



**NORA**

# **NATIONAL OCCUPATIONAL RESEARCH AGENDA (NORA)**

DRAFT PRELIMINARY PUBLIC COMMENT VERSION

## **NATIONAL HEALTHCARE AND SOCIAL ASSISTANCE AGENDA**

FOR OCCUPATIONAL SAFETY AND HEALTH RESEARCH  
AND PRACTICE IN THE U.S. HEALTHCARE AND SOCIAL  
ASSISTANCE (HCSA) SECTOR

August 18, 2009

**Developed by the NORA Healthcare and Social Assistance Sector Council**

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## **Introduction**

### **The National Occupational Research Agenda**

The National Occupational Research Agenda (NORA) is a partnership effort of stakeholders engaged in identifying critical knowledge gaps and in stimulating innovative research to improve workplace health and safety practices. Unveiled in 1996, NORA has become a research framework for NIOSH and the nation. Diverse parties collaborate to identify the most critical needs in workplace safety and health. Partners then work together toward solutions to address these needs.

The NORA Healthcare and Social Assistance (HCSA) Agenda is one element of the larger NORA endeavor. It focuses on the question: “What information is needed to reliably protect caregivers’ health and safety and, at the same time, ensure patient safety given the high hazard nature and risk of injury in this critical work sector?” The Agenda, drafted by stakeholders, consists of five strategic goals designed to address top safety and health concerns and to promote the greatest opportunities to advance protections within the HCSA Industrial Sector.

The agenda addresses a wide range of research in disciplines as diverse as laboratory bench research and research in the social science and human behavior arenas. Issues in the social and behavioral sciences inform public health practice methods that may, for example, increase the likelihood that new, safer work practices, when identified, will be adopted in the workplace. These sciences may also suggest efficiencies in applying new knowledge and translating research findings into usable tools and information that can be used by HCSA stakeholders to bring about needed, safer industry practices.

Informed by an enlarged definition of research that values the importance of demonstrating the ‘real world’ effectiveness of research results and dissemination of findings to those who can benefit from them, the NORA process seeks to facilitate rapid translation and application of research findings. Such “research to practice” (R2P) endeavors have long been a NIOSH priority and are reflected in the goals of this sector agenda, making the link between research and workplace impact. While not every stakeholder group is involved with research, almost every HCSA stakeholder group is somehow involved with converting knowledge into practice for use by employers, owners, and practitioners. Developing the NORA HCSA Agenda provides a vehicle for stakeholders to describe what they believe are the most relevant issues, gaps, and safety and health needs in the industry.

The NORA HCSA Agenda will provide guidance for industry stakeholders (e.g., industry, labor, professionals, and academics) to prioritize their work among the many safety and health issues of interest. It is intended to inspire decision makers to address these topics as top priorities. It is intended to steer researchers to cohesive topic areas for research proposals. Lastly it is to encourage dialogue and partnering among stakeholders on a subset of key issues – thus increasing our collective ability to make an impact in reducing injuries and illnesses among healthcare and social assistance workers.

## **Healthcare and Social Assistance Sector Council**

The NORA HCSA Sector Council has been working to develop the draft agenda for healthcare and social assistance. In response to its charge of developing and maintaining a healthcare and social assistance sector specific research agenda, the HCSA Sector Council developed a document, “State of the Sector—Healthcare and Social Assistance: Identification of Research Opportunities for the Next Decade of NORA” (<http://www.cdc.gov/niosh/docs/2009-139/>). The document provides information on the “state of the sector,” including magnitude and consequences of known and emerging health and safety problems, critical research gaps, and research needs that should be addressed over the next decade of NORA. The draft HCSA Research Agenda is broad and reflects the diversity of the four sub-sectors that comprise the North American Industry Classification System (NAICS) Sectors 62 (described below). It has been developed based on evidence provided in the referenced document. However, it is not intended to be an inventory of all issues, so not every possible issue of interest is included on the Agenda. Nor should the Agenda be viewed as suggesting that other topics are unimportant. In an attempt to focus on the Agenda, the HCSA Sector Council purposely restricted the number of critical topics or primary problem areas to a relatively small, manageable set of five goals. The Council anticipates a process in which these goals will be revised and reprioritized every few years as conditions change. The Council began with a focus on the healthcare subsectors. The unique issues of the social assistance subsectors, in particular child daycare services, will be addressed separately.

### **Basis for the Healthcare and Social Assistance Sector Research Agenda**

Background: Public awareness of the potential for healthcare to be a source of harm to patients, through exposure to infectious agents and unintended error or known side effects of hazardous treatments, has spawned a highly visible “patient safety” movement. Less visible, however, is the risk this same environment and these same hazards impose on the health of the men and women who work there. Although often thought of as clean and safe, workplaces in the HCSA Sector are associated with many of the same types of exposures to chemicals and hazards found in “blue collar” industrial settings. The HCSA Sector is burdened by the historical and entrenched belief that patient care issues supersede the personal safety and health of workers, and that it is acceptable for healthcare and social assistance workers to have less than optimal protections against the risks of hazardous exposures or injuries. Because patients and providers share the healthcare environment, efforts to protect patients and providers can be complementary, even synergistic, when pursued through a comprehensive, integrated approach.

HCSA Industries: The HCSA Sector is defined by the NAICS Sector 62 and includes establishments which provide healthcare and social assistance to individuals. Industries in this Sector exist on a continuum starting with those establishments providing medical care exclusively, continuing with those providing healthcare and social assistance, and finally with those providing only social assistance. The HCSA Sector is comprised of four NAICS Sub-Sectors – Ambulatory Healthcare Services (621); Hospitals (622); Nursing and Residential Care Facilities (623); and Social Assistance (624). Social assistance includes establishments that provide nonresidential individual and family services for youth, elderly, and persons with disabilities; community food, housing, and emergency relief services; vocational rehabilitation services; and child day-care services.

HCSA Demographics: An estimated 17 million people, about 11% of the U.S. workforce, are employed within the healthcare and social assistance sector. About 80% of the workers are in healthcare industries and 20% in social assistance industries. Growth of the healthcare and social assistance sector through 2014 is projected to be more than any other industrial sector, including 12 of the 20 fastest growing occupations. About 80% of healthcare and social assistance workers are women, a greater percentage than in any other industrial sector and nearly double that for all industrial sectors combined. Social assistance employs a greater percentage of women than healthcare, with child day-care services having the greatest percentage (95%).

HCSA Occupations: Workers in the healthcare and social assistance sector provide services to the sick and those in need of assistance. A partial list of these occupations includes physicians, dentists, dental hygienists and assistants, pharmacists, nurses, nursing aides, technologists and technicians, home health aides, respiratory therapists, occupational and speech therapists, social workers, child care workers, and personal and home care aides. Registered nurses constitute the largest occupation within the sector and number over 2 million, of which 70% are employed in hospitals. Nurses are perhaps the best studied group within the HCSA Sector, and issues with nursing recruitment, retention, and burnout exemplify the importance of occupational safety and health issues faced by the entire sector. The industry also employs many occupations found in other industries, such as food preparers and servers; housekeeping cleaners; ambulance, truck, and bus drivers; pilots; receptionists; billing and posting clerks; material moving workers; secretaries; and file clerks.

Connection Between Patient and Worker Safety: Promoting a culture of safety in the healthcare workplace benefits workers, patients, family members, and all who enter these facilities. The potential hazards which exist in healthcare settings – such as exposures to airborne infectious agents; unassisted lifting and transfer of patients; contaminated equipment and surfaces; slippery floors; or encounters with distraught, potentially violent emergency room visitors – affect both patients and workers. Similarly, safe patient lift assist equipment protects the healthcare worker's back and also prevents patient injury from skin tears or unanticipated falls during lifting. Thus, safety programs should not discriminate between patients and workers. Rather, they should promote comprehensive “systems of safety” in these facilities and promote “cultures of safety.”

Unique HCSA Health and Safety Issues: Although there are many commonalities between the occupational safety and health problems faced by HCSA workers and workers in other industrial sectors (e.g., exposure to hazardous chemicals) there are also a number of issues that are unique to the sector. Because eight in ten healthcare and social assistance workers are women, adverse reproductive outcomes and obligations outside of the workplace are especially prominent issues. Also unique to the HCSA Sector is the stress of dealing with the highly charged healthcare and social assistance environment, exacerbated by suboptimal patterns of work organization, including long or unpredictable work hours, rotating shifts, and under-staffing. Other unique hazards include risks associated with patient lifting and handling, exposures to hazardous drugs administered to patients, and sharps injuries with their associated risk of transmitting hepatitis virus or other bloodborne pathogens. Healthcare and social assistance workers must also face unknown exposures and risks as they are routinely on the front line in caring for those with emerging infectious diseases such as, severe acute respiratory syndrome (SARS), emerging strains of influenza (e.g., avian, novel H1N1, emerging pandemic strains) and, potentially, victims of bioterrorism attacks using agents such as anthrax, and smallpox.

**Conclusion:** The HCSA Sector is a large, growing and critically important set of employers and care providers and a dynamic segment of the US economy. The sector faces a range of occupational safety and health issues, many of them uniquely important to the sector, that threaten the safety of workers and patients and significantly impair the ability of the sector to retain its workforce. Dealing with this range of issues requires commitment to safety by all involved and a comprehensive approach to safety and health. Although many examples exist of institutions that have successfully adopted comprehensive approaches to safety and health, it is our hope that implementation of this National HCSA Agenda will lead to greater awareness of issues, more widespread implementation of best practices, and development of new ways to protect HCSA workers to the benefit of them and those they serve.

## **Safety and Health Programs**

There is consensus among professional and industry groups engaged in healthcare that new management systems are essential to improve patient care and increase access to care. Promoting a culture of safety is a major goal within healthcare. Principles of management systems designed to protect and enhance the workforce are articulated in detail in documents specific to health care (Joint Commission, ILO/WHO) and more generally to worker health and safety (ANSI 2005). The links between patient safety and worker health and productivity are increasingly noted as efforts continue to reduce poor patient outcomes in health care settings. (IOM 2000, 2001, 2004).

The HCSA Sector Council sets as the first strategic goal promotion of safe and healthy workplaces which optimize safety culture in healthcare organizations. This requires the promotion of injury and illness prevention programs in all healthcare settings. This goal creates a framework which supports all of the subsequent goals and which will inform future decisions regarding priorities for research and evaluation. The principles articulated here embrace those put forward in consensus documents referenced above. Some states have made worker health and safety programs mandatory, and the Council assumes that in these states there are specific opportunities to promote and evaluate such programs. This is reflected in some intermediate goals.

### **Strategic Goal 1: Promote safe and healthy workplaces and optimize safety culture in healthcare organizations.**

The following intermediate goals emphasize four broad areas where effective actions are needed: structure work organization to optimize safe and healthy workplaces for workers, patients, clients, and consumers; promote a culture of safety; establish effective injury and illness prevention programs; and increase adoption of proven interventions.

Recommended elements of prevention programs include:

- Management commitment and worker involvement
- Data systems that track, trend, and communicate hazards, illness, and injuries
- Workplace assessment of risks to worker and patient safety
- Root cause analysis of work-related incidents and injuries

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- Hazard elimination
- Workforce and management training
- Worker leadership training to promote full participation in injury and illness prevention programs

**Intermediate Goal 1.1:** Structure work organization to optimize safe and healthy workplaces for workers, patients, clients, and consumers: Healthcare and social services organizations will develop and implement organizational and management structures and strategies that best support the minimization of work overload.

**Activity/Output Goal 1.1.1:** NIOSH and key stakeholders will determine appropriate management competencies with respect to workplace safety and health for hospital and non-hospital based managers.

**Activity/Output Goal 1.1.2:** Identify most appropriate job competencies and selection criteria for healthcare managers.

**Activity/Output Goal 1.1.3:** Develop, implement, and evaluate management training programs specific to this sub goal.

**Intermediate Goal 1.2:** Structure work organization to optimize safe and healthy workplaces for workers, patients, clients, and consumers: Hospitals and other healthcare and social service settings will adopt best practices of scheduling and staffing that will minimize excessive workload and other factors associated with fatigue in the HCSA Sector.

**Activity/Output Goal 1.2.1:** Identify best practice guidelines for scheduling, staffing, and worker/patient/client ratios.

**Activity/Output Goal 1.2.2:** Assess the impact of excessive workloads and demanding work schedules on recruitment of new staff, retention, and job exit.

**Activity/Output Goal 1.2.3:** Evaluate the impact of excessive workload and demanding work schedules on organizational outcomes (e.g., productivity, costs associated with patient safety, recruitment and hiring, the training of new workers, etc.).

**Activity/Output Goal 1.2.4:** Determine the impact of workload and demanding work schedules on worker outcomes, such as quality of work, quality of “worklife,” injuries, near misses, and psychosocial work-stress.

**Activity/Output Goal 1.2.5:** Assess the impact of workload and work schedules on patient/client outcomes (e.g., medical errors, quality of care, patient safety).

**Activity/Output Goal 1.2.6:** Identify factors that lead to premature retirement and find ways to encourage older workers to safely continue employment.

**Intermediate Goal 1.3:** Structure work organization to optimize safe and healthy workplaces for workers, patients, clients, and consumers: Foster dissemination and implementation of effective teaching tools and strategies concerning risks of excessive

workload and demanding work schedules, to workers and managers in the health care sector.

**Activity/Output Goal 1.3.1:** Develop teaching tools and strategies.

**Activity/Output Goal 1.3.2:** Identify methods to disseminate the teaching tools and strategies.

**Activity/Output Goal 1.3.3:** Develop implementation strategies for the teaching tools and strategies.

**Activity/Output Goal 1.3.4:** Evaluate the effectiveness of implemented teaching tools and strategies.

**Intermediate Goal 1.4:** Promote a culture of safety: Enhance knowledge and skills needed to operationalize a culture of safety.

**Activity/Output Goal 1.4.1:** Identify key safety culture elements.

**Activity/Output Goal 1.4.2:** Develop a safety culture toolkit for hospital settings, including a safety climate survey.

**Activity/Output Goal 1.4.3:** Create a modified safety culture toolkit for non-hospital settings.

**Activity/Output Goal 1.4.4:** Develop “return on investment” metrics associated with safety culture initiatives.

**Activity/Output Goal 1.4.5:** Design a participatory action framework for safety climate, for employees and representatives (i.e., unions).

**Activity/Output Goal 1.4.6:** Develop and test effective teaching tools and strategies to promote safety culture.

**Activity/Output Goal 1.4.7:** Disseminate educational materials to healthcare organizations, workers, and managers.

**Intermediate Goal 1.5:** Promote a culture of safety: Healthcare organizations will institute best-practices management structures in the healthcare sector that best support a strong safety culture.

**Activity/Output Goal 1.5.1:** Identify pre-existing best practices and management structures that best support safety culture.

**Activity/Output Goal 1.5.2:** Conduct a systematic review of management practices and safety culture.

**Activity/Output Goal 1.5.3:** Prepare and disseminate best practices management tool kits.

**Activity/Output Goal 1.5.4:** Develop and test effective teaching tools and strategies to disseminate best management practices and safety culture to healthcare and social assistance organizations and managers.

**Intermediate Goal 1.6:** Establish effective injury and illness prevention programs: Analyze existing injury and illness prevention programs and assess reasons for success and failure.

**Activity/Output Goal 1.6.1:** Identify best practices in establishing and nurturing programs.

**Activity/Output Goal 1.6.2:** Identify factors and strategies that motivate adoption and maintenance of effective programs.

**Activity/Output Goal 1.6.3:** Develop policy to promote adoption of effective programs.

**Intermediate Goal 1.7:** Establish effective injury and illness prevention programs: Healthcare organizations, in states with mandated health and safety programs, will partner with worker representative organizations to implement effective programs.

**Activity/Output Goal 1.7.1:** Identify states with mandated programs.

**Activity/Output Goal 1.7.2:** Partner with states, healthcare institutions, and worker representative organizations to implement effective programs in hospitals, ambulatory care settings, nursing homes, and home care settings.

**Intermediate Goal 1.8:** Establish effective injury and illness prevention programs: Healthcare organizations with established programs will undertake systematic review of each program element, identify obstacles, and develop solutions.

**Activity/Output Goal 1.8.1:** Document barriers to implementation of effective programs.

**Activity/Output Goal 1.8.2:** Describe solutions to promote effective programs.

**Activity/Output Goal 1.8.3:** Document case studies of successful programs.

**Intermediate goal 1.9:** Increase adoption of proven interventions: Promote and increase adoption of comprehensive, coordinated, and effective workplace health protection/health promotion programs, policies, and practices for improving worker health and safety.

**Activity/Output Goal 1.9.1:** NIOSH, along with partners, will develop best-practice guidelines for effective workplace health protection/health promotion programs in healthcare settings.

**Activity/Output Goal 1.9.2:** Conduct a review of the worksite health protection/health promotion programs that have been successfully implemented in the healthcare and social service settings.

**Activity/Output Goal 1.9.3:** Develop workplace health protection/health promotion toolkits for the development and implementation of comprehensive health protection/health promotion programs in the healthcare sector.

**Activity/Output Goal 1.9.4:** Develop and test effective teaching tools and strategies to disseminate guidelines, toolkits, and programs to healthcare and social assistance organizations, workers, and managers.

## **Musculoskeletal Disorders (MSDs)**

Overexertion incidents are the leading source of workers' compensation claims and costs in healthcare settings. Frequent lifting and repositioning of patients is the leading source of injury for health care workers (U.S. Bureau of Labor Statistics, 2003). Nursing staff have high rates of back and shoulder injuries. In 2005, more than 20,000 recordable cases of back and other pain, carpal tunnel syndrome, and tendonitis were reported in the HCSA sector by BLS; of these, more than 42% were among healthcare support occupations such as aides and assistants. Among female workers in the United States, nursing aides and orderlies, registered nurses, and licensed practical nurses suffer the highest prevalence (18.8%) and report the most annual cases (n=269,000) of work-related back pain. Twelve percent of nurses left the nursing profession because of back pain.

As the U.S. population becomes older and heavier, the problem of MSD in HCSA workers is likely to grow. Employment for nurses is projected to increase by 25% by 2012 creating an expected shortage in the nursing labor pool of 20% by 2015 and 30% by 2020. The high injury rate coupled with a critical nursing shortage raises serious concerns about the nursing workforce's capacity to care for our nation's expanding population.

**Strategic Goal 2: Reduce the incidence and severity of musculoskeletal disorders (MSDs) among workers in the healthcare and social assistance (HCSA) sector.**

**Performance Measure:** By 2016, reduce by 25% the rates of sprains and strain injuries involving days away from work in hospitals and nursing homes where healthcare patients were listed as the source of injury.

**Intermediate Goal 2.1:** Federal regulatory and legislative bodies will develop MSD standards and/or guidelines for HCSA workers.

**Activity/Output Goal 2.1.1:** Evaluate the effectiveness of legislative mandates for safe patient handling in hospitals, long-term care, and home healthcare.

**Intermediate Goal 2.2:** Licensed hospitals, nursing homes, and home health care agencies will incorporate safe patient handling and movement programs into their standards of care.

**Activity/Output Goal 2.2.1:** Conduct research to validate the effectiveness of "best practices" safe patient handling and movement programs in hospitals, nursing homes, and home health care settings.

**Activity/Output Goal 2.2.2:** Identify and evaluate alternative methods for financing large scale implementation of safe patient-handling environments in all aspects of healthcare.

**Activity/Output Goal 2.2.3:** Conduct research to develop business case models to demonstrate the cost-benefit and/or cost-effectiveness of safe patient handling and movement programs.

**Activity/Output Goal 2.2.4:** Conduct research to evaluate the design of healthcare facility patient rooms, patient care areas, and transport areas.

**Activity/Output Goal 2.2.5:** Work with healthcare facility architects and architectural associations to incorporate mechanical lifting equipment including accommodations for bariatric patients during the design of health care facilities.

**Activity/Output Goal 2.2.6:** Evaluate the relationship between staffing patterns, use of safe patient handling equipment, and patient outcomes.

**Activity/Output Goal 2.2.7:** Evaluate different ways to successfully incorporate temporary staff into the standard of care that requires safe patient handling.

**Activity/Output Goal 2.2.8:** Assess different models for incorporating safe patient handling as a standard of care.

**Activity/Output Goal 2.2.9:** Test different models for implementing and sustaining effective safe patient-handling committees and safe patient handling programs.

**Activity/Output Goal 2.2.10:** Conduct case studies on how to successfully reduce resistance to change in implementing safe patient-handling programs.

**Activity/Output Goal 2.2.11:** Identify the organizational barriers to implementing safe patient handling and how they can be overcome.

**Activity/Output Goal 2.2.12:** Conduct evaluations to determine what technologies are effective in reducing biomechanical stresses associated with pushing, pulling, carrying, and minimizing awkward postures to caregivers during patient transferring tasks.

**Activity/Output Goal 2.2.13:** Conduct laboratory research to evaluate patient-handling procedures, devices and emerging technologies for their effectiveness in safely handling bariatric patients.

**Activity/Output Goal 2.2.14:** Conduct research to improve sling technology.

**Activity/Output Goal 2.2.15:** Develop a taxonomy of tasks by types of care requirements, environment, and organizational capacity. Evaluate how the physical and emotional strain/anxiety for the caregiver performing patient handling tasks can be reduced.

**Activity/Output Goal 2.2.16:** Develop algorithms that describe how patients should be lifted across all healthcare settings where patients require assistance to be moved.

**Activity/Output Goal 2.2.17:** Develop and test work-family balance models with respect to retention and recruitment of nursing staff as well as injury rates.

**Activity/Output Goal 2.2.18:** Assess peer cohesion models in reducing MSD injury rates and turnover.

**Intermediate Goal 2.3:** Homecare and home healthcare organizations will implement safe patient handling and movement programs to prevent MSDs among homecare and home healthcare employees.

**Activity/Output Goal 2.3.1:** Incorporate safe patient handling into standards of home care and home healthcare.

**Activity/Output Goal 2.3.2:** Develop better surveillance systems for tracking injuries and illnesses experienced by homecare workers.

**Activity/Output Goal 2.3.3:** Explore how known interventions to prevent MSD injuries can be effectively used in the home setting.

**Activity/Output Goal 2.3.4:** Identify barriers to use of known interventions (e.g., lack of access, client resistance, lack of available help, working alone) in the home and strategies for overcoming those barriers.

**Activity/Output Goal 2.3.5:** Explore how housekeeping tasks contribute to rates of injuries and how risks associated with housekeeping can be addressed.

**Activity/Output Goal 2.3.6:** Explore how to balance the patient/consumer's right to direct their care and the rights of healthcare workers to a safe workplace.

**Activity/Output Goal 2.3.7:** Identify effective training programs on prevention of MSDs for homecare workers and their clients. Incorporate this training into on-going certification and continuing education programs.

**Intermediate Goal 2.4:** Healthcare organizations will take steps to identify and address MSDs among non-patient handling staff working in such areas as laundry, housekeeping, and food service.

**Activity/Output Goal 2.4.1:** Develop better surveillance systems for tracking MSDs among non-patient care staff.

**Activity/Output Goal 2.4.2:** Identify effective interventions for preventing MSDs among these employees, including equipment, work organization, layout, staffing, work pace, etc.

**Activity/Output Goal 2.4.3:** Develop training materials addressing the prevention of MSDs to non-patient care staff.

**Intermediate goal 2.5:** Nursing (RN, LPN, CNA) and other allied health schools/training programs will adopt new safe patient handling and movement curriculums to prepare new graduates for using safe patient handling and movement methods that rely on mechanical patient lifting equipment and other assistive devices to move patients as part of a comprehensive safe patient handling (SPH) and movement program.

**Activity/Output Goal 2.5.1:** Asses the effectiveness of nursing schools in preparing new nurses for using equipment to handle patients as part of a comprehensive safe patient handling and movement program.

**Activity/output goal: 2.5.2:** Include safe patient handling concepts in exam study materials as well as in certification and licensure exams.

**Activity/output goal: 2.5.3:** Develop and disseminate Schools of Public Health Continuing Education Units (CEUs) modules for use by nurses and others to renew license to practice.

**Activity/output goal: 2.5.4:** Conduct surveys of schools of nursing to determine if they are teaching safe patient handling and movement practices, widely disseminate existing information to schools of nursing, and encourage schools of nursing to adopt new safe patient handling and movement curriculums.

## **Hazardous Drugs and Other Chemicals**

Healthcare workers are potentially exposed to highly toxic hazardous drugs and other chemicals as part of their job. Healthcare workers who prepare or administer hazardous drugs (e.g., those used for cancer therapy, and some antiviral drugs, hormone agents, and bioengineered drugs) or who work in areas where these drugs are used may be exposed to these agents in the workplace. About 5.5 million U.S. healthcare workers are potentially exposed to hazardous drugs, including pharmacy and nursing personnel, physicians, environmental services workers, workers in research laboratories, veterinary care workers, and shipping and receiving personnel. Workers may be exposed to hazardous drugs when they mix or administer these drugs, during cleanup of spills, or when disposing of waste (e.g., urine, feces) from patients receiving these drugs. Exposure may occur by breathing liquid aerosols or dusts, or by contacting contaminated surfaces. Published studies have shown that workplace exposures to hazardous drugs can cause multiple health effects ranging from skin rashes and asthma to adverse reproductive outcomes (including infertility, spontaneous abortions, and congenital malformations) and possibly leukemia and other cancers. The health risk depends on how much exposure a worker has to these drugs and how toxic they are. In addition to hazardous drugs, healthcare workers are also potentially exposed to other chemical and physical agents, including cleaning and disinfecting agents, chemical sterilants, anesthetic gases, surgical smoke, natural rubber latex, mercury, tissue preservatives, noise, and ionizing and non-ionizing radiation. Occupational exposures to these agents have been linked to adverse health effects, including allergic contact dermatitis, kidney and liver disorders, cancer, adverse reproductive outcomes, hearing loss, and asthma. Examples of occupations with potential exposure to hazardous drugs and other chemicals include nurses, pharmacists, pharmacy technicians, operating room personnel, medical supply technicians, surgeons, anesthesiologists, dentists, diagnostic-related technologists and technicians, housekeeping and custodial personnel, and maintenance workers. In many cases, the means to eliminate or reduce exposures to all of these hazards are well recognized. Efforts need to focus on hazard recognition and promoting safe handling guidelines, identifying barriers to implementation of best practices, and evaluating the effectiveness of interventions.

**Strategic Goal 3: Reduce or eliminate exposures and adverse health effects caused by hazardous drugs and other chemicals.**

**Performance Measures:** By 2016, all hazardous drugs package inserts will include guidance for safe handling of the drug.

By 2014, an inventory of agents in the healthcare environment that can cause and or exacerbate asthma will be developed.

**Intermediate Goal 3.1:** Disseminate information regarding potential hazards and best practice guidelines for preventing exposure to hazardous drugs [as defined by NIOSH and the American Society of Health-System Pharmacists (ASHP)] to healthcare workers including those employed by small establishments (i.e., private physician offices, home healthcare, free-standing oncology centers).

**Activity/Output Goal 3.1.1:** Partner with professional associations to acquire demographic information on members who compound and/or administer hazardous drugs by occupation and size and type of practice setting.

**Activity/Output Goal 3.1.2:** Survey members and/or convene focus groups of members working in small practice settings, to identify barriers to adherence with published guidelines for safe handling of hazardous drugs.

**Activity/Output Goal 3.1.3:** Create and disseminate language and literacy appropriate safe handling guidance materials for paraprofessionals (housekeepers, nurses' aides, etc.) who handle waste materials (i.e., urine, feces, soiled linens, etc.) from patients receiving chemotherapy.

**Intermediate Goal 3.2:** Promote safe handling of hazardous drugs across all applicable healthcare settings, through collaborative efforts with Provider, Payer, and Accrediting Organizations.

**Activity/Output Goal 3.2.1:** In collaboration with Center for Medicare and Medicaid Services (CMS), require adherence to best practice guidelines by any organization that uses CMS mechanisms for reimbursement for chemotherapy.

**Activity/Output Goal 3.2.2:** Conduct a focused educational campaign on safe handling of hazardous drugs for all healthcare organizations, through collaborations with accrediting bodies for hospitals, home care, ambulatory care, pharmacies, etc.

**Intermediate Goal 3.3:** Eliminate (through substitution) or reduce exposures and adverse health effects caused by chemical agents (other than hazardous drugs) that are used or generated in healthcare establishments.

**Activity/Output Goal 3.3.1:** Recognize and identify chemicals that may be associated with adverse health effects among healthcare workers by occupational group and job task. Health effects of particular concern include skin disorders (e.g., dermatitis), respiratory disease (e.g., asthma), adverse reproductive outcomes, and malignant diseases.

**Activity/Output Goal 3.3.2:** Develop a mechanism for pre-evaluation of health and environmental impact of new chemical-containing products and equipment, through collaborative efforts of management (executive leadership, purchasing authorities and employee health), labor unions, professional organizations, and

governmental agencies utilizing existing data, (e.g., material safety data sheets (MSDS), tox profiles, and peer-reviewed literature).

**Activity/Output Goal 3.3.3:** Evaluate the effectiveness of interventions that are intended to reduce or minimize exposure and health effects of chemicals, considering impacts on health care workers and patients/clients (e.g., via environmental sampling or analyzing medical surveillance data).

## Sharps Injuries

Exposures to blood and other body fluids occur across a wide variety of occupations. Preventing these exposures is one important step in ensuring a safe working environment for healthcare personnel and ancillary occupations, and complements healthcare systems' patient safety and infection control efforts. Combining strategies for achieving patient safety and worker safety ultimately lead to quality healthcare.

CDC defines healthcare personnel as persons (e.g., employees, students, contractors, attending clinicians, public-safety workers, or volunteers) whose activities involve contact with patients or with blood or other body fluids from patients in a health-care, laboratory, or public-safety setting.

The risk to healthcare personnel of exposure to bloodborne pathogens through needlesticks, cuts, or other sharps injuries (collectively referred to as percutaneous injuries), as well as through splashes and direct contact with mucous membranes or non-intact skin, is well documented, and is associated with the transmission of numerous pathogens, most notably, hepatitis B, hepatitis C, and HIV. The CDC estimates that each year 385,000 needlesticks and other sharps-related injuries are sustained by hospital-based healthcare personnel; an average of 1,000 sharps injuries per day. The exact number of sharps injuries among all healthcare personnel cannot be determined for several reasons. There is no national surveillance system to collect this data from non-hospital-based (long-term care, home healthcare, private offices) healthcare personnel. In addition, not all sharps injuries are reported. Surveys of healthcare personnel indicate that 50% or more do not report their injuries.

The majority of exposures to bloodborne pathogens among healthcare personnel are preventable. The following goals were developed to promote the identification and implementation of workplace strategies to prevent sharps injuries among all healthcare personnel.

*(For simplicity, throughout this Section, the term “sharps with engineered sharps injury protections” (SESIPs) will be referred to as “safety device” or “safe sharp.” It is acknowledged that not all sharps devices, with engineered safety features, are safer than their traditional counterpart.)*

### **Strategic Goal 4: Reduce sharps injuries and their impacts among all healthcare personnel.**

**Performance measure:** By 2016, surveillance systems will be in place to identify the number and types of healthcare personnel employed in all healthcare settings who sustain sharps injuries and the circumstances, mechanisms, procedures, and devices involved in those injuries.

**Intermediate Goal 4.1:** NIOSH, collaborating with partners, will promote the development and use of surveillance systems that monitor percutaneous injuries among healthcare personnel employed in all healthcare settings.

**Activity/Output Goal 4.1.1:** Develop and implement surveillance systems to monitor healthcare personnel employed in settings other than hospitals, who are at risk for percutaneous injuries.

**Activity/Output Goal 4.1.2:** Identify the number and types of healthcare personnel employed in settings other than hospitals, who sustain percutaneous injuries, and the circumstances, mechanisms, procedures, and devices involved in those injuries.

**Intermediate Goal 4.2:** Promote the development of new and re-engineering of safe sharps with device manufacturers, with a priority on sharps-free alternatives wherever feasible.

**Activity/Output Goal 4.2.1:** Identify and characterize medical, dental, and surgical procedures and techniques for which viable safe sharps do not exist.

**Activity/Output Goal 4.2.2:** Partner with device manufacturers to ensure that product design involves user feedback

**Activity/Output Goal 4.2.3:** Determine the quantity and circumstances of percutaneous injuries while using safety devices and partner with device manufacturers to address engineering failures.

**Activity/Output Goal 4.2.4:** Promote prevention through design strategies to encourage the development of medical devices that eliminate sharps.

**Activity/Output Goal 4.2.5:** Work with regulatory agencies and standard-setting groups to establish performance criteria for safety devices that address both worker and patient safety concerns.

**Activity/Output Goal 4.2.6:** Disseminate performance criteria to manufacturers and users of these devices.

**Intermediate Goal 4.3:** Promote the use of safety devices among healthcare personnel employed in all healthcare settings.

**Activity/Output Goal 4.3.1:** Identify pathways by which sharps that are not engineered with safety features enter healthcare environments.

**Activity/Output Goal 4.3.2:** Partner with medical, nursing, dental, and other relevant educational programs to add mandatory sharps safety training in curriculums.

**Activity/Output Goal 4.3.3:** Collaborate with medical, nursing, dental, and other relevant professional associations in encouraging their constituents to be actively involved in selecting, evaluating, prescribing the use of, and using safety devices within their scope of practice.

**Activity/Output Goal 4.3.4:** Collaborate with healthcare facilities and state health departments to establish a standard operating procedure (SOP) that sharps customers and users can follow when they are provided with sharps lacking safety features.

**Activity/Output Goal 4.3.5:** Identify the reasons healthcare personnel do not use safety devices and, if they are used, why they may not be used properly.

**Intermediate Goal 4.4:** Increase the rate and accuracy of reporting percutaneous injuries among all healthcare workers through partnerships with professional associations and unions.

**Activity/Output Goal 4.4.1:** Assess the barriers to accurate reporting.

**Activity/Output Goal 4.4.2:** Determine strategies to address the barriers.

**Activity/Output Goal 4.4.3:** Promote the adoption of innovative strategies to improve reporting by healthcare personnel within all healthcare settings.

**Intermediate Goal 4.5:** Evaluate and improve the utilization of best practices in all healthcare settings to reduce percutaneous injuries.

**Activity/Output Goal 4.5.1:** Identify, recommend and implement sharps injury prevention strategies based on sharps surveillance data and other information or research.

**Activity/Output Goal 4.5.2:** Develop strategies to ensure that existing best practices developed for the hospital are translated and used in outpatient and ambulatory care settings (e.g., medical, dental, and home healthcare).

**Activity/Output Goal 4.5.3:** Educate personnel who can train others on best practices for reducing percutaneous injuries.

**Activity/Output Goal 4.5.4:** Collaborate with The Joint Commission (TJC), CMS, OSHA, and other regulatory agencies to enforce the use of safety devices and best practices related to use of sharps.

**Intermediate Goal 4.6:** Advocate for the establishment, annual update, and implementation of a comprehensive exposure control plan that complies with the OSHA Bloodborne Pathogen Standard or relevant state standard, as appropriate, in all healthcare settings.

**Activity/Output Goal 4.6.1:** Identify the types of healthcare establishments most likely to not write, update, or implement a written exposure control plan, and the reasons for not doing so.

**Activity/Output Goal 4.6.2:** Partner with relevant professional organizations, associations, and unions in encouraging all healthcare establishments to write, update, and implement exposure control plans.

**Activity/Output Goal 4.6.3:** Develop tools to inform frontline healthcare workers of the employers' responsibility for ensuring a safe workplace that

includes, but is not limited to, provisions for evaluating and selecting safety devices, training, and appropriate pre- and post-exposure prophylaxis.

**Activity/Output Goal 4.6.4:** Develop materials, tools and examples to assist workplaces to develop and implement comprehensive exposure control plans.

**Activity/Output Goal 4.6.5:** Assess the extent of compliance with the OSHA mandate that frontline workers be involved in the evaluation and selection of devices.

**Activity/Output Goal 4.6.6:** Develop materials to assist employers, unions, professional groups and frontline workers in implementing meaningful worker participation in evaluation and selection of sharps devices.

**Intermediate Goal 4.7:** Partner with government agencies and standard setting organizations to incorporate sharps injury prevention into their policies, regulations and guidelines.

**Activity/Output Goal 4.7.1:** Identify all parties involved with sharps in healthcare including those related to procurement, reimbursement, use and disposal.

**Activity/Output Goal 4.7.2:** Work with government agencies and institutions to develop policies and plans that require the use of sharps with safety features.

## Infectious Diseases

Healthcare and social assistance workers are at risk for a range of occupationally acquired infectious diseases. Many are well known, but new infectious hazards continue to emerge. Depending on the specific pathogen, transmission can occur via direct contact with patients and contaminated surfaces or by exposure to bio-aerosols generated by actions such as sneezing and coughing. These agents can be transmitted naturally or as a result of intentional acts of terrorism. They can occur sporadically or cause epidemic disease and public health emergencies such as pandemic influenza. It should be noted that protecting healthcare and social assistance workers also benefits other groups that are potentially exposed to infectious agents in healthcare and social assistance settings (e.g., patients and visitors).

There are many challenges to stopping transmission of infectious diseases in healthcare and social assistance settings. Newly emerging pathogens, such as novel agents or already-recognized agents that have become antibiotic-resistant, are important problems. In addition, long-standing problem pathogens (e.g., pertussis) continue to re-emerge. Ease and frequency of global travel rapidly spreads infectious diseases throughout the world. Patients live longer with chronic illnesses, including those that impair their host defense systems and make them susceptible to infectious diseases. Intensive use and misuse of antibiotics drives the emergence of drug resistance. Understaffing of healthcare facilities results in time stress and lack of adherence to preventive measures perceived as time consuming, such as hand washing. Economic stress and insufficiently established safety cultures lead to suboptimal infection prevention and control programs.

*The following goals, addressing infectious disease transmission in the HCSA Sector, are organized based on general approaches relevant to many kinds of infectious diseases encountered in healthcare settings. Sharps injuries, an important cause of bloodborne pathogen transmission, are addressed in a separate strategic goal.*

**Strategic Goal 5: STOP transmission of infectious diseases in healthcare and social assistance settings among workers, patients and visitors.**

**Performance measure:** By 2016, increase to 60% the influenza vaccination rates among healthcare workers.

The following intermediate goals fall into several groups of major activities; understanding mechanisms and routes, improving approaches to worker vaccinations, improving hand hygiene, improving disinfection and decontamination, identifying and responding to highly infectious exposures, research and adopting best practices for personal protective equipment (PPE), designing facilities to facilitate appropriate work practices and incorporate protective engineering controls, and improving treatment after hazardous exposures.

**Intermediate Goal 5.1:** Understanding mechanisms and routes – Investigators across a broad range of disciplines will conduct research to understand mechanisms and determinants of routes by which infectious diseases are transmitted in the healthcare and social assistance setting.

**Activity/Output Goal 5.1.1:** Conduct research to develop better exposure assessment methods and apply them to better characterize infectious agent exposure.

**Activity/Output Goal 5.1.2:** Conduct research to better characterize key issues in infectious disease transmission for important agents in the healthcare setting, including determinants of continued agent viability and infectivity in various media; agent vulnerabilities in various media; relevant host characteristics; and dose-infection relationships.

**Activity/Output Goal 5.1.3:** Conduct research to better understand characteristics associated with airborne transmission, such as quantity and size distribution of aerosols generated by coughing and sneezing, determinants of survival and infectivity in airborne droplet nuclei, and virulence after airborne transmission.

**Activity/Output Goal 5.1.4:** Based on strong scientific foundations, including improved understanding of the amount of dose reduction needed for protection against infectious agents in healthcare and social assistance settings, develop, study effectiveness of, and implement improved mitigation and prevention strategies that utilize a broad range of approaches.

**Intermediate Goal 5.2:** Improving approaches to worker vaccinations – Investigators, standard-setting organizations, and work places will establish policies and practices consistent with CDC and Joint Commission standards and guidelines for vaccination of healthcare and social assistance workers.

**Activity/Output Goal 5.2.1:** Assess barriers and develop interventions to increase rates of healthcare and social assistance workers receiving vaccines against influenza, hepatitis B, whooping cough, and other vaccine preventable infectious diseases.

**Activity/Output Goal 5.2.2:** Target interventions and best practices at under-vaccinated populations and their employers encouraging them to increase vaccination rates.

**Activity/Output Goal 5.2.3:** Conduct surveillance for vaccination prevalence at baseline and over time.

**Intermediate Goal 5.3:** Improving approaches to worker vaccinations – Healthcare and social assistance workers will have access to improved approaches for objectively assessing their immunity to specific pathogens, including biothreat agents and their toxins, by rapid measurement of serum specific antibodies.

**Activity/Output Goal 5.3.1:** NIOSH will complete a literature review of currently available rapid and/or multiplex serum specific antibody detection technologies for assessing need for vaccine administration or documenting vaccine response, including gaps in science and areas where research funding could be best utilized.

**Activity/Output Goal 5.3.2:** NIOSH and partners will conduct focused research to improve rapid and/or multiplex serum antibody detection technology of responses to naturally-occurring pathogen, biothreat agent, and toxin vaccines.

**Activity/Output Goal 5.3.3:** NIOSH and partners will develop evidence-based recommendations for use of rapid and/or multiplex serum antibody detection technology to guide preventive interventions such as vaccination, re-vaccination, and workplace restrictions to avoid specific pathogen exposures.

**Intermediate Goal 5.4:** Improving hand hygiene – Investigators/industry will conduct research and development on ways to improve hand hygiene effectiveness and adherence.

**Activity/Output Goal 5.4.1:** Develop devices that facilitate use and optimal application of hand hygiene products.

**Activity/Output Goal 5.4.2:** Apply concepts of “Prevention through Design” to develop best practices for building and interior design to optimize rates of appropriate hand hygiene.

**Activity/Output Goal 5.4.3:** Design and evaluate methods to overcome barriers to facilities providing adequate hand hygiene resources.

**Activity/Output Goal 5.4.4:** Design and evaluate methods to overcome barriers to healthcare workers using provided hand hygiene resources.

**Intermediate Goal 5.5:** Improving hand hygiene – Healthcare and social assistance employers will establish policies and practices consistent with CDC and Joint Commission Guidelines to improve hand hygiene adherence.

**Activity/Output Goal 5.5.1:** Disseminate and implement policies/practices that overcome barriers to facilities providing adequate hand hygiene resources.

**Activity/Output Goal 5.5.2:** Disseminate and implement policies/practices that overcome barriers to healthcare workers using provided hand hygiene resources.

**Activity/Output Goal 5.5.3:** Develop a system to measure improvements in adherence to hand hygiene recommendations.

**Activity/Output Goal 5.5.4:** Evaluate high-risk activities/procedures to target interventions.

**Intermediate Goal 5.6:** Improving hand hygiene – Investigators will examine outcomes of improved hand hygiene adherence among healthcare and social assistance workers.

**Activity/Output Goal 5.6.1:** Assess unintended/adverse/side effects of hand hygiene products (e.g., contact dermatitis, cost-effectiveness).

**Activity/Output Goal 5.6.2:** Assess impact of improved hand hygiene adherence on healthcare-associated infection rates.

**Activity/Output Goal 5.6.3:** Assess impact of improved hand hygiene adherence on healthcare worker absenteeism or other measures of healthcare worker illness.

**Intermediate Goal 5.7:** Improving disinfection and decontamination – Investigators will develop improved approaches to reducing direct contact transmission of infectious diseases by developing improved approaches to disinfection/decontamination of the healthcare and social assistance environment, including surfaces and fomites.

**Activity/Output Goal 5.7.1:** Determine the types of infectious agents and conditions where disinfection or decontamination is beneficial.

**Activity/Output Goal 5.7.2:** Determine the types of disinfectants and decontaminants that optimally balance effectiveness in disinfection/decontamination and potential for adverse effects on human and environmental health.

**Activity/Output Goal 5.7.3:** Determine the optimal approaches to use of disinfectants and decontaminants that maximize disinfection/decontamination and minimize adverse health and environmental effects.

**Activity/Output Goal 5.7.4:** Clarify the appropriate indications and approaches to bio-decontamination of contaminated individuals.

**Intermediate Goal 5.8:** Identifying and responding to highly infectious exposures – Healthcare and social assistance workers will have improved ability to rapidly identify and respond to highly infectious exposures. Examples include patients with contagious diseases able to be transmitted through airborne or casual exposure, such as influenza, SARS, or TB (as opposed to patients with diseases not transmitted through casual exposure, such as HIV); as well as fomites or environments contaminated with infectious agents.

**Activity/Output Goal 5.8.1:** Assess barriers and develop interventions to ensure widespread adoption of currently-recommended approaches, to rapidly identify and isolate potentially infectious patients.

**Activity/Output Goal 5.8.2:** Develop new methods utilizing modern molecular and antibody-based technologies for rapid identification of pathogens and their toxins in samples derived from patients and healthcare and social assistance environments.

**Activity/Output Goal 5.8.3:** Develop evidence-based recommendations for using methods for rapid identification of pathogens and their toxins to protect against transmission of infectious diseases in healthcare and social assistance settings through identification and isolation of contagious patients or implementation of measures to reduce transmission through the healthcare and social assistance environment.

**Intermediate Goal 5.9:** Research and adopting best practices for PPE – Healthcare and social assistance facilities will establish and promote a culture of safety where employer and employee commitment to worker safety in general, and the appropriate use of PPE in particular, are strengthened.

**Activity/Output Goal 5.9.1:** Develop and disseminate training programs which emphasize the correct use (and disposal) of PPE during patient care across HCSA settings.

**Activity/Output Goal 5.9.2:** Conduct demonstration projects on PPE compliance and use.

**Activity/Output Goal 5.9.3:** Publish and disseminate broadly the results of these projects to ensure the proliferation of successful PPE strategies.

**Activity/Output Goal 5.9.4:** Conduct research to improve the understanding of how human factors and behavioral issues related to the ease and effectiveness of PPE use for extended periods of time and during diverse work environments affect PPE use and compliance.

**Activity/Output Goal 5.9.5:** Develop surveillance of PPE usage to identify priorities, trends, and emerging issues associated with the use of PPE in the workplace; and use the information to establish a baseline on PPE usage, develop benchmarks and performance measures, sharpen the focus of research efforts, and aid in the development of a more effective and active dissemination program.

**Intermediate Goal 5.10:** Research and adopting best practices for PPE – With a range of partners in the public and private sectors, encourage an integrated effort to fully understand the unique requirements of healthcare and social assistance workers, and to develop innovative materials, technologies, and products that can meet their needs, as well as those of their patients.

**Activity/Output Goal 5.10.1:** Conduct research to better understand the ability of agents to contaminate respirators and transform them into fomites.

**Activity/Output Goal 5.10.2:** Conduct research to document feasibility and develop practical strategies for decontamination and re-use of respirators without sacrificing filtration performance or fit.

**Activity/Output Goal 5.10.3:** Conduct research to document the protective differences between various types of PPE using methods that simulate real-life usage and assess all potential leakage paths.

**Activity/Output Goal 5.10.4:** Respirators utilized in healthcare settings were not designed for that particular venue; research should be conducted to address respirator characteristics germane to healthcare workers, such as speech intelligibility, visibility, hearing, physiological consequences (e.g., impact on workers' carbon dioxide and oxygen levels, etc.) with the goal of identifying features that would enhance respirator performance specific to the healthcare setting.

**Activity/Output Goal 5.10.5:** Conduct research to explore innovative application of new technologies, such as use of new materials to achieve better “out of the box” fit and reduce need for fit testing; or incorporating sensors into PPE to detect breaches and notify users of end-of-service life and other protection information.

**Activity/Output Goal 5.10.6:** Conduct research on the frequency of fit testing to assess the rate at which respirator fit changes as a function of time, to investigate the factors that affect such change, and to guide recommendations for frequency and type of fit testing.

**Activity/Output Goal 5.10.7:** Conduct pre-use check research, investigating the efficacy of user seal checks on filtering facepiece respirators.

**Activity/Output Goal 5.10.8:** Document existing performance standards for all PPE used by healthcare workers (gowns, gloves, respirators, etc.); conduct a quantitative performance analysis to assess the effectiveness of each type of PPE in reducing the risk of transmission of infectious agents important to the healthcare setting; and use these study findings, combined with surveillance data, to develop enhanced, evidence-based performance requirements.

**Activity/Output Goal 5.10.9:** Develop innovative approaches to PPE certification that use laboratory, simulated workplace, and pre-market workplace testing to achieve a true assessment of PPE effectiveness in the healthcare and social assistance setting. Adding assessment of additional respirator characteristics to the certification process, such as ability to fit and prevent inward leakage, should also be explored.

**Activity/Output Goal 5.10.10:** Develop methods to implement pre- and post-market testing of PPE used in healthcare and social assistance settings to provide ongoing assessment of PPE effectiveness and aid in the continued improvement and evolution of PPE design and use.

**Intermediate Goal 5.11:** Designing facilities to facilitate appropriate work practices and incorporate protective engineering controls – Investigators/industry will focus on ways to design facilities that reduce infectious disease acquired through airborne, contact,

waterborne, and multi-route transmission by facilitating appropriate work practices and incorporating protective engineering controls.

**Activity/Output Goal 5.11.1:** Facility designers will choose wall, floor, ceiling, and furniture surfaces that are easy to clean and disinfect.

**Activity/Output Goal 5.11.2:** Conduct research to identify the positive and negative aspects of carpeting, relative to other kinds of floor coverings, in the reduction of transmission of infections.

**Activity/Output Goal 5.11.3:** Promote installation and use of alcohol-based hand-rub dispensers by the bed and elsewhere to increase compliance with hand washing protocols.

**Activity/Output Goal 5.11.4:** Conduct research to determine the importance of the number, location, type (automated vs. manual) and accessibility of hand-washing sinks and alcohol-based hand-wash gel dispensers, for improving compliance with hand-washing protocols.

**Activity/Output Goal 5.11.5:** Conduct research to identify the role of human factors in doing hand-washing compliance research.

**Activity/Output Goal 5.11.6:** Facility designers and healthcare facilities will use single-bed rooms with private toilets to facilitate optimal isolation practices on high-risk patients, good air quality, and greater thoroughness in cleaning after a patient leaves.

**Activity/Output Goal 5.11.7:** Conduct studies of single patient rooms for their role in contributing to the reduced transmission of infections, in combination with the other interventions noted here.

**Activity/Output Goal 5.11.8:** Promote construction that adequately deploys measures shown to favorably impact air quality, such as high-efficiency particulate air (HEPA) filters, adequate barriers between patient areas and construction areas, negative air pressure in construction zones, and properly sealing patient windows.

**Activity/Output Goal 5.11.9:** Conduct research to identify the relationship between air quality and infection, for the purpose of accurately specifying either minimum ventilation and filtration requirements, or maximum allowable numbers of spores or other contaminants per cubic meter, in order to prevent the airborne transmission of infections.

**Activity/Output Goal 5.11.10:** Determine the cost benefit case for the application of sometimes costly air filtration configurations to better understand when higher cost is justified.

**Activity/Output Goal 5.11.11:** Develop and evaluate engineering control methods to inactivate infectious agents (e.g., UV germicidal irradiation) and develop and disseminate evidence-based recommendations for their implementation in healthcare and social assistance settings.

**Activity/Output Goal 5.11.12:** Facility designers and healthcare facilities workers will choose, and properly and regularly maintain, water systems with proper temperature, pressure and flow provisions, for point-of-use fixtures as well as for decorative fountains.

**Activity/Output Goal 5.11.13:** Conduct studies to identify the positive and negative aspects of furniture covering materials, various wall finishes and metals in reducing the contact transmission of infections.

**Activity/Output Goal 5.11.14:** Analyze various water fixtures, such as sinks and faucets, for their potential to be reservoirs of pathogenic microorganisms and their possible link to nosocomial infections. Further studies should be done on the proper and effective cleaning of those water fixtures to reduce the pathogenic presence.

**Activity/Output Goal 5.11.15:** Analyze various water fixtures, including especially decorative water fountains, for their potential to generate infectious aerosols.

**Activity/Output Goal 5.11.16:** Conduct research of different bundles of interventions in reducing the transmission of infections, in order to better understand the most cost-effective approaches to achieving the greatest reductions of infection transmission rates.

**Intermediate Goal 5.12:** Improving treatment after hazardous exposures – Prevent development and progression of clinical infectious diseases in healthcare and social assistance workers through improved approaches to prophylactic treatment after hazardous exposures to pathogens such as human immunodeficiency virus (HIV), hepatitis B virus (HBV), influenza virus, Neisseria meningitides, Mycobacterium tuberculosis, and Bacillus anthracis (anthrax) spores; and early detection and treatment of disease caused by agents such as influenza and Hepatitis C virus (HCV).

**Activity/Output Goal 5.12.1:** Work places will establish and implement policies and practices consistent with current standards and guidelines for post-exposure prophylaxis (PEP) and early detection and treatment of occupationally-acquired infectious diseases in healthcare and social assistance workers.

**Activity/Output Goal 5.12.2:** Conduct research to identify barriers to implementation of current standards and guidelines and to develop interventions that address these barriers and increase rates of healthcare and social assistance workers receiving appropriate PEP and early diagnosis and treatment for occupationally-acquired infectious diseases.

**Activity/Output Goal 5.12.3:** Conduct research to document the efficacy of PEP and early diagnosis and treatment using currently-recommended and new drug treatment regimens for occupationally-acquired infectious diseases in the healthcare and social assistance setting.

**Activity/Output Goal 5.12.4:** Conduct demonstration projects and prevention effectiveness research to demonstrate the effectiveness of programs implementing

PEP and early diagnosis and treatment of occupational infectious diseases in the healthcare and social assistance setting.

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