU. The directive applies to individual patients who decide to seek healthcare in a Member State other than the Member State of affiliation. However, cross-border healthcare is not restricted to patients. Medical doctors and nurses go abroad for training, to provide services temporarily or to establish themselves in another Member State. Increasingly, individual doctors and hospitals in different Member States cooperate with each other. In some cases, not only patients or providers but health services themselves move across borders, through telemedicine.

New technologies and innovations: Innovations in the healthcare sector are mainly connected to new services, new ways of work and/or new technologies (new medications or types of surgery). Innovations in the healthcare sector are the driving force in balancing reduction of costs and quality of care. These issues are key elements of work performance and competitiveness. In recent years, genomics and new biotechnologies have become important focal areas for healthcare innovation, and they are likely to remain so for the foreseeable future. They are followed closely by nanotechnologies and robotics (sometimes in combination with genomics and biotechnologies). The resulting innovations may revolutionise healthcare, although there are concerns about spiralling costs. Developments in these areas are expected to lead to — among other things — improved technologies and treatments for 'typical' age-related diseases, as well as to the means to prevent or delay the emergence of age-related illness or loss of functional ability. Other important innovations are in the field of information and communication technology (ICT).

Globalisation and the economic crisis: A general driver for the changing world of work is globalisation and the growth of the service sector (including healthcare), resulting in more competition, increased economic pressures, more restructuring and downsizing, more precarious work and an increase in job insecurity, as well as increased intensification and increased time pressures at work. The current crisis in Europe has increased the economic pressures on companies and this in turn intensifies the effects on EU employees. The European Hospital and Healthcare Federation (HOPE) in its report The Crisis, Hospitals and Healthcare, claims that the main consequences of the resources restrictions caused by the economic crisis on healthcare professionals are visible in employment policies and retirement reforms adopted by most EU Member States. In several cases, the government fostered policies aimed at firing or at least not replacing staff retiring or implementing restrictive policies on new recruitment and appointment of substitutes. A further package of measures consisted in cutting wages, a trend common to the entire public sector. Falling salaries in some countries — wage cuts have been as high as 25 % — have resulted in healthcare professionals moving abroad to further their careers.

What emerging risks can be expected across Europe based on the contextual changes and current risks and what will the impact on the work of and the service provided by care professionals be?

The main emerging and new risks identified in the literature review and the questionnaire responses included:

- An increase in exposure to relatively new chemical agents such as nanoparticles is expected, with unknown consequences for workers. Extra caution by workers working with nanomaterials is required and further research is needed on the effects of these materials.
- Exposure to biological agents may increase owing to an increase in travelling and mobility of patients. Furthermore, exposure to agents (particles from animals and so on) at people's homes is likely to increase, as the number of home care workers is expected to rise.
- Exposure to noise and physical risks (for example radiation) as a result of the use of new medical techniques (such as MRI) may increase as new devices are developed. This may bring new risks for workers and a need for further research into the impact of such exposure.
- Language barriers among workers and between workers and patients owing to immigration may pose an extra safety risk.
- The economic downturn may increase the risk of equipment failure since organisations invest less on maintenance, repair or buying new ones.
- The increase in costs of care together with the limitations on public spending, has increased the pressure on the system to improve on the services provided whilst maintaining the focus on a high standard of care.
- Hospitals have closed down due to the economic situation and this has resulted in fewer hospitals being available in close proximity to patients. Also with a reduction in staff there is a need to increase service efficiency and this will continue to put a strain on the existing workers.
- High physical workloads will remain an issue with the following factors contributing to it: lack of devices (such as lifting tools) in home care or an increase in long-term care for patients with chronic diseases such as obesity. The increasing implementation of ICT tools also influences physical issues. Mobile devices pose other ergonomic threats.
- Working time will remain an issue if workers have to do more hours (owing to high workloads) and if more workers (for example domestic workers and home care workers) are not protected by OSH legislation.
- Work intensification may increase because of budget constraints, restructuring, a lack of staff, a larger patient population and a greater need for efficiency. The increasing use of ICT may also influence this, as may a possible increase in the number of people who have more than one job. Home care workers and workers in other subsectors where there is a lack of staff may also suffer from this. Owing to restructuring within the sector, job insecurity is increasing.
- Work–life balance may remain an issue and affects particularly the large number of female workers in the healthcare sector.
- Violence and bullying, combined with emotional work; are still major issues in healthcare. Experts participating in EU-OSHA's *Expert Forecast on Emerging Psychosocial Risks* were of the opinion that, although these risks are not new, they are a growing concern, especially in the healthcare sector. The growing empowerment of patients will only contribute more to these risks.
- EU Directive 2011/24/EU on the application of patient's rights in cross border healthcare will have a negative impact in some of the EU-28 Member States. Although in theory the cooperation of healthcare professionals in initiatives that will allow patient mobility will permit them to learn from each other, being trained in new medical procedures and approaches, it will also have an array of potential effects on healthcare workers. Patient mobility will affect employment opportunities and workloads. In the country receiving these patients, it will mean that capacity will need to be extended, with additional staff; however, with the current shortage in healthcare professions (for example nurses), this will probably mean that there will be an increase in workload. In addition, these healthcare professionals may be confronted with expectations and attitudes that differ from those of domestic patients, and this will result in communication and cultural difficulties and even harassment and violent behaviours. For the countries that are losing healthcare professionals, their

existing resources will be stretched to the limit, resulting in burnout of staff and a high turnover of workers.

- Shift towards home care: With the imminent implementation of policy changes which highlight a move from institutional caring to community care more attention will have to be paid to OSH in the health care sector. People with pathology are not only seen in hospitals but also in home care and elderly homes. The pressure will increase on GPs and home care workers to take over more tasks from higher level healthcare institutions.

In addition to national societal and demographic changes, other changes and developments are expected to have a positive impact on OSH within the healthcare sector in the future.

Positive expected changes

More attention to sharps injuries:

- Amendments of national legislation will take more into account Council Directive 2010/32/EU of 10 May 2010 implementing the Framework Agreement on prevention from sharps injuries in the hospital and healthcare sector.
- With the implementation of this directive, it is expected that OSH enforcement, in terms of targeted inspections and cooperation between authorities, will improve. The same precautions regarding prevention from sharps injuries in health sector cover also other professions in the health sector (e.g., cleaning services, waste disposal, etc.). It is expected that these measures will have an impact on services and quality of care in a positive way.

Managing safety and health at work:

- More occupational health specialists in the healthcare section are expected. With more OSH specialists in hospitals (or any other establishment) with the power to make changes for example: insist on vaccination programs, provide help and support to workers with disability, provide rehabilitation programs etc. the OSH of healthcare workers should improve considerably.
- There are ongoing discussions on how to achieve better integration between health and social care which would result in a better quality of care. The implementation of “virtual hospitals” where a considerable amount of the treatment being undertaken is delivered in the homes of older people may improve service provision and outcomes. Having closer integration of clinical and OSH risks will have the potential to improve the management of both.

Legislation and inspection:

- Fulfilment of the legal framework, a strengthening of inspection bodies and an increase in awareness are expected.

Future research and practice

More in-depth research is needed to gain insights into the safety and health outcomes for specific risks and groups of workers and occupations, the interaction between risks, the interaction between OSH and quality of care, and the possible effects of healthcare systems on risks, OSH activities and outcomes.

Recommendations for research:

- There is a lack of recent comparable data at EU level on working conditions, exposures and safety and health outcomes for specific risks and groups of workers and occupations in the healthcare sector. More detailed data are needed to enable prioritisation of specific risks and groups of workers most at risk.
- There is limited information on the impact of current trends and existing risks on the quality of care patients are receiving; more research on the interaction between OSH and quality of care is needed.

- The impact of combined risks on healthcare workers has not been suitably studied; more research into these combined effects is needed, for example the interaction between ergonomic and psychosocial risks.
- Although one could argue that the performance of a healthcare system is interrelated with the OSH issues that their workforce are exposed too, no studies were identified focusing specifically on this relationship at macro level. More research in this area is of interest. For example, it would be worthwhile to study the impact of both efficiency and prevention activities on quality of care and OSH at different levels (organisation, country).

Directions for practice are:

- More practical initiatives are needed at national level to improve the working conditions of home care workers; based on the responses to the questionnaire, relatively few initiatives were identified. This relates to both formal and informal care-givers. About the latter group, relatively little information is available.
- The exchange of knowledge (such as in the form of examples of good practices) in the field of occupational health should be explored further.
- Owing to the ageing workforce, there may be an increased need for OSH interventions that take into account the working conditions of and the impact of risks on older workers; these interventions could target all age groups.
- Policies aimed at improving work–life balance and reducing wage differences between men and women are important.
- As a result of the increase in migration of healthcare workers, there may be a rise in language and cultural barriers in the workplace; extra attention should be paid to these issues, and proper and clear communication around OSH issues is needed. Equal working conditions and quality standards are desirable.
- Owing to the economic circumstances, the benefits of OSH need to be continually highlighted, for example by using the business case to show the added value that good OSH management brings.
- The introduction of new technologies, such as telemedicine, and new ICT systems requires continual training of workers. Furthermore, the related risks should be included in risk assessments. OSH could be taken into account in the design phase of new applications and other new technologies.
- New technologies, for example the introduction of robotics and exoskeletons, could also contribute to the improvement of working conditions. A further exploration of the possibilities, for example in a home care setting, is of interest.

1 Introduction

The health and social care sector is one of the largest sectors in Europe, employing around 10 % of workers in the European Union (EU), with women accounting for 77 % of the workforce. A significant proportion of healthcare workers are employed in hospitals; however, they can also be found in other workplaces, including nursing and care homes, medical practices and in other health-related activity areas (such as blood banks and medical laboratories) (EU-OSHA, 2007a).

A modern and innovative healthcare sector is seen as a driver for economic growth, as keeping people healthy benefits productivity and competitiveness. In addition, the healthcare sector is a key driver for research and development and produces the greatest number of innovative products and services (European Commission, 2012a). The sector is growing quickly, providing an ever greater number of 'white jobs' (those in the health and social services sector) opportunities (Eurofound, 2013a). This high employment potential is expected to continue in the years to come as a result of the ageing population, an expansion of services to better meet quality requirements and a rising demand for personalised care services (European Commission, 2012a).

The healthcare sector incorporates several subsectors dedicated to providing healthcare services and products. According to the World Health Organisation (WHO, 2013a), the healthcare sector is made up of people, institutions and resources, arranged together in accordance with established policies, whose primary purpose is to promote, restore and maintain health. It includes government ministries and departments, hospitals and other health services, health insurance schemes and voluntary and private healthcare organisations, as well as the pharmaceutical industry and drug wholesale companies. The United Nations (UN) International Standard Industrial Classification categorises human health and social care activities as the provision of health and social work activities (UN, 2013). These activities are wide-ranging, from healthcare provided by trained medical professionals in hospitals and other facilities to residential care activities that involve some healthcare activities to social work activities that do not involve healthcare professionals at all. These activities can be categorised as follows:

- Healthcare: generally consists of hospital activities, medical and dental practice activities and 'other human health activities'. This last class involves activities of, or under the supervision of, nurses, midwives, physiotherapists, scientific or diagnostic laboratories, pathology clinics, residential health facilities, and other allied healthcare professionals, for example in the fields of optometry, hydrotherapy, medical massage, yoga therapy and music therapy.
- Residential care: includes the provision of residential care combined with nursing, supervisory or other types of care, as required by the residents. Facilities are a significant part of the production process and the care provided is a mix of health and social services, with the health services consisting largely of some level of nursing services.
- Social work: includes the provision of a variety of social assistance services directly to clients. The activities in this division do not include accommodation services, except on a temporary basis.

The WHO defines healthcare workers as 'all people primarily engaged in actions with the primary intent of enhancing health' (WHO, 2006). Several professional groups can be distinguished, based on education, role and relevant regulatory structure, working in a wide range of institutions. Individuals, including healthcare professionals and members of allied healthcare professions, can be self-employed or work as employees in hospitals, clinics or other healthcare institutions, whether government operated, private for profit or private not for profit (for example non-governmental organisations (NGOs)). Relevant institutions include nursing homes, retirement homes and continuing care centres, which provide a more institutionally based care system and are commonly known as community care centres.

Home care services, on the other hand, offer the possibility of receiving a wide range of services in one's familiar surroundings. The care worker works in individuals' homes, assisting people who are unable to care for themselves or their families because of sickness, disability or old age. This means that a person does not have to relocate to a special facility to receive the care required. Home care is emerging as an increasingly promising option for providing health and social care for many conditions, especially those associated with older age, disability and chronic diseases.

Workers employed in the healthcare sector have to deal with a wide range of activities and environments that could pose a threat to their health and put them at risk of occupational disease or work-related accidents. Many of the settings in which healthcare workers carry out their jobs and the

multiplicity of tasks they perform when, for example, delivering frontline care for the physically or mentally impaired, handling patients or providing cleaning services can present a great variety of hazards (EU-OSHA, 2013a). Healthcare workers are exposed to a large number of concomitant risks such as:

- biological risks, such as infections caused by needlestick injuries and other communicable diseases;
- chemical risks, including from drugs used in the treatment of cancer and from disinfectants;
- physical risks, such as from ionising radiation;
- ergonomic risks, for example, during patient handling; and
- psychosocial risks, including violence and shift work.

The combination of these diverse risks makes healthcare a high-risk sector for workers. For example:

- According to European data, the work-related accident rate in the healthcare sector is 34 % higher than the EU average (EU-OSHA, 2003).
- At European level, the health and social care sector had the fourth-highest rate of serious work-related health problems, just behind industries such as manufacturing and construction (Eurostat, 2010a, p. 66).
- Women, who account for a large proportion of the healthcare workforce, experience a higher incidence of occupational falls, lower back problems and repetitive motion disorders. In comparison with all industries, healthcare has the highest proportion of days-away-from-work cases involving female workers (Bureau of Labour Statistics, 2011).
- Women in the healthcare and social work sector are more likely to have had one or more accidents at work than women working in other sectors (Eurostat, 2010a).
- According to EU-OSHA's European Survey of Enterprises on New and Emerging Risks (ESENER) (2010), the healthcare and social work sector had the highest rate of sickness absence monitoring by sector, at 58 %.

The quality of care in the sector is determined greatly by healthcare professionals. Moreover, even though the sector could be considered stressful and can often entail hazardous work environments, the safety and health of patients remain the first priority. This has long been the traditional focus of healthcare providers; it is ingrained in professionals in this area during their training and reinforced throughout their careers. The principle that patients' safety and health take priority is also the cultural norm and the management practice of conventional healthcare organisations reflects this. These organisations invest in systems, processes, equipment and controls, but resources are primarily allocated to meet the needs of patients, often leaving the safety of staff and issues around work–life balance unaddressed. It is important to connect worker safety with patient safety, since poor and unsafe working conditions could result in a higher probability of errors which could have serious implications for a patient. Patient safety and access to high-quality patient care can be achieved only if workplace safety and health issues are considered key priorities (Sikorski, 2009).

In addition to the well-known hazards, there are several new developments and trends that the health and social care sector in Europe has had to face, and these have resulted in a number of new occupational safety and health (OSH) challenges that have to be addressed and overcome. These include demographic, epidemiological, social, technological and cultural trends within EU countries that have an impact on existing care patterns. Examples include increasing shortages of healthcare professionals; an ageing healthcare workforce with insufficient new recruits to replace those who are retiring; the emergence of new healthcare patterns to tackle multiple chronic conditions; the growing use of technologies requiring new skill mixes; and imbalances in skill levels and working patterns. These changes have an impact on the working conditions and ultimately on the well-being and safety of healthcare workers. In addition, as identified by the European Commission (2012a), recruitment and retention are hampered by demanding working conditions as well as by low and slowly growing wages.

The ageing population, with people living longer and needing care for long-term and non-communicable conditions, is another issue. This is shifting the emphasis from acute hospital-based care to care in our homes and in community settings (Health Services Research Europe, 2011). The decline of the traditional large family and increasing urbanisation will also lead to gaps in the care of older or disabled people. The trend for people requiring care, basic maintenance, support or assistance in their own

homes instead of in residential settings continues to increase rapidly. As the number of people in older age or with a disability increases, demand for services that allow them to stay in their own homes and in the community are expanding. Home-based solutions are required more, not only for the health, social and emotional benefits but also because of the potential reduction in public expenditure, as home care provision has been demonstrated to be more effective and efficient than institutionalised care. For this reason, the European Commission has also highlighted the employment potential in the personal and household care sector. This potential is related to the ageing population, changes in the residential patterns of people with disabilities and rising female participation in the formal labour market, all of which contribute to a decline in the availability of family carers. This, in turn, leads to an increased need for paid care (European Commission, 2012b). Home care workers are a vulnerable group because of unfavourable working conditions (low wages, poor fringe benefits and generally high workloads) (Genet *et al*., 2012). The International Labour Organisation (ILO) pays special attention to 'domestic workers' in Convention No 189. Particular care is needed in managing the working conditions of those home care workers who fall into the category of domestic workers.

Finally, the economic crisis has had an impact on the health and social care sector, placing a heavy burden on national healthcare systems at the same time as drastic budget cuts undermine some essential safety programmes. The difficulties are in trying to reduce the cost of services but not the services themselves, that is, in providing more efficient services in a way that minimises the effects on their quality.

1.1 Aim and scope of the report

This state-of-the-art report considers the OSH issues in the health- and social care sector in the EU including the European Free Trade Association (EFTA) and candidate countries. The activities associated with healthcare in institutions such as hospitals and nursing homes, as well as those activities undertaken in patients' own homes are explored. Traditional hazards such as psychosocial risks, exposure to dangerous substances, safety issues and ergonomics are considered. New and emerging, aspects, such as the increasing demand for healthcare, the need for more long-term care, the rise in palliative care, and critical workforce shortages — especially in certain healthcare professions and medical specialisations or geographical areas — are addressed to determine their impact on the OSH of healthcare workers. If the EU is to preserve the safety and health of its healthcare workforce and maintain the quality of service to the public, it needs to be able to meet these challenges proactively. The results of this report will help to provide direction for research and practice for the further improvement of OSH issues in this sector.

The main objective of this report is to explore and gain an overview of current and emerging OSH risks and issues in the healthcare sector, including home and community care, in the EU. The report focuses on the question: ***What are the current and emerging OSH risks and issues for healthcare professionals and how will these issues affect the safety and health of healthcare workers and influence the overall service that they provide?***

While trying to answer this question, the report explores the following issues in detail:

- The main differences in healthcare systems across Europe, highlighting any current developments.
- The main categories of healthcare professionals in the healthcare sector in Europe.
- The main demographic, societal and technological trends and changes that have an impact on OSH in the healthcare sector across Europe.
- The main risks associated with activities undertaken and with the working environment for healthcare professionals, including non-professionals in home care. The impact of these risks on the work and the services provided by these care professionals is analysed.
- Identification of the healthcare professionals most at risk.
- The emergence of new risks across Europe based on the contextual changes and current risks and analysing the impact they could have on the work of and the service provided by healthcare professionals.

The importance of home and community care is emphasised in the report and the following aspects have been taken into consideration:

- The differences between the categories of home care workers across Europe. How do training, salaries and working conditions vary in different Member States?
- How home care work is organised across Europe, identifying current structures (public, mixed or private) and the foreseen future challenges for home care workers.
- The level of protection that informal or unregistered homecare workers receive, and if there have been any changes in the way the OSH of homecare workers is managed since the implementation of ILO Convention No 189.
- The OSH risks that workers providing home care are exposed to and how these differ from those faced by other healthcare professionals.

1.2 Methodology

Two main activities were used to source the information and data required for the report:

- desk-based research; and
- responses to a questionnaire sent to EU-OSHA's national focal points ([1]).

The information from and findings of the desk-based study have been integrated with the data from the questionnaire.

1.3 Desk-based research

The researchers used a desk-based method to assess the literature published throughout the EU on the following topics:

- healthcare infrastructure;
- current and future trends in healthcare;
- OSH risks that healthcare professionals encounter;
- the impact of poor OSH on the work of and the service provided by healthcare professionals; and
- home care across Europe.

The information and data reviewed in the report were sourced from:

- institutes such as the ILO, the WHO and the European Commission;
- experts on the healthcare professions;
- structured databases such as EUROSTAT's accident at work statistics;
- databases of peer-reviewed journals such as Scopus, ScienceDirect and PubMed; and
- resources found via the search engine Google.

1.4 Questionnaire

To gain a better understanding of how OSH in the healthcare sector varies across Europe, a questionnaire was designed that focused on the following issues at national level:

Current issues

- Societal and demographic changes having an impact on (a) the OSH of workers, (b) the work being undertaken and (c) the quality of care being provided in the healthcare sector.
- Main OSH risks in the healthcare sector.
- Professionals in healthcare (including community and home care) who are considered to be most at risk and the reasons why.

([1]) The focal points are nominated by the government in each of the Member States as EU-OSHA's official representative in that country. The focal points are typically the competent national authority for safety and health at work. Each focal point manages its own tripartite network consisting of government bodies and representatives from worker and employer organisations.

- How OSH protection of homecare workers is managed, including examples of any initiatives such as changes in legislation or policies that have been introduced since 2011. Have these initiatives been direct results of ILO Convention No 189?

Future issues

- Changes and developments that could have an impact on the OSH of workers in the healthcare sector.
- What would be the impact of these changes and how will they affect the OSH of healthcare professionals, the work they undertake and the quality of care they provide?

This questionnaire (see Annex 1), which targeted OSH experts, preferably with experience in the healthcare sector, was sent to the national focal points of the EU-28 countries and in addition to European Economic Area (EEA) and EFTA countries (Iceland, Liechtenstein, Norway and Switzerland) and (potential) candidate countries (Albania, Bosnia and Herzegovina, Macedonia, Montenegro, Serbia and Turkey). In total, 21 completed questionnaires were received from 16 countries.

Table 1: Questionnaire responses received from OSH experts

Country	Number of questionnaires received
Albania	1
Belgium	1
Cyprus	1
Czech Republic	1
Estonia	1
France	1
Hungary	3
Ireland	2
Italy	1
Latvia	1
Lithuania	2
Netherlands	2
Slovakia	1
Sweden	1
Switzerland	1
United Kingdom	1

Table 1 provides an overview of the completed questionnaires received from Albania, Belgium, Cyprus, the Czech Republic, Estonia, France, Hungary, Ireland, Italy, Latvia, Lithuania, the Netherlands, Slovakia, Sweden, Switzerland and the United Kingdom.

The majority of the responses came from representatives of national labour inspectorates, ministries with OSH responsibilities, OSH institutes, worker organisations and the healthcare sector. In general, the respondents had more than five years of OSH experience in fields such as safety, ergonomics, occupational medicine or psychology.

The results of the questionnaire have been incorporated into the chapters of this report.

2 Healthcare systems in Europe

According to the WHO, a healthcare system consists of 'all organisations, people and institutions producing actions whose primary intent is to promote, restore or maintain health'. This definition is now used by other organisations, such as the World Bank and the EU (Figueras & McKee, 2012).

A healthcare system includes, in practical terms, the following three items:

- the delivery of (personal and population-based) health services, including primary and secondary prevention, treatment, care and rehabilitation;
- the activities to enable the delivery of health services, specifically the functions of finance, resource generation and stewardship; and
- stewardship activities aimed at influencing the health impact of relevant interventions in other sectors, regardless of whether or not the primary purpose of those interventions is to improve health.

In all cases, according to the WHO (2013b), a well-functioning healthcare system requires a robust financing mechanism; a well-trained and adequately paid workforce; reliable information on which to base decisions and policies; and well-maintained facilities and logistics to deliver quality medicines and technologies. The budget for healthcare systems determines the ability to satisfy the needs of the population and the level to which they are satisfied.

2.1 Healthcare systems

There is a wide variety of healthcare systems around the world, with as many histories and organisational structures as there are nations. In some countries, healthcare system planning is distributed among market participants. In others, there is a concerted effort by governments sometimes in combination with trade unions, charities, religious organisations and/or other coordinated bodies to deliver planned healthcare services for the populations they serve. The exact configuration of the bodies involved in healthcare planning varies from country to country (Liverpool-ha.org.uk, 2013).

Every country needs to find a system to steer around 8 % of its national income into the healthcare sector. In Europe, two systems are primarily used, the Bismarck system (in, for example, Austria, Poland, Romania and Switzerland) and the Beveridge system (the UK, Italy, Spain and Sweden), although some countries use a mixture of the two.

2.1.1 Bismarck system

The Bismarck system was the first healthcare system in the world, founded in 1883 by the German chancellor Otto von Bismarck. The idea of insuring workers was based on an old tradition that arose in the medieval guilds. If one member of the guild was not able to provide for his family, the guild took care of them. This is why some aspects which are not directly linked to health insurance, such as the continued payment of wages in case of illness, are included in the Bismarck system. The idea is that every person who is not able to provide for himself because of illness must be insured by the regular health insurance.

The Bismarck system, based on a system of social health insurance, is a legally mandatory multi-payer system and involves three parties:

a) The population: participation is compulsory according to the conditions of employment. The insurance is extended to other groups (for example students, retirees and unemployed people). There is a notion of 'universal coverage'.

b) Providers: a public–private mix.

c) Contribution collectors:

- are statutory third-party payers;
- have decentralised sovereignty over revenue; and
- work independently from healthcare providers.

Contributions are not (health) risk-related; instead, they are usually wage related and tied to employment. They can also be community-related per capita premiums.

2.1.2 Beveridge system

The Beveridge system is characterised by the following criteria:

- It is tax-based and includes the entire population.
- It handles the financing and provision of healthcare within one organisational system.
- It covers a package of services of prevention, diagnosis and treatment for the whole population free of charge.
- It provides financial support during unemployment, sickness, disability and retirement.
- Additional private insurance is possible. Usually, this allows quicker and easier access to services and more comfortable settings. This can run the risk of creating a two-tier society, with a quality gap between private and public hospitals.

2.1.3 Healthcare reform

A growing number of healthcare systems across Europe are in the midst of a long-term process of structural and organisational reform. Both Beveridge and Bismarck systems, in western European countries and the countries of Central and Eastern Europe, are rethinking and often reconfiguring important organisational and institutional structures for delivering both individual clinical and population-based public health services. Initiatives are also being explored to encourage actors in other sectors to influence health determinants. While the broad policy objectives for most countries have remained relatively constant, the strategies and mechanisms by which policy-makers are trying to reach them have undergone considerable change (Figueras & McKee, 2012).

This expansive healthcare reform process was set in motion by, as well as facilitated and made possible through, a series of ongoing policy developments in six parallel areas:

- *evidence-based medicine*, providing a systematic framework to evaluate the effectiveness and appropriateness of clinical procedures and interventions and organisational developments;
- *market-based mechanisms*, particularly among providers, emphasising competition, cost reductions and patient responsiveness and satisfaction;
- *total quality management*, previously developed in manufacturing industries, leading in healthcare to re-engineering of the service production process, emphasising high quality of care, good outcomes and enhanced patient safety;
- *integrated care and provider substitution*, requiring sophisticated coordination between acute, primary, nursing home and home care in response to an ageing population and rising rates of chronic disease; in the process (involving a shift in emphasis in healthcare systems from inpatient specialists towards outpatient, primary care and primary healthcare arenas);
- *health promotion and disease prevention*, seeking to move personnel and resources upstream towards the behavioural, organisational and societal sources of ill health; and
- *information technology,* facilitating the digitalisation of clinical, financial and managerial information to support major new organisational efficiencies and organisational strategies.

2.2 Healthcare organisation

Healthcare systems are organised and financed in different ways across the EU Member States. There are generally five primary methods of funding healthcare systems (Liverpool-ha.org.uk, 2013):

- general taxation to the state, county or municipality;
- social health insurance;
- voluntary or private health insurance;
- out-of-pocket payments; and

- donations to health charities.

In most countries, the financing of healthcare services features a mix of all five models. The exact distribution varies across countries and over time within countries.

Costs in healthcare are related to many factors that determine the demand for and method of providing services. The key factors in this field include the structure and size of the population; the health conditions of the population; the goals of individuals and entire communities; and the rules governing access to healthcare (European Commission, 2012a). In many European countries, financing the healthcare system depends on social insurance drawn from the wages of active working citizens, while the ageing of the population leads to a reduction in the proportion of such persons (European Commission, 2012a). After public financing, the main source of funding for health expenditure in most countries is out-of-pocket payments. Private health insurance financing plays a significant role in only a few countries, according to the Organisation for Economic Co-operation and Development (OECD, 2012). Currently, healthcare systems have insufficient resources, both financial and human, and the resources they have are unevenly distributed, taking into account geographical and social localisation. This has a direct impact on general health conditions, including the rate of diagnosis and treatment quality (Social Europe, 2010).

Improving healthcare systems, while containing costs, is a key policy challenge in most European countries. The OECD (2010) has assembled comparative data on healthcare system performance and health policies. The data identify the strengths and weaknesses of each country's healthcare system in addition to the policies that will boost efficiency. Groups of countries that have broadly similar institutions are identified and performance across and within groups is compared (see Table 2).

The main conclusions can be summarised as follows:

- Six groups of countries having broadly similar institutions have been identified:
  - one group of countries relies extensively on market mechanisms in regulating both insurance coverage and service provision (Germany, the Netherlands, Slovakia and Switzerland);
  - Two groups (Belgium and France on the one hand and Austria on the other) are characterised by public basic insurance coverage and extensive market mechanisms regulating provision but differentiated by the use of gatekeeping arrangements and the degree of reliance on private health insurance to cover expenses beyond the basic package;
  - one group where the rules provide patients with choice among providers, with no gatekeeping but extremely limited private supply (Iceland, Sweden and Turkey);
  - two groups of heavily regulated public systems, separated by differing degrees of stringency of gatekeeping arrangements and of budget constraints (Denmark, Finland, Portugal and Spain on the one hand and Hungary, Ireland, Italy, Norway, Poland and the United Kingdom on the other).
- Efficiency estimates vary more within country groups having institutions with similar characteristics than between groups. This suggests that no broad type of healthcare system performs systematically better than another in improving the population's health status in a cost-effective manner. However, by making comparisons within the groups, it is possible to see the strengths and weaknesses of each country and identify areas where achieving greater consistency in policy setting could yield efficiency gains.
- Some suggestions for policy reform apply to many countries, independently of their group. In particular, better priority setting, improved consistency of responsibility assignment across levels of government and agencies, better user information on the quality and price of healthcare services and better balanced provider payment schemes would be reform options to consider in many OECD countries.
- For some policy instruments, a 'one-size-fits-all' approach to reform is not advisable, as increasing consistency in policy setting entails implementing different approaches. As an example, regulations concerning hospital workforces and equipment may need to be loosened in some countries and tightened in others.

- Administrative costs tend to be higher in most of those countries relying on market mechanisms to deliver a basic insurance package (Germany, the Netherlands and Switzerland). However, they also exceed the average level by a considerable margin in a few others (Belgium, France and Luxembourg), signalling potential for reducing spending. Inequalities in health status tend to be lower in three of the four countries with a private insurance-based system — Germany, the Netherlands and Switzerland — indicating that regulation and equalisation schemes can help in mitigating cream-skimming (refers to choosing patients for some characteristic(s) other than their need for care, which enhances the profitability or reputation of the provider) and the effects of other market mechanisms which can raise equity concerns.

Table 2: Groups of countries having broadly similar institutions (OECD, 2010, p. 15, adapted).

Market versus public mechanisms	Private/public	Type private/public	Countries in the EU
Reliance on market mechanisms in service provision	Private insurance for basic coverage		Germany, Netherlands, Slovakia, Switzerland
	Public insurance for basic coverage	Private insurance beyond the basic coverage and some gatekeeping	Belgium, France
		Little private insurance beyond basic coverage and no gate-keeping	Austria
Mostly public provision and public insurance	No gatekeeping and ample choice in of providers for users		Iceland, Sweden, Turkey
	Gatekeeping	Limited choice of providers for users and soft budget constraint	Denmark, Finland, Portugal, Spain
		Ample choice of providers for users and strict budget constraint	Hungary, Ireland, Italy, Norway, Poland, United Kingdom

According to the European Health Report (WHO, 2009), the improvement of the performance of countries' healthcare systems is a priority issue across the European region, especially in the current economic climate in which obtaining the greatest value from existing resources is paramount. Assessing a healthcare system's performance involves measuring and analysing how well it is meeting its ultimate goals, such as better health status and better financial protection for the population and increased responsiveness or efficiency for the healthcare system, but also looking at issues such as the quality and safety of health services, which contribute to reaching these goals (WHO, 2009).

2.3 The healthcare workforce and labour market

The workforce in the healthcare sector comprises workers primarily delivering healthcare services, such as healthcare professionals; allied healthcare professionals; public health professionals; health management staff; and administrative and support staff. Many people also work indirectly for the healthcare sector, such as those employed in the industries and services supporting it, for example, pharmaceutical industry, medical device industries, health insurance, health research, eHealth, occupational health and spas (European Commission, 2012a). These workers who are indirectly employed in the sector are excluded from this report. Healthcare professionals can be salaried or self-employed. In several countries, general practitioners and outpatient specialists are mostly independent,

self-employed with private practices or contracted by funds or hospitals to provide services (European Commission, 2012a).

2.3.1 Human resource challenges

The healthcare sector is a vital part of national economies and constitutes an important labour market in most countries. In Europe, healthcare sector jobs accounts for 10 % of overall employment (European Observatory on Health Systems and Policies, 2010). The trend towards greater numbers of people being employed in the health- and social care sector will continue (European Commission, 2012a). Even during the economic crisis, employment in the healthcare sector has continued to grow: while overall employment in Europe fell by 5 million people, between 2008 and 2010 the healthcare sector increased its share of total employment by half a percentage point, creating more than 770,000 new jobs (European Commission, 2012a).
There is now widespread recognition that effective healthcare systems and the provision of quality healthcare depend on the performance of an adequately educated, skilled and motivated healthy workforce (European Observatory on Health Systems and Policies, 2010). Better working conditions increase the motivation of healthcare workers and create the prerequisites for a more effective workforce. Increased workloads, greater stress, and dissatisfaction of healthcare workers with their working conditions undermine their motivation and health, frequently resulting in poor performance (European Observatory on Health Systems and Policies, 2006).

It is estimated that in 2020 most healthcare jobs will require highly qualified people (more than 5 million), while the need for medium-qualified personnel will remain rather significant (around 3 million). Around 200,000 job openings will be for low-qualified people. The estimated shortages of healthcare workers by 2020 in all groups vary between 13.5 % for physicians and for dentists, pharmacists and physiotherapists and 14 % for nurses. The highest absolute magnitudes of the shortages are in the groups of physicians (230,000) and nurses (590,000) compared with 150,000 in the other group (see Table 3) (European Commission, 2012a).

Table 3: Estimated shortages in the healthcare sector by 2020 (European Commission, 2012a, p. 6)

Healthcare professionals or other health workers	Estimated shortage by 2020	Estimated percentage of care not covered
Physicians	230,000	13.5 %
Dentists, pharmacists and physiotherapists	150,000	13.5 %
Nurses	590,000	14.0 %
Total	970,000	13.8 %

There are concerns in many European countries about shortages of doctors and nurses, although recent cuts to public spending on healthcare in some countries may have led to at least a temporary reduction in demand (OECD, 2012).

- Since 2000, the number of doctors per capita has increased in almost all EU Member States. On average across the EU, the number of doctors grew from 2.9 per 1,000 of the population in 2000 to 3.4 in 2010. Growth was particularly rapid in Greece and the United Kingdom.
- In nearly all countries, the balance between generalist and specialist doctors has changed such that there are now more specialists. This may be explained by a reduced interest in traditional 'family medicine' practice, combined with a growing remuneration gap between generalists and specialists. The slow growth or reduction in the number of generalists raises concerns in many countries about access to primary care for certain population groups.

- Concerns about possible shortages of nurses may well intensify in the future as the demand for nurses continues to increase and the ageing of the 'baby boom' generation precipitates a wave of retirements among nurses. Over the past decade, the number of nurses per capita has increased in nearly all EU Member States. The increase was particularly large in Demark, France, Portugal and Spain. However, recently there has been a reduction in nurses employed in some countries hardest hit by the economic crisis. In Estonia, the number of nurses was increasing until 2008 but has decreased since then, with a resulting fall from 6.4 nurses per 1,000 of the population in 2008 to 6.1 in 2010 (OECD, 2012).

However, countries face different human resources challenges and needs. The current supply and distribution of healthcare workers varies across the European region. Shortages of staff (especially primary care physicians and higher-level nurses) in many parts of Western Europe contrast with the inherited oversupply of physicians and beds in many countries in Central and Eastern Europe and the Commonwealth of Independent States (WHO, 2009).

Variation in supply may reflect not only different organisational arrangements for ambulatory care, such as in relation to the patient's first point of contact with the system, but also differences in underlying demographic and economic trends.

Planning the proportions of general to specialist physicians and of nurses to physicians raises particular challenges. In some countries, mainly in Western Europe, the proportion of physicians who are generalists appears to be declining, reflecting not only the increasing complexity of medical treatment but also cultural and financial factors. Many countries have therefore recently stepped up measures to train and/or retrain additional primary care physicians (the United Kingdom) and/or sought to encourage more graduating medical students to take up positions in primary care (Finland and Sweden). Countries have also accelerated efforts to train more nurses (the Netherlands), to retain nurses who are thinking about leaving and to re-attract those who have already left the profession (WHO, 2009). Important challenges that face those responsible for workforce management in the healthcare sector are (European Observatory on Health Systems and Policies, 2006):

- The healthcare workforce must be aligned with healthcare system goals and with what is required to sustain changes that are needed to improve the organisation and delivery of healthcare.
- An adequate supply means not only sufficient numbers of all types of healthcare workers but also an equitably balanced distribution in geographical terms.
- There is a need for accurate and comprehensive information systems on the actual number of healthcare workers and their distribution in the healthcare system. In several European countries, these information systems are still lacking, so that the picture of the healthcare workforce remains incomplete and inaccurate.
- Having sufficient numbers of workers optimally distributed who are qualified to perform their job well is only part of the equation and will not automatically result in improved patient care and satisfaction. Of equal importance is the optimal use of workers, consistent with their technical and interpersonal skills, and under conditions that promote the best possible performance.
- Beyond the issue of numbers, many activities relevant to the planning of the healthcare workforce, such as changing the scope of practices, redesigning jobs, and transforming the skills and roles of professional groups, are prerequisites to progress on major reforms of healthcare systems.

In addition, the report '*Investing in the Future of Jobs and Skills: Health and Social Services'* (Eurofound, 2009a) more specifically outlined that:

- Health and social care professionals will certainly need new skills in the future. Some will be technical in nature to ensure that workers can get the most out of new information systems and advances in technology. Other skills will need to be more organisational, as people learn to work in multidisciplinary teams that deliver integrated care to patients.
- The sector should promote lifelong learning and devise more tailored training courses. Multi-skilling — where employees gain knowledge from different disciplines — will improve approaches to integrated patient care. Special training courses could be developed to help the sector's older workers upgrade their skills. Efforts should also be made to retain and recruit older workers to keep employment levels up as demand grows.

2.4 Impact of healthcare systems and organisation on OSH

Comparing healthcare systems and the impact they have on the OSH of their workers is very difficult because of the lack of up-to-date and comparable data. In addition, most healthcare indicators identified in the review are quality related and not very objective. Financing mechanisms differ between countries; however, there is no clear relationship between these mechanisms and efficiency. Although one could argue that the performance of a healthcare system (for example in terms of the efficiency, quality and safety of care services) and the OSH of its workers are interrelated, no studies were identified that focused specifically on the relationship between these characteristics and indicators and OSH.

In the absence of any available data, an attempt has been made to try to identify any trends, strengths or weaknesses in the various systems that would have an overall influence on the OSH of healthcare professionals.

Across Europe, healthcare is barely managing to cover its costs. Not only are the methods of raising funds to cover costs inadequate, but, of even greater concern, the costs themselves are set to soar. According to World Bank figures, public expenditure on healthcare in the EU could jump from 8 % of GDP in 2000 to 14 % in 2030 and continue to grow beyond that date (The Economist, 2011). The overriding concerns of Europe's healthcare sector are finding ways to balance budgets and restraining spending. Unless that is done, the funds to pay for healthcare will soon fall short under either of the systems in operation in Europe. For example:

- In the Beveridge system, the healthcare ministry must battle with other policy areas for its share of tax revenue. In addition, demographic changes will lead to an increased burden on tax revenues both quantitative (increased number of old people) and qualitative (more expensive healthcare services and technology).
- In the Bismarck system, because of demographic changes, the system needs to support a steadily increasing number of retirees who no longer pay into it. In addition, financial cutbacks by companies, caused by the economic crisis, have led to a steep climb in the unemployment rate and, as a result, fewer employees are contributing to the system.

This future healthcare funding crisis is also linked to the ageing of the population, the parallel rise in chronic disease and the rising cost of medical technologies, factors which are interlinked.

Healthcare is a high-risk, high-demand, high-stress industry in perpetual change, one with unique OSH challenges. It operates 24 hours a day, 7 days a week, and 365 days a year and often involves in matters of life and death. Professionals in this sector work in a fast-paced environment which entails high physical work demands and requires constant mental astuteness to oversee the needs of fragile, complex, very ill people, often in unpredictable settings. If to this you add the economic uncertainty, with less money being invested and treatment costs rising but with the expectation that more patients will be treated, the only possible outcome is an increase in the OSH risks that these workers will face in their day to day activities. Healthcare restructuring and changes in the delivery of patient services will naturally affect the work environment. Work-related injuries, violence in the workplace and stress on the job are interrelated aspects of work conditions that are sensitive to both internal changes (such as staff cutbacks) and external changes. Healthcare workers' safety and health have implications for patient care and costs because staff turnover and lost work days affect continuity of care and availability of trained staff. Healthcare professionals will want to help people in need, but the sheer logistics of expanded care delivery, the current and growing shortage of personnel, and the limited resources available in already overloaded healthcare systems will most likely result in:

- Distribution shortfalls, leading to a continued inability to meet local demand for healthcare.
- Disproportionate ratios of healthcare professionals to patients, leading to doctors and nurses working extended shifts of more than 12 hours. With a diminished workforce, maintaining sufficient ratios to ensure the required level of care will be difficult. For example, nurses working longer shifts are more likely to experience burnout and job dissatisfaction while at the same time not being able to provide the level of service that they would like to.
- An increase in lone working. This becomes a concern when workers have to undertake manual handling operations or interact with patients or family members with a known history of violent or aggressive behaviour.

- Higher expectations and unrealistic demands. Doctors and nurses will be rushed, with insufficient time to be able to provide good care.
- A need for higher intensity of care. As more patients suffer from chronic diseases, there will be an increase in the number of additional care hours required to ensure good-quality care.
- An increase in the need for home care, leading to more healthcare professionals working away from traditional institutions. Those professionals who have to go into a patient's home are more at risk of verbal and physical abuse.

Without a strong and growing workforce operating under better working conditions, the OSH of healthcare professionals will not improve and nor will the quality of care that they provide. Working in healthcare is difficult with adequate personnel; it will be much more so with the anticipated shortfall of workers. Increased work-related stress will affect and aggravate the mental and emotional health of these workers. There will be heavier workloads, which will be seen to increase dramatically as more patients enter healthcare systems across Europe. With a reduced workforce, this will overwhelm already stressed medical professionals. The need for staff members to do more paperwork, again linked to projected shortages of staff, will reduce the time spent with patients, and this is seen as a burden on the workforce, who would much rather have direct patient care hours.

In the study '*Health and Satisfaction of Healthcare Workers in France and in Europe'* (Estryn-Behar, M., Le Nézet, O., Jasseron, C. 2005), the main reasons for dissatisfaction or strong dissatisfaction in all healthcare occupational levels in the 10 countries studied (Belgium, Denmark, Finland, France, Italy, the Netherlands, Norway, Poland, Slovenia and the UK) were, in order of importance:

- pay in relation to need for income;
- lack of psychological support;
- physical working conditions;
- lack of opportunities to give patients the care they need;
- lack of work prospects;
- staff handovers when shifts change; and
- the way abilities are used.

These issues and other OSH risks, together with the importance of good working conditions for healthcare professionals, will be considered in more detail in Chapter 4.

3 Home and community care across Europe

Demographic, epidemiological, social and cultural trends in European countries are changing the traditional patterns of care. The next decades will see increasing numbers of care-dependent older people, and non- communicable diseases will become the leading cause of chronic illness and disability. The decline of the traditional large family group and increasing urbanisation will also lead to gaps in the care of older or disabled people. These changes in needs and social structure require a different approach to health- and social care sector policy and services; a disease-oriented approach is no longer appropriate.

An answer to these issues is home and community care, a sustainable approach that prevents the need for unnecessary short- or long-term institutionalisation and allows individuals to remain in their home and community for as long as possible.

3.1 What is home and community care?

Community care services are intended to help people who need care and support to live with dignity and independence in the community and to avoid social isolation. These services provide the right kind of care and support to people who have difficulty managing on their own, such as older people who are ill, people with physical disabilities, people with sensory disabilities, people with learning disabilities and people with mental health problems.

The aims of community care are to:

- enable people to live as normal a life as possible in their own homes or in a homely environment in the local community;
- provide the right amount of care and support to help people achieve maximum possible independence; and
- give individuals a greater say in how they live their lives and the services they need to help them do so.

Each person has different requirements for their care, and services available to them may include home care, equipment aids and home adaptations (for example handrails and stair lifts), meals on wheels, day care (provided in day centres) and respite care (non-residential).

3.1.1 Home care

According to the WHO (2008), home care aims to satisfy people's health and social needs in their homes by providing appropriate and high-quality home-based healthcare and social services, by formal and informal care-givers, with the use of technology when appropriate, within a balanced and affordable continuum of care.

A recent report by Eurofound (2013a) showed that the term 'home care' is understood very differently across countries and sectors. This study has defined home care as 'care provided by professional carers within clients' own homes'. Professional care that relieves informal care-givers (respite care) has also been taken into account. Although the main focus is on formal care (provided by professional carers), informal care has been considered complementary to formal care and a co-determinant in the allocation of formal care. Informal care is provided by spouses, family members, friends and volunteers, who are usually not paid, and by privately hired non-professionals who are paid informally. It includes not only long-term care but also short-term care provided at home. The nature of home care services can be preventative, acute, rehabilitative or palliative (OECD, 2005). As demand is becoming increasingly complex, mixed types of home care (social care services combined with healthcare services) are becoming more prevalent.

The focus of a study on the type and range of home care services (Genet *et al.*, 2012) highlighted the social services aspects — for example domestic aid, personal care and technical aid — as well as nursing services. Home care does not exclusively refer to care for frail elderly people. Patients of all ages might be in need of home care after hospitalisation and adults with disabilities may require home care.

In this study, the following activities were distinguished:

- Domestic aid services relate to instrumental activities of daily living, such as using the telephone, shopping, food preparation, housekeeping, transportation, taking medication and financial administration.
- Personal care services provide assistance with dressing, feeding, washing and using the toilet, and getting in or out of bed (sometimes referred to as 'personal activities of daily living').
- The provision of health information and education known as 'supportive nursing services'.
- Technical nursing includes activities such as assistance with putting on prostheses or elastic stockings; changing stomas and urinal bags; help with bladder catheters; skincare; disinfection and prevention of bedsores; oxygen administration; and catheterisation and giving intravenous injections.
- Rehabilitative nursing refers to occupational therapy or physiotherapy

The difference between social care and healthcare provided at home needs to be taken into consideration. The labelling of services as either social care or healthcare depends on the characteristics and boundaries of both systems in a country. Home nursing is normally part of the healthcare system; domestic aid usually comes under social services. The position of personal care varies. This is an important distinction, since home healthcare and home social care are usually regulated differently.

Traditionally, whether home care is covered by the healthcare system or the social care system depends on the nature of the service provided (WHO, 2008).

Home care services provided by healthcare systems often include rehabilitation supportive, health-promoting or disease-preventative and technical nursing care, both for chronic and acute conditions (such services in relation to acute conditions are better known as hospital-at-home schemes), occupational therapy and physiotherapy. Home healthcare recipients are mostly older people, people with complex illnesses or disabilities and people with terminal illness.

Home help services, traditionally provided by the social services sector, comprise:

- Household duties such as shopping, cooking, cleaning and administrative paperwork (for example filling in forms and paying bills), activities such as socialising or going for walks, and personal care (help with bathing, dressing and so on).
- These services are commonly substituted for informal care; however, they may also supplement it (help for family members, neighbours or friends) and provide moral and psychological support (counselling and advice). Once again, most people receiving home help services are older people, many of them living alone.

There are countries in which the term 'home care' has a narrow meaning and does not include community care. In a recent report (Eurofound, 2013a), community-based care is defined as health and social care that is provided to people to enable them to live in a community. Therefore, community care can be part of home care, although it is not necessarily the same. In this report, the focus is on home care, which might include community care.

3.2 Approaches to organising and funding home care

Many countries, such as Belgium, Spain, France, Italy, Portugal and the United Kingdom, have an organisational model in which the 'health' component of home care is part of the healthcare system and the 'social' component is part of the social system (see Table 4). In other countries, especially Denmark, Finland and Sweden, policy-makers have recognised the advantages of providing home care through a single organisation under the responsibility of one institution. For example, municipalities have provided home care in Denmark since 1992. In contrast to local government-oriented single-agent solutions, Germany and the Netherlands have a single funding stream (insurance-based) that covers home nursing and social care services. In addition to these institutional actors, voluntary, charitable and for-profit providers of home care services have extensive roles.

Table 4 : Country-specific organisation of home health and social care in selected EU countries (WHO, 2008, p. 14)

Country	Healthcare at home	Social care at home
Belgium	Central or regional government	Local government or municipality
Denmark	Local government or municipality	Local government or municipality
Finland	Local government or municipality	Local government or municipality
France	Social insurance and local government or municipality	Local government or municipality
Germany	Social insurance	Social insurance
Ireland	Central or regional government	Central or regional government
Italy	Central or regional government	Local government or municipality
Netherlands	Social insurance	Social insurance
Portugal	Central or regional government	Local government or municipality
Spain	Social insurance	Local government or municipality
Sweden	Local government or municipality	Local government or municipality
United Kingdom	Central or regional government	Local government or municipality

When confronted with a rising demand for long-term care, some countries have been quite prepared to raise taxes or social insurance contributions to fund the basket of services that includes home care (WHO, 2008). Countries with universal long-term care coverage consequently have concerns about the financial sustainability of their systems, especially if the national population is expected to age significantly in the future.

- Some countries, such as Germany and the Netherlands, have created a single funding stream.
- Other countries have reduced the scope of public funding: for example, the social insurance-based system in the Netherlands has dramatically reduced the scope of services covered by AWBZ (National Act on Exceptional Medical Expenses) insurance.
- In some other countries, reforms such as developing rehabilitation and disease prevention services have been adopted: for example, the tax-based system in England is investing heavily in rehabilitation. Other countries freeze benefit levels — for example, the value of home care services for those qualifying for long-term care insurance in Germany — while costs rise, so that an increasing gap develops and is met by individual contributions.
- Means testing has been tightened in some other countries (where benefits had been offered to most of the population) and thresholds increased for residential care subsidies.

3.3 Labour market

The balance of community-based versus institutional care varies across countries. Overall, there is an increasing trend towards more community-based care. As an example, in the UK, the Office for National Statistics regularly surveys the provision of home care services, and the following results were published in February 2013 (NHS, 2013):

- Community based services (for example, home care, day care and meals) were provided to 1.23 million service users during 2010-11.
- Councils with Adult Social Services Responsibilities (CASSRs) purchased or provided 188 million contact hours of home care during the 2011-12, an increase of 4 per cent on 2006-07, but a decrease of 6 per cent from 2008-09
- The number of contact hours provided directly by CASSRs has fallen by 57 per cent since 2006-07 while the number of contact hours provided by the independent sector (private and voluntary sectors) has increased by 25 per cent over the same period.
- The number of contact hours provided by the independent sector (private and voluntary sectors) increased by 2 percentage points between 2010-11 and 2011-12, and has increased by 15 percentage points from 2006-07. 89 per cent of all contact hours were provided by the independent sector in 2011-12, compared to 87 per cent in 2010-11 and 74 per cent in 2006-07.
- The average number of contact hours provided increased year on year from 2006-07 to 2008-09 and continued to increase in 2010-11. 2011-12 saw a decrease in the average number of contact hours provided. There has been an 18 per cent increase in the average number of contact hours per service user between 2006-07 and 2011-12.
- Although there has been a drop in the number of service users receiving home care, the number receiving more than 10 hours or overnight/live-in/24hr services has increased slightly to 122,000. It now represents 41 per cent of all service users receiving home care compared to 38 per cent in 2010-11.

The momentum towards home care appears to be driven by lower costs, policies promoting greater independence for people with disabilities, the preferences of clients and the potential of assisted-living technology (Eurofound, 2013a). Figure 1 shows the reasons for the increasing demands for home health- and social care: policy factors, demographic shifts, social changes, changes in epidemiology, science and technical innovation, and changes in attitudes and expectations.

Demographic shifts: Demographic changes are leading to an increased demand for home care. The population structure in EU countries is set to change dramatically in the near future. In particular, the proportion of old and very old people is set to increase, while the number and relative proportion of children, young people, young adults and adults will decline, as birth rates are falling sharply.

Social changes: Changes in social attitudes, values and behaviour contribute to an increased demand for formal home care services. The fragmentation of the traditional large family group into small family units in an urbanised context reduces the number of people who can provide care to dependent family members. Increased female labour market participation also results in a smaller pool of people being available for family care. Greater internal mobility across Europe at all points in the life course (including working and retirement age) can give rise to considerable distances between family members.

Changes in epidemiology: Improvements in public health have contributed towards changing epidemiology. A rise in non-communicable diseases influences the demand for home care, in various ways:

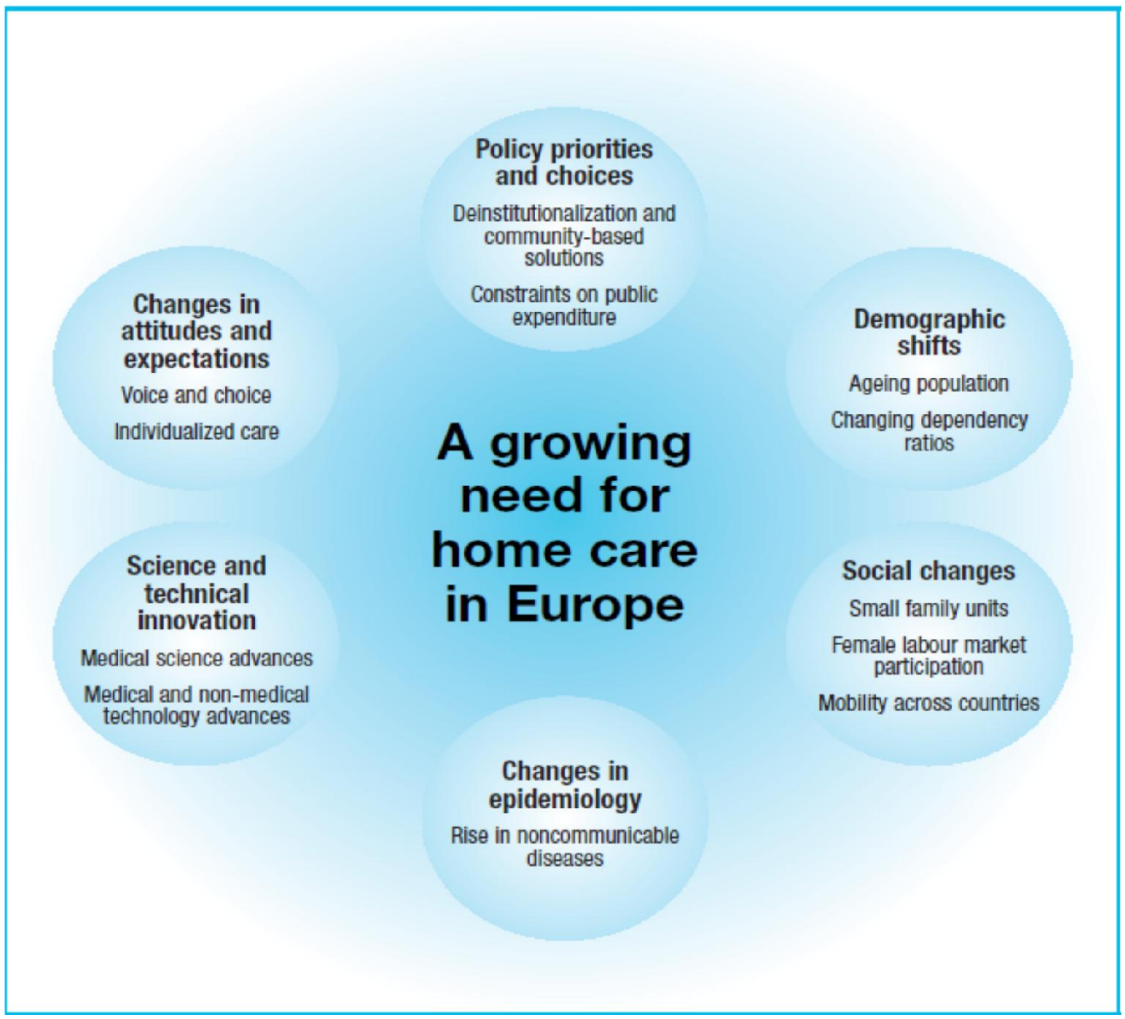
- Mental illness is increasingly being recognised and treated, and home care is preferred to institutional care.
- The pattern of disease is changing. Some diseases, such as Alzheimer's disease and dementia, are becoming more prevalent in an ageing population. There is also greater awareness and understanding of such conditions and how effective treatments and support may be offered within a home setting using a range of home care services.

- More people are living with the consequences of diabetes, heart disease, respiratory diseases, stroke and cancer. Many of these people can be effectively and efficiently taken care of at home with appropriate and targeted support.

Science and technical innovation: Developments in science and technology (both medical and non-medical) are affecting the demand for and the supply of home care. Medical advances in pharmaceuticals, devices and surgical technologies have contributed towards increasing life expectancy and enhancing quality of life for many disabled people, older people and children with complex care needs. Simple home modifications (such as adapted toilets, showers and baths, and lifting equipment) more easily match residential settings to the needs of people with impairment.

Changes in attitudes and expectations: There are rising expectations around consumer choice and citizen voice in relation to the organisation and delivery of home care services.

Figure 1: Influences on the supply of and demand for home care (WHO, 2008, p. 3)



According to the Eurofound study (2013a), it is difficult to determine the size of the workforce in community-based care for the elderly and disabled. Data are available only for Austria (20,100 jobs), France (393,000 jobs), the Netherlands (132,200 jobs), Spain (115,900 jobs) and the United Kingdom (960,000 jobs). Data for three of the study countries show rising numbers of home care workers: on average, in Austria by 740 yearly, in France by 19,800 yearly and in the United Kingdom by 28,000 yearly. This rising trend very probably also exists in other countries. The trend is expected to continue in the coming years.

Generally, the labour market for community-based care is characterised by shortages, especially at higher qualification levels. These have been mitigated temporarily by the economic crisis. Europe is in the midst of an economic crisis that is leading to cutbacks in care services and more emphasis on the financial argument for community-based care over institutional care. High unemployment rates are making the sector more attractive to work in (Eurofound, 2013a). In the long term, however, increasing shortages are to be expected, especially of better-qualified personnel.

Four labour market strategies have been identified to improve recruitment and retention in the sector (Eurofound, 2013a):

1. Targeting labour reserves to attract new employees to the sector, including the recruitment of unemployed people and groups such as immigrants and migrant workers;

2. Promoting and facilitating the education of potential employees by, for example, creating specific learning paths, developing campaigns to encourage young people to choose a career in the sector and improving the relationship between this labour market and educational institutions;

3. Improving the working conditions of current employees to optimise their potential and retain them in the sector, for instance by introducing training programmes, professionalising the sector and providing more career opportunities for existing employees; and

4. Improving the operational management and labour productivity of organisations, for example through the use of new technologies and direct payments or by distributing tasks more effectively among staff.

3.3.1 What are the different types of home care workers?

According to EU-OSHA's publication 'E-fact 35: Risk Assessment for Care Workers', home care workers are people who work in private homes and care for patients who are unable to function independently as a result of diseases, disability or age. Their duties include preparing meals, cleaning the home, transporting the patient, and taking care of hygienic needs (EU-OSHA, 2008a).

In the Eurofound study (2013a), home care workers are defined as health and social care workers who:

- provide health and social care services to a specific target group (adults with a physical or intellectual disability, or with chronic physical or mental health problems, particularly people below retirement age);
- provide care of a specific type (long-term care);
- work in a specific setting (community-based care as opposed to institutional care); and
- work in a formal (waged) context (as opposed to informal, non-waged carers).

Based on these activities, this study focused on a number of occupational groups roughly corresponding to Statistical Classification of Economic Activities in the European Community (NACE) code 88.10 (social work activities without accommodation for the elderly and disabled), including home carers, social care workers, social workers, activity workers, community nurses and other professions, such as therapists.

The WHO (2008) identifies a wide variety of providers in the home setting. These are a mix of professional and non-professional personnel, including nurses, therapists (physical, occupational and speech), home care assistants, social workers, physicians, dieticians, homemakers, companions, volunteers and others:

- Nurses represent the largest group of professional home care employees. Frequently, nurses evaluate people who receive home care, develop care plans, provide skilled nursing care and determine whether or not other services are required. They also make the best use of the care assistance available for people receiving home care and their family members through education.
- Home care assistants, or aides, are the foundation of the home care workforce because of the wide variety of services they provide. These services range from assisting with therapy and the activities of daily living to preparing food. Of the professional providers identified, home care assistants typically visit most frequently and spend the most time with the person receiving care.
- Other home care workers include social workers and therapists. Social workers support people receiving care and their families in seeking and gaining access to community assistance,

overcoming red tape and financial concerns, and considering social aspects that may influence the plan for home care treatment. Therapists, such as physical, occupational and speech therapists, consider therapy needs, develop care and rehabilitation plans and have oversight of any assistants involved in providing therapy.

Home care is necessarily a labour-intensive activity that relies on a variety of providers to deliver an array of formal clinical and social services, as well as informal services, in the home setting; therefore, it is not possible to identify one category of worker who would cover all the activities undertaken.

3.3.2 Informal carers and carers outside the registers

At present, informal care is preferred to professional care in many countries (for example countries in southern and south-east Europe), but even there family care and other informal care is expected to decline and old-age dependency ratios are increasing (Genet *et al*., 2012).

Relatively little is known about the private market and the grey economy of care across some European states; for example, some illegal immigrants in southern Europe receive an informal salary and do not pay taxes, although they supply substantial home care services (WHO, 2008). The group of home care assistants in particular includes workers who are not licensed and work outside the oversight of regulatory bodies; concerns about the quality of care have, thus, been raised (WHO, 2008). There are significant flows of these care workers from low- and middle-income countries to high-income countries within Europe, for example from Slovakia and Hungary to Austria, from Eastern European countries to the United Kingdom, and from Albania to Italy. In Italy, for example, the proportion of workers employed in domestic positions who were born outside the country increased from 20 % in 2001 to 83 % in 2006.

Mapping Professional Home Care in Europe (EURHOMAP) has gathered data (Genet *et al*., 2012) indicating that informal care-givers are paid less than formal care-givers in most of those countries in which direct payments have been introduced. Similarly, their working conditions and entitlement to social rights are less favourable than those of formal care-givers. Some country experts assumed that direct payments were not intended to support informal care-givers but rather to limit the provision of formal care and reduce spending on long-term care. Supporting informal care-givers as ‘co-workers’ helps to secure the continuity of care because informal care-givers and family members are always ‘available’. However, the efficacy of such an arrangement depends not only on the extent and type of coordination and integration between informal and formal care-givers, but also (and much more) on the availability of a sufficient workforce of formal care-givers. In a number of countries (for example the Netherlands, Norway, Slovenia, Sweden and, to some extent, Italy), formal regulations define informal care-givers’ responsibilities and duties as well as the duration of their working hours.

Genet *et al*., 2012 highlights that care provided outside the registers (often by immigrant workers in some countries) may also become a future policy issue. Policy-makers need to find solutions to the mistreatment of immigrant workers (unfair wages, lack of social security and poor working conditions) and to safeguard the quality of care of such unregistered providers. As the importance of such types of informal care grows, policy-makers may need to consider legalising and formalising them (as in Cyprus, Austria and Italy).

3.4 Legislation around home care workers

At European level, formally employed home care workers are covered by the European Framework Directive on Safety and Health at Work (Directive 89/391 EEC). It guarantees minimum safety and health requirements throughout Europe, while Member States are allowed to maintain or establish more stringent measures as long as they concerns employees and not self-employed workers. The directive obliges employers to take appropriate preventative measures to make work safer and healthier. It aims to establish an equal level of safety and health for the benefit of almost all workers: the exceptions are domestic workers and certain public and military services (EU-OSHA, 2013b). Self-employed workers are not covered by EU OSH legislation.

Home care workers can work directly for a householder. In this case, they fall under the definition of domestic workers. A domestic worker is a person performing work done in a household under an employment relationship. A person who conducts household work casually or sporadically is not

referred to as a 'domestic worker' (ILO Convention No 189). Their work may include tasks such as cleaning the house, cooking, washing and ironing clothes, taking care of children, or elderly or ill members of a family, gardening, guarding the house, driving for the family and even taking care of household pets.

Research carried out for the ILO report *Domestic Workers across the World* (2013a) shows that only 10 % of all domestic workers (or 5.3 million) are covered by general labour legislation to the same extent as other workers. In contrast, more than one-quarter — 29.9 %, or some 15.7 million domestic workers — work in countries where they are completely excluded from the scope of national labour legislation. Between these extremes, a number of intermediate regimes exist. Exclusions and partial coverage result in weaker protection for domestic workers in a number of important areas, including key working conditions provisions.

In Western Europe and the Scandinavian countries, the working conditions of domestic workers tend to be regulated by special labour laws, with only a few countries, such as France and Italy, having collective agreements on domestic work. By contrast, the Eastern European labour law tradition has not favoured dedicated norms for domestic workers (ILO, 2013a).

Within Europe, the biggest employers of domestic workers are Spain, France and Italy. A common pattern among them — and other Western European countries — is the employment of migrant women, for whom domestic work is a main entry point into the labour market. Data from the 2004 European Community Labour Force Survey show that 36 % of all female migrant workers in Spain find work as domestic workers. Similarly, 27.9 % and 21.1 % of all female migrant workers are hired by private households in Italy and France respectively (ILO, 2013a).

Because domestic workers (including informal carers and carers outside the registers) do not have as much legal protection as other workers, domestic care work is rarely seen as a real form of employment. On top of that, access to private homes is restricted and inspections by labour inspectorates are difficult. In some sectors, including domestic work, it is particularly difficult for labour inspectorates to intervene, because either these sectors fall outside the scope of action of labour inspection or there is a lack of resources. The prevailing rules regarding access of labour inspectors to private households require either the consent of the householder or prior judicial authorisation, turning the inspection visit into a problematic operation and demanding of inspectorates innovative approaches which are still rarely taken (ILO, 2013b).

To improve the working conditions of domestic workers, the ILO introduced Convention No 189 (2011) targeting domestic workers. This convention effectively promotes and protects the human rights of domestic workers. Its provisions include freedom of association and the effective recognition of the right to collective bargaining, elimination of all forms of forced or compulsory work, elimination of child labour and elimination of discrimination in employment and the work environment. More specifically, it requires that ILO members ensure the effective protection of workers from exploitation, abuse and violence, a level of employment, decent working conditions and decent living conditions, including respect for the right to privacy in the case of domestic workers living in the household. It establishes the rights of domestic workers to equal treatment in relation to working time, to a salary for overtime, to periods of daily and weekly rest and to paid annual leave. To ensure coverage of so-called rules, the convention also set down the requirements that domestic workers receive a minimum wage and that their wages be determined without discrimination based on sex (ILO Convention No 189). ILO members established a minimum age for employment as a domestic worker. In case of employment a workers aged less than 18 and above the minimum age for employment, a member of the ILO is to apply measures to ensure that the work will not prevent or interfere with further education of the employee (ILO Convention No 189).

3.4.1 Employment conditions

Good working conditions are needed to recruit and retain qualified home care workers. The following employment conditions were investigated in the study *Home Care across Europe* (Genet *et al*., 2012):

- whether or not tasks are laid down at national/regional level;
- whether or not home care professionals have permanent working contracts;
- whether or not collective agreements on working conditions and salaries are in place; and

- home care workers' salaries.

Working conditions differ greatly across types of profession in home care (they are best for home care nurses). Generally, home care workers tend to have a regular contract with a salary paid by a home care agency or by the local municipality. Most home care professionals work part time. Self-employment is possible in most countries and is quite common (mainly for nurses) in Belgium, Estonia, Greece and France. Short-term contracts for home care social workers are also common in several countries; in Greece and Lithuania, these are the most usual type of contract. There is not much information available about the salaries and contract status of social workers, but the experts in the study described in *Home Care across Europe* indicated that well-trained social workers attract good salaries and have high educational levels. Collective working condition agreements are quite common, but often these hold only for professionals working in the public sector, or relate only to salaries and differ markedly between the home healthcare and home social care sectors (Genet *et al*., 2012). Among nurses, salaries tend to be best in Denmark and UK, where they are above the average income, and relatively bad in Norway and Poland. Caution is needed when comparing the salaries of home care social workers across countries, as roles and tasks may differ widely (in some countries they also have a coordinating role). Availability of data on the actual salaries of home care workers was fragmented, so no comprehensive overview could be achieved on this subject.

A major concern in the home care sector across Europe is the challenge of how to cope with growing demand in a time of financial constraints and shortages of professional human resources. Most EU countries seem to be fighting a losing battle in trying to meet fully the demand for home care with the current capacity. In many cases, deinstitutionalisation policies have compounded the negative influences of a lack of funding and unfavourable working conditions, especially for domestic aides. For countries in Central and Eastern Europe, the current period of shrinking public resources is further delaying the development of early home care systems (systems to protect against home care failures) (Genet *et al*., 2012).

Issues that are specifically important for domestic workers are working time regulation, minimum wage coverage and in-kind payments, and maternity protection. These issues are further described in the ILO report *Domestic Workers across the World* (2013a).

3.4.2 Management of OSH at Member State level and existing initiatives: results of the questionnaire answered by National OSH experts

Since individual countries can set out their own vision on home care and apply additional legislation targeting these workers, in the questionnaire the following questions were posed to the OSH experts:

1. How is the OSH protection of home care workers managed in your country?

Overall, there was no mention in any of the responses of specific legislation at national level that covered home care workers. Home care workers are protected by existing OSH legislation if they are classified as employees, for example if they are working for a hospital or healthcare organisation or employed by an agency to provide care at home. The OSH protection of those who are considered self-employed is less clear and not managed as well.

Table 5: Questionnaire responses on how OSH protection of home care workers is managed at national level

Country	Management of OSH protection
Belgium	Home care workers have the same protection as hospital workers. The employers of home care worker organise the OSH training and provide the information that is needed.
Cyprus	OSH protection of home care workers is managed through the enforcement of the safety and health laws in accordance with the European Social Charter.

Country	Management of OSH protection
Czech Republic	Home care workers are not a numerous employment group and their safety is covered by the existing laws on workplace safety and health, as is the safety of all healthcare and social workers.
Estonia	There are no special requirements or legislation for home care workers.
France	There is general protection for all workers (which include home care workers) which are covered by a high level normative array.
Hungary	Homecare workers are mainly private entrepreneurs and thus are not covered by the OSH protection system at all. The comprehensive protection of home care workers is challenging. Most home care activities are carried out in an unregistered way. The quality of care is unpredictable, waiting lists are getting longer and informal/irregular payments (made by patients to personnel in the hope of receiving better care) are distorting the patient–care-giver relationship. Patients have more information than in the past but it is often unreliable, and they have less trust in care personnel. The country's small wealthy stratum is turning to private healthcare providers.
Ireland	Where home care workers are employees, they are covered by occupational safety and health legislation in the same way as other healthcare employees.
Italy	OHS protection of home care workers is critical, because they take risks in various situations. Home care workers can be self-employed, employed by private companies or employed in agreement with the national health system. This means that the laws regulating home care work and the legal protection provided vary. The OSH protection of home care workers is managed in the same way as that of other workers with the same kind of contract. Legislative Decree 81/2008 on safety and health at work aims to protect non-standard work and work at home, but it does not make specific provisions for domestic workers and those providing home care services.
Latvia	There is no legislation in Latvia regarding home care (domestic) workers in particular. All the current laws and regulations on OSH and labour cover the home care sector and home care workers. Household premises may be visited by a labour inspector to check information if the labour inspectorate receives information (a complaint) from a home care worker. The main challenge for labour inspectors is gaining access to private household premises. Home care workers are not widespread in Latvia in the present economic circumstances.
Lithuania	There are no special requirements or legislation for home care workers.
Slovakia	Home care workers are covered by safety and health legislation. Laws and regulations are in place for the protection of the OSH and working conditions of domestic workers.
United Kingdom	Some home care workers may not be covered by the United Kingdom's safety and health legislation (that is in Great Britain the Health & Safety at Work Act 1974 (HSWA) and in Northern Ireland the Health & Safety at Work (Northern Ireland) Order 1978) where their activity is deemed to be as a 'domestic servant' employed by someone within their private household. However, guidance was developed during 2011–12. This can be found at: http://www.hse.gov.uk/healthservices/domiciliary-care.htm. Where HSWA does apply, for example where difficult people handling are required, life-support equipment is used or challenging-behaviour training is necessary, the Health and Safety Executive (HSE) will continue to provide, update and review guidance.

Country	Management of OSH protection
	Home care agencies and local authorities are also regulated by others, such as the Care Quality Commission (England), the Care and Social Services Inspectorate Wales and the Care Inspectorate (Scotland). However, their focus may be on quality of care rather than traditional safety and health.

2. Have any initiatives (legislation, policies or other initiatives) been introduced in your country since 2011 (the introduction of ILO Convention No 189) that focus on the OSH protection of home care workers?

Deplorable working conditions, labour exploitation and abuses of human rights are the major problems that domestic workers face. The ILO, in undertaking to protect the rights of domestic workers, promotes equality of opportunity and treatment, and improves working and living conditions. Its global strategy consists of strengthening national capacities and institutions, including encouraging policy and legislative reforms; promoting the ratification and implementation of Convention No 189 and Recommendation No 201; facilitating the organisation of domestic workers and their employers; awareness-raising and advocacy; and the development of a knowledge base and policy tools.

The majority of the responses received and shown in Table 6, did not report any initiatives for the OSH protection of home care workers that had come about as a result of ILO Convention No 189.

Table 6: Questionnaire responses to a request for examples of initiatives implemented for the protection of home care workers

Country	OSH initiatives for home care workers
France	French law already provides a level of protection for home care workers at least equivalent to that of the ILO Convention No 189. The French law was a precursor of this convention.
Ireland	There have been some OSH initiatives for the protection of home care workers; however, these were as a result of negative publicity regarding the provisions for home care workers in Ireland and not related to the convention.
Italy	As the only EU country that ratified the convention, Italy has undertaken several initiatives for domestic workers which cover activities such as cleaning, cooking, gardening, childcare and caring for ill family members.

4 OSH risks in healthcare including community and home care

Healthcare workers deal with a wide range of activities that not only pose a threat to their safety and health, resulting in adverse health effects in the form of work-related diseases or accidents and injuries at work, but also reduce their effectiveness in the workplace. The healthcare sector is very different from other industries since it is people orientated and labour intensive, involves a diverse workforce, has challenging working environments, requires workers to deal with urgent life-or-death situations, involves multidisciplinary operations and entails the use of sophisticated equipment. All these factors result in healthcare workers being potentially exposed to a wide variety of hazards during their working day.

In this chapter, the main risks associated with the work being undertaken by and the working environment of healthcare professionals (including home care) are considered and discussed. Through a review of the literature and an analysis of the responses to the questionnaire, the impact of these risks on the quality of these care professionals' work and the quality of the service that they provide are highlighted, and the healthcare professions that are seen to be most at risk are identified.

4.1 Prevalence of exposures and OSH outcomes in the healthcare sector

To get an overview of the main risks in the healthcare sector, available data at EU level were collected and analysed.

The main OSH monitoring initiatives at European level are the European Working Conditions Survey (EWCS) (Eurofound, 2013b) and the European Union Labour Force Survey (LFS) (Eurostat, 2013). The aim of the first is to provide an overview of the state of working conditions throughout Europe and to indicate the nature of changes affecting the workforce and the quality of work. The second initiative is a quarterly EU household survey that provides comparable data on employment and unemployment in the Member States. The results of this survey and the statistics produced show that:

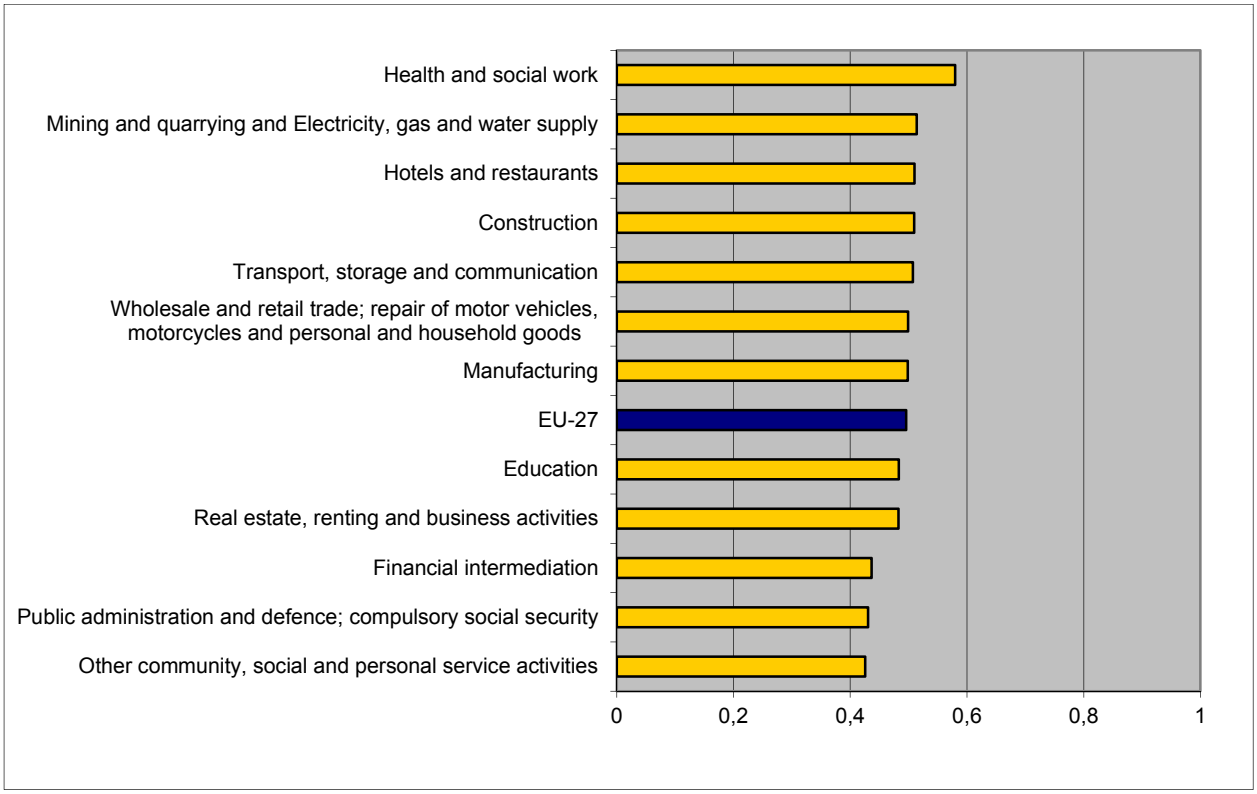
- Health- and social care workers have the fourth-highest rate of serious work-related health problems in the previous 12 months, just behind industries such as manufacturing and construction (Eurostat, 2010a). The highest proportion of occupational diseases was found in the sectors 'manufacturing' (38 %), 'construction' (13 %), 'wholesale retail trade, repair' (7 %), and 'health and social work' (5 %) (Eurostat, 2010a).
- Women in the health and social work sector were more likely to have had one or more than one accident or to have suffered from an occupational disease than women working in other sectors (Eurostat, 2010a).
- According to the Fifth European Working Conditions Survey, exposure to biological and chemical risks is most prevalent in the healthcare sector, where doctors and nurses frequently have to handle infectious materials as well as the chemicals that are used to disinfect instruments and the workplace (Eurofound, 2012a).
- For posture-related risks, the healthcare sector is in fifth position, after construction, agriculture, industry, and wholesale, retail, food and accommodation, according to the EWCS (Eurofound, 2012a).
- Work-related stress, violence and harassment are recognised as major challenges to occupational safety and health. All of these psychosocial risks are of greatest concern in health and social work, followed by education and public administration (EU-OSHA, 2010).
- According to the EWCS 2005 (Eurofound, 2007), the prevalence of stress and anxiety was high in the sectors 'education' and 'health and social work'. Even though stress and anxiety are frequently not the most serious work-related health problem in the health and social work sector, as indicated by the LFS ad hoc module 2007, workers in this sector often do experience stress and anxiety (Eurostat, 2010a). The Registered Nurse Forecasting (RN4CAST) study (Aiken, 2012), for example, concludes that various factors negatively influence retention of highly skilled healthcare professionals, including physical loads, organisation and management structures (for example a

shortage of healthcare workers), and the work environment. This study concludes that job dissatisfaction of nurses varies among European countries and ranges from 11 % in the Netherlands to 56 % in Greece, with an intention of nurses to leave their position of up to 50 % in Greece and Finland.

ESENER (EU-OSHA, 2013c) also provides relevant information on the way that OSH is managed across Europe in different sectors. It focuses on the way in which safety and health risks are managed in practice, particularly those that are 'new and emerging', such as work-related stress, violence or harassment. ESENER provides specific information about risk management activities in the healthcare sector and the results show that issues such as sickness absence and psychosocial risks are of major concern to the sector. These results show that:

- For applying risk assessment or similar measures (% establishments, EU-27), health and social work is just above the EU average but behind sectors such as construction and manufacturing.
- Sickness absence monitoring (% establishments, EU-27) in the health and social work sector is the highest in the EU (see Figure 2).
- The health and social work sector is the sector with the highest concern regarding work-related stress and violence or threat of violence.
- The health and social work sector is the sector with the highest percentage of procedures in place to deal with work-related stress, bullying or harassment and work-related violence.
- The health and social work sector had the highest percentage of establishments to have taken measures to deal with psychosocial risks in the previous three years.
- The health and social work sector is the sector with the highest percentage of establishments that inform employees about psychosocial risks and their effects on safety and health.

Figure 2: Sickness absence monitoring by sector (EU-OSHA, 2010, p. 30)



Statistics at national level also help to highlight the high-risk nature of the activities being undertaken in the health and social work sector:

- The health and social work sector reports more than 1,000 injuries each year to the Irish Health and Safety Authority (HAS). This accounts for nearly 20 % of all workplace injuries reported to the HSA each year (HSA, 2012).
- In the United Kingdom, an estimated 4.6 million working days, or 1.6 days per healthcare worker, were lost in 2012–13 because of self-reported work-related illness. This is one of the highest rates of all the sectors and twice that of the 0.81 days lost per worker across all industries (HSE, 2013).
- According to the German workers survey in 2007), more than one in four healthcare workers feel that they can hardly cope with their work (27 % versus a 16.6 % average), more than 40 % of healthcare workers suffer from a heavy emotional burden (compared with 11 % on average), among healthcare workers 57 % of men and 64 % of women have back pain, and healthcare workers are twice as likely have sleeping problems (37 % versus a 19 % average).
- An analysis of micro data on occupational accidents that entailed time off work in residential care establishments in Spain showed that during 2012 there were 9,772 work-related accidents. This accounted for 2.4 % of all accidents reported in Spain for that year. This percentage is quite considerable when you take into account the fact that residential care accounts for only 1.5 % of jobs in Spain. Of the accidents, 88.9 % involved women and 12.1 % migrant workers (INSHT, 2014).
- A recent national study, *Work Conditions and Risk in Latvia, 2013*, highlighted the seven most prevalent workplace risk factors in healthcare as being:
    - For employers: awkward postures (90.5 %), different biological agents (81.4 %), night shifts (77.5 %), shift work (75.6 %), lifting and moving heavy loads (71.5 %), insufficient time (60.5 %) and work with modern and fast-changing technologies (as a stress factor) (59.5 %).
    - For employees: direct contact with clients (as a stress factor) (80.1 %), awkward postures (63.8 %), different biological agents (50.4 %), repetitive motions (49.8 %); insufficient time (46.5 %), lifting and moving heavy loads (45.3 %) and working with modern and fast-changing technologies (as a stress factor) (45.0 %).

Healthcare is not only a high-risk sector in Europe; the same trends and statistics exist in the rest of the world. For example, in Australia in 2005–06 there were 1,038,000 workers in the health and community services industry. Around 80,000 of these workers experienced work-related injury (77 injuries per 1,000 workers), which is around 10 % higher than the rate for all Australian workers (69 injuries per 1,000). Lifting, pushing or pulling objects was the cause of nearly one in three injuries, with hitting or being hit or cut by an object the cause of a further one in four injuries (Safe Work Australia, 2009).

In Canada, organisational health and well-being is at the top of the agenda for most organisations. In Ontario, healthcare is among the top four sectors for frequency of lost-time injuries (just before mining and construction). The top two sources of lost-time injuries in healthcare are musculoskeletal disorders (54 %) and slips & falls (17 %). Healthcare has the highest rate of violence and client aggression (higher than police work). Ample evidence exists to show correlations between high rates of injury and illness, absences from work and adverse outcomes for patients and workers. Related effects have increased costs and diminished resources for patient care (Sikorski, 2009).

The Centre for Disease Control and Prevention (CDC) in the US reported that injuries in the healthcare sector are on the increase and that healthcare workers experience more workplace injuries than any other sector in the nation. The incidence rate for injuries requiring days away from work among nursing aides, orderlies and attendants was 489 cases per 10,000 workers in 2011 — more than four times the rate for all workers in the nation. These workers had the highest rate of work-related musculoskeletal disorders that same year — more than seven times the national rate for all employees (Public Citizen's, 2013).

4.1.1 OSH risks identified by the National OSH experts

The OSH risks most frequently identified in the responses to the questionnaire by EU-OSHA'S national focal points included ergonomic, biological, psychosocial, chemical and all kinds of physical and safety risks. In table 7, specific types of OSH risks have been described, showing those that are most prevalent and serious within healthcare workplaces at national level. Since these risks have different effects on OSH within the various healthcare professions and even at national level, it is not possible to rank the risks from the questionnaire results in any order.

Table 7: Current healthcare sector OSH risks identified in questionnaire responses

OSH risk	Hazards	Questionnaire findings
Psychosocial risks	High workload and time pressure resulting in stress	The most common reason for high workloads is lack of staff. High workloads occur both in hospitals and in home care. There is increasing overcrowding of hospitals providing emergency care in bigger cities. Patients are treated in corridors or in other wards where the doctors and nurses do not always have the knowledge to make the correct diagnosis. Nurses are anxious about patient safety, because they have limited time to spend with patients. There is an overall feeling that healthcare professionals cannot perform their activities properly.
	Lack of control	There is limited control over how the work is carried out, increasing stress levels and dissatisfaction in the profession. If workers are not happy with how they are expected to undertake their activities, they will not perform to the best of their ability.
	Poor organisational climate	Ineffective organisation of work results in tensions between workers and also been workers and patients.
	Language difficulties	Inability to communicate with patients or even between colleagues has been identified as a source of stress for healthcare workers.
	Lack of optimal working time	Shift work and night work have been identified as important risks, since a significant proportion of the healthcare sector is affected by them. The impact that these working patterns have on work–life balance was strongly highlighted. According to one expert, 'the organisation of working hours has an important impact on the effect of load factors with which health and social care staff are confronted during their work. This concerns not only the duration of the working time from which the load arises, but also its arrangement and distribution. This is a risk as fatigue increases with the length of working time, while concentration decreases. This relationship also applies to weekly and monthly working time. The "accumulation" of working hours over these periods has an influence on exhaustion, the possibility of regeneration and also the reconciliation of family and the job.

OSH risk	Hazards	Questionnaire findings
		In hospitals, nursing homes and the home care sector, where the working day actually encompasses 24 hours, work is conducted at times which are not typical of the normal routine. Staff in hospitals and nursing homes and those who provide home care services must also make themselves available in the evenings and at night. Sundays and public holidays also have to be covered.'
	Emotional events	An emotional stress factor results from exposure to patients with severe and terminal illnesses and from dealing with the anxiety of patients and pressure from relatives. Another example of this emotional stress is that triggered by treating patients with somatic and mental diseases in geriatric institutions.
	Economic crisis	The economic crisis has had a great impact on how healthcare services are run and provided. As a result of this, healthcare professionals are becoming frustrated with the lack of financial support and moral appreciation from employers and policymakers in the one hand, and from patients on the other.
	Lone working	As health and social care budgets are cut, there will be increasing numbers of individuals working alone. This is the case in particular when services provided in institutional settings are cut back in favour of a greater focus on home care services. Healthcare workers find themselves increasingly working alone, very often in isolation without regular supervision and support.
	Violence and harassment	Frustration about the quality of service being provided is not only an issue that affects healthcare workers; ultimately, it also affects the patients, whose expectations are not always met. This has resulted in an increase in the number of reports of violence. This applies to emergency care, psychiatric wards, ambulances and home care. Threats delivered by mobile phone and email have also increased; it is easier to threaten somebody anonymously. Institutions and their workers are not always adequately prepared or trained to cope with such situations. In addition to physical injuries, for those affected there is often also the risk of mental disorders. As a result, there is a high sickness rate among workers, a high turnover of staff, a poor working atmosphere and poor performance, which all have an effect on the quality of care provided to patients in hospitals, in residential care and being cared for at home.
	Working in two jobs	In some situations, healthcare professionals have to undertake activities which they would not normally be expected to. This might include working in various departments within a hospital or even undertaking activities in two different countries'.

OSH risk	Hazards	Questionnaire findings
	New technologies	More computer work in hospitals means more demanding cognitive work. Nurses in intensive care need to work a great deal with different kinds of software and applications, which increases mental strain.
Ergonomic risks	Lack of training	There is a lack of training in the use of tools, especially among care-givers in retirement homes, which results in equipment being used incorrectly or not being used at all.
	Bad ergonomic design of workplace and unavailable/unsuitable equipment	With overcrowded hospitals and reductions in budgets, hospital rooms are not adapted for the activities that nurses have to undertake. This means that in some situations equipment is unavailable or cannot be used (for example to lift patients).
	Shift towards home care	With a policy shift from the provision of care in institutions (including hospitals and residential centres) to its provision in people's homes, there will be a greater burden of care, because we will see more dependent people being looked after at home in environments which are often not ideal for care-giving. This may potentially give rise to a situation whereby staff will be at increased risk of injury.
	High workload increases risks for musculoskeletal disorders (MSDs)	A high workload in terms of numbers of patients was highlighted. There is an increase in the number of elderly patients who need assistance, in combination with a reduction in staff levels and a lack of space and time to undertake activities; the risk for MSDs will increase.
Biological risks	Exposure to biological agents	All the different tasks in the healthcare sector, although at different levels, involve contact with patients actually or potentially infected, with biological fluids and with sharp instruments or needles, to name just a few of the most frequent vehicles of biological agents. The variety of biological agents to which healthcare workers may be exposed is greater because of an increase in movement of people and goods across the world.
	Contact with specific agents	Specific mentioned agents included: ▪ Resistance to antibiotics, more resistant bacteria. ▪ Pseudomonas. ▪ Legionella. In both health- and social care, waterborne bacteria are a major concern, and managing the risks is more difficult because of technology used to prevent scalding, which may affect thermal disinfection at the water outlet. ▪ Hepatitis. For example, treatment of homeless patients is an issue because of the risk of infection (mainly hepatitis B and C and parasitic infections;

OSH risk	Hazards	Questionnaire findings
		the most frequent occupational disease in healthcare workers is scabies). Furthermore, the treatment of drug addicts involves a risk of infection (for example with hepatitis B or C). ▪ Tuberculosis, for example, in the treatment of immigrants. There is a risk of infection from people coming from non-vaccinated populations (typically not vaccinated against tuberculosis). There is even greater danger of transmission of drug-resistant microbes following an inadequate treatment. ▪ HIV (human immunodeficiency virus).
	Sharps injuries	There is a high risk of infections as a result of needlestick injuries during examinations, surgery or other procedures. Although needlestick injuries are a major physical issue, the impact is often more psychosocial than biological, since seroconversion is rare.
	Lack of vaccination programmes	There are no vaccinations against HCV and HIV, while invasive medical interventions are common, the number of carriers is rising and the consequences to healthcare workers are very serious. This relates mostly to in-patient care.
	Overcrowded hospitals	As hospitals are getting more crowded patients are being moved between wards — and sometimes hospitals — there is an increasing risk of exposure to infections of more healthcare workers. As a result of the increase in multi-drug-resistant bacteria, there are more patients at risk; this leads to much more stress for healthcare workers.
	Change in Biocidal Products Directive	Copper and silver ionisation, used in the health and social care sector to control bacterial growth, has been affected by the recent Biocidal Products Directive and is subject to an 'essential use derogation' application seeking permission for its continued use.
Chemical risks	Contact with specific chemicals	▪ Carcinogenic drugs and cytostatics; ▪ Nanomaterials; ▪ Disinfectants; ▪ Anaesthetic gases; and ▪ Radioactive substances.
	Allergies	Chemicals cause allergies and dermatitis, especially among nurses and cleaners, because many irritating and allergic chemicals are used; often, however, occupational allergies are not diagnosed and no measures are taken.

OSH risk	Hazards	Questionnaire findings
	Home care work	Chemical exposure risks increase in the home care environment because the correct procedure for their handling is not always possible. In addition, many home care workers do not always know what kind of medications the patient is taking or the consequences of exposure to them.
	Lack of training	In some professions, attention to training in chemical handling and exposure is very high; however, in the healthcare sector there are many people who could be exposed to these chemicals, for example cleaners, who do not seem to receive any training.
Safety risks	Slip, trips and falls	In the healthcare sector, there are situations that can result in slippery floors, for example spills, obstructions, ramps, poor floor selection in contaminated areas and cleaning causing additional risks. In addition, time pressure heightens the risk of falling.
	Equipment safety (use or failure)	Equipment failure, misuse or lack of provision accounts for a number of fatal incidents with risks including musculoskeletal disorders due to the inappropriate use of hoists and slings, scalds, and equipment entrapment (for example when working with bedrails). There is a risk that, with the economic downturn, there may be cutbacks on safety measures.
	Specific exposure to physical risks	▪ Exposure to X-rays. ▪ Exposure to radiation (electromagnetic/infrared). ▪ Exposure to lasers.

Based on the statistics collected, literature reviewed and responses to the questionnaire, the following risks are considered to be relatively high in the healthcare sector and have been examined in more detail:

- Biological risks (for example exposures to blood-transmitted pathogens or infectious micro-organisms).
- Chemical risks (for example exposures to sensitising or allergenic substances, or carcinogens).
- Physical risks (for example exposure to X-rays).
- Safety risks (such as slips, trips and falls).
- Ergonomic risks (for example manual handing in home care settings).
- Psychosocial risks (such as time pressure and emotional demands).

4.2 Biological risks

In the 21st century, we are still faced with the continuous emergence of new or newly recognised pathogens (such as the severe acute respiratory syndrome (SARS), avian influenza, Ebola and Marburg viruses) and the re-emergence of well-characterised outbreak-prone diseases (such as cholera, dengue, measles, meningitis and yellow fever).Whilst until the end of 2005, only three diseases—cholera, plague and yellow fever — had to be reported to the World Health Organization (WHO), the new International Health Regulation now encompasses all ‘public health emergencies of international concern, including emerging diseases’, which must be reported as soon as possible to the WHO (EU-OSHA, 2007e).

Directive 2000/54/EC of the European Parliament and of the Council on the protection of workers from risks related to exposure to biological agents at work defines a biological agent as a micro-organism, including those which have been genetically modified, cell culture or human endoparasite which may be able to provoke any infection, allergy or toxicity. For the purposes of the directive, biological agents are classified in four risk groups, according to the level of risk of infection.

Group 1: The biological agent is one that is unlikely to cause human disease.

Group 2: The biological agent is one that can cause human disease and might be a hazard to workers; it is unlikely to spread to the community; there is usually effective prophylaxis treatment available.

Group 3: The biological agent is one that causes severe human disease and present a serious hazard to workers; it may present a risk of spreading to the community, but there is usually effective prophylaxis treatment available.

Group 4: The biological agent is one that causes severe human disease and is a serious hazard to workers; it may present a high risk of spreading to the community; there is usually no effective prophylaxis or treatment available.

Considering the activities undertaken in the healthcare sector, the following modes of transmission are deemed to be the most relevant to healthcare professionals:

- Bloodborne infections (hepatitis B, C and D viruses, HIV). Bloodborne infections are transmitted from blood to blood (parenteral transmission) through a healthcare worker's broken skin or through mucous membranes. Infection of healthcare workers is caused by contact with the infected body fluids of a virus carrier.
- Airborne infection (mumps, influenza, rubella, tuberculosis, measles, severe acute respiratory syndrome (SARS)). Airborne infections are transmitted from human to human and can be spread by a patient coughing or sneezing. A cough or a sneeze can release millions of microbes into the air in droplets of mucus or saliva, which can then infect healthcare workers if they breathe in the infected particles.
- Direct and indirect contact infections (e.g. hepatitis A virus, staphylococci, Ebola, shigella, amoebae). Contaminated hands are the biggest risk in relation to this kind of biological hazard. Direct contact with the skin of an infected person causes transmission to the body surface of a susceptible recipient. Healthcare workers' hands are probably the most important vehicles of cross-infection. Patients' hands can also carry microbes to other body sites, equipment and staff. Indirect spread of infection is said to occur when an intermediate carrier, such as fomite, is involved in the spread of pathogens. A fomite is defined as an object which becomes contaminated with infected organisms and which subsequently transmits those organisms to another person. Examples of potential fomites are bedpans, urinals, thermometers, oxygen masks or practically any inanimate article. Percutaneous or permucosal transmission occurs as a result of exposure of the healthcare worker to infected blood or other body fluids, for example because of a sharps injury, bite or blood splash. The average risk of transmission of bloodborne viruses following a single percutaneous exposure to blood known to contain a bloodborne virus has been estimated to be (NHS, 2012):
    - hepatitis B virus (HBV) 33.3 % (1 in 3);
    - HCV 3.3 % (1 in 30); and
    - HIV 0.31 % (1 in 319).
- Special infections (tubercular infections; scabies; multi-resistant nosocomial bacteria, such as MRSA (methicillin-resistant Staphylococcus aureus), and multi-resistant bacteria; Pseudomonas; seasonal influenza). Some strains of Staphylococcus aureus have become resistant to methicillin (a once commonly used antibiotic), as well as to other antibiotics. MRSA behaves in the same way as ordinary Staphylococcus aureus and does not cause more severe or otherwise different infections. However, MRSA is harder to treat, as there are fewer antibiotics with which to treat it, and some of these antibiotics may have to be given by injection or infusion. They may also have unpleasant side effects. MRSA rarely causes infection in healthy people, such as healthcare staff

and their families, and does not normally spread easily outside of a hospital or other healthcare setting. Transmission of special infections occurs during contact with patients. It involves such activities as breathing, oral inspection, sputum provocation, autopsy or long periods of time (more than 40 hours) spent with a tuberculosis patient in a closed room. (European Commission, 2010a).

Healthcare workers undertake their activities in various areas within hospitals, in medical institutions or even in patients' own homes. This means that they have the potential to be exposed to infections in a number of ways:

- clinical examinations;
- taking samples of blood, other body fluids or other clinical samples;
- surgical procedures;
- dressing/treatment of wounds; and
- care of patients incapable of looking after themselves (European Commission, 2010a).

In addition, the following activities can also present a risk of infection:

- cleaning, disinfection, repair, transport and disposal work in contaminated areas and/or with contaminated equipment and objects;
- work in contaminated areas and/or with contaminated equipment and objects;
- contact with areas where infection is suspected, such as contaminated materials in laundries;
- handling/moving of cleaning or disinfection apparatus;
- handling pointed or sharp instruments or equipment (WHO, 2003a);
- work in laboratories, especially for new laboratory workers and students; and
- home care workers who have contact with natural or organic materials such as soil, plant materials, substances of animal origin, food, organic dust, waste, dirty water, blood and other body fluids (EU-OSHA, 2007b).

In the European Commission's guide to prevention and good practice, 'Occupational Health and Safety Risks in the Healthcare Sector' (2010a), general precautions and measures to avoid the transmission of pathogens to healthcare workers are outlined. Some of the technical and hygienic preventative methods mentioned includes:

- hygienic hand disinfection;
- organisational measures, for example only suitably qualified professional to undertake tasks that require the identification of infection risks, no consumption or storing of food or drink in places where there is a high danger of contamination with biological agents;
- use of barrier protection, for example use of gloves, protective clothing or filtering face masks;
- cleaning, disinfection and sterilisation of medical instruments;
- procedures for the handling of soiled linen;
- vaccination of healthcare workers.

4.2.1 Bloodborne pathogens

There are two ways in which bloodborne pathogens can be transmitted:

- percutaneous transmission — this type of transmission occurs when the skin is penetrated by a needle and other sharp object;
- mucocutaneous transmission — this type of transmission occurs when the skin is broken although it may be apparently intact and also occurs through mucous membranes and other membranes in the eyes, nose and mouth (Imperial College London, 2006).

Healthcare workers are exposed to the risk of infection when infectious blood or other body fluids come into contact with wounds or mucous membranes. Examples of such are inoculation of blood by a needle or other sharp, contamination of broken skin with blood, swallowing a person's blood (for example after mouth-to-mouth resuscitation), contamination because the individual has an open wound and their clothes are soaked with blood, and bites (where the skin is broken).

Needlestick and sharps injuries

It is estimated that there are 1 million needlestick injuries in Europe each year, with many of these not being reported. Many injuries are not reported because of the belief that most exposures are not significant. Other reasons for not reporting exposures include the time required, confidentiality issues, not understanding the importance of reporting and concern about negative repercussions. Among the 35 million healthcare workers worldwide, about 3 million receive percutaneous exposures to bloodborne pathogens each year, 2 million to HBV, 0.9 million to HCV and 170,000 to HIV. These injuries may result in 15,000 HCV, 70,000 HBV and 500 HIV infections. More than 90 % of these infections occur in developing countries. Worldwide, about 40 % of HBV and HCV infections and 2.5 % of HIV infections in healthcare workers are attributable to occupational sharps exposures (WHO, 2002).

Most of these needlestick injuries take place in fast-paced, stressful and understaffed facilities. However, similar injuries occur in other settings, including nursing homes, clinics, emergency care services and private homes. The main activities associated with needlestick injuries include:

- handling needles that must be taken apart or manipulated after use;
- disposing of needles attached to tubing;
- manipulating the needle in the patient;
- recapping needle;
- transferring body fluid between containers using needles or glass equipment;
- failing to dispose of used needles in puncture-resistant sharps containers;
- lack of proper workstations for procedures using sharps;
- rapid work pace and productivity pressures;
- bumping into a needle or sharp instrument or a worker using one of these; and
- inadequate staffing and poor leadership (National Institute for Occupational Safety and Health (NIOSH), 2010).

In addition, safe equipment and utensils should be used in situations that present a high risk of infection and/or injury, such as:

- care and treatment of patients with bloodborne infections and
- attending patients who pose an infection threat to others in ambulance and emergency services and casualty departments (European Commission, 2010a).

The introduction on 10 May 2010 of the EU Council Directive 2010/32/EU on the prevention of sharps injuries in the healthcare sector has helped to ensure that Member States implement specific preventative measures necessary to protect healthcare workers from injuries caused by needlesticks in view of the risk of infection from serious bloodborne infections, such as hepatitis B and C and HIV. This directive applies to all workers in the healthcare sector. Employers and workers' representatives need to work together to eliminate and prevent risks, protect workers' safety and health, and create a safe working environment following the hierarchy of general principles of prevention via information and consultation:

- avoiding risks;
- assessing the remaining risks;
- combating risks at source;
- adapting the work to the individual;
- adapting to technical progress;
- replacing the dangerous with the non-dangerous or less dangerous;
- developing an overall prevention policy;
- collective measures over individual methods; and
- instructions to workers.

Thorough risk assessments have to be carried out when exposure to blood or other potentially infectious material is possible. The assessment should focus on how to eliminate these risks. When looking at the risks from needlesticks, it is essential that all the workers who may be harmed are identified. Nurses and other medical staff may be at highest risk, but cleaners, laundry workers and others, such as laboratory technicians and students, may also be at risk. Risk management measures should include specifying and implementing safe procedures (including safe disposal), eliminating unnecessary sharps

use, providing safety-engineered medical devices, prohibiting recapping, establishing a coherent overall prevention policy, providing training and information, supplying personal protective devices and offering vaccination.

While eliminating the risk of transmission of bloodborne pathogens through needlestick injuries is difficult, particularly in healthcare establishments, over the years there have been major efforts to reduce the number of sharps injuries, as these are the primary pathogen exposure route. Advances have been made in developing engineered safety devices to protect healthcare workers from sharps injuries and mucocutaneous exposure. Measures that should be considered include:

- procuring safer medical equipment, such as syringes with retractable needles;
- introducing better control of medical waste;
- improving working conditions, such as lighting;
- improving work organisation, for example dealing with fatigue (from long shifts, for example), which can be a causal factor for worker harm, and improving supervision to ensure compliance with systems of work;
- providing personal protective equipment (PPE) (for example gloves);
- offering immunisation for the hepatitis B virus (although this does not prevent the transmission of other bloodborne pathogens); and
- putting in place safe systems of work (no recapping of needles).

Non-sharps (mucocutaneous) exposure

Although needlestick injuries get the most attention when the transmission of viruses and other pathogens from patients to healthcare workers is considered, non-sharps (mucocutaneous) exposure also poses a problem. Such exposure can arise from incidents ranging from accidental splashing of blood into the eyes or a skin cut when starting or removing an intravenous catheter to disposing of body fluids and dressing an open wound. A 2003 study carried out in the US found that nurses had a higher mucocutaneous exposure rate than physicians and medical technologists. More than one-third (39 %) of registered nurses and one-fourth (27 %) of licensed practical nurses said they had experienced one or more mucocutaneous blood exposures in the previous three months, but few reported their exposures (Desilio, 2012). Mucocutaneous exposures are more widely underreported than sharps injuries, since these exposures are believed not to be significant enough to be worth reporting.

As with working with sharps, a thorough risks assessment needs to be carried out for any procedures that entail the potential or actual risk of a bloodborne pathogen splashing onto the face or into the eyes of a healthcare worker. In addition to the hierarchy of general principles of prevention, workers should be provided with:

- protective eyewear, which must prevent splashing, which should include lateral splashing, without the loss of visual acuity; and
- face visors, which must offer an appropriate degree of protection for all procedures involving the risk of splashing of blood, to include aerosol-generating procedures.

4.2.2 Airborne pathogens

Airborne transmission occurs through dissemination of airborne droplet nuclei (small residual particles (5 mm or smaller)), evaporated droplets containing micro-organisms or dust particles containing the infectious agent (for example dust created by rotary-powered foot care tools). Micro-organisms carried in this manner remain suspended in the air for long periods of time and can be dispersed widely by air currents. These may be inhaled by a susceptible host in the same room or further away from the source client, depending on environmental factors. Small particles represent a particular risk if droplet nuclei and aerosols hang in the air for long enough to be inhaled in sufficient quantities and deposited in the pulmonary alveoli (European Commission, 2010a).

Aerogen-transmitted infections include:

- mumps
- influenza

- rubella
- tuberculosis
- measles
- SARS (European Commission, 2010).

Healthcare workers in areas such as tuberculosis clinics, care homes for the elderly and paediatric clinics will be most at risk. The transmission of diseases that are spread through the air must be managed through a combination of engineering controls, administrative controls (including safe work practices) and PPE. The following guidelines should be considered (WorkSafe BC, 2009):

- Ensure adequate hygiene standards. Hand washing is the simplest, most effective means of controlling the spread of infectious diseases.
- Follow routine practices, which include hand hygiene and the use of PPE such as gloves, eye protection, respiratory protection (filtering face masks) for protection against inhalation of infectious aerosols (European Commission, 2010), and gowns.
- Develop safe work procedures that encourage infection prevention and control practices. During an outbreak, minimise unnecessary patient activities and consider restricting public access to the facility.
- Place patients with infectious TB, chicken pox or measles in a separate room with the door closed; partition rooms.
- Hospitals rooms should have appropriate ventilation (directed air flow, air exchange and negative pressure).
- Appropriate filtering measures (filter systems, exhaust air control) should be used.
- All staff should receive information, instructions and training on safe work practices.
- Develop laundry and waste collection procedures that minimise surface contamination.
- Sterilising measures: develop procedures and schedules to ensure disinfection of contaminated surfaces. For example, dilute bleach solutions or alcohol-based disinfectants (for small surface areas) are usually sufficient.
- Encourage all staff to get vaccinated, if vaccines are available.
- Encourage staff with signs and symptoms of illness to stay at home until they feel better.
- Encourage cough/sneeze etiquette (coughing into sleeves instead of hands) and put surgical masks on coughing people.

4.2.3 Contact diseases

Contact diseases are infectious diseases transmitted through direct or indirect contact with bacteria or viruses.

Direct contact involves direct body surface-to-body surface contact and physical transfer of micro-organisms between an infected or colonised person, such as occurs when a healthcare provider turns a client, gives a client a bath or performs other client care activities that require direct personal contact. Direct contact transmission can also occur between two clients or a client and a visitor, with one serving as the source of the infectious micro-organisms and the other as a susceptible host. For example, visiting nurses must wash their hands at the beginning and end of their visit, so that they do not transfer organisms from one person to another.

Indirect contact involves contact between a susceptible host and, usually, a contaminated inanimate object, such as equipment, instruments or environmental surfaces. This is often the result of unwashed hands contaminating the object or environment.

Examples of contact diseases are:

- Coronavirus — a large family of viruses that can cause a range of illnesses. For example SARS — respiratory disease (Maine.gov, 2013)
- Group A streptococcal infections — caused by bacteria often found in the throat and on the skin, sometimes resulting in no symptoms of illness. Most group A streptococcal infections are relatively mild illnesses (such as ‘strep throat’ or impetigo). Occasionally, these bacteria can cause severe and even life-threatening diseases.

- Ebola virus — is a serious, usually fatal, disease for which there are no licensed treatments or vaccines. The virus may be acquired upon contact with blood or other bodily fluids of an infected human or other animal. Spreading through the air has not been documented in the natural environment. Health-care workers caring for patients with suspected or confirmed Ebola virus should apply extra infection control measures to prevent contact with the patient's blood and body fluids and contaminated surfaces or materials such as clothing and bedding. When in close contact (within 1 metre) of patients with the virus, healthcare workers should wear face protection (a face shield or a medical mask and goggles), a clean, non-sterile long-sleeved gown, and gloves (sterile gloves for some procedures). Laboratory workers are also at risk. Samples taken from humans and animals for investigation of Ebola infection should be handled by trained staff and processed in suitably equipped laboratories.
- Legionellosis — an infection caused by the bacterium Legionella pneumophila.

Procedures which decrease or eliminate microbes in the environment include precautions that create a barrier and physically separate the source of infection from the healthcare worker. This should also cover staff that are not directly involved in patient care such as laundry, security, maintenance, volunteers etc. that can be potentially exposed to these infectious diseases that can be transmitted from the patients. Some of the measures that should be taken to minimise exposure are:

- Infected patients should be in a single patient room (containing a private bathroom) with the door closed. A log of all persons entering the patient's room should be maintained.
- Work surfaces as well as any equipment or instruments should be easy to clean.
- The generation of aerosols and dusts should be avoided and appropriate measures to achieve this should be in place.
- Limit the use of needles and other sharps as much as possible.
- Appropriate and sufficient washing facilities should be made available.
- Personnel changing facilities should be kept separate from work areas.
- The collection of waste containing biological agents should be undertaking using suitable containers.
- Organisational measures such as daily cleaning, a hygiene plan and the avoidance of spray disinfection should be in place.
- Proper disinfection of hands. This should be done before patient contact, before and after any procedure, after exposure to body fluids and after patient contact.
- Appropriate provision, use and maintenance of PPE. This should include: gloves, gown (fluid resistant or impermeable, eye protection (googles or face shields), and face mask. Additional PPE might be required in certain situations such as the presence of considerable amounts of blood or other body fluids (vomit or faeces) in the working environment. In these situations, PPE such as double gloving, disposable shoe covers or leg coverings will be used.
- Information, instructions and training for all workers but particularly those involved in transporting patients.

4.2.4 Special infections

Since their discovery during the 20th century, antimicrobial agents have substantially reduced the threat posed by infectious diseases. However, this advantage is now seriously jeopardised by the emergence and worldwide spread of antimicrobial-resistant organisms, which make infections more difficult to treat, increase the severity of illness and add to healthcare costs (EU-OSHA, 2007e).

Antibiotic resistance is one of the most serious health threats to healthcare workers and it is a worldwide problem. Infections from resistant bacteria are too common, and some pathogens have become resistant to multiple types of antibiotics. Ability to fight infectious diseases and manage infectious complications can be undermined because of the loss of effective antibiotics. Antibiotics are the most commonly prescribed drugs used in medicine and using them is the single most important factor leading to antibiotic resistance (CDC, 2013a).

Examples of drug-resistant organisms include:

- MRSA: methicillin/oxacillin-resistant Staphylococcus aureus;
- VRE: vancomycin-resistant enterococci;
- ESBL (extended-spectrum beta-lactamases)-producing bacteria;
- PRSP: penicillin-resistant Streptococcus pneumoniae;
- GISA: glycopeptide-intermediate Staphylococcus aureus;
- VISA: vancomycin-intermediate Staphylococcus aureus;
- MDR-TB: multidrug-resistant tuberculosis;
- XDR-TB: extensively drug-resistant tuberculosis;
- multi-resistant Escherichia coli and salmonellae;
- carbapenem-resistant Acinetobacter; and
- ciprofloxacin-resistant Neisseria gonorrhoeae.

There is evidence that resistant organisms can move from human to human by direct contact or inhalation, thus posing a health risk to healthcare workers.

Drug-resistant organisms spread the same way other bacteria and organisms spread. Healthcare workers are at higher risk of infection if they have:

- an existing severe illness;
- an underlying disease or suffer certain health disorders such as chronic renal disease, insulin-dependent vascular disease, dermatitis or skin lesions and chronic respiratory system disease.
- previously been exposed to antimicrobial agents;
- undergone an invasive procedure such as dialysis or catheterisation.

In the healthcare sector, skin contact with devices or surfaces contaminated with body fluids from an infected person, or skin contact with an infected person, are the most common routes of exposure. MRSA, for instance, is not airborne but usually spreads through physical contact. Hospital workers are more likely to be exposed to drug-resistant organisms because of the number of patients with whom they come into contact in a single shift. Hospitals are in any case a critical component of the antimicrobial resistance problem. Indeed, the combination of highly susceptible patients, intensive and prolonged antimicrobial use and cross-infection may lead to nosocomial infections with highly resistant pathogens in patients, who then become reservoirs of contamination for staff. Failure to implement simple infection control practices before and after contact with patients, such as washing hands and changing gloves, is a common cause of cross-contamination between staff and patients.

In hospitals, antimicrobial-resistant nosocomial infections are expensive to control and extremely difficult to eradicate. The basic measure against spreading antibiotic-resistant organisms and other pathogens responsible for epidemics such as SARS among healthcare workers is still thorough hand washing. However, broader measures, including at collective and organisational levels, are necessary to ensure effective prevention of the spread of drug-resistant pathogens, and of epidemics in general. These include:

- improvement of work organisation (shift schedule and so on);
- patient isolation;
- restrictions on patient moves;
- dedicating equipment such as stethoscopes, bedside commodes and thermometers to one patient or one group of patients;
- regular hospital cleaning;
- aseptic techniques for patient-care equipment and the working environment;
- use of safety-engineered devices (for example, retraction or shields for sharp instruments);
- appropriate handling and disposal of sharps (for example, needles) and clinical waste (waste generated during patient care);
- use of PPE such as gloves, mask, goggles, gowns and plastic aprons;
- changing gloves and washing hands, especially after contact with body fluids, and even between procedures on the same patient to prevent cross-contamination to different body sites; and
- training workers on correct hand washing, use of safety devices, safe disposal and so on.

4.3 Chemical risks

Many hazardous substances are used in healthcare settings, for a variety of reasons: to treat patients (medications and anaesthetic agents); in laboratory work; or to clean, disinfect and sterilise surfaces and supplies (cleaners/disinfectants). In some situations, drugs or other medications used to treat patients can have unintended consequences for workers who are exposed to them when preparing and administering solutions or are exposed to the off-gassing during anaesthesia and aerosolised breathing treatments. For these reasons, the management of exposures to hazardous chemicals in the healthcare sector cannot be taken lightly.

To demonstrate the impact that chemical exposure could have on healthcare workers, Physicians for Social Responsibility (PSR) conducted a bio-monitoring investigation of healthcare professionals (Wilding, Curtis and Welker-Hood, 2009). Twelve doctors and eight nurses (from 10 states: Alaska, California, Connecticut, Maine, Massachusetts, Michigan, Minnesota, New York, Oregon and Washington) agreed to be tested for the presence in their bodies of six chemicals or chemical groups: bisphenol A (BPA), mercury, perfluorinated compounds (PFCs), phthalates, polybrominated diphenyl ethers (PBDEs) and triclosan. These chemicals were identified specifically because they are emerging or known chemicals of concern, are known to be used in the healthcare setting and have been associated with certain diseases, the incidences of which are on the rise. The results showed that all the participants tested (blood and urine) had a minimum of 24 individual chemicals in their body with two participants having a high of 39 chemicals detected. In addition:

- 18 chemicals were detected in every single participant;
- all 20 participants had at least five of the six kinds of chemicals tested for, and 13 of the participants had all six;
- all participants had bisphenol A, and some form of phthalates, PBDEs and PFCs; and
- 13 participants had dimethyl phthalate metabolites.

These outcomes show that healthcare professionals are exposed throughout the workplace to a wide range of chemicals which are known or suspected to cause health problems. These workplace exposures can occur via the inhalation exposure path (handling of volatile substances such as solvents or anaesthetic gases) or the dermal exposure path (low-volatility or non-volatile substances, such as special disinfectant agents) (European Commission, 2010a).

The handling of chemicals in the healthcare sector becomes more difficult because:

- Some of the dangerous pharmaceuticals (for example anaesthetics, cytostatic drugs and disinfectants) do not fall under the mandatory labelling provision of the European directives for dangerous substances and are only classified and marked in accordance with pharmaceuticals law.
- Hygiene measures demand the use of chemical disinfectants and cleaning agents (for example when cleaning hospital surfaces, medical instruments, hands and skin, and rooms).
- Working sequences and high workloads can give rise to worker protection being neglected.

An analysis of health service activities has revealed that activities involving work with the following substances must be considered in the risk assessment, in particular (European Commission, 2010a):

- cleaning and disinfectant agents;
- hazardous drugs: anaesthetic drugs, cytostatic/cytotoxic drugs;
- substances which can endanger reproduction, especially certain pharmaceutical substances;
- latex; and
- nanomaterials.

4.3.1 Cleaning and disinfectant agents

Everyone expects a hospital to be clean and free of the presence of infectious micro-organisms that put at risk patients' and workers' health. However, many traditional cleaning products, floor strippers and disinfectants aimed at destroying micro-organisms present health hazards to workers exposed to them. These products may contain chemicals that can cause cancer, reproductive disorders, respiratory ailments (including occupational asthma), eye and skin irritation, central nervous system impairment

and other human health effects. As with dangerous substances in any other sector, the use of dangerous substances should be eliminated by changing the process or product in which the substance is being used. For example:

Technical measures:

- Use of automated procedures. For example, in the case of instrument disinfection, this would reduce exposures to workers involved in manual disinfection procedures.
- Extraction of evaporating dangerous substances at source.
- Room ventilation during disinfection work. Technical room ventilation should be constantly monitored when working with volatile disinfectant agents.

Organisational measures:

- Avoidance of excessive 'wet work' (or exposure to water during cleaning procedures) by means of work rosters which also provide 'dry' activities.
- Training, instruction and information for all workers handling disinfectants.
- Pregnant women, young workers and workers with allergies should not be allowed to perform tasks involving disinfectants.
- Appropriate procedures that reduce exposure to disinfectant should be in place.

Cleaning agents

A variety of cleaning products are used during hospital housekeeping activities (excluding sterilisation and disinfection of surgical or medical instruments) on floors, windows, bathrooms, carpets and other surfaces throughout the hospital and waiting areas. Hospital housekeeping staff have the highest risk of exposure; however, hospital patients, visitors and other hospital staff can also be exposed. Accidental exposures to high concentrations of chemicals can occur through spills or during mixing of incompatible chemicals.

The primary routes of exposure to cleaning agents are inhalation of aerosolised droplets or vapours and skin exposure. Several cleaning agents are known sensitisers and can lead to dermatitis upon repeated skin exposure. Wet work can increase the risk of skin irritation and skin absorption. Table 8 shows the health effects of commonly used cleaning agents based on epidemiological studies on janitors, cleaners and other housekeeping staff employed in hospitals, office buildings, schools and private homes. The health risks associated with cleaning agents vary depending on the type of cleaning agent used and the concentration in which it is used.

Table 8: Main chemical components of cleaning products (New Solutions, 2013, p. 38)

Type of product	Purpose	Chemical components	Primary health effects
Detergents	Lower surface tension of water	Fatty acid salts (soap), organic sulphonates	Skin, eyes and mucous membrane irritation
Complex agents (water softeners)	Dissolve and bind calcium and other cations; regulate pH	Ethylenediamine tetraacetic acid (EDTA, tripolyphosphates	Skin, eyes and mucous membrane irritation
Alkaline agents	Dissolve fatty substances, disinfect, inhibit corrosion of metal surfaces	Silicates, carbonates, sodium hydroxide, ammonia	Skin, eyes and mucous membrane irritation
Acids	Dissolve calcium	Phosphoric, acetic, citric, sulphamic, hydrochloric acid	Skin, eyes and mucous membrane irritation

Type of product	Purpose	Chemical components	Primary health effects
Solvents	Dissolve fatty substances	Alcohols, glycol ethers	Neurotoxin
Corrosion inhibitors	Protect metal surfaces	Ethanol amines	Sensitisation
Film formers, polishes	Surface care	Wax, acryl polymers, polyethylene	Sensitisation
Disinfectants	Destroy bacteria and other micro-organisms	Hypochlorite, aldehydes, quaternary ammonium compounds	Sensitisation, mucous membrane irritation
Preservatives	Prevent microbial growth during product storage	Benzalkonium chloride, isothiazolines, formaldehyde	Sensitisation
Perfumes, scent	Introduce pleasant smell	d-Limonene, terpenes (pinene)	Sensitisation, irritation

Substitution may not be feasible for certain cleaning agents; however, hospitals can purchase cleaning agents that have no added synthetic fragrances. Natural ventilation, such as keeping the windows open in the area that is being cleaned, is important during the application of chemical-heavy cleaning products, which is typically done at night when general building ventilation is reduced. Replacing cleaning sprays with wipes or liquid formulas reduces the risk of inhalation exposure. Ordering ready-to-use cleaners instead of cleaners that need to be mixed together or diluted can reduce the risk of spills. Automated mixing and dilution systems eliminate worker exposure to concentrated solutions and prevent dilution errors. Using disinfectants and antiseptics only when necessary and cleaning heavily soiled areas more frequently with less harsh detergents can also minimise exposures. Suitable PPE includes appropriate gloves, non-absorbent gowns and eye protection to minimise skin and eye exposure. Carefully selected respiratory protection is recommended when using high concentrations of harsh cleaning agents that may become aerosolised or vaporised.

Disinfectant agents

Hospitals use a variety of methods to disinfect and sterilise surfaces and equipment. Steam sterilisation under pressure (or using an autoclave) is the most effective, least toxic method for sterilising instruments. However, some pressure-sensitive devices such as transducers are damaged by the autoclaving process, and chemical agents need to be used instead.

Some of the most commonly used chemical products in healthcare cleaning and disinfecting activities, such as formaldehyde and ethylene oxide, have been shown to cause serious health effects to workers.

Formaldehyde

Formaldehyde is a colourless, flammable and strong-smelling chemical used in some cleaning products as a disinfectant or preservative. For example, in medical laboratories it is commonly used:

- as an industrial fungicide, germicide and disinfectant;
- to prepare viral vaccines;
- as an embalming agent;
- as a tissue fixative; and
- to sterilise medical equipment (for example surgical instruments, haemodialysers).

However, in addition to being bactericidal, an acute exposure can cause irritation of the eyes, nose and throat, burns to the skin, allergic sensitisation, concentration-dependent discomfort, nausea, dyspnoea and finally death (WHO, 2001). Some studies of exposed workers have even indicated an increase in mutagenic activity in cells, in the incidence of leukaemia and in adverse reproductive effects.

Routes of exposure for formaldehyde include re-ingestion, inhalation, dermal absorption and blood exchange, as in dialysis (very rare).

According to a study by the French Agency for Environmental and Occupational Health Safety (AFSSET), in France in 2005, 54.4 % of preparations for domestic use contained formaldehyde for its preservative properties. The concentration in formaldehyde in these products was less than 1 % (generally between 0.2 % and 0.3 %). In domestic cleaning products such as toilet and bathroom cleaners, in which formaldehyde was used as disinfectant, the concentrations were very variable (between 0.1 % and 40 %). In newer products, a trend towards lower concentrations of formaldehyde was noted, and even towards substitution of formaldehyde with other substances. However, these substituting substances were found to form formaldehyde as a by-product when the detergent was used and could not therefore be considered an alternative.

Localised ventilation systems should be installed where formaldehyde is used and stored. Laboratories that use formaldehyde should be under negative pressure, with a minimum of 10 air changes per hour. Containers of formaldehyde and/or formalin should be tightly sealed to prevent off-gassing. Healthcare workers should be provided with suitable PPE, including rubber gloves, face shields or safety goggles, and aprons.

Ethylene oxide

Ethylene oxide (EtO) is a flammable colourless gas used to sterilise medical equipment that cannot tolerate heat, moisture or abrasive chemicals (for example, optical, rubber and plastic instruments and devices). Small cartridges containing 100 % EtO are used in fully automated sterilising machines. Large cylinders of 12 % EtO and 88 % Freon are used for multi-chamber manual machines. The workers most at risk of exposure are those working in central supplies who change EtO cylinders, and workers in other areas where sterilisation takes place. EtO can stay in a medical device as an unchanged compound or as one of its reaction products. The principal route of exposure is inhalation. Once in the lungs, it is metabolised to ethylene glycol and to glutathione conjugates. EtO is a known human carcinogen and reproductive toxin. Long-term exposure can cause a wide range of tumours (including leukaemia, lymphoma, brain tumours and lung tumours) and there is also some evidence of an association between ethylene and haematological cancers. EtO induces gene mutations at all phylogenetic levels tested *in vitro* (in a test tube) and *in vivo* (in the living body). There is consistent evidence that EtO has induced clastogenic changes in exposed workers (WHO, 2003b).

In October 2009, 23 scientists from six countries met at the International Agency for Research on Cancer (IARC) to reassess the carcinogenicity of several chemical and occupational exposure circumstances previously classified as ‘carcinogenic to humans’ (Group 1) and to identify additional tumour sites and mechanisms of carcinogenesis (IARC, 2009). For ethylene oxide, the epidemiological evidence was limited, but there was sufficient evidence of its carcinogenicity in rodents. In addition, ethylene oxide is genotoxic and mutagenic in many *in vitro* tests and *in vivo* studies in animals and its cytogenetic effects in lymphocytes of exposed workers provided strong support for its classification in Group 1.

The use of a fully enclosed, automated, single-chamber sterilising machine can reduce airborne concentrations of EtO. These types of sterilisers eliminate direct worker contact with EtO because the cartridge of EtO is automatically punctured inside the machine when the door is closed and locked shut. The single chamber also eliminates worker exposure that would otherwise occur while transporting the sterilised objects from the steriliser to an aeration chamber for off-gassing the removal of the EtO. As a result, PPE is not required when using enclosed automatic EtO sterilisers. When using a manual, multistage EtO sterilising machine, local exhaust ventilation is recommended near the steriliser door and the exhaust drain of the machine; it is also recommended in storage areas for EtO cylinders to prevent exposures in the loading and aeration processes, as well as overexposures from leaks in the system. Alarm systems can be installed to alert workers when EtO has escaped into the environment. Possible substitutes for EtO include peracetic acid and plasma phase hydrogen peroxide (New Solutions, 2013).

4.3.2 Hazardous drugs

Healthcare workers who prepare or administer hazardous drugs (for example drugs for cancer therapy, antiviral drugs, hormone agents, bioengineered drugs) or work in areas where these drugs are present

can be inadvertently exposed to these agents (CDC, 2013b). The effects of even low-level exposure to many of these agents can be irreversible.

These hazardous drugs include carcinogens, mutagens and reprotoxins (CMRs):

- Carcinogens: 'substances and preparations which, if they are inhaled or ingested of if they penetrate the skin, may induce cancer or increase its incidence.'
- Mutagens*:* 'substances and preparations which, if they are inhaled or ingested or if they penetrate the skin, may induce heritable genetic defects or increase their incidence.'
- Reprotoxins*:* 'substances and preparations which, if they are inhaled or ingested or if they penetrate the skin, may produce or increase the incidence of non-heritable adverse effects in the progeny and/or an impairment of male or female reproductive functions or capacity' (ANSES, the French Agency for Food, Environmental and Occupational Health and Safety, 2013).

The specific categories of these hazardous drugs are outlined in Table 9.

Table 9: Categories of carcinogens, mutagens and reprotoxins (ANSES, 2013)

Effects/hazard class	Category	Category definitions
Carcinogens	Category 1A	Substances known to have carcinogenic potential for humans.
	Category 1B	Substances presumed to have carcinogenic potential for humans.
	Category 2	Substances suspected of having carcinogenic potential for humans.
Mutagens	Category 1A	Substances known to induce hereditary mutations in the germ cells of humans.
	Category 1B	Substances presumed to induce hereditary mutations in the germ cells of humans.
	Category 2	Substances of concern because they could induce hereditary mutations in the germ cells of humans.
Reprotoxins	Category 1A	Substances known to be toxic for human reproduction.
	Category 1B	Substances presumed to be toxic for human reproduction.
	Category 2	Substances suspected of being toxic for human reproduction.

As an example, chemotherapy and other hazardous drugs may pose risk of:

- carcinogenicity;
- teratogenicity or developmental effects in a fetus;
- reproductive toxicity or adverse pregnancy outcomes;
- organ toxicity at low doses; and
- genotoxicity or chromosome alteration.

Anaesthetic gases

The use of anaesthetics given intravenously or as gas fed into the patient's respiration air is indispensable in surgical operations. Close attention has to be paid to anaesthetic gases with regard to

workers in operational domains, since their gaseous state means that they can quickly escape into the indoor air. Anaesthetic gases are used anywhere where people have to be supplied with anaesthetic in emergency situations (such as in emergency admission departments), in operating theatres and operating rooms in surgical practices and in anaesthetic recovery rooms. In hospitals, these medical gases may also be supplied using centralised gas supply facilities.

Waste anaesthetic gases (WAGs) include nitrous oxide and various halogenated anaesthetics (including halothane, enflurane, isoflurane and desflurane). Exposure to these gases can occur if the patient's anaesthetic breathing apparatus leaks during delivery of anaesthetic and through patients exhaling anaesthetics gases when recovering from a procedure that required anaesthesia. Healthcare workers will be subjected to much lower gas concentration exposures than patients, but this continual exposure can occur throughout their career. If the work hygiene parameters are not adequate, the workers concerned often complain about symptoms such as dizziness, light-headedness, nausea, fatigue, headache, irritability, depression and low levels of concentration. Effects of exposure include liver and kidney disease and difficulty with cognitive functions, perception, judgement and motor skills. Of even greater concern is the fact that there is also evidence of more serious physical impairments, such as reduced fertility and problems during pregnancy. The risk of spontaneous abortion to women exposed to anaesthetic gases is greatest in the first trimester, with incidence one and a half to two times greater than in unexposed women.

The most important influencing factors with respect to the nature and level of health effects in healthcare workers are the type of anaesthetic gas used, the level of gas concentration present in the worker's respired air and the duration of exposure.

At present, there are different national air limit values in Europe for assessing inhalation exposure. In Germany, occupational exposure limits have been published for the gases di-nitrogen monoxide (100 ppm/180 mg/mP^{3}P), halothane (5 ppm/41 mg/mP^{3}P) and enflurane (20 ppm/150 mg/mP^{3}P), in each case as a mean value over eight hours. Other countries have an air limit value for isoflurane, for example France (2 ppm/15 mg/mP^{3}P) and Switzerland (10 ppm/77 mg/mP^{3}P).

Table 10 gives an overview of the Dutch recommendations on anaesthetic gases.

Table 10: Dutch recommendations regarding classification of some inhalational anaesthetics with respect to effects on fertility, developmental toxicity and lactation (Health Council of the Netherlands, 2013)

Anaesthetic	Recommendation for classification for effects on:		
	Fertility	Developmetal toxicity	Lactation
Isoflurane	Lack of appropriate data precludes assessment of classification	Lack of appropriate data precludes assessment of classification	Lack of appropriate data precludes assessment of classification
Enflurane	Lack of appropriate data precludes assessment of classification	Lack of appropriate data precludes assessment of classification	Lack of appropriate data precludes assessment of classification
Nitrous oxide	Category 3: Substance which causes concern for human fertility	Category 3: Substance which causes concern for humans owing to possible developmental toxic effects	Lack of appropriate data precludes assessment of classification
Halothane	Lack of appropriate data precludes assessment of classification	Category 3: Substance which causes concern for humans owing to possible developmental toxic effects	Lack of appropriate data precludes assessment of classification

Source: (Health Council of the Netherlands, 2000a; Health Council of the Netherlands, 2000b; Health Council of the Netherlands, 2002; Health Council of the Netherlands, 2013)

Scavenging systems are effective in reducing concentrations of WAGs originating from the anaesthesia machine and exhaled residual gases from the patient. Waste gases should be vented to the outside or into a non-recirculated air system. Proper operation, leak testing and maintenance of the scavenging system and anaesthesia machine are critical in reducing exposures. Even if the scavenging units are working correctly, leaks can occur that result in very high levels of nitrous oxide. Many anaesthetic machines have safety features such as keyed fillers, interlocks and secured vaporisers to minimise staff exposure to waste gases. Proper sizing of masks, especially for paediatric patients, will help reduce leakage. The use of cuffed endotracheal tubes, when appropriate, can also help minimise exposure to waste gases. Work practices such as making sure the mask is in place before turning the gas on, and turning the gas off before turning off the breathing system, can help to reduce exposure levels. If the scavenging system is in proper working order, no PPE is necessary to control exposures to WAGs (New Solutions, 2013). In anaesthetic recovery rooms, where patients are regularly supplied with gas anaesthesia, only a ventilation system can ensure adequate ventilation. Natural ventilation generally cannot ensure that the aforementioned air limit values are observed. The ventilation installations must be designed in accordance with national specifications.

Cytostatic drugs

Cytostatic drugs are medications used for the treatment of various cancers and possess toxic properties which may cause mutagenic, carcinogenic and teratogenic effects. Hence, individuals handling these drugs in the course of their employment may face health risks. For this reason, it is important to monitor occupational exposure to these drugs.

Healthcare workers generally come into contact with cytostatic drugs when preparing and administering antineoplastic agents, during the in-house transportation of ready-to-use infusions, when cleaning up chemotherapy spills and when handling patient excreta (European Commission, 2010a) (Martin, 2005). It is well known that hospital workers may come into contact with cytotoxic agents through such accidents as needlestick injuries or ampoule breakages. Contamination of vials and ampoules, permeation through gloves, aerosols caused by overpressure in vials, and contamination of patients' body fluids, bedding and clothes are also long-recognised hazards. The probable exposure routes therefore include dermal absorption, ingestion and inhalation.

Under the local action of cytostatic drugs as an active substance or in the form of highly concentrated pharmaceutical preparations, various local reactions may arise, such as sensitisation or irritant effects (reddening, burning and itching, for example) and effects which destroy tissue (necrotising). Many of the cytostatic drugs in use today, and especially the so-called alkalising substances (the oldest substance group which acts directly on the DNA), have mutagenic, carcinogenic and/or teratogenic effects (European Commission, 2010a). Experimental evidence indicates that at least nine commonly used chemotherapeutic agents for which there is no known safe level of exposure may pose carcinogenic risks to humans. This evidence is based on epidemiological research that associates secondary tumours in cancer patients with treatment using these drugs.

Studies have identified an association between the degree of cytotoxic drug skin contact or exposure and the presence of acute symptoms reported by nursing staff. Some of the adverse health effects that are connected with occupational exposure to antineoplastic chemotherapeutic agents include nausea, vomiting, headaches, dizziness, hair loss and liver damage. These acute symptoms were positively correlated with the number of doses handled and the use of protective equipment. Hepatocellular damage was noted in nurses employed on an oncology unit. This symptom was associated with the employees' duration of work exposure and the volume of handling (Martin, 2005).

In addition to acute adverse effects, several studies have indicated an association of hazardous drug exposure with long-term adverse effects. Exposure to chemotherapeutic agents poses a significant risk to female reproductive health. The literature reports the incidence of such reproductive deficits as infertility, spontaneous abortions, foetal abnormalities and menstrual cycle abnormalities. Among nurses and pharmacists who reported occupational chemotherapy exposure, a cross-sectional self-reported survey found an increased prevalence of infertility. Among women, there was a significant increase in reported cases of infertility among nurses handling chemotherapy, regardless of whether they had a history of skin contamination with chemotherapeutic drugs. The use of vertical laminar flow cabinets rather than the traditional horizontal flow type was shown approximately 15 years ago to reduce mutagenic activity in the urine of technicians preparing cytotoxic drugs. Since then, safety

guidelines have been further developed and refined to protect workers handling these drugs, with particular attention being paid to the use of protective clothing and equipment (Martin, 2005).

The literature regarding the risk of cancer among healthcare personnel who handle antineoplastic drugs is limited and has focused predominantly on leukaemia. A significant increased risk for leukaemia was noted among oncology nurses who handled chemotherapy agents (Martin, 2005).

Only individuals trained in the safe handling of cytostatic drugs should be involved in their handling. Retraining and competency testing should be done at least on a yearly basis. This training should include the location and use of spill kits, fit-testing of equipment, the use respirators and sources of safety information (for example, material safety data sheets and standard operating procedures) for all employees handling antineoplastic drugs. The use of safe-handling practices for antineoplastic and other hazardous drugs in some primary areas can dramatically reduce the potential exposure of healthcare workers to these drugs. Table 11 gives some recommendations for the safe handling of these drugs.

Table 11: National Institute for Occupational Safety and Health (NIOSH) recommendations for safe handling of antineoplastic and other hazardous drugs (Connor *et al*., 2006)

Activity	Recommendation
Receiving and storage of drugs	▪ Wear PPE suitable for task being performed ▪ Properly label all hazardous drugs ▪ Store and transport drugs in proper containers
Preparation and administration of drugs	▪ Evaluate drug preparation and administration policies ▪ Wear suitable PPE, including double gloves, for task being performed ▪ Limit access to areas where drugs are prepared ▪ Use proper engineering controls when preparing drugs ▪ Wash hands with soap and water before donning and after removing gloves ▪ Prime intravenous tubing in a ventilated cabinet ▪ Use needleless or closed systems when preparing and administering drugs ▪ Do not disconnect tubing from an intravenous bag containing a hazardous drug ▪ Dispose of used materials in the appropriate container
Using ventilated cabinets	▪ Perform all preparations of hazardous drugs in a ventilated cabinet designed to reduce worker exposure ▪ Do not use supplemental engineering controls as a substitute for a ventilated cabinet ▪ When asepsis is required, select a cabinet designed for both hazardous drugs containment and aseptic processing ▪ Horizontal laminar-flow clean benches should not be used for preparation of hazardous drugs ▪ Properly maintain engineering controls as required by the manufacturer
Routine cleaning, decontamination, housekeeping, and waste disposal	▪ Use suitable PPE for the task being performed ▪ Establish periodic cleaning routines for all work surfaces and equipment used where hazardous drugs are prepared or administered

Activity	Recommendation
	▪ Consider used linen and patient waste to be contaminated with the drugs and/or their metabolites ▪ Separate wastes according to national guidelines and regulations
Medical surveillance	▪ Participate in medical surveillance programmes at work, seek medical advice if one does not exist ▪ Medical surveillance should include the following: ▪ reproductive and general health questionnaires; ▪ complete blood count and urinalysis; ▪ physical examination at time of employment and annual health status questionnaire review; and ▪ follow up for workers who have shown health changes

Latex

Products containing latex are derived from the sap of the rubber tree. Healthcare workers are frequently exposed to latex through the use of latex-containing medical equipment and latex gloves (still used because of their low cost, tactile qualities, durability and resistance to leakage). The powder used in latex gloves can often cause a latex allergy, the result of excessive protein reaching the skin when the gloves are worn. Furthermore, when the gloves are changed particles of powder from inside them are released into the air and could be inhaled (European Commission, 2010a).

Over the years there has been more evidence that latex allergy has become a major occupational health problem, one which has become epidemic in scope among highly exposed healthcare workers. Reports from multiple centres in different countries, using a variety of assessment instruments and criteria, are remarkably uniform in finding that between 8 % and 17 % of exposed healthcare workers, numbering well over 100,000 employees, are at risk for latex reactions.

Three types of reaction are caused by latex products:

- Irritant contact dermatitis: this is the most common adverse reaction to repeated exposure to an irritating substance. The symptoms are dry, itchy, irritated areas of the skin. It can be caused by putting on and taking off latex, by repeated hand washing and drying, incomplete hand drying, using cleaners and sanitisers, and repeated contact with powders added to some latex gloves.
- Allergic contact dermatitis (delayed hypersensitivity): this is a skin reaction caused by contact with chemicals added during harvesting, processing or manufacturing of latex products. It generally begins 24–96 hours after contact and may develop to oozing blisters or spread from the initial area of contact.
- Latex allergy (immediate hypersensitivity): potentially, this kind of allergy involves a more serious reaction than the other two. Mild reactions consist of redness of the skin, hives or itching. More serious reactions include a runny nose, sneezing, itchy eyes, a scratchy throat or asthma (difficulty breathing, wheezing and coughing). Shock is a reaction that can occur, although this is rare. Allergic reaction to latex occurs within minutes of exposure, but the symptoms may be delayed for a few hours.

The most effective preventative measure for latex allergy is the modification of standard procedures by replacing the use of gloves and equipment made with natural rubber latex with similar items made of vinyl or other non-rubber materials. This requires the involvement of the purchasing and supply departments, which should also mandate the labelling of all latex-containing items so that they can be avoided by individuals with latex sensitivity. This is important for healthcare workers who have a history suggestive of latex allergy. Aerosolised latex, from latex powder, is also problematic. Healthcare workers who are allergic and who do not use latex gloves may still be affected by the powdered latex gloves used by co-workers. A significant problem is presented by the wide variation in latex content among gloves from different manufacturers and even among gloves from the same manufacture. Glove

manufacturers are experimenting with gloves using formulations with smaller amounts of natural rubber latex, as well as with coatings that will obviate the need for talcum powder to make the gloves easy to put on and take off. The goal is to provide comfortable, easy-to-wear, non-allergenic gloves that still provide effective barriers to the transmission of the hepatitis B virus, HIV and other pathogens.

Gloves termed 'hypoallergenic' are also made of latex. These products release less latex, thus reducing the risk of sensitisation. These products are not safe for those who already have a proven latex allergy, but they are useful in diminishing the incidence of latex allergy in healthcare workers.

A careful medical history with a particular emphasis on prior latex exposure should be elicited from all healthcare workers who present symptoms suggestive of latex allergy. In suspect cases, evidence of latex sensitivity may be confirmed by skin or serological testing. Since there is evidently a risk of provoking an anaphylactic reaction, skin testing should be performed only by experienced medical personnel.

Generally, it is recommended that gloves be taken off when it is not necessary to wear them. Hands should also be washed carefully to remove latex particles stuck to the skin. Less contact time means less chance of becoming allergic. Removing gloves also helps to avoid maceration of the skin, which would allow the skin's natural barriers to be breached, enabling latex to penetrate within. Rings should not be worn under gloves, because latex particles can be trapped underneath them for prolonged periods.

4.3.3 Nanomaterials

A relatively new technology in healthcare is the use of nanomaterials. Nanomaterials can circulate through the body by moving in and out of blood vessels, enter cells and interact with biomolecules both on the cell surface and inside cells in numerous areas of the human body. As a result of this ability, nanomaterials in healthcare have the potential to detect diseases, deliver treatments and allow prevention in new ways. The main therapeutic uses of nanomaterials are as follows: solubility (for otherwise insoluble drugs), acting as carriers for hydrophobic entities, multifunctional capability, active and passive targeting, and ligands (size exclusion). Furthermore, because of their specific properties, nanomaterials are also used in diagnostic tools, in imaging agents and methods, and for implants and tissue-engineered constructs. The properties and behaviours of nanomaterials therefore allow the diagnosis, monitoring, treatment and prevention of diseases, including cardiovascular diseases, cancer, musculoskeletal and inflammatory conditions, neurodegenerative and psychiatric diseases, diabetes and infectious diseases (for example bacterial and viral infections, such as HIV (human immunodeficiency virus)) (EU-OSHA, 2013e). Table 12 provides a list of the applications of certain nanomaterials in the healthcare sector.

Table 12: Main types of nanomaterials in healthcare applications (EU-OSHA, 2013e)

Type of nanomaterial	Applications in healthcare
Metallic particles (such as iron (III) oxide, gold and silver)	▪ Hyperthermia cancer treatment ▪ Selective magnetic bioseparations ▪ Coated with antibodies to cell-specific antigens, for separation from the surrounding matrix ▪ Membrane transport studies ▪ Drug delivery ▪ Magnetic resonance imaging contrast agent
Silver nanoparticles	▪ Anti-microbial agent ▪ Incorporated into a wide range of medical devices, including bone cement, surgical instruments, surgical masks
Gold shell nanoparticles	▪ Improve solubility of drugs ▪ Permit further conjugation

Type of nanomaterial	Applications in healthcare
Carbon nanomaterials (fullerenes and carbon nanotubes (CNTs))	▪ 'Buckyballs' (football-shaped structures made of 60 carbon atoms) are used in drug delivery systems to support the optimal transport and release of medicines to the right target inside the body ▪ Coatings for prosthetics and surgical implants ▪ Functionalised CNTs: o for therapeutic delivery o for biomedical applications such as vascular stents and neuron growth and regeneration o gene therapy, as a strand of DNA can be bonded to a nanotube
Quantum dots	▪ Tag multiple biomolecules to monitor complex cellular changes and events associated with diseases ▪ Optics technology ▪ Disease diagnosis and screening technologies
Dendrimers	▪ Polymerised macromolecules — highly branched structures with interior nanocavities or channels with properties different from those on the exterior ▪ Used as a carrier for a variety of drugs (for example anti-cancer, anti-viral, and anti-bacterial drugs) with the capacity to improve the solubility and bioavailability of poorly soluble drugs
Lipid-based nanoparticles	▪ Can fuse with the cell membrane and deliver molecules inside the cells
Ceramic nanoparticles	▪ Inorganic systems used as drug vehicles (if porous and biocompatible); used in cosmetic applications (zinc oxide, titanium dioxide)
Nanotubes, nanowires, magnetic nanoparticles	▪ Disease diagnosis and screening technologies, including 'lab on a chip' devices

Although nanomaterials in the healthcare sector can offer a large number of benefits to patients, they may also expose healthcare workers to new risks. There are still gap in the information available regarding the toxicity of manufactured nanomaterials, which makes performing risk assessments difficult (EU-OSHA, 2013e).

Owing to the unique properties of these materials at the nanoscale — mainly linked to their small size but also to their particle shape, chemical nature, surface state (for example surface area, surface functionalisation, surface treatment) and state of aggregation/agglomeration — their interactions with the human body and consequently their health effects are expected to be different from those associated with the same materials of the same composition at the macro scale. Therefore, this raises concerns about the health effects that might result from occupational exposures to nanomaterials. Under normal environmental conditions, nanomaterials may form agglomerates or aggregates larger than 100 nm, thereby changing (but not necessarily losing) their nano-specific properties. However, nanomaterials may be released again from weakly bound agglomerates and, under certain conditions, even from more strongly bound aggregates. The question of whether or not this could happen in lung fluid after inhalation of such agglomerates or aggregates is being investigated. Agglomerates and aggregates containing nanomaterials should therefore also be taken into consideration in workplace risk assessments. The internal exposure mechanism, following the entry of nanomaterials into the body,

could include further absorption, distribution and metabolism. Some nanomaterials have been found in, for example, the lungs, liver, kidneys, heart, reproductive organs, fetus, brain, spleen, skeleton and soft tissues. There are open questions concerning the bioaccumulation of nanomaterials and elimination mechanisms from cells and organs. An additional issue is that, while a nanomaterial itself may not be toxic, it could act as a Trojan horse, meaning that a more toxic material may attach itself to the nanomaterial and gain entry to the body, organs or cells. The most important effects of nanomaterials have been found in the lungs and include inflammation, tissue damage, oxidative stress, chronic toxicity, cytotoxicity, fibrosis and tumour generation. Some nanomaterials may also affect the cardiovascular system. The potentially hazardous properties of manufactured nanomaterials are a matter of ongoing research. Table 13 highlights some of the potential health hazards and OSH risks that healthcare workers face when using and handling certain nanomaterials.

Considering the activities that are undertaken within the healthcare sector, the workers who are most likely to be exposed to nanomaterials are those who prepare or administer nanodrugs or who work in areas where these drugs are used (for example pharmacy and nursing personnel, physicians, environmental service workers, shipping and receiving personnel), as they can readily come into contact with these airborne agents. Other situations in healthcare in which exposure to nanomaterials may occur are:

- disposal of excreta from patients receiving nanodrugs;
- nanomaterial spills;
- handling of nanomaterial-contaminated items;
- consumption of food and beverages that have come into contact with nanodrugs; and
- cleaning and maintenance of areas where nanodrugs are handled.

Possible exposure situations can also be found in dental and surgical procedures involving the milling, drilling, grinding and polishing of applied medical materials containing nanomaterials (EU-OSHA, 2013e).

Table 13: Examples of nanomaterials used in the healthcare sector and their potential health hazards and OSH risks

Example of nanomaterials	Potential health hazards and OSH risks
Carbon nanomaterials	There is evidence that, when inhaled, some types of carbon nanomaterials can lead to lung disorders, including asbestos-like effects.
Dendrimers	In spite of extensive applicability in the pharmaceutical field, for example in delivery of anti-cancer drugs, the use of dendrimers in the human body is restricted because of their inherent toxicity. There has been a case of erythema multiforme-like contact dermatitis resulting from exposure to dendrimers.
Silver nanoparticles	According to ENRHES (Engineered Nanoparticles - Review of Health and Environmental Safety), the use of silver nanoparticles represents a potential hazard to human health; however, the study of its toxicity is still in its infancy. The EU's Scientific Committee on Emerging and Newly Identified Health Risks was asked for a scientific opinion on the safety, health and environmental effects and role in anti-microbial resistance of nanosilver. Serious concerns arise because silver nanoparticles, at high doses, can cause adverse health effects, such as pulmonary oedemas and skin stains. In fact, the most commonly reported response of humans to prolonged nanosilver exposure is argyria or argyrosis (grey or grey-blue discolouration or black pigmentation of the skin, nails, eyes, mucous membranes or internal organs by silver deposits). These conditions cannot be reversed and are incurable.

Example of nanomaterials	Potential health hazards and OSH risks
	In the healthcare sector, nanosilver has been used as an anti-bacterial agent in wound dressings to protect patients with severe burns against infections. This results in one of the main exposure risks for healthcare workers. Furthermore, concerns were raised about indirect adverse effects of nanosilver on human health as a result of the increasing resistance of micro-organisms to silver. In research carried out on rats, it was documented that silver nanoparticles can reach the brain through the upper respiratory tract.
Titanium dioxide (TiO_2)	TiO_2 particles, when inhaled, have been classified by the International Agency for Research on Cancer (IARC) as Group 2B, 'possibly carcinogenic to humans'. NIOSH has recommended a lower exposure limit for ultrafine particles of TiO_2: 0.3 mg/m^3 for TiO_2 nanoparticles (<100 nm) versus 2.4 mg/m^3 for fine particles (>100 nm).
Gold nanoparticles	The toxicity of gold nanoparticles, when inhaled by rats, has been studied, and an accumulation of gold in the lungs and kidneys was observed

In addition to health risks, the aerosolisation of nanodust or combustible nanoparticles can pose a risk of explosion or fire.

It is important to properly assess and manage the possible OSH risks of nanomaterials in the healthcare sector to protect workers' safety and health adequately.

4.3.4 Phasing out of dangerous substances in medical devices

Healthcare professionals are threatened by the presence of hazardous substances in many products, including medical devices that are intended to contribute to the treatment of diseases. Several healthcare systems and hospitals throughout Europe have already recognised the need to avoid the use of harmful chemicals and have voluntary started to phase out medical equipment containing phthalates and other hazardous substances.

Substances that can induce or promote cancer or genetic mutations or damage the reproductive process should not be allowed in medical devices when safer alternatives are available. Substances classified as CMRs include certain phthalates (for example DEHP and DBP) that are abundant in PVC-based medical devices such as blood bags, tubes, catheters and disposable gloves, and metals (for example cadmium, cobalt and chromium) that are used in metal-on-metal medical devices. These substances can be released from medical devices and cause serious health effects to patients and healthcare professionals.

Substances that can interfere with the hormone systems of living creatures (endocrine-disrupting chemicals, EDCs) and that are used in medical devices include phthalates and bisphenol compounds such as BPA. These substances are present in and can be released from medical devices, including medical tubing, haemodialysers, incubators for newborns and dental composite resins. Exposure to low doses of EDCs has been linked to various health problems, including hormone-related cancers, birth defects, reproductive impairments and diabetes, and this has caused alarm in the scientific and medical community.

In October 2013, the European Parliament voted in favour of an amendment to Annex I of the proposed EC regulation on medical devices stating that chemicals that are CMRs, or EDCs, and which are contained in medical devices that are invasive or come into contact with the body of patients or are used to administer, transport or store medicines, body fluids or other substances, including gases in concentrations above 0.1 % by weight, shall be banned. This amendment still allows the use of CMRs and EDCs in medical devices for a period not exceeding four years through a derogation process. Manufacturers may ask for exemption where the elimination or substitution of these substances is technically impracticable, the reliability of the substitute substance is not ensured or the negative impact

caused by the substitution would outweigh the benefits to the patient's safety and health. Finally, the amendment also establishes that EDCs are to be identified not only through the procedure specified in REACH but also by scientific evidence of their effects on human health or according to the new criteria being developed by the European Commission.

4.4 Physical risks

Physical hazards which can occur in the healthcare sector include: excessive levels of noise, non-ionising radiation (such as ultraviolet radiation and electromagnetic fields from MRI) and ionising radiation (such as from X-rays).

4.4.1 Noise

Noise remains a major and largely unsolved problem in healthcare. In healthcare facilities, exposure to excessive noise can be encountered in various areas, for example compressor rooms, workshops, laundries, orthotics areas, plaster rooms and dental clinics. Workers' exposure to noisy machinery or equipment may induce hearing loss, hearing impairment, tinnitus, acoustic trauma, interference with speech communication and with perception of warning signs, disruption of job performance, annoyance and extra-auditory effects. Among other non-auditory health end points, short-term changes in circulation (including blood pressure, heart rate, cardiac output and vasoconstriction) as well as in levels of stress hormones (including epinephrine, norepinephrine and corticosteroids) have been studied in experimental settings for many years. From this, the hypothesis emerged that persistent noise stress increases the risk of cardiovascular disorders, including high blood pressure and ischemic heart disease (EU-OSHA, 2005).

A study by Johns Hopkins University found that hospital noise levels have increased over the past 50 years. Since 1960, average daytime hospital sound levels have gone up from 57 to 72 dB, and this is quite alarming when you consider that the recommendation by the World Health Organisation is 35 dB as the maximum sound level in patient rooms. Healthcare workers and patients also raise their voices in an effort to be heard over background noises such as monitoring and life-sustaining equipment beeps around patients' beds; these beeps occasionally erupt into alarming warning signals. Healthcare workers report exhaustion, burnout, depression and irritability caused by working in noisy environments during long shifts (Johns Hopkins University, 2005). Exposure to different levels of noise during the working day causes higher levels of stress and tension during periods defined as acoustically 'bad'. During acoustically 'good' periods, the work environment is perceived by staff more favourably, and patients judged staff attitudes and care to be better than during the 'bad' periods. Mental activities requiring a lot of working memory are especially affected by noise. Distractions caused by noise often result in medication errors (Joseph and Roger, 2007).

The healthcare personnel most at risk of noise exposure include workshop technicians, laundry staff, facilities management staff, nurses and doctors. Dental professionals are also exposed to equipment that intermittently emits differing levels of noise. Common sources of noise exposure in a dental office include equipment such as:

- angled-design turbine hand pieces
- low-speed angled-design hand pieces
- lab electromotor hand pieces
- high-speed turbine hand pieces
- low-speed hand pieces
- stone mixers
- lab machines
- ultrasonic scalers
- ultrasonic cleaner

These machines can emit sounds ranging from 66 dB to 91 dB. Exposure depends on the type of treatments that are scheduled and the type of equipment used. Furthermore, older equipment may result in an increased exposure to noise. Older drills may produce louder sounds, of up to 100 dB. The higher intensity reduces the allowable exposure time to two hours per day (Mervine, 2008).

The control of excessive noise in the healthcare sector can be supported by establishing an effective hearing conservation programme (HCP) whenever employee noise exposures equal or exceed an eight-hour time-weighted average (TWA) sound level of 85 dBAs (WSHC, 2008). The basic HCP should include:

- Monitoring of noise exposure levels to identify noise hazards and evaluate the risks involved.
- Implementation of reasonably practicable noise control measures, such as engineering and administrative controls to minimise the risk from noise, for example reducing the amount of sound energy released by the noise source, diverting the flow of sound energy away from the worker, proper maintenance of equipment or provision of acoustic shields and barriers.
- Provision of suitable personal hearing protectors to all persons exposed to excessive noise and ensuring their usage.
- Training and educating all persons involved in HCP, including management, HCP team members and all employees who are exposed to excessive noise, to increase their awareness of noise hazards and their prevention.
- Annual audiometric examinations to determine the effectiveness of HCP in preventing noise-induced hearing loss and to detect hearing impairment at an early stage.
- Record keeping (for example documenting the measures taken to protect employees from noise).
- Evaluation of HCP to determine its effectiveness and areas for improvement.

4.4.2 Radiation

Radiation is a term that encompasses a broad category of energy-containing emissions that have no mass and travel at the speed of light. The electromagnetic spectrum is made up of subcategories of these forms of energy, the properties and effects of which are dependent upon the wavelength and frequency of the energy emitted. Unlike sound waves (and ultrasound), electromagnetic waves can propagate in a vacuum. The energy contained in the particles (or photons) that are transferred increases with the increasing frequency of the waves and, therefore, with decreasing wavelength. At the low-energy (long wavelength/low frequency) end of the spectrum are AM radio waves. In ascending order of energy, next come shortwave radio, FM radio and television, microwaves, radar, infrared, visible light, ultraviolet, X-ray and, finally, gamma rays at the high energy (short wavelength/high frequency) end of the spectrum. Radiated heat (infrared spectrum) is a relatively low-energy form of electromagnetic radiation, identical to visible light but at a different wavelength and frequency. In other words, radiated heat is just a different ‘colour’ of light, outside of the spectrum visible to humans.

All forms of electromagnetic radiation, improperly used, can cause harmful effects to healthcare professionals. In general, radiation at the low and middle range of the energy scale produces damage by transferring heat and is called ‘non-ionising’ radiation. High-energy electromagnetic radiation in the form of X-rays, gamma rays and even very high-energy ultraviolet rays is called ‘ionising’ radiation because it has enough energy to break chemical bonds and create ions in the tissue, thus disrupting the machinery of the cell. The damage ionising radiation can do to DNA molecules, if not repaired, can lead to genetic mutations and the development of cancer. Ionising radiation can cause dose-related, potentially reversible, changes called ‘non-stochastic’ or ‘deterministic’ effects. There is a threshold below which no damage occurs, and the severity of the damage increases as the total dose increases. For example, the skin erythema one sees after a few doses of therapeutic radiation gets progressively worse as the dose increases, potentially leading to ulceration if the dose gets too high. The same changes can be seen with diagnostic X-rays if, for example, a fluoroscope is misused, resulting in unacceptably high doses of skin radiation. The other form of damage caused by ionising radiation is called its ‘stochastic’ effect, which simply means a ‘random’ effect. This is an ‘all or none’ phenomenon that has no completely safe threshold, is not dose related and is not reversible. Theoretically, any dose of radiation can cause a stochastic effect, but the probability of the effect occurring increases as the dose increases. One never knows which photon or photons might strike the DNA molecule in just the right (or in fact wrong) way to cause a cancer; however, the probability of such damage occurring increases with every unit of energy delivered. If one develops a cancer because of radiation, it is identical to any other cancer, and its severity is not related to the dose of radiation that caused it.

In the healthcare sector, protection methods are used to reduce the exposure of patients and workers to radiation. Hospital employees who work in radiology, nuclear medicine, radiation oncology and some

laboratories will be aware of sources of radiation. However, other hospital workers who work around these sources may be indirectly exposed to radiation while preforming their normal duties without being aware of it. A lack of detailed radiation training has been highlighted as one of the root causes of excessive radiation exposure in the healthcare sector. Whereas interventional radiologists are trained in the safe use of radiation, interventional cardiologists and vascular surgeons, for instance, typically receive minimal radiation training. Because they are generally unfamiliar with all of the sources of radiation exposure, they may know little about risk-reduction and safety strategies. Compounding the problem is the fact that, while a radiologist's key team member is a radiological technologist (who has also received radiation safety training), an interventional cardiologist or vascular surgeon's key team member may be a nurse, who has probably received little or no radiation safety training. That is not to say that all radiologists employ best radiation safety practices. Despite their training, many of them have become complacent (Kiah *et al*., 2012).

While in the United States radiation is now being used more often, with an increased emphasis on ensuring the highest quality images, which means more radiation, in Europe safety is more highly valued. The ideal dose is the smallest amount of radiation possible to produce an acceptable image. A good operator knows how to produce good images without excess radiation (Kiah *et al*., 2012).

4.4.3 Non-ionising radiation

Magnetic resonance imaging (MRI)

Nuclear magnetic resonance (NMR) is a well-known research method involving the phenomenon of resonant absorption and reemission of radiofrequency radiation by protons in a strong static magnetic field. It can be used for medical imaging (high resolution, computerised images of the human body) or spectral analysis of the chemical structure of samples. In MRI systems used for medical examinations, the required magnetic field is the result of the combination of two components: a static field constantly produced by strong magnets (permanent, resistive or superconductive) and pulses of a time-varying gradient field produced by gradient coils located inside the housing of the MRI scanner.

For healthcare staff (nurses, technicians and radiologists), the static magnetic field from MRI scanners is of special concern, as, during their shift, the field is constantly turned on. The highest exposure occurs in direct proximity to the magnet's housing. Healthcare workers are exposed to static magnetic fields while attending patients before and after examination and also while operating the scanner's console, situated on the housing of the magnet. Exposure to gradient and radiofrequency pulses is possible only during an examination; it affects workers in special cases only, for example during so-called dynamic examinations or in emergencies (Karpowicz, Hietanen and Gryz, 2007). The level of a worker's exposure depends both on the type of the magnet and on the ergonomic design of the MRI device.

Individuals working in the vicinity of an MRI machine may be affected if they have a pacemaker, artificial limbs or other medical devices that contain iron. Care has to be taken to ensure there are no loose metallic objects in the vicinity, since these can be pulled towards the strong MRI magnet, causing serious injury or death not only to the patient but also to the MRI technician. In one particular incident, a six-year-old boy undergoing an MRI examination died after the machine's powerful magnet pulled a metal oxygen tank through the air, fracturing his skull (CBS news, 2001).

The health effects of static magnetic fields have not been thoroughly explored, and the WHO has pointed out that there is not sufficient data derived from scientific research to establish what the health risks are.

Ongoing research has demonstrated that healthcare professionals such as MRI technicians, surgeons and even cleaners may experience transient neurocognitive effects when working in the vicinity of MRI machines. Study participants who completed standardised head movements while inside the static magnetic stray field of a 7 tesla (T) MRI system experienced a temporary decrease in attention, concentration and visuospatial orientation that did not occur in sham conditions. A significant relationship between increasing magnetic strength and participant attention reduction was detected, indicating a reduction in working memory, a decrease in verbal memory function and a decrease in visuospatial perception. These findings add to the evidence that MRI static fields which are present once the machine is switched on (even when imaging is not under way) can cause sensory symptoms such as nausea, dizziness and a metallic taste in the mouth. Although results indicate that the

neurocognitive effects of MRI static stray fields disappear once exposure ends, more studies are now being undertaken to investigate the possibility of long-term effects on workers (Williams, 2012).

European Commission Directive 2004/40/EC on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields) has not into force because of problems with its implementation. In 2006, the medical community informed the Commission of its concerns regarding the implementation of the directive, claiming that the exposure limit values laid down therein would have made some MRI techniques difficult or even impossible to carry out while remaining compliant with the law. Subsequently, other industrial sectors also expressed their concerns about the impact of the directive on their activities. In June 2013, the European Parliament voted to amend a proposed strict European safety and health law aimed at protecting workers from the risks posed by exposure to electromagnetic fields. The proposed legislation had threatened the use of MRI scanners for imaging vulnerable patients and children, for MRI-guided surgery, including some types of brain surgery, for research and development, and even routine cleaning and maintenance of the machinery. Campaigning by a cross-Europe alliance of scientists, doctors and other healthcare workers, patient groups and health activists succeeded in engaging the support of leading MEPs and resulted in changes to the proposed legislation. The outcome of the vote means that staff working with MRI scanners will still be protected from adverse effects and risks to their safety and health, but will enable the routine use of scanners to continue. Special rules to safeguard workers will apply in these circumstances (NHS Confederation, 2013).

On 29 June 2013, the European Commission repealed Directive 2004/40/EC and published Directive 2013/35/EU on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields). The agreed new text reviews exposure limits on the basis of new scientific evidence and provides for derogations, in particular for medical applications using MRI. The new directive distinguishes between two biophysical effects of electromagnetic fields on the human body:

- thermal effects (tissue heating through the absorption of energy from electromagnetic fields);
- non-thermal effects (stimulation of muscles, nerves or sensory organs) which may affect physical and mental health and affect workers' ability to work safely.

Exposure to ultraviolet radiation

Ultraviolet (UV) radiation is emitted by the sun and it is part of the electromagnetic spectrum. UVA and UVB are of major importance to human health. The production of vitamin D requires small amounts of UV, but over exposure to these radiations may result in acute and chronic health effects on the skin, eyes and immune system (WHO, 2014).

Problems related to UV exposure are:

- skin cancer and other skin damage;
- premature ageing;
- cataracts and other eye damage; and
- immune system suppression (EPA (United States Environmental Protection Agency), 2013).

In healthcare services, UV radiation is used in decontamination (decontamination lamps reduce the presence of pathogens and multidrug-resistant organisms such as MRSA) (American Ultraviolet, 2014).

The short-term effects of UV radiation on the skin include reddening of the skin, sunburn and swelling, which may be very severe; the long-term effect of UV on the skin is skin cancer. The effects of UV radiation on the eyes are photokeratitis and photoconjunctivitis (inflammation of the cornea and the conjunctiva respectively), known as 'snow blindness' or 'welder's flash' (WHO, 2003c).

4.4.4 Ionising radiation

The potential health effects of radiation are somatic (relating to body) and/or genetic (relating to the offspring):

- Acute: erythema and dermatitis. Large whole-body exposures cause nausea, vomiting, diarrhoea, weakness and death.

- Chronic: skin cancer and bone marrow suppression. Genetic effects may lead to congenital defects in the employee's offspring (United States Department of Labour, 2014).

Exposure occurs when unprotected employees are near a machine in operation. The degree of exposure depends on duration of exposure, amount of radiation, distance from the source and type of shielding in place.

Burns and acute radiation syndrome (ARS), also called 'radiation poisoning' or 'radiation sickness', which is caused when the entire body (or most of the body) is exposed to a high dose of penetrating radiation in a very short period of time) can be caused by short-term, high-level (or acute) exposure to radiation. It can lead to premature ageing and death (Wild Iris Medical Education, 2011).

Acute exposure of the skin to radiation (especially to beta radiation or X-rays) and the presence of radioactive materials in patient's clothes can cause cutaneous radiation syndrome. Inflammation, erythema (redness) and dry or moist desquamation are the result of damage to the basal cell layer of the skin by radiation. Epilation (hair loss) can also be a result of radiation, because of damaged of hair follicles. In addition, within the first few hours of radiation exposure, transient and inconsistent erythema (associated with itching) can occur (Wild Iris Medical Education, 2011).

Exposure to X-rays

X-ray machines are used in radiography and fluoroscopy and they can be permanently installed (fixed) or mobile.

- Fixed: these are primarily located in X-ray or radiology departments, but they may be located in other areas of the hospital, such as operating rooms and emergency rooms. These X-ray machines are used in the diagnosis of disease. These are located in a specially shielded room and are typically operated by personnel trained in the proper use of the equipment (AAPM, 1995).
- Mobile: these machines are similar in function to fixed machines; however, they can be transported to patients who cannot be moved. Mobile machines are typically used to examine patients in operating or recovery rooms during or after surgery, trauma victims in emergency rooms, patients located in intensive care units and neonatal units and other bedridden patients. Personnel and other patients may receive a small amount of exposure to X-rays during the time that the X-ray machine is on. Personnel who assist in holding patients should wear protective aprons, as should the operator (AAPM, 1995).

Typically, healthcare professionals who regularly work near sources of radiation are trained in radiation safety. However, some nurses may not be aware of the extent of their exposure to radiation. For example, neonatal intensive care nurses often hold babies still during portable radiograph acquisition in neonatal intensive care units. A recent study (Russell *et al*., 2013) that evaluated radiography images of neonates for the presence of adult fingers found that of 230 radiographs audited, 30 (13 %) contained adult fingers directly in the X-ray beam, representing a significant source of occupational exposure for these neonatal nurses.

When a person undergoes an X-ray examination, millions of photons pass through their body. These can damage any molecule by ionisation, but damage to the DNA in the chromosomes is of particular importance. Most DNA damage is repaired immediately but, rarely, a portion of a chromosome may be permanently altered (a mutation). This may lead ultimately to the formation of a tumour. The latent period between exposure to X-rays and the clinical diagnosis of a tumour may be many years. The risk of a tumour being produced by a particular X-ray dose can be estimated; therefore, knowledge of the doses received by radiological techniques is important. While doses and risks to workers may be small, a number of epidemiological studies have provided evidence of an increased risk of brain, salivary gland and thyroid tumours, for example in workers involved in dental radiography. The effects described above are believed to have no threshold radiation dose below which they will not occur. They can be considered as 'chance' (stochastic) effects, where the magnitude of the risk is proportional to the radiation dose. There are other known damaging effects of radiation, such as cataract formation, skin erythema and effects on fertility, that definitely have threshold doses below which they will not occur.

No exposure to X-rays can be considered completely free of risk, so the use of radiation by healthcare professionals implies a responsibility to ensure appropriate protection. Radiation exposure to

technologists, nursing staff, physicians and others must be kept as low as reasonably achievable. Staff protection measures need to be based on a prior evaluation of the risk associated with the work and on an assessment of the required arrangements to limit doses to staff and their implementation. In general, the employer will be responsible for ensuring that the requirements for radiation protection, in terms of equipment, facilities and work procedures, are assessed and implemented in line with the requirements of national legislation and in consultation with appropriate medical physics experts. This is often best carried out as a formal risk assessment with the main findings being documented. The overriding principle of staff radiation protection is to ensure that doses are kept as low as reasonably achievable. This principle is known as the ALARA principle and is the backbone of all radiation protection practice. Essentially, ALARA requires that any measure that can reasonably be implemented should be to ensure that radiation protection is optimised. In deciding reasonableness, economic and social factors can be taken into account.

Three of the most basic and easy to follow principles of radiation protection are time, distance and shielding. Radiology technologists can greatly reduce their exposure to X-rays by following these principles.

Time: as the length of time that a technologist is exposed to X-rays increases, the dose received increases in direct proportion. During fluorscopic examinations, a technologist should be in the room only when needed to assist; otherwise, they should be behind a lead wall, dressed in a lead apron and thyroid collar just in case their assistance is needed. In most cases, this is not feasible, but there are some exams, such as modified barium swallows, where the technologist's assistance during the exam is rarely needed. Another way to reduce exposure time is to avoid holding patients during exams if possible. Mechanical holding devices should be used when a patient or film requires added support. If that is not possible, then another person available, such as a relative of the patient or even a nurse who is rarely exposed to X-rays should be asked to restrain the patient. This person will need to wear a lead apron and gloves. Finally, there should be proper techniques in place to minimise the number of repeat exposures.

Distance: the most effective of the principles is distance. The further a person is from the source, the less intense the radiation source will be. When the distance from the source is doubled, the intensity at the new distance is only one-quarter of the original intensity. When performing portable X-ray examinations, a technologist should be at least 1.8 metres from the source of radiation.

Shielding: when the use of time and distance principles is not possible, shielding should always be used. Wearing protective lead shielding and thyroid collars can protect the radiosensitive areas of the body when it is required for the technologist to be near the source of radiation. Protective aprons, gloves and thyroid collars are usually made of lead-impregnated vinyl. The most widely used and recommended standard for protective apparel is a 0.5 mm lead equivalent.

Another issue that needs to be taken into consideration is that of scatter radiation. This is a type of secondary radiation that occurs when the useful beam intercepts any object, causing some X-rays to be scattered. During an X-ray or fluoroscopic exam the patient is the most significant source of scatter radiation. Most of a technologist's occupational exposure comes from scatter radiation; therefore, using safety measures against scatter radiation will effectively lower any occupational exposure. Ways to reduce exposure to scatter radiation include:

- Always collimate to the area of interest; the larger the amount of tissue the beam is allowed to irradiate, the more scatter radiation is produced.
- Using high peak voltage (kVp) and low milliamperes-second (mAs) techniques produces less scatter.
- Use protective equipment, such as lead-lined walls and lead aprons, when involved in an exam.
- During fluoroscopy exams, always make sure the bucky slot cover is in place and the lead curtain is on the fluoro tower.
- During mobile examinations, stand at least 1.8 metres away and if possible at a 90-degree angle from the radiation source (the patient).

Whenever a worker is likely to receive 10 % or more of the annual occupational dose of 50 millisieverts (mSv) in a year's time, radiation exposure monitoring is required. Monitoring of these exposure levels is achieved by issuing personal dosimeters to the worker to wear during their shift. A dosimeter detects and measures the amount of radiation a worker has been exposed to over a set amount of time. The

dosimeter must be read at least once a year, but most facilities have their dosimeters read quarterly or even monthly. A personal dosimeter should be worn on the anterior part of the body, attached to the scrub top or shirt collar area. Wearing this dosimeter consistently in this location will help to provide an approximate dose to the thyroid and lens of the eye, which are highly radiosensitive areas. When a worker is wearing a lead apron, the dosimeter should always be worn outside the apron to receive an accurate dose reading. A worker's record of exposure becomes part of their permanent employment record. Personnel monitoring reports list the deep, eye and shallow occupational doses for each of the workers assigned a dosimeter. The report will show the doses received during that period, along with the running total from past reports.

It is well documented that the fetus is sensitive to ionising radiation. Consequently, special attention is paid to workers using ionising radiation who are pregnant. Pregnant workers who have declared their pregnancy should be able to continue to perform their duties while following established radiation safety practices. The radiation safety officer will provide advice to the pregnant worker on how to keep the fetus safe while working with radiation. The pregnant worker is also given a second dosimetry badge for her to wear at her waistline; this is monitored monthly rather than quarterly. When wearing a lead apron, the pregnant worker should wear the badge under the apron to get a reading of what the foetus is exposed to. The monthly equivalent dose to the foetus should not exceed 0.5 mSv and the limit for the entire pregnancy is not to exceed 5.0 mSv.

4.5 Slips, trips and falls

Slips, trips and falls are the most common causes of accidents resulting in serious injury to workers in all workplaces across Europe. Slips, trips and falls are also the main reason for absences from work of more than three days (EU-OSHA, 2008c).

For example:

- Slips and trips are the most common causes of injuries among nurses, housekeepers, carers, ambulance staff and cleaners/domestic staff. Every year, up to 2,000 injuries are attributed to slips, trips and falls among healthcare workers. Nurses have the most such accidents and doctors the fewest (European Commission, 2010a).
- In Ireland, slips, trips and falls (on the level) were the second highest reported accident trigger in the healthcare sector in 2009. Of reported incidents, 30 % resulted in the person involved being absent from the workplace for more than one month (HSA, 2009).
- In the UK, the HSE's reported data for the healthcare sector provided the following statistics:
  - 22 % of slips were due to slippery substances and surfaces, and a further 15 % were due to wet surfaces;
  - 17 % were caused by trips over obstructions and 10 % by tripping on an uneven surface;
  - 68 % of slipping and tripping injuries involved on-site transfer, while 10 % occurred during nursing processes; and
  - 25 % of major slipping and tripping accidents happened to nurses.

A 'slip' is defined as the 'slipping of one or both feet when the grip between the shoe and the floor is too low', while a 'trip' is 'a sudden stop of the movement of the foot by an obstacle, with continued forward movement of the body'. They happen when there is too little friction between footwear and the walking surface. Falls are usually the result of slips and trips but can also occur without slipping or tripping. There are two basic types of falls: same-level falls and falls from heights (EU-OSHA, 2008c).

Slips, trips and falls may result in sprains or strains, broken bones, back injuries, burns (when near hot surfaces or when they occurs during handling of hot fluid) or cuts (if they occurs near sharp objects)

The four main causes of slipping and tripping accidents in healthcare are (HSE, 2003):

- slippery surfaces caused by water and other fluids;
- slippery surfaces caused by dry and dusty floor contamination, such as plastic, lint or talcum powder;
- obstructions, both temporary and permanent; and
- uneven surfaces and changes in level, such as unmarked ramps.

Other causes include factors such as type of flooring, trailing cables, poor level of lighting and external glare, human factors such as employees rushing, running or carrying heavy items, the wearing of unsuitable footwear, the capabilities of the individual and improper cleaning regimes (EU-OSHA, 2008c).

When dealing with the causes of slips, trips and falls, healthcare employers should put into practice preventative measures. Safety and health managers and staff should be aware of where the risks, such as floor contamination or inherent slip resistance not adequately maintained, arise. They should also be able to identify measures to control the risks. The following are examples of measures that could be taken.

- Eliminate contamination in the first place by maintaining equipment and clearing liquid leakages as soon as possible.
- Maintain resistance of floor surfaces by using appropriate cleaning methods and 'cleaning in progress' signs.
- Maintain adequate lighting in all areas of the healthcare establishment.
- Ensure that environmental conditions, such as glare, shadows and temperature extremes, do not distract the attention of staff, patients and visitors away from the condition of the floor.
- Train and retrain staff on a regular basis so that they understand the dangers of lifting heavy loads, restricted views and other moving and handling issues, and ensure that they operate within their individual capacity.

4.6 Ergonomic risks

Ergonomic hazards and associated MSDs have been described as the leading occupational health problem affecting the nursing workforce. Healthcare workers consistently rank among the top occupations with disabling back injuries, primarily from manual handling of patients. Nursing aides, orderlies and attendants are in second place and registered nurses sixth in a list of the top ten at-risk occupations for strains and sprains that includes truck drivers (first), labourers (third) and construction workers (seventh) (EU-OSHA, 2007a).

MSDs are painful disorders of the muscles, tendons, joints and nerves. MSDs arise from movements such as bending, straightening, gripping, holding, twisting, clenching, squatting, kneeling and reaching. Work situations such as continued repetition, having to use force, lack of time for recovery and speed of movement are hazardous. The upper limbs and back are the parts of the body most commonly affected by musculoskeletal disorders (EU-OSHA, 2010).

Musculoskeletal disorders among healthcare workers are caused by work activities such as:

- lifting, pushing or pulling heavy loads, including patients;
- awkward postures when lifting;
- repeated movements without adequate recovery time;
- prolonged standing; and
- sitting for long periods of time (NIOSH, 2010).

Lifting and moving patients ('patient transfers'), bathing, dressing and feeding patients are the most frequent causes of back pain and other injuries among nursing staff (NIOSH, 2010). An individual's age, body weight and physical activity outside work are also likely to affect his or her vulnerability to pain in the back, neck and shoulders (Waters *et al*., 2006).

There are also some circumstances specifically relating to lifting patients that may cause musculoskeletal injuries:

- the patient is heavy;
- the body weight of the patient is not evenly distributed,
- the patient may be connected to a catheter or other equipment, resulting in awkward postures for workers involved in his or her transfer;
- the functional limitations of the patient — physical, mental or both — may interfere with the lift; and
- special lifting techniques used to minimise the load on the back may increase the load on other body parts, such as the neck, shoulders and arms.

Musculoskeletal injuries are acute and painful, and others are chronic and lingering, with steadily increasing continuous pain. Some acute examples include:

- tearing of muscles as a result of lifting a heavy load;
- bone fracture as a result of a sudden force; and
- blocking of a vertebral joint as a result of a violent movement protrusion/dislocation of a vertebral disc as a result of bending forward or heavy lifting.

The fourth EWCS (2005) found that in the healthcare workforce:

- 48.7 % report that they have to work in tiring or painful positions;
- 43.4 % have to lift or move patients;
- 27.7 % have to carry or move heavy loads;
- nearly 80 % report standing or walking while working;
- 26.3 % report backache; and
- 24.3 % report muscular pains (Eurofound, 2007).

A wide range of inflammatory and degenerative diseases in the locomotor system are covered by MSDs:

- inflammations of tendons (tendonitis and tenosynovitis), especially in the forearm, wrist, elbow and shoulder, evident in occupations involving prolonged periods of repetitive and static work;
- myalgia, that is pain and functional impairments of the muscles, occurring predominantly in the shoulder/neck region, often affecting those in occupations with large static work demands;
- compression of nerves — entrapment syndromes — occurring especially in the wrist and forearm; and
- degenerative disorders occurring in the spine, usually in the neck or lower back, especially in those performing manual handling or heavy physical work. Such disorders may also occur in the hip or knee joints (EU-OSHA, 2010).

Most nursing staff complain of suffering lumbar back pains (Silvia *et al*., 2002). Numerous epidemiological studies have shown that employees in this professional group are exposed to the occurrence of pain in the neck, shoulders, wrists and knees (Daraiseh *et al*., 2003). The results of tests carried out on a group of 213 nurses working in four hospitals in Poznań have shown that arthritis pain and/or spine problems (occurring at least once a month) affect about 73.23 % of the respondents. Approximately one-quarter of nurses had pains directly related to heavy lifting or stooping in the course of their duties (Bilski and Sykutera, 2004).

Additional research has shown that each year 12–18 % of nurses leave the profession because of chronic back pain (Moses, 1992). In Sweden, a study has shown that poor physical working conditions (such as heavy patient transfer carried out by lone staff members and limited use of transfer devices) were related to a higher risk of medical staff leaving the profession (Fochsen *et al*., 2006).

Available data on emergency medical technicians indicate that more than 13 % of workers reporting back pain had to leave the profession, with more than half (52.2 %) stating that the pain interfered with their daily work. Back pain occurring within the previous six months was reported by almost 48 % of emergency medical technicians (with 31.9 % of them developing spinal injury as a result of the performance of official duties) (Crill *et al*., 2005).

A boom in new technologies in the healthcare sector could also mean that doctors and nurses will face a rise in musculoskeletal injuries. The widespread adoption of electronic medical records and other digital technologies in the healthcare sector might lower costs and reduce errors, but it may also entail hidden risks. With an increase in computer usage and prolonged sitting, poor office layouts and improper use of computer devices may result in an increase in repetitive strain injuries amongst doctors and nurses. In a lot of hospitals and medical offices, workplace safety focuses on preventing slips, trips and falls and on patient handling, but the effects of computer use on the human body are neglected. There is a misconception that simply because people are doctors or work in healthcare, they know about ergonomics. With so many potential negative effects for doctors and patients, it is critical that the implementation of new technology is considered from a design and ergonomics perspective (Walter, 2012).

4.7 Psychosocial risks

Psychosocial risks are defined as 'those aspects of the design and management of work, and its social and organisational contexts that have the potential for causing psychological or physical harm' (EU-OSHA, 2010).

The fifth EWCS (Eurofound, 2012a) includes a number of indicators for psychosocial risks. The following results are important to bear in mind for the healthcare sector:

- Healthcare had the highest percentage of employees hiding their feelings always or most of the time.
- Healthcare had the highest percentage of workers exposed to adverse social behaviour (physical and verbal violence, intimidation at work).
- There is comparatively high exposure to organisational change in terms of job security (healthcare was the sector in which the second greatest percentage of workers expressed feelings of job insecurity).

Figure 3 shows the particular psychosocial factors in the workplace that would have an influence on psychosocial risks arising in the healthcare sector (European Commission, 2010a). These risk factors, which coincide with the issues highlighted in the OSH experts' questionnaire results, are described in more detail below.

Figure 3: Psychosocial risk factors (European Commission, 2010a, p. 173)

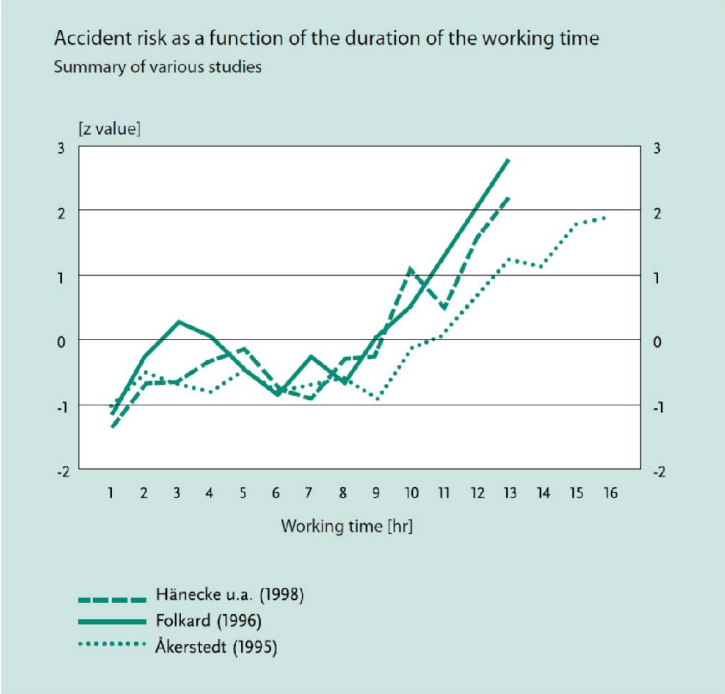
4.7.1 Working hours

Working time is hugely important for the healthcare sector across Europe because of the implications of long working hours for the OSH of staff, for patient safety and for work–life balance (and therefore the recruitment and retention of staff). The organisation of working hours has an important influence on the effect of load factors with which workers are confronted during their work. This concerns not only the duration of the working time from which the load arises, but also its arrangement and distribution.

Working longer hours also adds to other risk factors that healthcare workers are confronted with during their working day. For example, working long hours without appropriate breaks will increase the effects of fatigue, which in turn can lead to lapses in attention, difficulty in staying focused, compromised problem solving, memory lapses, poor communication, slower or faulty information processing, poor

judgement and reduced productivity. Fatigue also increases the risk of adverse events that will not only compromise patient safety but also increase risks to the worker's safety and personal well-being. A study has shown that nurses working shifts longer than eight hours have a greater incidence of sharps and needlestick injuries (Ilhan, *et al*., 2006) (see Figure 4).

Figure 4: Accident risk as a function of the duration of working time (European Commission, 2012a)



Working long hours also impairs the work–life balance of healthcare workers. While it is acknowledged that many factors contribute to fatigue, including but not limited to insufficient staffing and excessive workloads, these are all directly connected to an extended working day and to cumulative days of extended working hours.

Fatigue can be described as the body's response to sleep loss or to prolonged physical or mental exertion; it interferes with the ability to undertake work activities efficiently and effectively. In healthcare, fatigue is an extremely important issue because:

- Twelve-hour shifts have become a common practice in healthcare. These shifts help with continuity of care over the course of a day but not over the week.
- Care is needed for an ever-increasing population of ill patients with complex plans of care.
- Rotating shifts are harder on healthcare workers than working one shift; 60–80 % of these workers suffer from chronic fatigue and sleep disturbances.
- Many feel that, no matter how little sleep they get they will not fall asleep at work because their job is too important and they always stay busy. The reality is, however, that healthcare workers often go into an involuntary sleep known as 'microsleep'.

Another important aspect of working hours that needs to be taken into consideration for healthcare workers is shift and night work. In hospitals and other facilities, shift work predominates and workers have to deal with it every day. While working in shifts is common in healthcare, it does place additional strains on the worker. Not least of these is the effect of night work on the sleep cycle of the worker. Healthcare workers have demanding schedules that lead to difficulties with sleep because of the need to sleep at irregular times and at times that are out of phase with normal circadian rhythms. This misalignment of sleep with circadian rhythms leads to difficulty falling asleep, waking up more frequently during sleep and waking up too early, leading to poorer sleep quality and shorter sleep duration (Dubeck, 2014). Furthermore, sleep duration may be shortened by insufficient time between work shifts and the competing demands of work and personal life. Economic pressures could force healthcare workers to

seek second jobs, extra shifts or longer hours, leaving even less time for them to sleep. Inadequate sleep can have the following effects:

- Less than five hours of sleep in 24 hours causes a decline in cognitive abilities.
- Missing a day/night of sleep causes a 25 % decline in cognitive performance, which increases to 40 % if two days/nights are missed.
- An accumulated loss of one hour of sleep per night can cause decreased concentration.
- Lack of sleep can result in falling asleep at work.
- According to a 2011 American Nurses Association (ANA) safety and health survey, the top concerns of 74 % of registered nurses were stress and overwork. An alarming 10 % of respondents had experienced a vehicle crash that was believed to be a consequence of shift work and fatigue.
- Nurses who experienced poor quality of sleep resulting from shift work were found to have increased fatigue levels (Samaha et al., 2007).
- Studies show that night-shift work has an influence on increasing the risk of a breast cancer among nurses (International Agency for Research on Cancer, 2007).

More than 200 physiological functions depend on the sleep cycle and are responsible for the change to the activity phase in the daytime and the recuperative phase at night. Working night shifts will disturb the cycle and cause a so-called 'physiologic de-synchronisation of body functions'. This de-synchronisation can exacerbate symptoms and affect the progression of chronic diseases, such as sleep disorders, gastrointestinal disorders, heart disease, hypertension, epilepsy, psychiatric conditions, alcohol and other drug abuse, insulin-dependent diabetes, asthma, and health conditions that require medications with circadian changes in effectiveness. Shift work and long work hours also put strain on personal relationships, including marriages and family life.

4.7.2 Violence and bullying

Violence in the healthcare sector differs from violence experienced by workers in other industries. Healthcare workers must interact closely with their patients and their families, often under difficult circumstances. Patients may react aggressively because of their medical condition or the medication they are taking. They may also have a history of violent behaviour, or feel frustrated and angry as a result of their circumstances.

Healthcare professionals also have to deal with bullying. Bullying is 'offensive, abusive, intimidating, malicious or insulting behaviour, or abuse of power conducted by an individual or group against others, which makes the recipient feel upset, threatened, humiliated or vulnerable, which undermines their self-confidence and which may cause them to suffer stress. Bullying is behaviour which is generally persistent, systematic and ongoing.'

The health and social care sector has the highest reported exposure to violence at work in the EU-27 (15.2 %) (harassment and bullying in this sector is higher than average). In 2001–02 in the United Kingdom, the National Health Service (NHS) reported 95,501 cases of violence and aggression, and nurses were most often the victims (National Audit Office, 2003). Situations identified as involving particular risk of workplace violence are:

- working alone;
- working outside normal working hours;
- working and travelling in the community;
- handling valuables or medication;
- providing or withholding a service;
- exercising authority;
- working with people who are emotionally or mentally unstable;
- working with people who are under the influence of drink or drugs; and
- working with people under stress.

Violence can be defined as 'any incident in which a person working in the healthcare sector is verbally abused, threatened or assaulted by a person in receipt of services, member of the public or a member of staff arising out of the course of their work'. Violence is not multidimensional; it covers uncivil behaviour, lack of respect for others, physical or verbal aggression and assault. There are various reasons why violence occurs in the workplace. It can arise from difficult personal circumstances of patients who suffer from severe or chronic illnesses, dementia or disabilities. This correlates with the fact that violence is reported more frequently by those working in intensive care, geriatric care, emergency care and psychiatric care.

Examples of violent and aggressive behaviour in the healthcare sector include:

- A carer is bitten by a person with learning disabilities in the course of the normal care of that person.
- An irate visitor who considers that his relative has not been properly treated verbally abuses a ward manager.
- A nurse is verbally abused and threatened by a patient who is unwilling to take prescribed medication.
- A catering assistant providing refreshments is hit by a confused elderly patient.

Possible effects of violence are high sickness rates among workers, high turnover, poor working atmosphere and poor working performance.

A quantitative review on nurses' exposure to physical and non-physical violence, bullying and sexual harassment was undertaken in 2013 and showed that overall violence exposure rates were 36.4 % for physical violence, 66.9 % for non-physical violence, 39.7 % for bullying and 25 % for sexual harassment, with 32.7 % of nurses reporting having been physically injured in an assault. Physical violence was most prevalent in emergency departments, geriatric facilities and psychiatric facilities. Rates of exposure varied by world region (Anglo, Asia, Europe and the Middle East), with the highest rates for physical violence and sexual harassment in the Anglo region and the highest rates of non-physical violence and bullying in the Middle East (Spector *et al*., 2013).

Before an escalation, tension often builds up over a long time. For the effective prevention of violence, the reasons have to be observed and analysed. Violence can be triggered by:

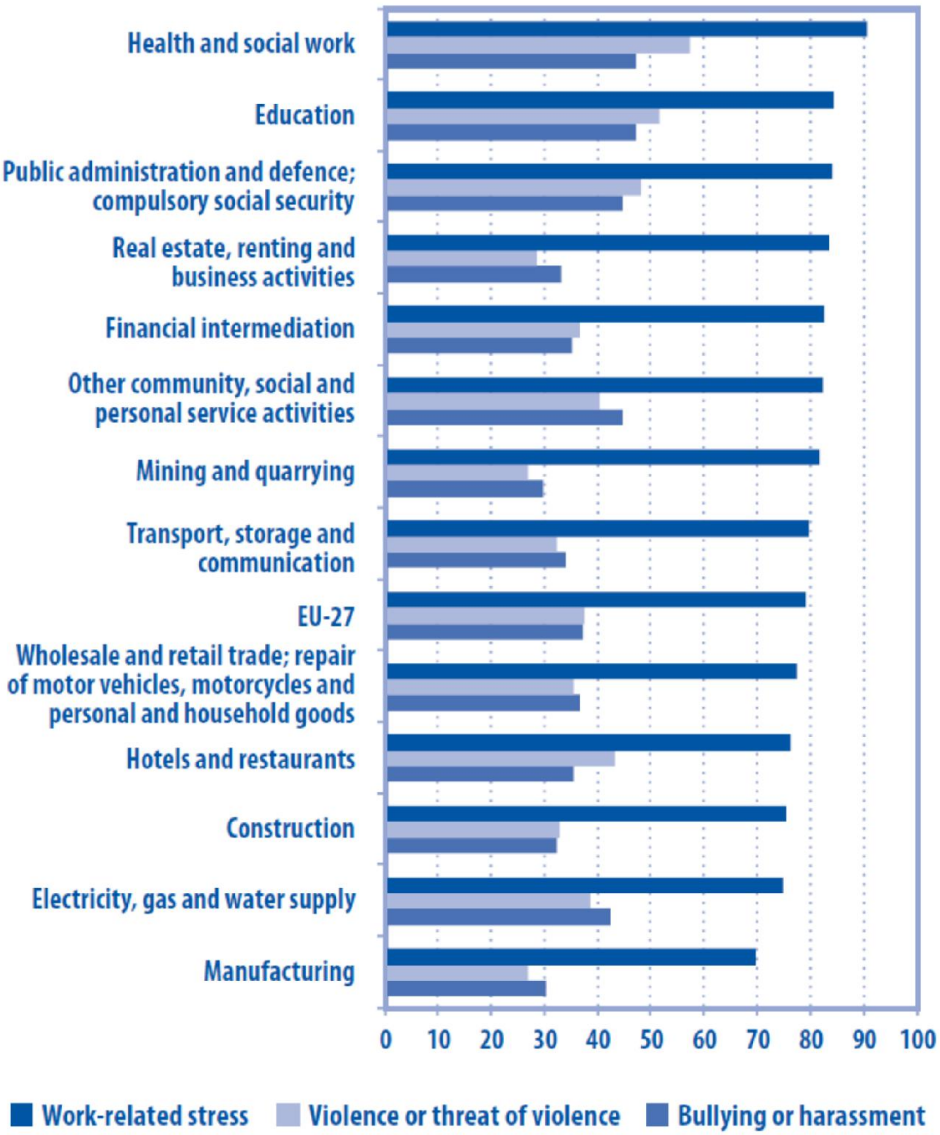
- frustration on the part of the patient, which can be caused by fixed schedules with regard to personal hygiene, meals, sleeping times and so on;
- anxiety about uncertain situations, about not being cured or receiving an unfavourable diagnosis;
- contradiction of patients own wishes, interests and perception of the situation;
- trauma or pain after an accident or operation;
- psychiatric factors, for example patients fearing that they are being poisoned by the nurse;
- disorientation after admission to hospital or transfer to a new facility;
- constraints, for example patients being medicated against their will; and
- lack of attention and dedication by nurses as a result of heavy workloads, inadequate equipment or staff shortages.

Under-reporting of violence and abuse is widely recognised as occurring for a variety of reasons:

- violence and abuse are viewed as part of the job and often linked to medical conditions such as dementia;
- there is a lack of clarity around what constitutes violence or abuse;
- staff are unclear about the next steps following an incident;
- some staff may fear that admitting to a violent incident will reflect badly on their competency; and
- active avoidance of paperwork.

According to EU-OSHA's ESENER survey (see Figure 5), health and social work as a sector has the highest rates of concern about work-related stress, violence or threat of violence, and bullying or harrassment.

Figure 5: Concern regarding work-related stress, violence or threat of violence, bullying or harassement, by sector (% establishments, EU-27)



Evidence indicates that violence and abuse have a negative impact on staff morale, motivation, retention, absenteeism, perception of staff value and stress levels in the workplace. Employers offer a range of support, both to help prevent violence and abuse in the first instance and to help staff should an incident occur. As with other areas, responses vary across the sector and there is no consistent approach to how these issues are tackled. However, evidence from across studies highlights the following as good practice (skills for care, 2013):

- supportive management following an incident;
- effective training for staff;
- clear and consistent guidance for staff;
- a formal debrief of the circumstances surrounding the incident;
- review of risk assessment and risk management processes as an ongoing part of case management;
- a preventative approach to managing violence and abuse; and
- an open organisational culture.

4.7.3 Drug abuse

Drug abuse is the regular consumption of substances (alcohol, nicotine, drugs or medication) leading to physical or mental dependence. Because of specific risk factors, such as exposure to high workloads, dealing with terminally ill and dying patients, inadequate preparation for the demands of the job, burnout and insufficient knowledge of alcohol and drug hazards, medical staff are especially at risk for substance abuse. The ANA estimates that 6–8 % of nurses use alcohol and/or drugs to an extent that is sufficient to impair professional performance. The consequences of drug abuse must be considered according to the degree of dependence; they range from restriction of performance and impairment to increased accident risk and massive damage to health. For example, alcohol or drug abuse could lead to:

- a high rate of absenteeism;
- non-compliance with accepted policies and procedures;
- deteriorating job performance;
- an inability to meet deadlines;
- sloppy/illegible/erroneous or absent charting; and
- transfer to an after-hours shift or an area where the worker is isolated.

There are several reasons why doctors and other healthcare professionals may be at risk of drug and alcohol misuse. The long years of medical training are characterised by intense competition, excessive workloads and fear of failure, and few occupations face the intense stresses experienced in the daily practice of medicine. Drugs are one of the primary tools used by healthcare professionals to treat and help their patients. They prescribe, administer and dispense medications every day. Exposure and accessibility to mind-altering medications, pharmacological knowledge of the drugs (which fosters a false sense of control) and a tendency to self-treat or self-medicate are a few contributing factors. Misuse of drugs by healthcare professionals may begin with a 'legitimate' reason, such as insomnia, depression, emotional stress or back pain, particularly when healthcare professionals choose to diagnose and treat themselves, usually inappropriately. They may find themselves self-prescribing or diverting medications from patients or from drug supplies. If healthcare professionals do not suffer any negative consequences while self-medicating, they may start doing it on a regular basis. When self-medicating, the healthcare professional convinces himself/herself, 'It's only going to happen once.' Unfortunately, without treatment of the underlying causes for the self-medication, the drug use continues and escalates (DHHS, 2011).

The most critical component in identification of addiction is to identify the personal and practice baseline from which a person has normally functioned. Negative behaviours and practice that clearly move away from the individual's baselines are common indicators of addiction, especially if they appear related to use of alcohol or drugs. Healthcare professionals will work to maintain their personal, family, and professional standards, and may continue functioning successfully for a long time in spite of their active addictions. Eventually, they will reach a point of personal or practice deterioration that is impossible to ignore (DHHS, 2011).

4.7.4 Emotional demands

Over the past few years, the phenomenon of emotional labour has received considerable attention because of its relevance for healthcare workers. One of the core job activities for healthcare workers is social interaction with patients or clients, in which the requirement to regulate emotions plays a key role (De Jonge *et al*., 2008). Emotional labour has usually been conceptualised in two main ways. First, employee-focused emotional labour denotes employees' efforts to manage their own emotions. Second, job-focused emotional labour denotes the level of emotional job demands in an occupation. This has usually been measured according to job demands such as frequency of interactions with clients or dealing with death and dying (De Jonge *et al*., 2008). Caring for dying people is often considered to be one of the more stressful aspects of nursing work (Hopkinson *et al*., 2005).

It is well known from the literature on job stress that emotional job demands contribute to stress reactions such as burnout and psychosomatic health symptoms (De Jonge *et al*., 2008). Research shows that care-givers report negative effects of caregiving on their mental and physical health, on their sleep and rest, and on their social life and leisure time (Kesselring *et al*., 2001). Some research shows that matching the job resources of care-givers with job demands can decrease the level of stress caused by emotional job demands and can improve the well-being of workers (De Jonge *et al*., 2008). Examples

of interventions include training about coping with stress and support from supervisors and co-workers (Hopkinson *et al*., 2005).

4.7.5 Stress and burnout

Stress is an intensive, unpleasant state of tension in a heavily aversive, threatening, subjectively long-lasting situation whose avoidance is subjectively crucial (European Commission, 2010). Talking about stress allows us to point to causes, process and consequences. Groups of stressors in the healthcare sector arise from:

- working tasks (for example excessively rigorous qualitative and quantitative requirements, pressure of time and deadlines, constant interruptions and disturbances by colleagues, patients, residents or relatives);
- the work role (for example lack of professional experience, lack of support and assistance, lack of recognition);
- the social environment (for example poor working atmosphere, conflicts with superiors and colleagues, lack of information, lack of staff);
- the physical environment (for example toxic substances, biological agents, needlestick injuries);
- integration in the workplace (for example being alone in the workplace); and
- person system (for example fear of own mistakes, lack of social and communicative skills) (European Commission, 2010a).

Burnout is a disturbance of well-being which is expressed in a negative change of feelings, attitudes and expectations and has adverse consequences when it comes to caring for others. In addition, burnout describes a long-term impairment of well-being and performance (European Commission, 2010a). The concept of burnout was originally introduced to describe an individual reaction to high emotional job demands in human service work. According to the literature on emotion regulation, burnout can be considered an indication that employees are no longer able to regulate their emotions adequately in patient or client interactions (De Jonge *et al*., 2008). Burnout arises from interactions between external, internal and individual-related factors. External factors include work requirements, work organisation and the occupational situation. Factors which trigger burnout are time pressure; rigid hierarchical structures; lack of gratification and reward; inadequate personnel leadership; lack of relevant information; lack of support from management staff; work-related loads (shift work, night work, irregular working hours); social conflicts; difficulties in the field of communication and interaction; and work organisation which is not ideal (European Commission, 2010a).

Psychosocial risk factors can arise among all occupational groups in the healthcare sector, including nurses, doctors, cleaning staff and medical-technologists service (European Commission, 2010a).

Stress in the healthcare sector can be assessed by looking at available information such as:

- feedback from staff and patients;
- sickness absences reports and fit notes;
- exit interviews with staff who are leaving;
- observations of how staff are performing their jobs; and
- direct contact with staff.

Key to the management of work-related stress is working in partnership: employers, employees and their representatives should work together to address potential sources of work-related stress throughout the organisation, and together develop sensible and cost-effective measures to tackle them. Table 14 gives example of how to best tackle stress at work.

Table 14 : Examples of how to tackle work-related stress (HSE, 2014, p. 57)

Problems that can lead to stress	What management can do
	Doing the job
○ The kind of support needed for particular residents.	○ Change the way the jobs are done and move people between tasks.
○ Lack of information from residents.	○ Give staff as much information as possible.
○ Working alone.	○ Give warning of urgent or important jobs, priorities tasks, stop unnecessary work.
○ Inadequate resources and equipment	○ Provide relevant training.
	Responsibilities
○ Poor management	○ Ensure everyone has clearly defined objectives and responsibilities
○ Confusion about roles	○ Provide training oand support for those with responsibilities
○ Having responsibility for looking after the others	○ Monitor what's happening and provide positive and constructive feedback
	Balancing work and home
○ Irregular patterns of workdays	○ See if there is scope of flexible work schedules
○ Short notifications of workdays	○ Plan work rotas well in advance
	Relationships
○ Poor relationship with others	○ Provide training in interpersonal skills
○ Bullying, racial or sexual harassment	○ Set up effective systems to prevent bullying and harassment (ensure there is a grievance procedures and investigation of complaints)
	Working conditions
○ Physical danger (for example hazardous chemicals, risk of violence) and poor general physical working conditions	○ Provide adequate control measures ○ Ensure that working conditions and systems of work meet appropriate standards

Problems that can lead to stress	What management can do
	Management behaviours
○ Lack of control over work activities.	○ Provide opportunities for staff to contribute ideas, especially in planning and organising their own work
○ Lack of communication and consultation.	○ Introduce good communication, clear objectives, and close employee involvement, particularly during periods of change.
○ Negative culture, for example a culture of blame when things go wrong, denial of potential problems.	○ Be honest with yourself, set a good example, respect others and listen to them
○ Inability to discuss problems because of fear or criticism/reprisals	○ Introduce good communication, clear objectives, and close employee involvement, particularly during periods of change.
○ Lack of support for individuals to develop their skills	○ Provide as much support as possible (for example leave or financial help) for staff to develop their skills.

4.8 Gender-specific risks

There has been an increase in participation of women in the healthcare workforce. The health and social work sector is female dominated, with a proportion of only 21.4 % male workers compared with the sector average of 55.5 % (Eurofound, 2009b). Overall, there were more than 13.1 million women working in the healthcare sector in 2010, making up more than three-quarters of the healthcare workforce in the EU-16. Healthcare is also a sector with an ageing female working population (EU-OSHA, 2013g). Therefore, a short overview is given of risks that are of special interest for women, taking into account work–life balance, ergonomic risks, exposure to biological and chemical agents, and night and shift work.

The issue of work–life balance is particularly relevant in the healthcare sector. Women are still regarded as mainly responsible for family-related tasks, such as caring for children and/or elderly relatives. The concurrence of work and family responsibilities and the associated multiple demands may result in chronic overload and deteriorating health (European Commission, 2012a). In many Member States, the intake of women to medical schools is now more than 50 %. However, so far, this growing feminisation of the healthcare workforce has not always been properly reflected in measures to improve the reconciliation of professional and private life. It is a factor which may increase difficulties in retaining the healthcare workforce in the future (European Commission, 2012a).

Lifting and heavy work, prolonged standing and long working hours have an impact on women in pregnancy, but the level of risk is small. Healthcare workers have a significantly higher risk of intra-uterine growth restriction. Prolonged standing results in pooling of blood in the veins of the legs, potentially resulting in reduced venous return, cardiac output and, ultimately, arterial blood pressure, and this could lead to a reduction in uterine blood flow. Reduction of maternal blood pressure and/or blood flow from the uterus to the placenta can be caused by altered body or strain (Royal College of Physicians, 2009).

Shift work is not associated with a high risk of adverse pregnancy outcome, but there is a need for more research in this area. In a study by the Royal College of Physicians (2009), there were conflicting results, particularly in relation to preterm birth with heavy physical work and preterm birth with shift or night work, for same outcome–exposure combinations. Pregnant women who work a night shift between 22.00 and 07.00 hours have a higher risk of delivering prematurely than women who work the same number of hours during the day. In addition, night work may hinder the regulation of the hormone melatonin, which helps regulate natural body rhythms that could be important in regulating uterine activity during pregnancy (Medical News Today, 2005). However, because of the lack of knowledge and research in this area, there is a pressing need to examine the association between shift work and pregnancy.

The protection of pregnant workers from biological and chemical agents is the topic of Directive 92/85/EEC, which establishes guidelines for assessing the risks related to chemical, physical and biological agents, to certain industrial processes, to certain movements and postures and to physical and mental stress.

Agents harmful for pregnant women are:

- physical — work in a hyperbaric atmosphere;
- biological — toxoplasma, the rubella virus; and
- chemical — chemicals capable of being absorbed by the human organism.

Pregnant workers and workers who have recently given birth or are breastfeeding are a specific group of workers, and measures must be taken with regard to their safety and health. Employers shall take any necessary measures that allows exposure to physical, chemical and biological agents to be avoided (adjusting working conditions and/or working hours). If this is impossible, the employer should move the worker to another job and if this transfer is not feasible the worker shall be granted leave in accordance with national law (Directive 92/85/EEC). Pregnant workers and workers who have recently given birth or are breastfeeding may under no circumstances be obliged to perform duties for which the assessment has revealed a risk of exposure (Directive 92/85/EEC).

4.9 Hazards specific to home care workers

The home care setting is a challenging work environment in terms of home care workers' safety for a number of reasons. First, residential settings may present household-related hazards, such as poor indoor air quality or toxic substances that are associated with numerous negative health effects. Second, many of the same well defined hazards related to healthcare in clinical settings, such as spread of infections, development of resistant organisms and medication errors, are also found in home care settings. Third, home care may be delivered under conditions that are not controlled. Fourth, healthcare providers may have limited training or expertise in the area of patient safety and often have little or no direct supervision. Finally, risk management is especially problematic in home care because each home is, in essence, a 'worksite', yet all the necessary healthcare workplace protections, for both workers and patients, may not be in place or readily available.

For these reasons, controlling hazards in home care can be difficult. Although studies continually add to the existing knowledge base on worker safety in the acute care setting, understanding of the safety and health hazards associated with home care is limited and highly reliant on anecdotal and qualitative reports, even though these hazards have important implications for the health and well-being of home care workers and patients.

There are many common risk factors for healthcare workers in institutional settings and for home care workers. However, home care may represent a particular safety challenge for care workers travelling between, and working in, patients' homes. Injuries resulting from road traffic accidents, overexertion (and repetitive movements) when assisting patients, and slips, trips and falls inside and outside their homes are the main causes responsible for lost working time among care workers. Other causes of accidents and diseases in care workers include exposure to hazardous chemicals (caustic, irritant, toxic or allergenic substances), being struck by objects, assaults and violent acts or behaviour. In addition, home care workers may be exposed to infectious diseases (hepatitis, HIV, flu, TB, measles and chickenpox) when providing direct client care, such as dressing or bathing, or cleaning and cooking for, infected clients. Various working conditions may also lead to mental or emotional fatigue in care workers. Dealing with clients and family members who may be stressed and difficult to work with and

working independently in unfamiliar and uncontrolled situations are examples of situations that may cause stress to these workers.

The problems which are specific to home care workers are listed below (NIOSH, 2010; EU-OSHA, 2008a). It can be said that the main difference between an institutional and a home care setting is that the circumstances and risks are less controllable in a patient's home.

Ergonomic risks:

- Rooms in patients' homes are often small or crowded. About 40–48 % of a home healthcare worker's time may be spent in poor posture combinations, including bent forward and twisted postures, which are associated with shoulder, neck and back problems. Inadequate space to shower/bath the client results in ergonomic and manual-handling risks.
- The most important problem in patients' homes is non-adjustable beds (problems with the bed's height, width, and placement). Patients' homes usually do not have equipment to help with transfers; normal aids and equipment generally found in hospitals will not be available in patients' homes.
- Home healthcare workers frequently endure long periods of standing or walking.
- Heavy lifting, lifting in awkward postures and lifting without assistance are significant predictors of permanent work disability in home healthcare workers (NIOSH, 2010). Work-related musculoskeletal disorders caused by transferring patients to and from bed or helping patients to walk or stand are a major problem in the home healthcare industry (specific risks in this area include changes in client mobility that require excess exertion by the worker, the use of inappropriate equipment, having inadequate space to move the patient and not having help in lifting the patient). In 2007, sprains and strains were the most common lost-work-time injuries to home healthcare workers and, in comparison with other workers, home care workers take more frequent sickness leave as a result of work-related musculoskeletal symptoms.
- Providing help with activities of daily living (dressing, eating, walking and toileting) may be connected with a risk of musculoskeletal disorders because of the weight of the patient.

Physical risks:

- The physical environment inside the home: good housekeeping is an important factor in maintaining a safe work area for home care workers. Many home care workers are injured because they trip, stumble or step on objects in their way. Adequate lighting must be available to enable staff to work safely. Furthermore, if a home is cluttered and poorly lit, it may be difficult to leave quickly in the event of an emergency or an attack on a home care worker.
- Oxygen is both a prescribed treatment and a fire hazard. Fires can occur unexpectedly and smoking is the most frequent cause of house fires.
- Very often, clients' homes are not adapted to care workers' needs. A Spanish study involving 500 patients' homes concluded that only 6.5 % had adjustable articulated beds and only 16.1 % had adaptable showers; globally, only 12.9 % of homes surveyed had adequate conditions to meet care workers' needs and to enable them to work in a healthy and safe manner (United States Department of Labour, 1997).
- The physical environment outside the home: the physical environment may present hazards; slips, trips and falls inside and outside the home are frequent causes of accidents to home care workers. Pavements, particularly uneven ones, steps, wooden ramps covered with water, ice, snow, leaves or moss, items left on pavements and pathways, and poor lighting represent other hazards that may be responsible for accidents outside the home. In addition, when a care worker goes outside with a client, the risks for the carer and client may be far greater than when the carer is outside alone.

Safety risks:

- Slip, trips and falls: accidents may be caused by, for example, walkways, wet floors or wet carpeting (less controllable circumstances).
- Driving to patients' homes: road traffic accidents are one of the most frequent causes of occupational accidents in home care workers and the most important cause of fatal accidents.

Such hazard and risk can be minimised by, for example, wearing a seatbelt, checking tyres for wear and tear, attending to vehicle maintenance, reducing speed and distractions, being particularly cautious at intersections and not driving while sleepy or under the influence of alcohol or other drugs.

- Burns and scalds: people working in home care settings are often exposed to hazards that may cause burns, for example hot water, kettles, electrical appliances and chemicals. Burns are most commonly caused by exposure to flames, hot objects, hot liquids, chemicals or radiation. Scalds are caused by contact with wet heat, such as boiling water or steam.
- The dangerous behaviour of people outside the home: the home may be in a high-crime or unsafe area or an isolated location. In such locations, healthcare workers may be at risk of assaults. The presence of gang members, drug abusers or alcohol abusers may pose an increased risk of work-related assault.
- Family members and visitors (violence) (EU-OSHA, 2008c): violence to care workers may result from patients and occasionally from hostile family members and visitors who feel stressed, disturbed, frustrated, vulnerable or out of control. Family members may become argumentative because of their frustration with the client's condition or the care arrangements.
- Home care workers may be at risk from animal bites or injury caused by animals.

Biological and chemical risks:

- Unsanitary conditions are a special concern, since the ease with which infectious disease spreads within a household is well documented and various procedures in home care can present a risk of infection. Cross-contamination, such as the transfer of pathogens through direct and indirect contact with contaminated inanimate objects, can place home care workers at risk. Unsanitary homes may also harbour pests, including rodents, lice, scabies and termites.
- Household laundry is also a concern because it has been shown to be a route for the spread of disease. For example, the spread of Staphylococcus aureus via laundry has been documented. A review on domestic hygiene noted that changes in household laundry practices — such as lower temperatures, less use of household bleach and use of lower volumes of water — had an adverse impact on laundry hygiene in general. These changes could place home care patients and workers at increased risk of infection (Gershon, et al., 2007).
- The patient's health condition: home care workers may come into contact with infectious diseases such as hepatitis, HIV, Ebola, flu, TB, measles and chickenpox. Most bloodborne occupational infections occur through injuries from sharps contaminated with blood, resulting from accidents or unsafe practices.
    - Tuberculosis, measles, chickenpox and influenza are examples of diseases that may be transmitted by inhalation, coughing or sneezing or by touching a person or object and then touching the eyes, nose or mouth.
    - HIV/AIDS, hepatitis B and C or Ebola are diseases that are spread through direct contact with the contaminated blood or body fluids of a person with the disease (they may be transmitted by a contaminated needle or via a cut in the skin).
    - Hepatitis A virus, *E. coli* and *Giardia* are example of organisms that may be transmitted though food, water or sharps and needle use.
    - Herpes, MRSA infection, scabies, influenza, rubella, mumps and ringworm are example of diseases that may be transmitted by blood, other body fluids and contaminated objects.
- Mismanagement of medical waste may also be a cause for concern in the home care environment because it can be a source of pathogenic microbes.
- Exposure to sharp equipment: home healthcare workers are responsible for the use and disposal of any sharps. Patients and their families often do not dispose of sharps appropriately (contaminated sharps may be left around the home or in wastebaskets), which is one of the main risk factors for workers. Furthermore, syringes and lancets are often left uncovered in various places in the home. Home care workers often use anything that is available at a patient's home for disposal (such as coffee cans, jugs) because of the lack of a standard disposal container. While carrying out tasks involving wound care or because of episodes of sudden profuse bleeding,

healthcare workers may also be exposed to bloodborne pathogens (NIOSH, 2010). Home healthcare workers give various reasons for not reporting all needlestick injuries: fear of being blamed for carelessness, fear of the implications for their present job or future jobs, fear that employer might think of them as a bad nurse, history of patient diseases, anxiety about the post-injury process and fear that the post-injury process will be time-consuming (NIOSH, 2010).

- Another area of concern is the reuse of certain single-use disposable items. For example, it has been reported that many diabetes patients repeatedly reuse insulin syringes, without disinfection, until the needle is no longer sharp. Similarly, in the home care setting, drainage bags may be disinfected and reused, a practice that rarely occurs in hospitals.
- Lack of water: home healthcare workers may encounter homes without running water or with poor-quality water.
- Domestic duties may expose workers to chemicals: chemical exposure risks increase in the home care environment because the correct procedure for handling chemicals is not always possible. In addition, many home care workers do not always know what kind of medications the patient is taking or the consequences of exposure to them. In general, home care workers should:

    - avoid mixing chemicals;
    - keep all substances clearly labelled with their full name and any health or safety warnings;
    - never use substances in unlabelled containers;
    - only use chemicals for their correct purpose and which they have been trained to use;
    - follow instructions for safe use on labels and material safety data sheets;
    - stop using chemicals that cause any reaction;
    - use the safest alternative chemicals (where possible);
    - use exhaust fans or open windows to increase ventilation (where possible);
    - use bleaches with care, as they may cause burns to the skin, eyes and mouth in high concentrations; and
    - when using detergents and other substances, wear gloves to prevent dermatitis.

Psychosocial risks:

- There may be a mismatch between the assistance required by the client and that available from the care worker (NIOSH, 2010).
- No supervisor: home care workers' work is not directly supervised; they generally work alone, they may travel through unsafe neighbourhoods, and they may have to face alcohol or drug abusers, family arguments, dangerous dogs or heavy traffic. Some studies suggest that they may have more on-the-job stress than teachers or childcare workers, as they have reported having less control over and being less stimulated by their work. Home healthcare workers took the most long-term sickness leave (30 days or more per year) and had the second highest frequency of absenteeism (NIOSH, 2010).

Table 15 gives examples of preventative measures that can be implemented to reduce the OSH risks identified above for home care workers.

Table 15: Examples of preventative measures that reduce OSH risks for home care workers (EU-OSHA, 2008a).

Home care activity	Examples of preventative measures
Driving to the patient's home	Informing the client before travelling; finding out who should be in the home. Carrying an extra set of car keys, a torch, a mobile phone and possibly a personal alarm when visiting a client; planning the safest route to the client's home; keeping the car well maintained; taking precautions in the event of a breakdown.

Home care activity	Examples of preventative measures
The dangerous behaviour of persons outside the home	Do not leave personal items visible in the car; when it is dark, park your car in an open spot near a streetlight. When travelling and working alone, the risk of exposure to violent behaviour can be reduced by: sticking to busy roads and streets, locking the car while driving, avoiding bus stops that are poorly lit or where there are few people, walking directly to the nearest place of business — without running or looking back — if you feel you are being followed.
The physical environment outside the home	If necessary, treating slippery surfaces chemically, using appropriate cleaning methods. Ensuring ground surfaces and access routes are checked regularly. Ensuring adequate lighting of surfaces and access routes; reporting broken light bulbs outside the home.
The physical environment inside the home	**Fire/explosion** Ensuring that smoke detectors are checked regularly. Ensuring appropriate choice and location of fire extinguishers, and that they are regularly checked and serviced. Carrying out a visual check for defects in equipment; using only equipment with the EC mark; ensuring that defects are repaired by an electrical expert. Ensuring the appropriate storage of combustible or flammable substances. Bearing in mind that oxygen is a fire hazard; keeping all sources of flame away from oxygen cylinders; storing oxygen cylinders in a rack, or chained to the wall, in a well-ventilated area. **Lighting** Ensuring that lighting intensity and uniformity are adequate for the work; increasing the wattage of a bulb if more lighting is needed; using additional local or localised lighting where high levels of lighting are required. **Animals** Ensuring that aggressive pets are on a leash or locked up in a separate room before leaving the car or entering the home.
Activities of daily living	The employer must ensure that proper safety and health information, instruction and training for work activities are provided to care workers. Performing only those tasks for which training has been provided. Understanding the risks of MSDs and working safely within one's physical capabilities. Never trying to hold a client in a standing position; never trying to stop a client from falling, but rather control the client's fall to the floor as trained; using mechanical aids to move heavy objects; using equipment such as portable lifts whenever possible; working in pairs or teams to lighten the load (when possible). Avoiding pinch grips and using a power grip instead; reducing awkward shoulder, wrist or trunk postures; taking short breaks to rest the lower back, neck, shoulders and wrists; alternating static with dynamic postures and activities.

Home care activity	Examples of preventative measures
	Transferring and repositioning Checking for hazards and assessing the risks when transferring or repositioning a client. Ensuring adequate training and correct technique for transferring or repositioning clients: ▪ Using transfer assistive devices such as transfer belts or low-friction slide sheets. ▪ Accessing a position close to the client by removing obstacles from around the bed or chair; avoiding the client holding on to the carer. ▪ Working in pairs or teams to lighten the load (when possible). ▪ Using proper techniques: during a transfer or repositioning task, shift the body weight using your legs. Do not pull with the arms or back. ▪ Ensuring a strong base of support, by keeping the feet shoulder width apart, by positioning one foot forward and one foot back, by bending the knees and by keeping the back straight. ▪ Avoiding trying to stop a client from falling and instead controlling the client's fall to the floor as trained. **Bathing** Using correct techniques for bathing clients: ▪ Planning the bathing process. Assembling everything needed and positioning all equipment. In small bathrooms, pulling the wheelchair from the front to avoid climbing around it. ▪ Seating clients on a transfer bench or shower stool before helping them into the bath and lathering the far side of their bodies. Placing the client's feet on a stool or the edge of the bath and lathering them. ▪ Sitting on a stool, the side of the bath or the toilet seat (if it is closer) will keep the carer's back more upright and reduce the need to reach and bend. ▪ Holding on to grab bars (if available) with one hand to support the carer's upper body. ▪ Taking short breaks to rest the carer's lower back (for example by standing up straight and arching the back slightly backwards). ▪ When bathing a client in bed, trying not to twist, bend or reach for water. Placing the water basins on a stool or table at a comfortable height and close to where the carer is working. **Assistive devices** Various assistive devices may be used in helping with activities of daily living. Lifting equipment, transfer benches, sliding boards, low-friction slide sheets or posts may be required in helping to get the client in and out of bed or to helping the client when walking; a wheelchair may be required to transfer the client between different locations; a shower chair or a transfer bench for the bathroom may be required to assist clients during bathing; a small stool or other elevated surface may be required to lift a client's thighs off the bed.

Home care activity	Examples of preventative measures
The patient's health condition (infectious conditions)	**Bloodborne diseases** Ensuring that the carer receives the necessary training in interacting with clients with bloodborne diseases. Ensuring that the carer has available basic protective equipment such as disposable gloves, a face mask, plastic garbage bags, bleach, paper towels, alcohol hand wipes, goggles and a waterproof apron. Handling all blood and body fluid materials as if they were infectious. Avoiding contact with blood or body fluids. If the carer is at risk of direct contact with blood or body fluids, special precautions must be taken to ensure that no blood or body fluid comes into contact with the carer. Adequate actions and provisions to prevent the carer from bloodborne diseases include: ▪ having the hepatitis B vaccination; ▪ using appropriate PPE as trained; ▪ wearing gloves, a gown or apron, a mask and protective eyewear when in contact with blood or other body fluids; ▪ using proper hand-washing procedures, as trained; ▪ putting used needles into properly designed rigid containers; ▪ Being alert for sharp objects sticking out of bags or containers when handling garbage bags or waste containers; and ▪ Not compressing garbage bags or holding them against the body. Adequate procedures in case of unprotected contact with potentially infected blood or body fluids include: ▪ washing the skin with soap and water immediately, flushing out the eyes with running water, and the nose and mouth if the mucous membranes in them were exposed, allowing the wound to bleed freely; ▪ going to the nearest hospital for evaluation within two hours of exposure; ▪ reporting the incident immediately to the carer's manager; and ▪ following the post-exposure guidance that is given. **Airborne diseases** Ensuring that the carer receives the necessary training in interacting with clients with airborne diseases. Ensuring that the carer has available basic protective equipment such as disposable gloves, a face mask, plastic garbage bags, bleach, paper towels and alcohol hand wipes. If the carer is exposed to airborne diseases (such as flu, tuberculosis, measles or chickenpox), special precautions must be taken to ensure that the carer will not be contaminated by the disease. Adequate actions and provisions to protect carers from airborne diseases include: ▪ having the appropriate vaccinations and booster shots (such as those for flu, measles and chickenpox); ▪ trying not to touch the eyes, face or mouth during work; ▪ washing the hands frequently using proper hand-washing procedure; ▪ using appropriate PPE (including gloves, gown, goggles, face shield and respirator) as trained; ▪ wearing gloves, gowns and a mask when in contact with contaminated objects;

Home care activity	Examples of preventative measures
	▪ ensuring that infectious clients wear surgical masks; and ▪ understanding the risk assessment results from the carer's manager and following the recommended safe work procedures. **Contact diseases** Adequate actions and provisions to protect carers from airborne diseases include: ▪ having the appropriate vaccinations and booster shots; ▪ trying not to touch the eyes, face or mouth during work; ▪ washing the hands frequently using proper hand-washing procedure; ▪ using appropriate PPE (including gloves and gown) as trained; ▪ not washing and reusing gloves; ▪ understanding the risk assessment results from the carer's manager and following the recommended safe work procedures.
Psychosocial issues	**Client behaviour, including violence** The carer is entitled to leave the home when feeling threatened; using specific techniques to calm family members and visitors, as trained; refraining from arguing or raising the voice; trying to maintain a safe distance from the client. Being aware of any mental health diagnoses. Being aware of specific triggers, and ways to minimise violent behaviour; being informed of whether or not the client has a history of violent behaviour. When arriving at the client's home, assessing the client's mood before starting work. Contacting the carer's manager or the patient's family members to find different ways to communicate with the client.

5 Emerging trends and OSH issues in the healthcare sector

Recent decades have seen significant technological advances in the workplace, which, together with rapid globalisation, have transformed work for many throughout the world. The effects of such changes on OSH in the healthcare sector have also been significant. In some cases, more traditional hazards and risks have been reduced or eliminated, but new technologies have also created new risks. At the same time, many workers are exposed to 'new' risks emerging from changing patterns of work, for example increased pressures to meet the demands of modern working life. Workforce age profiles are also changing, as is the gender balance in many workplaces. These changes in employment patterns have created evident risks that were either less prevalent or less obvious previously. The numbers of work-related accidents and diseases in the healthcare sector are still unacceptably high.

This chapter considers the main demographic, societal and technological trends and changes that affect OSH in the healthcare sector across Europe. More specifically, it:

- describes demographic, societal and technological trends and changes in Europe;
- addresses the impact of demographic, societal and technological trends and changes on healthcare organisations in Europe; and
- addresses the impact of demographic, societal and technological trends and changes on OSH in healthcare.

For the purpose of this review, an 'emerging OSH risk' has been defined as any occupational risk that is both new and increasing ([2]).

By 'new', it is meant that:

- the risk did not previously exist and is caused by new processes, new technologies, new types of workplace or social or organisational change; or,
- a long-standing issue is newly considered a risk as a result of a change in social or public perceptions; or,
- new scientific knowledge allows a long-standing issue to be identified as a risk.

The risk is 'increasing' if:

- the number of hazards leading to the risk is growing; or
- exposure to the hazard leading to the risk is increasing (exposure level and/or the number of people exposed); or
- the effect of the hazard on workers' health is getting worse (seriousness of health effects and/or the number of people affected).

There are several trends and changes that have an impact on the workforce and therefore on the OSH of workers in the healthcare sector. The main trends and changes in Europe found in the literature review include:

- demographic changes;
- changes in family patterns;
- lifestyle factors (including chronic diseases);
- migration and employment mobility;
- new technologies; and
- globalisation and restructuring.

These themes also cover the four major topics of the recent report *Priorities for Occupational Safety and Health Research in Europe: 2013–2020* (EU-OSHA, 2013d), which identified priorities for OSH research in the coming years in accordance with both the Europe 2020 strategy (European Commission, 2010b) and the Horizon 2020 programme (European Commission, 2011) and their priorities and key objectives of 'smart, sustainable and inclusive growth' and 'excellent science — competitive industries — better society'. The four major topics of the EU-OSHA report were:

([2]) EU-OSHA (2005). Expert forecast on emerging physical risks related to occupational safety and health. (pp. 12–13). Retrieved December 2013, from: https://osha.europa.eu/en/publications/reports/6805478.

- demographic change — sustainable work for healthier and longer working lives;
- globalisation and the changing world of work — OSH research contributing to sustainable and inclusive growth;
- OSH research for safe new technologies as a prerequisite for sustainable growth; and
- research into new or increasing occupational exposures for the benefit of a smart and sustainable economy.

5.1 Demographic changes

5.1.1 Ageing

The ageing of the EU population is one of the main demographic changes and is affected by the following aspects:

- Low birth rates are one of the main factors influencing the ageing of societies. European countries are characterised by the lowest fertility rate in the world. The average number of children per woman is 1.4 (Eurostat, 2010b).
- An increase in life expectancy: life expectancy for women in 2010 was 80 years while for men it was 72.5 years, giving a difference of 7.5 years (WHO, 2013c). The increase in life expectancy results from socio-economic factors. Level of education (a higher level of education results in a higher life expectancy; however, women always have a higher life expectancy than men at the same level of education), level of income, employment and quality services in the field of medical care and access to them all have an influence on mortality and health (Eurostat, 2010b).
- A significant increase in older people, including people aged 80–90: the proportion of older workers in the EU will increase during the next few decades. The EU-27 working-age population trends indicate that older workers (in the 55–64 age group) will increase by about 16.2 % (9.9 million) between 2010 and 2030. All the other age groups show a declining trend, from 5.4 % (40–54) to 14.9 % (25–39). This pronounced demographic change is due to higher life expectancy and lower fertility rates. The consequence is that the European workforce will be older than ever before. In many countries, older workers will make up 30 % or more of the working-age population. Employment rates for older workers in the EU-27 countries are currently less than 50 %. Only 15 countries worldwide show an employment rate of older workers which is higher than 50 %. More than half of older workers leave work before the mandatory retirement age, for a variety of reasons. Therefore, better and longer work careers are urgently needed to finance and support the longer life of European citizens. A good working life is an important platform to promote active ageing. Therefore, occupational safety and health play a crucial role in securing active ageing through a better and longer work life (EU-OSHA, 2012).
- The inflow of migrants influences (increases) the mean age of the population (Commission of the European Communities, 2006).

The ageing population has an impact on the patient population and on the worker population, as older workers will eventually leave the workforce and older patients require more care.

5.1.2 Ageing of the patient population

The number of elderly people (aged 65 and over) is projected to almost double over the next 50 years, from 87 million in 2010 to 152.7 million in 2060. The demand for healthcare will increase dramatically with Europe's ageing population. Ageing societies are a challenge for healthcare, as they are likely to increase economic costs, but it is hard to estimate accurately what these costs will entail.
A growing number of people in old age and changes in family structure and participation of women in the workforce (see also Section 5.1.2) influence the number of people who can provide informal and long-term care for older people. Healthcare systems will be forced to take over the care of those elderly people (Commission of the European Communities, 2006). The increasing numbers of elderly people with multiple chronic conditions will require new treatments and new care delivery models; changes in

skill mixes and new ways of working will be required for healthcare professionals. Healthcare systems will have to adapt and react to ageing societies and their changing needs (WHO, 2013c).
An American study on the impact of the ageing population on the healthcare workforce (NHS, 2008) in the United States describes older adults in the ageing American population having different healthcare needs from younger age groups and examines how this will affect the demands placed on the healthcare system in the future. Some specific characteristics are:

- Older adults are more than younger people likely to suffer from chronic illnesses (for example cancer, heart disease, diabetes).
- Older adults are more likely to require the services of healthcare professionals as a result of injuries and illnesses, as they are more physically vulnerable (for example, they are more likely to break bones in falls and more likely to contract pneumonia as a consequence of having flu).
- Older adults have more limitations in terms of performing activities of daily living than younger people, as a result of higher rates of physical and cognitive disability.
- Older adults consume far more prescription medications than younger people.
- Older adults consume more ambulatory care, hospital services, nursing home services and home healthcare services than younger people.

Furthermore, the needs and use patterns of 'baby boomer' older adults may be different from those of current older adults in important ways, and this will also affect the demands placed on the healthcare system in the future and may also involve changes in the way services are currently provided to older adults. Baby boomer older adults will have a smaller pool of potential family care-givers than current older adults. They have had fewer children than their parents, and are more likely to have had none. They are also more likely to be divorced and will thus be more likely to live alone as they enter old age (NHS, 2008).

Another trend is that older adults will be better educated and have greater access to information and more socioeconomic resources. These demographics may lead to changing patterns of use of and different demands for healthcare services than those seen in previous generations of older adults (FIOH, 2010). Individuals with internet access may use this as way to obtain more information on their health concerns and to source alternative treatments (Commission of the European Communities, 2006).

The increasing complexity of the needs of older people, the growing interest in the emancipation of patients and the striving for efficiency in healthcare organisations, including nursing homes, have led to individualisation and the need for small-scale care units. Therefore, there is a gradual change from more traditional nursing home care (supplier-orientated, large-scale, fragmentation and less coherence in care) to more integrated care (demand-orientated, small-scale, cooperated and coordinated provision of services). This is opposed to decentralisation and specialisation in healthcare, which have resulted in further fragmentation of patient care and loss of coherence between care organisations and different care-givers. Integrating the provision of services by different providers (care, cure and therapy) has direct consequences for the work and task performance of the separate disciplines involved. To date, the emphasis in the literature on integrated care has been on describing such changes, but there is insufficient evidence of the effects. Furthermore, there is insufficient knowledge about the extent to which integrated care exists in practice (Boumans *et al*., 2008).

5.1.3 Ageing of the workforce

Generally, the workforce is getting older and older. This includes healthcare workers. The large numbers of workers who will retire within the next 10 to 20 years will drastically shrink the EU's healthcare workforce (European Commission 2012a). In 2009, about 30 % of all doctors in the EU were over 55 years of age, and by 2020 more than 60,000, or 3.2 %, of all European doctors are expected to retire annually. Based on data collected by some Member States, the average age of nurses employed today is between 41 and 45, with not enough young recruits coming through the system to replace those who leave. Figures 6 and 7 show, respectively, employment growth by age group compared with other sectors and number of physicians by age group over time. Employment in the healthcare sector is increasing particularly among older workers and the number of physicians is mainly increasing in the older age groups.

Figure 6: Headcount of physicians by age group in 17 EU Member States (European Commission 2012a, p. 4; Eurostat, 2011). Absolute numbers. Data available from 17 Member States: AT, BE, CZ, DK, DE, ES, FI, FR, HU, IT, LV, LT, NL, RO, SK, SE, UK. Note that for F, NL and IT data refers to professionally active doctors who may or may not have direct contact with patients)

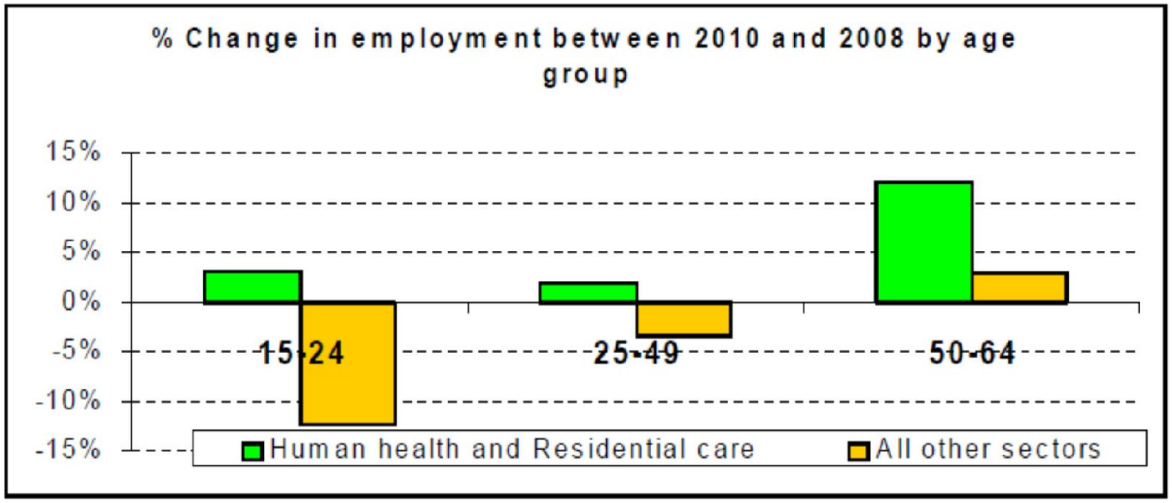
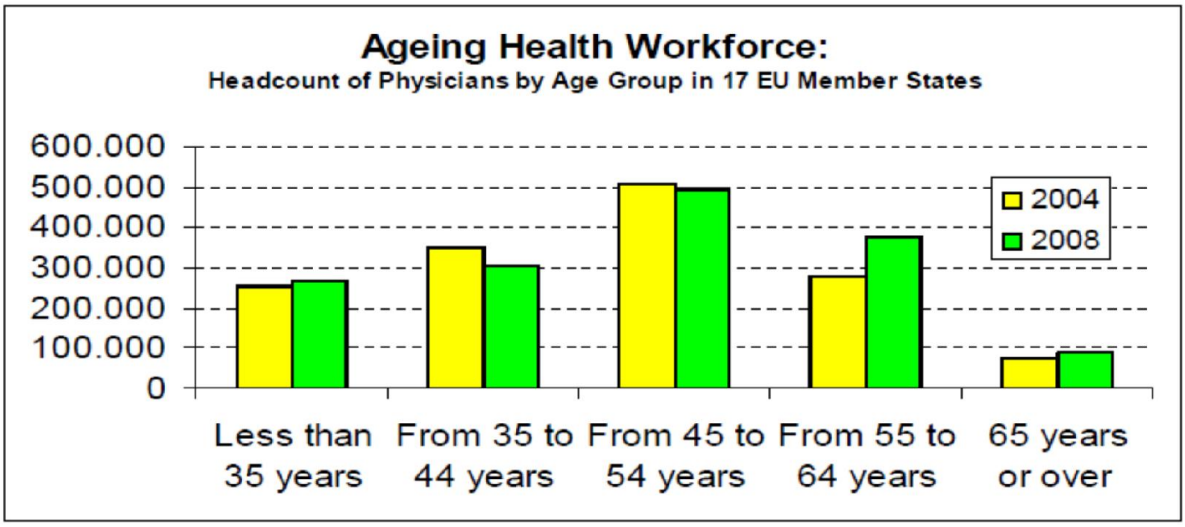


Figure 7: Percentage change in employment in the healthcare sector between 2010 and 2008 by age group (European Commission 2012a, p. 2, based on Eurostat Labour Force Statistics for NACE Rev. 2, Sectors 86 and 87)



Ageing healthcare workers and the lack of new, experienced and qualified personnel causes higher demands and greater burdens for those who remain employed. The most important factors to consider are education, maintaining the employment and the recruitment of young workers while caring for and investing in resources for older workers (Commission of the European Communities, 2008).

5.1.4 OSH and health issues for ageing workers

Older workers are in general exposed to many of the same workplace hazards as other workers. The most prevalent events leading to job-related injuries or fatalities are falls, assaults, and harmful exposures. Older workers often suffer from more severe injuries than those suffered by younger workers. Older workers who receive a workplace injury may require longer recovery periods than their younger counterparts. For example, falls on the same level can have more severe effects on older workers than on younger workers. For workers aged 65 and older, four out of five falls leading to days away from work were falls on the same level; for all workers, the ratio was two out of three (AOEC, SOEH, 2009).

Older workers die from workplace injuries at a higher rate than do younger workers (AOEC (Association of Occupational and Environmental Clinics) and SOEH (Society for Occupational and Environmental Health), 2009). Of the 5,488 workplace fatalities in 2007, 558 — slightly more than 10 % — were among workers aged 65 and older. However, the fatality rate for older workers (9.9 fatalities per 100,000 workers) was nearly three times that of younger workers. Because older workers' injuries tend to be more severe when they do happen, it is important to make adjustments to workstations or work patterns to make them as safe as possible. It is also important to make sure that a person is suited for a particular task and is safely able to do it.

Furthermore, many workplace injuries are the result of doing the same things again and again. Repetitive motion injuries, for example, develop over time. An older worker, then, may report more musculoskeletal injuries since they have had longer for the condition to develop.

The impact of cognitive demands can be different for older workers, too. Older workers may find it hard to work with complex or confusing stimuli. This means they might find it hard to do tasks in which they have to do (or think) a lot of different things quickly or at the same time. They may also find it tricky to work in a busy environment where a lot of different things are going on. They may be less able to focus attention only on information relevant to the task at hand, especially in 'new' situations. This means that there may be so much going on in new situations that they are not sure what to prioritise, what to pay attention to and what to ignore.

Various forms of chronic ill health (such as heart disease, stroke, cancer, diabetes and depression) are highly or even becoming increasingly, prevalent within the ageing workforce. These diseases develop slowly but are of long duration. Chronic conditions can lead to functional limitations and disability associated with ill health. Therefore, people with chronic diseases may be to some extent restricted in their ability to participate in the workforce. Many older workers might have an existing chronic illness, disorder or health condition, including a mental illness or disorder that is under various levels of personal control, medical treatment or clinical management (EU-OSHA, 2013d). This is a factor that needs to be taken into account when considering the healthcare sector. The two main characteristics of ageing in general are disabilities and limitations in daily functioning. Deteriorating muscle strength and problems with balance, vision or hearing are common problems for the elderly. These problems cause difficulties in everyday life and functioning. This also applies, of course, to medical personnel (Joint Programming Initiative, 2011).

Although health and physical capacity deteriorate as one gets older, several other functions improve with age. Mental growth is the success story of ageing. For example, strategic thinking, sharp-wittedness, considerateness, wisdom, ability to deliberate, ability to rationalise, control over life, holistic perception and language skills improve with age. Older workers are also committed to and engaged with their work and loyal towards their employers and they often record less absenteeism than other age groups. Work experience and life management improve with age. Age and work experience improve the valuable social capital of older workers: professional competence, tacit knowledge and cooperation skills grow, structural awareness about the organisation and its functions improve, and customer contacts and networks expand. Understanding about changes in the operational environment also improves. While learning new things is not an issue for older workers, the learning process changes with age, and this should be taken into account when developing training for this group. It is important that older workers have access to training and are provided with equal opportunities to learn new skills and update their professional competencies. Active participation in working life is important for active ageing. The strengths of older workers should be better identified and used, with the aim of making these workers valuable assets in workplaces (EU-OSHA, 2012).

5.2 Changes in family patterns

Changes in family patterns, in particular the fact that older people increasingly do not live with their children under one roof any more, as well as the increase in female employment and families in which both parents work, will lead to the decline of informal care provided within the family and to an increased demand for formal care (for example day-care centres, kindergartens and retirement homes) (European Commission, 2009a).

As a result of many changes occurring to the family structure, the elderly cannot rely on their family members for support to the extent that they have done in the past (European Commission, 2003). One

of the reasons for this is migration. People who migrate for an increased salary or for employment often leave behind their older parents and, in some cases, even their children. Because of the instability of families and the tendency for women to develop professional careers, the elderly will need more formal care in the future (Commission of the European Communities, 2006).

In contrast to the consequences of ageing on healthcare, which are well anticipated, the impact of these other demographic and social changes on future healthcare needs and related healthcare costs have not really been explored and require further investigation and research and development activities (European Commission, 2009a).

5.3 Lifestyle factors

It is not only age-related illnesses that are a factor contributing to changes in demand for healthcare. So-called civilisation illnesses, caused by changes in nutritional habits, unhealthy diets, smoking, alcohol and drug consumption and lack of physical activity, will lead to an increased demand for care of patients with, for example, obesity, diabetes or coronary heart disease (European Commission, 2009a). These lifestyle-related diseases have been recognised as one of the main causes of avoidable illness (FNR, 2007). The British foresight report *Tackling Obesities: Future Choices* (2nd edition) mentions obesity as one of the major challenges for the UK and predicts that by 2050 half of the UK population may be obese. The report further estimates that NHS costs attributable to overweight and obesity are projected to double to GBP 10 billion per year by 2050 (Government Office for Science, 2007).

5.4 Migration and workforce mobility

Healthcare worker migration has been increasing worldwide over the past decades, especially from lower income countries with already fragile healthcare systems (WHO, 2010). The best solution to a lack of healthcare personnel was to recruit personnel from less developed countries. This practice is often connected to employing personnel abroad on temporary or short term contracts (HWWI, 2007). Over the last 30 years, the number of migrant healthcare workers increased by more than 5 % per year in many European countries. In OECD countries, around 20 % of doctors come from abroad. In some Gulf States, such as Kuwait or the United Arab Emirates, more than 50 % of the healthcare workforce consists of migrants (WHO, 2010). Nurses from the Philippines (110,000) and doctors from India (56,000) account for the largest share of the migrant healthcare workforce in OECD countries. However, countries with smaller populations than India and the Philippines may suffer from a larger impact in terms of expatriation rates. In some low-income countries, more than 50 % of highly trained healthcare workers leave for better job opportunities abroad (WHO, 2010).

A positive consequence of this workforce mobility is that it creates an opportunity to increase occupational and personal qualifications for the migrating staff. However, a negative consequence of this activity is the inability of countries with low incomes to protect inhabitants' rights to proper healthcare, since qualified staff leave the country (HWWI, 2007).

Maintaining patient and worker safety can be an additional challenge in multicultural and multilingual working environments. The situations of these workers, including culture-specific perceptions and attitudes concerning work and occupational risks, must be taken into account when it comes to safety and health and related research. There are several general OSH issues that require special attention in the healthcare sector:

- cultural (for example language-related) barriers to communication and training in OSH;
- the high prevalence of overtime work and related risks for accidents and ill health among migrant workers; and
- cooperation and leadership in multicultural teams and guidance on cultural diversity issues at work (EU-OSHA, 2013f).

Migration has caused many cultural and linguistic differences which can contribute to incorrect communication, especially between physicians and patients but also between staff members (Government of Alberta, 2013). Diversity among employees can cause tensions, misunderstanding and conflict. Negative consequences are also found with respect to job satisfaction, absences and conflicts

(EU-OSHA, 2013f, p. 39). A literature study on migrant workers (EU-OSHA, 2007c, p. 31) concluded that migrants in Ireland, the Netherlands and the United Kingdom more often feel that they experience discrimination from managers and colleagues and report communication problems, bullying, sexual harassment and intimidation. Stress and burnout are higher among migrants than among nationals, and job satisfaction levels are lower in many countries in Europe (Spain, Finland, Sweden and the United Kingdom). Furthermore, research shows that discrimination in terms of wage differences and perceived racism is also a problem in Belgium, Austria and Switzerland (EU-OSHA, 2007c, p. 21). Another problem reported in the literature study on migrant workers (EU-OSHA, 2007c, p. 23) concerns language differences, which often form a barrier. These issues are not specific to the healthcare sector, but it is important to take them into account. Enhancing a constructive safety climate in a diverse workforce requires special attention. Therefore, work teams should pay special attention to developing a shared vision on the safety climate (EU-OSHA, 2013f).

5.4.1 Cross-border healthcare

Cross-border healthcare has become a more prominent phenomenon in the EU. The threat posed to healthcare workers by infectious diseases (for example the Ebola virus being spread by tourism and other travelling activities to foreign countries) or anti-microbial resistant pathogens (such as MRSA) has taken on an increasingly pan-European dimension thanks to greater population mobility and provision of cross-border health care.

The growth in 'imports' and 'exports' of patients together with other stakeholders and services has been fuelled by a number of factors.

Technological advances in information systems and communication allow patients or third-party purchasers of healthcare to seek out quality treatment at lower cost and/or more immediately from healthcare providers in other countries. Increases in the portability of health cover, as a result of regional arrangements with regard to public health insurance systems or developments in the private insurance market, are also further increasing patient mobility. Patient mobility in Europe may see further growth as a result of an EU directive adopted in 2011 which supports patients in exercising their right to cross-border healthcare and promotes cooperation between healthcare systems (Directive 2011/24/EU). The directive applies to individual patients who decide to seek healthcare in a Member State other than the Member State of affiliation (OECD, 2012).

However, cross-border healthcare is not restricted to patients. Medical doctors and nurses go abroad for training, to provide services temporarily or to establish themselves in another Member State. Increasingly, individual doctors and hospitals in different Member States cooperate with each other. In some cases, not only patients or providers but health services themselves move across borders, through telemedicine. Cross-border healthcare can also include collaboration between providers and competent financing institutions (European Observatory on Health Systems and Policies, 2011).

Patient safety raises particular issues in the context of cross-border care. Patients should trust the healthcare structure as a whole; they must be protected from the harm caused by poorly functioning health services, medical incidents and errors. A question now facing Europe's legislators is 'Can the citizens of Europe be assured of receiving high-quality care if they need healthcare beyond their national frontiers?' The following steps are recommended in the report (European Observatory on Health Systems and Policies, 2011). The first step is to ensure that effective policies on quality of care exist within each country. These should promote care that is effective, acceptable, appropriate to the patient's needs and patient-centred in approach. The second step to ensure high-quality care for those crossing borders. Since patient safety and worker safety are interrelated, this development is also important for the working conditions of workers and related legislation and procedures to ensure proper conditions.

5.5 New technologies and innovations

The past century has given us a great many innovations in the healthcare sector. These have improved the length and quality of life, diagnostics and possibilities for treatment and also the effectiveness and efficiency of healthcare systems (Varkey, Horne and Bennet, 2006). Innovations in the healthcare sector are mainly connected to new services, new ways of work and/or new technologies (new medications or types of surgery). Innovations in the healthcare sector are the driving force in balancing reduction of

costs and quality of care. These issues are key elements of work performance and competitiveness (Omachonu and Einspruch, 2010).

In recent years, genomics and new biotechnologies have become important focal areas for healthcare innovation, and they are likely to remain so for the foreseeable future. They are followed closely by nanotechnologies and robotics (sometimes in combination with genomics and biotechnologies). The resulting innovations may revolutionise healthcare, although there are concerns about spiralling costs (European Commission, 2009a). Developments in these areas are expected to lead to — among other things — improved technologies and treatments for 'typical' age-related diseases, as well as to the means to prevent or retard the emergence of age-related illness or loss of functional ability. Other important innovations are in the field of information and communication technology (ICT).

Some examples of new technologies are:

- electronic illness histories;
- electronic medical card indices (for patients and doctors);
- electronic visit reservations;
- computerised input of medical recommendations;
- electronic prescription transfers, archiving systems and image storage, individual illness and health records;
- patient portals;
- telemedicine;
- radio identification;
- bar coding;
- business analysis
- detection of hospital infections in real time;
- robot applications for the rehabilitation of stroke victims;
- high-definition television signals used by surgeons in cameras called videoscopes; and
- the da Vinci Surgical System, which allows doctors to perform minimally invasive procedures to treat most urological and gynaecological diseases (sitting at a console, a doctor can see, through a small camera, magnified, stereoscopic (3D) images. This makes it possible to perform complex operations with 1- to 2-cm incisions, eliminating the natural tremor of human hands) (Frączkowski, 2010).

5.5.1 Genomics and new biotechnologies

In this context, regenerative medicine, tissue engineering and the development of biomaterials appear particularly promising. Regenerative medicine is an applied field of tissue engineering that holds the realistic promise of regenerating damaged tissues *in vivo* and externally creating 'tissues for life' available for implantation. Tissue engineering, as defined by the European Commission's Directorate-General for Health and Consumers in 2001, is the 'regeneration of biological tissue through the use of cells, with the aid of supporting structures and/or biomolecules'. This technology has the potential to develop therapies for previously untreatable diseases and conditions. It offers, in particular, the prospect of extended healthy lifespans (European Commission, 2009a).

Furthermore, Europe's ageing populations are expected to benefit from progress in genomics that may lead, for instance, to methods for the identification of genetic disposition towards age-related diseases or mental disorders, and of the early signs of chronic illness and loss of functional ability involving a number of biomarkers in new population screening programmes. Genomics may also allow for the development of preventative medicines, follow-up treatments (such as new, individualised drug treatments, incorporating information from the individual patient's genetic profile) and even support services such as lifestyle counselling (European Commission, 2009a).

All these advances may contribute to improving quality of life throughout life and reducing the healthcare costs related to the ageing of European populations. However, potential acceptance problems have to be faced: the admission of gene therapy and regenerative medicine into the treatment of widespread chronic disease by the year 2030 will, for instance, require a genuine legal and societal paradigm shift. In particular, reservations over the widespread genetic profiling of large population groups and the use

of sensitive genetic data based on the analysis of individuals have to be faced. In addition, ultimately, the interpretation of genetic data has to become more reliable (European Commission, 2009a).

5.5.2 Nanotechnologies

Advanced biotechnology and nanotechnology, which are becoming increasingly interrelated, also hold many promises for future medicine, especially in the area of developing treatments for cancer (for example through nanotechnology-based imaging procedures and targeted drug delivery), genetic interventions (such as gene therapy) and tissue engineering (for example as a substitute for organ transplants and in curing neurodegenerative diseases). Nanotechnology also holds promises for new forms of medication, especially for brain-related diseases, because nanoparticles can cross the brain—blood barrier. These properties, however, could also pose new risks (European Commission, 2009a). These were outlined in more detail in Chapter 4.

5.5.3 Robotics and prosthetics

Robotics is an innovation area for healthcare and care for the elderly. Japan and South Korea in particular are promoting the idea of developing and deploying robots in hospitals and nursing homes and as assistants for home care. Other applications relate to developments in prosthetics and implant technology (European Commission, 2009a). Robotic technology and developments in prosthetics and implant technology are also closely related to each other, and these two areas rely heavily on neuro- and information science. Brain–computer interfaces (BCIs), prostheses coupled to the nervous system, artificial vision, ICT implants and even neurochips (at an early stage) are among to the latest developments.

Advances in medical technology, the problem of age-related diseases and the call for more prevention have raised a totally new issue in medicine: human enhancement technologies (HET), which are technologies that are used not only to treat diseases but also to improve the capabilities of healthy individuals. Here, the traditional borders between prevention, treatment and improvement become increasingly blurred, causing new legal and ethical problems (for example with regard to genetic engineering, genetic testing and embryo selection) and posing new challenges in relation to financing and equity (European Commission, 2009a).

A relatively new phenomenon is the potential use of exoskeletons in the healthcare setting. Despite all the interventions in healthcare work, patient handling is still dangerous to workers' own health, resulting in many cases of back pain. One type of solution developed recently to increase the lifting ability of healthcare workers is full-body exoskeletons (Taal & Sankai, 2011). The exoskeleton robot system is a human–robot cooperation system that enhances the power of the wearer in various environments while the human operator is in charge of position control, contextual perception and motion signal generation through the robot's artificial intelligence. The purpose of exoskeleton robot systems can be divided into two: there are power assistance types that give power directly to human joints and power augmentation types that augment the power of the wearer. Exoskeletons include robotics systems worn by humans to carry loads but also systems that collaborate with patients either as rehabilitation devices or assistive devices. Exoskeleton technology is still in its infancy (Taal & Sankai, 2011).

5.5.4 Virtual reality

Another example of new technology in medicine is virtual reality. Using virtual reality to educate and train provides opportunities to reduce costs, provide safer training courses and develop skills without the risk of damaging a patient's health as a result of an error. Virtual reality techniques are used in surgery (including in planning and supporting procedures/operations, virtual endoscopy), training courses (for example visualisation of the anatomy, laparoscopic simulators), psychology (motor training in Parkinson's disease or strokes) and telemedicine (consultancy, assistance during treatment, surgical robots) (Krętowski, 2009).

5.5.5 Information and communication technology

Implementation of ICT is considered one of the major challenges for healthcare during this decade.

As a result of the fusion of ICT and knowledge systems with biotechnology, substantial sections of health services will become partially independent of time and space: consequently, telemedicine and telemonitoring applications will emerge (European Commission, 2009a).

Telemedicine is the use of telecommunication and information technologies to provide clinical healthcare at a distance. Other expressions similar to telemedicine are the terms 'telehealth' and 'eHealth', which are frequently used to denote broader definitions of remote healthcare, not always involving active clinical treatments (ATA, 2011). Telemedicine often refers only to the provision of clinical services, while telehealth can refer to clinical and non-clinical services involving medical education, administration and research. The term eHealth is often used as an umbrella term to refer to telehealth, electronic medical records and other components of health information technology (Della Mea, 2001).

It includes such activities as medical consultations at a distance using the telecommunication infrastructure and the use of modern methods of communication for the transmission of medical data. Thanks to the use of these communication elements, medicine and informatics, it is possible to diagnose (sending high-quality documents in digital format) and monitor a patient's health regardless of where the patient lives (this is especially useful for people from villages and small towns). It also includes mHealth: the use of mobile devices in collecting aggregate and patient-level health data, providing healthcare information to practitioners, researchers and patients, real-time monitoring of patient vitals and direct provision of care (via mobile telemedicine).

Another example is the development of electronic patient records and dossiers or electronic medical/health records. These are about to replace the old system of paper-based files recording a patient's medical history. The digitised format has many advantages with regard to information access, processing speed and communication (for example between different physicians) and can also prevent unnecessary and duplicated examinations and treatments (European Commission, 2009a). Other ICT applications are decision support systems, order entry systems, adverse event alert systems and incident reporting systems (European Commission, 2007). However, before the advantages of such systems can be exploited, interoperability has to be guaranteed, as well as sufficient data security. So far, the introduction of electronic health dossiers and electronic health/medical records has been limited because of the associated organisational restructuring that will be required, difficulties in standardisation, legal issues (for example liability questions) and concerns about interoperability, as well as patients' resistance on the basis of security concerns (European Commission, 2009a). Internationally recognised interoperability standards will emerge, which, in turn, will promote the adoption of integrated electronic health records. Traceability systems document the activities along the patient pathway. As the volume of information per patient escalates, decision support software will assist clinicians in adhering to best practices (DNV, 2013).

The benefits of using new technology are visible for patients, better quality of services, better access to specialists, quicker help in an emergency) and also for doctors (lower costs of treatment and healthcare, better administration, better possibilities to gain qualifications). Upgrading technological infrastructure is the biggest cost related to telemedicine. In many countries, only a small section of hospitals are connected to a broadband network or have a fast local network which is responsible for connecting medical equipment with database servers and other stations to visualise the results (Koprowski, Laurentowski and Radziszowski, 2003).

5.5.6 Impact of new technologies

Computers, on the one hand, make the work of healthcare workers easier and more efficient. On the other hand, they cause extra visual and muscular strain, and can result in computer vision syndrome, carpal tunnel syndrome, respiratory or pulmonary syndrome, thoracic syndrome and stagnant syndrome (FIOH, 2010).

General research on the impact of the increasing use of portable computing and communication devices and its impact on health sets out the following stressors and ergonomic risks (European Commission, 2009b):

- The blurring of boundaries between work and home life, the extension of the working day, difficulties in supervising mobile employees at work and the feeling that mobile employees have of being insufficiently involved in company decisions and having poorer career prospects. These factors may cause increased stress and mental fatigue, which in turn may have long-term consequences, such as weakening of the immune system, psychosomatic diseases, sleep disorders and cardiovascular disease.
- Manual handling problems resulting from the inevitable compromise in terms of usability in the design of portable devices, bearing in mind that they will sometimes be used in cold conditions or situations encouraging poor posture;
- Repetitive movements, especially involving a pinch grip, which may induce repetitive strain injury.
- Poor legibility resulting from small display screens and controls, together with problems arising from reflective glare or excessively low ambient lighting.
- Excessive noise levels resulting from high volume settings to compensate for background noise.
- Static and/or poor posture resulting from using the devices in an unsuitable environment.
- Cognitive load resulting in accident risks, for example when driving or as a pedestrian crossing the road.

The impact depends on the duration and intensity of (portable) systems use. Particularly with regard to biomechanical workload, it is important to analyse the organisation of work as well (European Commission, 2009b)

Many benefits also result from new technologies. They include reductions in (Frączkowski, 2010):

- cases in which drugs were incorrectly applied because of improper doses (84 %);
- cases in which drugs were incorrectly applied because a patient was wrongly diagnosed (83%);
- potential adverse events (also known as potential accidents, 60 %);
- duplicate laboratory tests/chemicals (48 %);
- wrongly discharged prescriptions (15 %);
- visits to primary care physicians (9.7 %); and
- visits to a general practitioner (replaced consultations by phone, 7 %).

5.6 Globalisation and the economic crisis

A general driver for the changing world of work is globalisation and the growth of the service sector (including healthcare), resulting in more competition, increased economic pressures, more restructuring and downsizing, more precarious work and an increase in job insecurity, as well as increased intensification and increased time pressures at work. The current crisis in Europe has increased the economic pressures on companies and this in turn intensifies the effects on EU employees (EU-OSHA, 2013d).

Growth in health spending per capita slowed or fell in real terms in 2010 in almost all European countries, reversing a trend of steady increases. Spending had already started to fall in 2009 in the countries hardest hit by the economic crisis (such as Estonia and Iceland), but this was followed by deeper cuts in 2010 in response to growing budgetary pressures and rising debt-to-GDP ratios. On average across the EU, health spending per capita increased by 4.6 % per year in real terms between 2000 and 2009, followed by a fall of 0.6 % in 2010 (OECD, 2012).

The European Hospital and Healthcare Federation (HOPE) in its report *The Crisis, Hospitals and Healthcare* (2011), claims that the main consequences of the resources restrictions caused by the economic crisis on healthcare professionals are visible in employment policies and retirement reforms adopted by most EU Member States. In several cases, the government fostered policies aimed at firing or at least not replacing staff retiring or implementing restrictive policies on new recruitment and appointment of substitutes. A further package of measures consisted in cutting wages, a trend common to the entire public sector. Falling salaries in some countries — wage cuts have been as high as 25 % — have resulted in healthcare professionals moving abroad to further their careers. Other examples from European countries are a cut in administrative costs in the Ministry of Health and cuts to publicly reimbursed health services in Estonia. Investment in health infrastructure has also been put on hold in a number of countries, including the Czech Republic, Estonia, Iceland and Ireland, while gains in

efficiency have been pursued through mergers of hospitals or accelerating the move from inpatient care in hospital to outpatient care and day surgery (OECD, 2012).

Furthermore, in a report by HIRES.Public (Health in Restructuring) it is mentioned that public sector employees across Europe are facing major restructuring in response to the 2008–10 financial crisis and recession (HIRES.Public, 2011). They identify the following categories of restructuring:

- downsizing of the workforce;
- geographical and structural reorganisation;
- outsourcing and privatisation;
- changes in ways of working and organisational cultures; and
- work intensification.

The healthcare sector is specifically mentioned in relation to outsourcing. There has been significant outsourcing of support services such as cooking, cleaning and laundry. Privatisation and outsourcing can lead to workers being marginalised from social dialogue through being removed from formal social dialogue structures or by the more limited union recognition and membership density in the private sector (HIRES.Public, 2011). In all countries and all sectors, restructuring caused significant intensification of work. Healthcare professionals reported intensification of physically demanding jobs leading to increased physical risks and increased musculoskeletal injuries and stress. Increased expectations by clients (citizens/consumers) resulting from and driving restructuring were also reported as a key stressor for these workers. In many cases, employees have reported that the intensification of work occurs simultaneously with what was described as the increasing Taylorisation of work processes, which led to alienation and to reduced job satisfaction. Many also reported that restructuring and work intensification undermined their ability to perform their work properly because of reduced time (HIRES.Public, 2011).

According to the findings of a 2012 European Restructuring Monitor (ERM) report in relation to restructuring and health, employees in restructured workplaces were significantly more likely to report (Eurofound, 2012b):

- higher exposure to psychosocial workplace risks;
- higher levels of psychosomatic disorders (especially depression, stress and sleeping problems);
- higher levels of work absenteeism and in particular of presenteeism; and
- higher physical risks, especially among those employed in the healthcare sector.

The Health Consumer Index 2012 (Health Consumer Powerhouse, 2012) identified no clear impact of the economic crisis on quality of care yet. They found:

- no detectable quality deterioration;
- a slight increase in waiting times for elective surgery; and
- an increase in the private out-of-pocket contribution to healthcare costs in Central and Eastern Europe and countries hardest hit by the financial crisis (Portugal, Greece, Ireland and Iceland); there seems to be a slight decrease in the percentage of healthcare costs paid for by public financing. This is not detectable, or hardly detectable at all, in economically stable, more affluent European states.

However, a study by KPMG (2012) predicted that the financial crisis would have an impact on both quality of care and health. For example, while cost sharing or charging patients for specific services could reduce the unnecessary use of services, it could also reduce the necessary use of services by vulnerable groups, such as low-income individuals and patients with chronic or complex health conditions (with above-average direct costs of care). In Greece, for example, people are increasingly hesitant to seek medical care from a doctor or dentist despite its necessity. The reasons cited for this trend include long queues and waiting times, distances to the point of care and inability to afford care following the 2009 crisis.

Other trends are that drug-related HIV infections and drug addiction are on the rise in European countries such as Bulgaria, Estonia and Lithuania. The prevalence of HIV in Greece is estimated to have increased by 52 % between 2010 and 2011. According to the annual epidemiological report for 2011 of the European Centre for Disease Prevention and Control (ECDC, 2011), measles is slowly

becoming an epidemic in many countries in Europe, with more than 30,000 cases reported across the region in 2011. Multi-drug-resistant and drug-resistant strains of TB are also growing at a rapid rate in the region (KPMG, 2012). In the past, a number of studies have indicated a relationship between economic recession and increased susceptibility of certain populations and high-risk groups, such as prisoners and homeless people, to infectious diseases. Generally, poor nutrition and low living standards lead to high stress levels and lower immunity, which in turn result in increased incidence of diseases such as TB and measles. These trends may have an impact on the working conditions of healthcare workers as well, since they may be exposed to more people with infectious diseases or neglected diseases.

The current financial crisis is an acute form of what is likely to become chronic in many Western economies. The scale of the challenge requires not only solutions that are effective in the short term but also some bold and radical measures in the medium to long term. Reducing costs and improving operational management while maintaining quality will be essential, but not necessarily sufficient. Potential future measures mentioned in the KPMG report (2012) are:

- Redesigning delivery models to lower dependence on institutional care, improve preventative care, reduce variation, make significant improvements in coordination and integration and maintain focus on effectiveness.
- Empowering patients and care providers to take more responsibility for their own care.
- Focusing on measuring and purchasing value for patients; using health technology assessment (HTA) to increase value and not just control costs. Health technology assessment (HTA) is the systematic evaluation of the properties, effects and/or impacts of health technology.
- Facilitating effective use of information technology to allow population health management, reduce errors in hand-offs, improve decision making and patient self-management, and achieve seamless coordination.
- Tackling corruption and fraud, which hamper reform in a number of systems, including preventing informal payments, unofficial private practice, coding fraud, procurement irregularities and unambiguously criminal activities.
- Focusing on prevention.

5.7 Results of the questionnaire by National OSH experts

There are several societal and demographic trends and changes that have an impact on the healthcare sector and its workforce and therefore on the OSH of workers. Based on the literature, demographic changes, changes in family structure, migration and employment mobility, new technologies, and globalisation and restructuring have been described. Table 16 highlights the forecast trends as described by the OSH experts who completed the questionnaire.

5.7.1 Current trends

Table 16: Emerging and new risks identified in questionnaire responses

Trend	Observation
Ageing	A common trend mentioned by experts in nearly all the European countries is the ageing of the population. There are more people who need care and there is a higher demand for care professionals. A discrepancy between demand and availability of care jobs is quickly becoming a problematic trend.
Migration	The migration of healthcare workers to older EU countries and Norway is an issue amongst countries such as Estonia, Latvia, Lithuania and Hungary. The consequence of this migration of healthcare workers is that there is a shortage of qualified personnel within their home countries. In addition, staff tend to move to urban areas, a consequence of which is that healthcare institutions are reorganising and cover larger non-urban areas as well (concentrating services in regional centres). This has negative consequences for the accessibility of healthcare.

Trend	Observation
	An increase in foreign and migrant workers from inside and outside Europe was highlighted as a concern. Issues such as difficulties in communicating in the workplace, additional training demands of workers (for example language training), the need for new management methods and the way patients are approached were all mentioned.
Economic recession	Experts in several countries mentioned the impact of the economic recession, which has resulted in cost saving activities by governments, while care demands are increasing. Examples included: ▪ The increase in costs of care together with the limitations on public spending, has increased the pressure on the system to improve on the services provided whilst maintaining the focus on a high standard of care; and ▪ Hospitals have closed down due to the economic situation and this has resulted in fewer hospitals being available in close proximity to patients. Also with a reduction in staff there is a need to increase service efficiency and this puts a strain on the existing workers. .
Staff shortages	A lack of qualified staff (nurses and doctors) is observed. This is becoming more of a concern because of the number of healthcare professionals retiring without sufficient recruits entering the sector.
Reorganisation	There is an increase in 'rationalisation by merging hospitals together, downsizing and specialisation between the hospitals'.
Shift to home care	There is a clear shift across Europe from institutional care towards home care.
Changes in lifestyle	There is an increase in obese and overweight patients, which is having a direct impact on the OSH of healthcare workers.

5.7.2 Expected changes in the future

In addition to national societal and demographic changes, the experts were also asked to describe other expected changes and developments that could have an impact on OSH within the healthcare sector in the future. It was remarkable that positive as well as negative changes were mentioned.

Positive expected changes

More attention to sharps injuries:

- Amendments of national legislation will take more into account Council Directive 2010/32/EU of 10 May 2010 implementing the Framework Agreement on prevention from sharps injuries in the hospital and healthcare sector.
- With the implementation of this directive, it is expected that OSH enforcement, in terms of targeted inspections and cooperation between authorities, will improve. The same precautions regarding prevention from sharp injuries in health sector cover also other professions in the health sector (e.g., cleaning services, waste disposal, etc.). It is expected that these measures will have an impact on services and quality of care in a positive way.

Managing safety and health at work:

- More occupational health specialists in the healthcare section are expected. With more OSH specialists in hospitals (or any other establishment) with the power to make changes for example: insist on vaccination programs, provide help and support to workers with disability, provide rehabilitation programs etc. the OSH of healthcare workers will improve considerably.
- There are ongoing discussions of how to achieve better integration between health and social care which would result in a better quality of care. The implementation of "virtual hospitals" where a

considerable amount of the treatment being undertaken is delivered in the homes of older people may improve service provision and outcomes. Having closer integration of clinical and OSH risks will have the potential to improve the management of both.'

Legislation and inspection:

- The fulfilment of the legal framework, a strengthening of inspection bodies and an increase in awareness are expected.

Negative expected changes

Economic climate:

- The effects of a poor economic climate may result in further pressure being put on resources. The management of work related stress may become increasingly important.
- Due to the 2008 financial crisis there is less money to invest in OSH. The policy of some governments is now focused on changing the care from professional health workers to support from family and relatives, in the person's own private network. In the next coming years there will be less money available for homecare.
- Workloads will continue to increase and due to the speeding emigration of young and middle-aged professionals the mean age of the workforce in some EU countries will keep on surging.

New agents:

- New strains of infectious agents and infections will need to be managed in the healthcare sector. Greater management requirements will be needed when handling patients and when dealing with infectious diseases.
- The increase of infections due to globalisation and resistance to and lack of medication is a challenge.
- The risks of using nanomaterials in medicines and medical devices will increase. There is still a lot of uncertainty concerning the OSH risks of handling nanomaterials for healthcare workers.

Shift towards home care:

- With the imminent implementation of policy changes which highlight a move from institutional caring to community care more attention will have to be paid to OSH in homecare settings.
- The pressure will increase on GPs and home care to take over more tasks from higher level health care. This will require different working and OSH organisations: highly specialised devices and healthcare workers in hospitals and more trained home care workers.
- There will be a shift in the risk of infections from hospitals and other medical institutions into households that will result in the control of infectious diseases in these new home environments more difficult.

In the home health care, it will be important to:

- analyse the care needs of the patients;
- understand the family and social environment and housing;
- plan interventions through the provision of prosthetic devices, instrumentation (for example ventilator and uninterruptible power supply), anti-decubitus mattresses, the elimination of architectural barriers;
- plan care interventions (time schedule of visits to general practitioners, access medical specialists, nursing attendance, schedule the exchange of health aids and sanitary systems, etc.).

These commitments determine for home healthcare operators the need:

- for information, training and personal protective equipment;
- for information, education and support of the family group to recognize and deal with actual and real emergencies, to manage assistance in the forms provided by the program;

- for planning periodic visits and adapting them to the needs;
- for the provision of suitable technology for rehabilitation activities;
- for the provision of advice to achieve a proper home care logistics.

The changes taking place will have a major impact on the management of health and safety of workers. It is easier to inform and train operators working at a facility rather than workers who work in a decentralised manner. In the same way, it is easier to manage the safety devices in the hospital rather than in homes of patients with unknown characteristics. This will require specific training of the operators, taking into account the characteristics often different from each of the domiciles of assisted patients. A particular problem is that of the aids provided to patients for the risk of musculoskeletal disorders. The existence of complex home care needs requires development, through collaborations among multiple institutional partners, of integrated services that enable the development of welfare responses to increasing service quality. There are several initiatives on the national territory to optimize the hospital and home care. The orientation is to limit hospital admissions for acute forms or forms that require any action, moving the patient care or post-acute to assisted nursing homes or to the patients' homes. Italy is organising therefore, through the public system or private, to achieve a more efficient service network. The work of home care should not be a reduction in the quality of patient care.

Lack of personnel:

- The recruiting and retaining of sufficient nurses and doctors will continue to be a challenge in the future. This poses more demands on continuous education and learning about new risks and prevention measures.

Ageing:

- Further increase of older people and necessity of better and more expensive health care for them.
- The proportion of elderly and those living with chronic health impairment will reach a paramount level while the working age generation will shrink. It will be even aggravated by the continuous emigration of physicians and health care professionals. The state health insurance system will become unsustainable and state health care providers will have to be shut down also due to the lack of professionals. There is a growing chance that health care will be torn up into basic state (emergency and services for the poor) health care and up-to-date for-profit private providers. The OSH situation will deteriorate in most institutions, except for those that are privately owned (for-profit) and some elite state providers. Quality of care will be hard to be maintained except for privately owned providers.

Other:

- If there are further increases in the numbers of overweight/obese and elderly patients this may cause further issues with safe patient handling.
- An increase in psychiatric patients as a result of stress at work and in private life is expected.

6 Examples of good practices in the healthcare sector

Good practices can be defined in very different ways, but generally they are described as examples of activities which reduce potential exposure to risk arising from identified sources, improve general working conditions and effective health promotion, and aim to steadily and clearly reduce OSH risk to workers.

During the literature review of this report, a selection of good practices demonstrating successful interventions to reduce risks in the healthcare sector were found. These examples, for various types of risks, are described below.

6.1 Ergonomic/physical risks

Good Practice 1	ErgoCoaches system (European Commission, 2010a)
Risk/issue	Musculoskeletal disorders
Country	Netherlands
Goal	Prevention of musculoskeletal disorders and slips-and-trips risks, improving working conditions, increasing work satisfaction and improving work quality, and integrating the topic into general procedures
Content	Training about ergonomics and back-friendly working methods, redesigning rooms, ergonomic design of workplace, modification of structural arrangement and design, improving work procedures, improving cooperation between occupational groups, acquiring ergonomic equipment, testing and procuring aids like support tools and technical aids, providing cleaning workers with instructions on how to organise work ergonomically, ensuring that support tools (sliding films, rollboards, lifters) are provided on a regular basis, making special work shoes compulsory in the operating theatre and emergency room and for patient transport, forming a partnership with a sports and fitness centre, providing internal courses in yoga
Applied in	St Elisabeth Hospital
Care professionals	Nurses, cleaning workers
Impact/results	Improved working conditions and work quality, increased work satisfaction, better integration of workers

Good Practice 2	**Prevention — manual handling of residents in a care home (EU-OSHA, 2008d)**
Risk/issue	Musculoskeletal disorders
Country	Slovakia
Goal	Reducing musculoskeletal disorders; to eliminate or at least reduce the manual handling of people. Measures included the introduction of bathing beds, lifts and handrails in the corridors.
Content	The programme consists of buying new equipment and creating barrier-free access. These measures were complemented by training on OSH and in the use of the new

Good Practice 2	Prevention — manual handling of residents in a care home (EU-OSHA, 2008d)
	devices. On-the–job training and medical examinations were also carried out regularly.
Applied in	Home care services
Care professionals	Nurses/care home staff
Impact/results	New equipment was purchased for manual handling. Training was conducted on OSH issues and in the use of the new devices

6.2 Biological risks

Good Practice 1	Management system for dealing with infections, including an operating manual for handling contact infections (European Commission, 2010a)
Risk/issue	Infectious diseases
Country	Germany
Goal	Reduction of contact infections
Content	Monitoring of use of protective clothes, monitoring of hand disinfection; in case of suspicion of highly infectious diseases checks must be made to ensure the patient is isolated; providing training for workers in the requisite hygiene measures; antibiotics are only to be dispensed if there is a strict indication; measurement of consumption of gloves is a hygiene indicator; this hospital is part of a network of hospitals exchanging specialist information about infectious diseases
Applied in	Schramberg District Hospital in the Black Forest
Care professionals	Hospital workers
Impact/results	A sharp reduction in contact infections; a low consumption of antibiotics, which is relatively constant year to year

Good Practice 2	Preventative measures applied in an ambulance service when dealing with biological risks (European Commission, 2010a)
Risk/issue	Needlestick injuries
Country	Germany
Goal	Prevention of needlestick injuries
Content	Rules and procedures for handling instruments and relating to the conduct of staff in case of needlestick injuries; waste boxes (disposable boxes in which waste is disposed of in accordance with the requirements of the Biological Agents Ordinance); small sharps containers in all rucksacks and cases; training about needlestick injuries, skin protection and risks of infection; use of face masks, gowns and goggles when working with highly infectious patients

Good Practice 2	Preventative measures applied in an ambulance service when dealing with biological risks (European Commission, 2010a)
Applied in	Emergency Medical Faculty at the University Clinic of Jena
Care professionals	Ambulance service
Impact/results	

6.3 Psychosocial risk factors

Good Practice 1	'Alzheimer holiday' programme (Alzheimer Europe, 2013)
Risk/issue	Burnout
Country	Austria
Goal	Preventing carer burnout. Thanks to the programme, both care-givers and patients can enjoy a break from their daily routine.
Content	The programme lasts for two weeks and takes place in an area of Upper Austria that is a popular holiday destination. To promote a close-to-life setting, the participants stay in a hotel and all programme activities are provided there as well. During their stay, care-givers receive information about the disease, are trained in special communication techniques and receive group and individual counselling. Social activities, trips to nearby attractions and taking daily walks are additional aspects of the programme.
Applied in	Home care services
Care professionals	Carers
Impact/results	A total of 104 patient–care-giver dyads have taken part in the programme. The short intervention showed significant improvements in the patients' cognition and behaviour and eased the care-givers feelings of being burdened and their depressive symptoms (these problems decreased significantly).

Good Practice 2	Seminar: 'How to avoid emotional burnout syndrome' (Central and Eastern European Harm Reduction Network, 2006)
Risk/issue	Burnout among social workers
Country	Bulgaria
Goal	Preventing burnout
Content	The professionals involved are those who have direct contact with clients. The seminar teaches techniques and methods for dealing with stress and finding a balance between professional tasks and duties and personal leisure time, as well as ways of coping with the consequences of prolonged exposure to significant social stress.

Good Practice 2	Seminar: 'How to avoid emotional burnout syndrome' (Central and Eastern European Harm Reduction Network, 2006)
Applied in	Home care services
Care professionals	Social workers
Impact/results	Improvement of the services provided and of skills and knowledge

Good Practice 3	Professional exhaustion among nurses working in a clinic for paediatric and genetic disorders at Sv. Georgy University Multiprofile Hospital for Active Treatment, Plovdiv (Georgieva, Karaslavova and Todorova, 2008)
Risk/issue	Burnout among social workers
Country	Bulgaria
Goal	Raising awareness of the significance of psychosocial risk factors and the responsibility of the managing staff for their control; reducing and surmounting stress as possibilities for preventing burnout.
Content	Training on the influence of work environment risks on stress and behavioural professional exhaustion syndrome (burnout) occurrence among specialists in healthcare delivery at the Department of Paediatrics. Provision of a burnout self-test (Maslach, Jackson, 1986) to estimate professional and emotional exhaustion, depersonalisation (dehumanisation) and decline in labour achievements. Training in techniques for reducing and surmounting of stress at possibilities for preventing burnout. Raising awareness of the significance of psychosocial risk factors and the responsibility of the managing staff for their controlling.
Applied in	Department of Paediatrics, Sv. Georgy University Multiprofile Hospital for Active Treatment, Plovdiv'
Care professionals	Nurses and healthcare workers
Impact/results	Improvement of skills and knowledge for participants and the services provided for the organisation

Good Practice 4	Conferences on 'How to deal with conflict and stress management' and 'How to prevent burnout syndrome' (Carein (Emotional Intelligent Care in Health and Social Assistance), 2009)
Risk/issue	Burnout, stress management
Country	Czech Republic
Goal	To gain the ability to avoid and manage stress factors; improvement of attitudes and conflict resolution in the workplace; knowledge of stress management.

Content	Two conferences: How to deal with conflict in the workplace: Attendance Introduction to conflict and its types Selective perception Conflict management Conflict within teamwork, identification of tactics in dealing with conflict What can you manage and solve? How to prevent burnout syndrome and stress management Attendance Importance of psychology, neurology and immunology Stress psychological terms, test Mind body awareness Stress and crises Burnout syndrome and possible solutions Consequences of stress, solutions
Applied in	Research, tests and solution analysis
Care professionals	Nurses and other healthcare staff
Impact/results	Improved conflict resolution skills, knowledge of methods to minimise stress (for participants); improvement in quality of services and productivity (for organisations)

Good Practice 5	Training course in professional motivation and burnout prevention (Carein, 2009)
Risk/issue	Burnout
Country	Italy
Goal	Improving motivation and thereby improving services; a better understanding on participants' part of their professional lives and of their needs, emotions and sense of themselves as individuals; self-realisation on the part of participants
Content	Training on: preventing burnout new perspectives for the comprehending the needs of individuals, colleagues and users improvement of relationships with patients improvement of relational skills
Applied in	Traditional course, teamwork
Care professionals	Employees in the health and social care sector

Good Practice 5	Training course in professional motivation and burnout prevention (Carein, 2009)
Impact/results	Improvement of relationships with patients, families and colleagues; greater motivation and self-awareness

Good Practice 6	Five-day course on preventing violence, conflict resolution and development (Carein, 2009)
Risk/issue	Violence
Country	Denmark
Goal	To provide training in preventing violence and handling conflicts, focusing on: the developmental perspective in treating the violent client current legislation and regulations on this area attendees' role in the prevention of violence support and care for the employee who has been exposed to violence
Content	Based on the seminars, the participant will be able to: support and maintain the developmental perspective in the treatment of the violent client during and after violent behaviour; handle situations involving violence that occur in connection with work within the health and social care sector on the basis of current regulations and legislation; work in a conflict-limiting and violence-preventing manner; support and act with care towards the victim, the violent person and the observer during and after an episode of violence and independently contribute to violence being regarded as a joint concern at the work place; and gain an insight into the reasons behind violent clients' behaviour, as well as the power — and powerlessness — mechanisms that occur in the helper–client relationship.
Applied in	Five-days of seminars: discussion, teaching, case studies, exchange of experiences, role playing
Care professionals	Employees in the health and social care sector
Impact/results	Less violence in the work place

6.4 Language inequalities, migrants

Good Practice 1	NHS Direct (Public Health England, 2012)
Risk/issue	Language difficulties
Country	United Kingdom
Goal	Elimination of language inequalities

Content	For the entire country, the NHS offered translation services which are free and available throughout the country. NHS Direct, a health and information service provided by the NHS, signed an agreement with translators and its services were provided in languages other than English. Healthcare professionals could call the interpreter, who would translate conversations between doctors and patients by telephone.
Applied in	Hospitals in the United Kingdom
Care professionals	Healthcare professionals
Impact/results	Improved communication between foreign patients and healthcare professionals

Good Practice 2	Roma health mediators (European Intercultural Workplace, 2007)
Risk/issue	Poor access to healthcare for migrants
Country	Bulgaria
Goal	Improving access to healthcare and eliminating obstacles posed by cultural bias
Content	The Bulgarian Ministry of Health and Bulgarian NGOs have initiated the creation of the position of Roma health mediators. The mediator's role is to facilitate access for minorities, and especially the Roma minority, to health- and social care and support in overcoming discriminatory attitudes. Mediators are members of the Roma community who help illiterate people or people who do not understand the healthcare system and social security system to obtain better access to health- and social care.
Applied in	Hospitals in Bulgaria
Care professionals	Healthcare professionals
Impact/results	Better access to healthcare for the Roma community, especially the illiterate part of this community.

7 Conclusion

This state-of-the-art report considered the OSH issues in the health- and social care sector in the EU Member States. The activities associated with healthcare in institutions such as hospitals and nursing homes, as well as those activities undertaken in patients' own homes, were explored. The context of the healthcare sector and current trends and changes in it were outlined. The risks associated with traditional hazards such as psychosocial risks, exposure to dangerous substances, safety issues and ergonomics were outlined. Trends and changes in the context of the healthcare sector are having an effect on current risks and creating new risks; therefore, they pose new challenges with regard to the working conditions of healthcare workers, OSH management, and education and training. If the EU is to preserve the safety and health of its healthcare workforce and maintain the quality of service to the public, it needs to be able to meet these challenges proactively through research, policy making and practical initiatives.

7.1 Overview of current OSH risks

Based on statistics and the responses to EU-OSHA's questionnaire by experts, it was concluded that biological, chemical, physical, safety, ergonomic and psychosocial risks were relatively high in the healthcare sector. Table 17 gives an overview of the specific identified risks, causes and workers at risk.

Table 17: Overview of current risks and workers most at risk

	Current risks	Causes	Workers most at risk	Source (L=literature, Q=questionnaire)
Biological	Bloodborne infections (such as hepatitis B, C, D) and viruses (HIV) (needlestick/sharps injuries)	Increase in resistant bacteria, and mixed exposures, lack of proper equipment (L)	All, especially laboratory, institutional care (hospitals and other institutions) and home care workers	L, Q
	Airborne infections (such as tuberculosis, *Legionella*)	Contact with patients, increase in people travelling around the world, lack of vaccination programmes for workers/patients, overcrowded hospitals, lack of rules and standards (Q)		L,Q
	Contact infections (such as hepatitis A, infections from resistant bacteria)			L, Q
	Exposure to animals in home care	Specific circumstances in home care, less controllable environment (L)		L
Chemical	Cleaning and disinfectant agents (such as ethylene oxide, formaldehyde) with carcinogenic and reprotoxic effects.	Introduction of new chemicals (L)	All, especially, laboratory, institutional care (hospitals and other institutions) and home care workers	L, Q
	Hazardous drugs	Lack of diagnosis of allergies and measures (Q)		L,Q
		Unknown what medicines people take at home (Q)	Women with regard to reprotoxic effects of chemicals	

	Current risks	Causes	Workers most at risk	Source (L=literature, Q=questionnaire)
	(such as anaesthetics, cytostatic drugs) with carcinogenic and reprotoxic effects.	Lack of legislation and training (Q)		
	Latex		Hospital workers, laboratories	L
	Nanomaterials		Mainly hospital workers	L,Q
Physical	Noise	Increase in noise levels (L), technologies that make more noise, talking louder to be heard (L)	Specific hospital workers but also dentists and other professionals dealing with several techniques (radiology, tools)	L
	MRI	Insufficient protection	Hospital workers	L
	Radiation: X-rays, UV, EMF	Insufficient protection	Hospital workers, dentists and other professionals working with radiation	L, Q
	Temperature	Less controllable	Home care	L
Safety	Slips, trips and falls	Slippery floors, obstructions, ramps, and so on. Heightened by time pressure (Q)	All	L, Q
	Equipment safety issues	Misuse, lack of information, lack of investment in equipment (Q)	All	Q
Ergonomic	Lifting, pushing, pulling, awkward positions, repeated movements, prolonged standing and sitting	Lack of training, bad ergonomic design of workplace, high workloads, new technologies (computers) and working alone in home care (less assistance) (Q)	All, especially nurses and other care personnel in and outside institutions (Q)	L, Q
Psychosocial	Working hours		Especially emergency workers, anaesthetists, reanimatologists, psychiatrists (Q)	L, Q

Current risks	Causes	Workers most at risk	Source (L=literature, Q=questionnaire)
Bullying		All, especially nurses and other care personnel in and outside institutions (Q)	L, Q
Violence		All, especially nurses and other care personnel in and outside institutions, emergency and ambulance personnel (Q)	L, Q
Drug abuse		Workers who come into contact with medicines	L
High job demands and lack of resources causing stress and burnout, for example time pressure, unclear role tasks, bad social atmosphere, working alone, lack of rewards, fear of making mistakes.	Lack of staff, too many patients, economic crisis causing frustration (Q)	All, especially nurses and other care personnel in and outside institutions, emergency and ambulance personnel (Q)	L, Q
Work–life balance		All, especially women	L
Working alone		Especially home care workers	L,Q
Emotional demands	Emotionally demanding work	All Increase of older and neglected individuals (Q)	L, Q
Having several jobs		Doctors, nurses, midwives	Q
Issues related to language and cultural difference in the workplace	Working across borders		L, Q
Less favourable employment conditions	Less protection, low salaries, low awareness of OSH issues (Q)	Nursing homes and homecare	L, Q

7.2 Overview of emerging and new OSH risks

Table 18 provides an overview of the emerging and new identified trends and their expected impact. A reliable assessment of the impact of the trends on risks factors was not completely possible because of a lack of supporting data. Instead, assumptions have been made about their possible impact on the OSH of healthcare workers.

Many of these trends and consequences are interrelated and affect each other. It should be noted that the input of the experts was analysed in a qualitative way, since, because of the variety of answers, no quantitative analysis could be performed (some issues were mentioned by only one respondent while others were raised by several experts). Some trends and changes directly affect working conditions; others might affect the working conditions indirectly, through, for example, a change in the patient population (its size, characteristics and so on).

Table 18: Overview of emerging trends, issues and impact by source

Trend	Issue	Description of issue	Possible OSH impact	Source (L = literature, Q = questionnaire)
Demographic changes	Ageing of the patient population	Increase in healthcare expenditure and need for efficiency	Increase in job demands	L, Q
		Increase in demand for homecare, higher demand for home care workers and general practitioners (staff shortages), poor working conditions, with workers less protected and few initiatives to help	Increase in unfavourable working conditions related to homecare	L, Q
		More patients, increase in chronic diseases (such as obesity), multiple conditions, requiring new treatments and care models and new ways of working for healthcare workers	Change in patient population, increase in ergonomic and psychosocial risks	L, Q
		Patients are more empowered, have better access to information	More psychosocial risks, more demanding patients	L
	Ageing of the workforce	Smaller workforce, need to attract workers, greater demands for those employed	Increase in workload for workers who remain, need for education and recruitment of new workers while investing in OSH	L, Q
		Specific OSH issues for older workers, need for ergonomic adjustments to prevent mental and physical problems and to prevent accidents	Increased need for age-specific OSH interventions	L
		Higher number of workers with a chronic disease.	Increased need for OSH interventions	L
	Increase in participation of women in the workforce	Work–life balance is important	Proper policies	L
		Specific risks for women	Increased need for gender-specific OSH interventions	L

Trend	Issue	Description of issue	Possible OSH impact	Source (L = literature, Q = questionnaire)
Change in family patterns	More single households, less children, more migration	Less availability of informal carers (within families), increased need for formal carers	Increased demands on healthcare workers	L
Lifestyle factors	More chronic and lifestyle-related diseases (such as obesity)	Need for more longer-term care More people who need care, increased need for healthcare professionals	More 'heavy' patients, higher need for ergonomic measures Higher workloads	L
	Increased need for integrated care	As a result of ageing of the patient population and need for efficiency	Shift in workload from inpatient to outpatient care More coordination between care providers needed, higher workloads	L
Migration and employment mobility of workers and patients	Healthcare worker migration	From low- to high-income countries, resulting in a lack qualified staff in some countries	Increase in workloads in low-income countries	L, Q
		Less use of health care by immigrant workers, more longer-term, serious diseases and health problems	More seriously ill people on the work floor	L
		Other risks relate to perceptions and attitudes regarding OSH by foreign workers, language problems, barriers for OSH communication, workers more at risk for overtime work and accidents	Need for proper communication methods around OSH	L, Q
	Cross-border healthcare	Patient mobility to other countries	Communication/cultural differences issues with patients from other countries	L

Trend	Issue	Description of issue	Possible OSH impact	Source (L = literature, Q = questionnaire)
		Different quality standards and working conditions for workers who are crossing borders	Need for decent working conditions in all countries.	L
Globalisation and economic crisis	Resource restrictions in the sector	Cost reductions by cutting wages, lack of investment in health infrastructure, higher payment by patients, direct payments by clients	Increased working pressure, job insecurity	L, Q
	Restructuring	Restructuring: downsizing (firing staff, not replacing staff), mergers, move from inpatient to outpatient care, outsourcing of support services, all this affecting working conditions	Lower social protection, increase of workload, intensification of work causing ergonomic risks. Feelings of job insecurity and stress. This might also have an impact on the quality of care	L, Q
		Closing of hospitals, demand for more efficiency in existing hospitals	Increased working pressure	Q
		Impact on quality of care expected. Lower use of healthcare affecting health, higher prevalence of diseases	Higher prevalence of diseases, increasing biological risks	L
	More vulnerable groups of people as a result of less use of healthcare	More drug addicts, homeless people	Higher prevalence of diseases, increasing biological risks Possible lower work intensity if patients stay away	Q
	Lower investment in OSH	The business case is important to prove the additional value of OSH management (some experts expect an increase in initiatives to increase OSH in healthcare following introduction of legislation)	Constant attention for OSH necessary	Q

Trend	Issue	Description of issue	Possible OSH impact	Source (L = literature, Q = questionnaire)
New technologies	ICT	To support administration (for example patient records) Increasing amount of computer work and accompanying risks (Q) Need for proper training of healthcare workers	Increase in computer work and related risks, might also have an impact on workload/administrative burden	L, Q
	Robotics	Used for patient care or prosthetics	Positive impact on ergonomic devices; demands new skills and training of workers May pose new safety issues.	L
	Application of exoskeletons	Can be used for patient handling	May reduce physical workload if proper, practical skeletons are available	L
	Telemedicine/e-Health	Medical consultation at a distance More computer work and working with mobile devices	Demands new skills and training of workers Higher physical load (more computer/device work) Higher mental workload related to use of devices Blurring of boundaries between work and private life Less patient care activities	L
	Virtual reality	Used for training and education purposes	Promotes proper training of professionals	L
	Nanotechnology	Exposure to nanomaterials of workers	Potential health effects in healthcare workers exposed	L, Q
	Biotechnologies	Better treatment of (age-related) diseases	Potential health effects in healthcare workers exposed	L

Several societal and demographic and technological trends were identified that have an impact on the workforce and therefore on the OSH of workers in the healthcare sector. Below, the main OSH issues that could be related to one or more trends are outlined.

- Exposure to biological agents may increase owing to an increase in travelling by patients, leading to a possible increase in people with diseases caused by economic circumstances and an increase in resistant bacteria. Furthermore, exposure to agents (for example particles from animals and so on) at people's homes is likely to increase as the number of home care workers is expected to rise. These risks affect a wide range of workers. Extra caution by healthcare workers during their work and the availability of appropriate measures are required.
- An increase in exposure to relatively new chemical agents such as nanoparticles is expected, with unknown consequences for workers. Extra caution by workers working with nanomaterials is required and further research is needed on the effects of these materials.
- Exposure to noise and physical risks (such as radiation) as a result of the use of new medical techniques may increase as new devices are developed. This may bring new risks for workers and a need for further research into the impact of such exposure.
- Language barriers among workers and between workers and patients owing to immigration may pose an extra safety risk. Additional measures may therefore be necessary to maintain the quality of care.
- The economic downturn may have an impact on the condition of working equipment. There is a potential for failure of medical equipment caused by organisations investing less in their maintenance or not buying new equipment.
- High physical workloads will remain an issue. The following factors contribute to this: lack of devices (such as lifting tools) in home care and an increase in long-term care for patients with chronic diseases such as obesity. The increasing implementation of ICT tools also influences physical risks. Mobile devices pose other ergonomic risks. On the other hand, new supporting equipment, such as exoskeletons, is under development, although such solutions are still in their infancy.
- The following psychosocial risks are significant:
    - Working time will remain an issue if workers have to do more hours (owing to high workloads) and if more workers (for example domestic workers and home care workers) are not protected by OSH legislation.
    - Work intensification may increase because of budget constraints, restructuring, a lack of staff, a larger patient population and a greater need for efficiency. The increasing use of ICT may also influence this, as may a possible increase in the number of people who have more than one job. Home care workers and other workers in other subsectors where there is a lack of staff may also suffer from this. Owing to restructuring within the sector, job insecurity is increasing.
    - Rising cognitive stress is an issue, caused by the increasing number devices in the workplace of the healthcare professional.
    - Work–life balance may remain an issue and affects particularly the large number of female workers in the healthcare sector.
    - Violence and bullying combined with emotional work are issues in healthcare. Experts participating in EU-OSHA's *Expert Forecast on Emerging Psychosocial Risks* (2007d) were of the opinion that, although these risks are not new, they are a growing concern, especially in the healthcare and service sectors, which are growing and where competition is increasing. The growing empowerment of patients may contribute to these risks.
- EU Directive 2011/24/EU on the application of patient's rights in cross border healthcare will have a negative impact in some of the EU-28 Member States. Although in theory the cooperation of healthcare professionals in initiatives that will allow patient mobility will permit them to learn from each other, being trained in new medical procedures and approaches, it will also have an array of potential effects on healthcare workers. Patient mobility will affect employment opportunities and

workloads. In the country receiving these patients, it will mean that capacity will need to be extended, with additional staff; however, with the current shortage in healthcare professions (for example nurses), this will probably mean that there will be an increase in workload. In addition, these healthcare professionals may be confronted with expectations and attitudes that differ from those of domestic patients, and this will result in communication and cultural difficulties and even harassment and violent behaviours. For the countries that are losing healthcare professionals, their existing resources will be stretched to the limit, resulting in burnout of staff and a high turnover of workers.

7.3 Future research and practice

More in-depth research is needed to gain insights into the safety and health outcomes for specific risks and groups of workers and occupations, the interaction between risks, the interaction between OSH and quality of care, and the possible effects of healthcare systems on risks, OSH activities and outcomes.

Recommendations for research:

- There is a lack of recent comparable data at EU level on working conditions, exposures and safety and health outcomes for specific risks and groups of workers and occupations in the healthcare sector. More detailed data are needed to enable prioritisation of specific risks and groups of workers most at risk.
- There is limited information on the impact of current trends and existing risks on the quality of care patients are receiving; more research on the interaction between OSH and quality of care is needed.
- The impact of combined risks on healthcare workers has not been suitably studied; more research into these combined effects is needed, for example the interaction between ergonomic and psychosocial risks.
- Although one could argue that the performance of a healthcare system is related to the OSH issues that their workforce are exposed to, no studies were identified focusing specifically on this relationship at macro level. More research in this area is of interest. For example, it would be worthwhile to study the impact of both efficiency and prevention activities on quality of care and OSH at different levels (organisation, country).

Directions for practice are:

- More practical initiatives are needed at national level to improve the working conditions of home care workers; based on the responses to the questionnaire, relatively few initiatives were identified. This relates to both formal and informal care-givers. About the latter group, relatively little information is available.
- The exchange of knowledge (such as in the form of examples of good practices) in the field of occupational health should be explored further.
    - Owing to the ageing workforce, there may be an increased need for OSH interventions that take into account the working conditions of and the impact of risks on older workers; these interventions could target all age groups.
    - Policies aimed at improving work–life balance and reducing wage differences between men and women are important.
    - As a result of the increase in migration of healthcare workers, there may be a rise in language and cultural barriers in the workplace; extra attention should be paid to these issues, and proper and clear communication around OSH issues is needed. Equal working conditions and quality standards are desirable.
    - Owing to the economic circumstances, the benefits of OSH need to be continually highlighted, for example by using the business case to show the added value that good OSH management brings.

- The introduction of new technologies, such as telemedicine, and new ICT systems requires continual training of workers. Furthermore, the related risks should be included in risk assessments. OSH could be taken into account in the design phase of new applications and other new technologies.
- New technologies, for example the introduction of robotics and exoskeletons, could also contribute to the improvement of working conditions. A further exploration of the possibilities, for example in a home care setting, is of interest.

This report has some limitations. First, the focus was mainly on English language literature and on statistics at EU level (statistics at national level were not included for language reasons). Since the aim of this review is to give a global overview of available trends and risks, more extensive literature analyses could provide more in-depth information, specifically about the different OSH risks and their effects on workers and quality of care. An important activity within this review was the consultation of OSH experts from EU countries; unfortunately, a response from every country was not achieved. Furthermore, the backgrounds of the experts differed, which made it difficult in some cases to make comparisons.

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9 Annex 1: Questionnaire

Introduction:

National research institutes from The Netherlands (TNO), Poland, (CIOP) and Romania (INCDPM) are currently working on a study on current and emerging risks in the healthcare sector (including community care). We would like to invite you as a national OSH expert in the healthcare sector to give your opinion about current and emerging risks.

About you:

(Information is kept confidential within the project team and is used only for the purposes of the Agency's expert forecast project)

Date:		
Name:		
E-mail address:		
Country:		
Institution:		
Function:		
Main activity:	☐ Research	☐ Development
	☐ Policy/standards development	☐ Testing/certification
	☐ (Law) enforcement promotion	☐ Research planning/management
	☐ Labour inspectorate	☐ Training/teaching
	☐ Consulting	☐ Other:.....
Please state your main subject area	☐ Psychology	☐ Ergonomics
	☐ Occupational medicine	☐ Sociology
	☐ Safety	☐ Management Studies
	☐ Other:	
Do you have at least 5 years' experience in this area?	☐ no	☐ yes

Questions about current and future risks

	Current issues
1	What are in your country societal and demographic changes that have currently an impact on OSH in the Healthcare sector and the work and quality of care? (e.g. ageing population, splitting rural/urban healthcare)
2 a	What are currently the main OSH risks in the Healthcare sector? (risks can be related to psychosocial and physical issues, dangerous substances, related to safety etc.) Please write down in the order of importance, starting with the highest risk and explain: ▪ why this is a risk ▪ if this risk is related to a specific sector.
	1. Risk: ……..because…… 2. 3. 4. 5. 6. 7. etc.
3	Which professionals in Healthcare (including home care) are most at risk? Why?
4 a	Were there any initiatives (legislation, policies, or other initiatives) in your country since 2011 focused on the OSH protection of home care workers?
4 b	Were these the result of the ILO convention 189?
	Future issues
5	What (further) changes and developments do you expect in the future that will have an impact on OSH in Healthcare?
6	What will be the impact on the OSH risks, work and service/quality of care?
	Impact on OSH:…… Impact on Work:….. Impact on service and quality of care:…..

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The European Agency for Safety and Health at Work (EU-OSHA) contributes to making Europe a safer, healthier and more productive place to work. The Agency researches, develops, and distributes reliable, balanced, and impartial safety and health information and organises pan-European awareness raising campaigns. Set up by the European Union in 1996 and based in Bilbao, Spain, the Agency brings together representatives from the European Commission, Member State governments, employers' and workers' organisations, as well as leading experts in each of the EU Member States and beyond.

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