Health Surveillance for Health Care Workers

A VITAL ROLE FOR THE OCCUPATIONAL AND ENVIRONMENTAL HEALTH NURSE

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Keeping health care workers healthy can be a challenge for the occupational and environmental health nurse. The health care work force (e.g., physicians, nurses, emergency medical personnel, dental professionals and students, medical and nursing students, laboratory technicians, hospital volunteers, administrative staff) (Centers for Disease Control and Prevention [CDC], 1997) is composed of more than 9 million workers (Bureau of Labor Statistics, U.S. Department of Labor, 1997) from all socioeconomic and education levels, with variable English language skills (Salazar, 1997). As technology improves and the life span extends, the trend in delivery of health care services is shifting from hospitals to community clinics, provider offices, and home and residential care facilities (Salazar, 1997). The complexity of a rapidly growing diverse work force in a variety of health care settings underscores the need for a dynamic health surveillance program. However, historically several reasons have been cited in the literature for not providing health surveillance for health care workers (McDiarmid, 1996; National Institute for Occupational Safety and Health [NIOSH], 1998):

- Safety and health policies in hospitals were developed mainly for clients, not workers.
- Hospitals and health institutions were considered safer than other work environments, especially in comparison to industrial settings.
- Hospital workers have been viewed as health professionals with a greater awareness of hazards and a capability of maintaining their own health without assistance.
- The availability of informal consultations with hospital physicians reduces the use of employee health services.
- Hospitals are oriented toward disease management rather than health maintenance.
- Exposure to infectious clients or other hazards is "part of the job" in health care. Thus, prevention strategies, safe work practices, and health and safety programs do not belong in hospitals.

Despite these reasons or perhaps because of them, when compared to the total work force, health care workers have a greater percentage of workers' compensation claims for sprains and strains, infectious and parasitic diseases, dermatitis, hepatitis, mental disorders, eye diseases, influenza, and toxic hepatitis (NIOSH, 1998). Potential also exists for exposure to toxic substances, radiation, and the less obvious hazards resulting from shift work and stress (NIOSH, 1998). By keeping accurate records of illness and injury data, the nurse in the workplace may track trends that identify a need for surveillance programs. Because of this recording and reporting, the Occupational Safety and Health Administration (OSHA) recognized the need for health surveillance of health care workers and established regulations affecting hospitals and health care facilities (Rogers, 1994).

A successful health surveillance program is composed of three primary activities (American College of Occupational and Environmental Medicine [ACOEM], 1997):

- Collection of specific exposure data.

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- Familiarity with routes of exposure and toxic doses.
- Selection and application of appropriate medical examinations.

This article addresses the most current and important health surveillance issues for general health care workers.

SURVEILLANCE OF BIOHAZARDS

The combination of physical hazards (e.g., sharps) with biological ones (e.g., bloodborne pathogens) has created a deadly formula that deserves careful surveillance. The occupational and environmental health nurse, together with the occupational health team, needs to review the vast list of biological hazards and identify those specific to the client population involved. Some of these hazards are vaccine preventable diseases. Therefore, health surveillance of immunity is an essential role for the occupational and environmental health nurse.

Hepatitis B

Hepatitis B is the most infamous bloodborne pathogen to infect health care workers. According to the CDC (1995), health care workers with frequent exposure to blood have a prevalence of serologic evidence of hepatitis B infection between 15% to 30%. In contrast, the prevalence in the general population averages 5%. Because of the ease of transmission, health surveillance for hepatitis B begins at the preplacement or post offer physical examination, determining a worker's immunity. The cost effectiveness of serologic screening to detect susceptible health care personnel depends on the prevalence of infections and the costs of testing and of the hepatitis B vaccine. Essentially, each institution must decide whether serologic screening is cost effective. Vaccination of individuals who already have antibodies to hepatitis B has not been shown to cause adverse effects (CDC, 1995). Any health care worker who performs tasks involving contact with blood, blood contaminated body fluids, other body fluids, or sharps should receive the three dose vaccination series (CDC, 1997). Hepatitis B recombinant vaccine is given in two doses 4 weeks apart with the third dose given 5 months after the second. One to 2 months following the series, serologic response should be tested (CDC, 1997).

HIV

Unfortunately, unlike the hepatitis B virus, HIV does not have a vaccine. The CDC recommends chemoprophylaxis should be offered to workers after occupational exposures associated with the highest risk for HIV transmission occur. Exposed employees need to report immediately to employee health services for evaluation, counseling, and treatment if needed. The CDC's (1998) postexposure prophylaxis guidelines call for treatment with antiviral medications within a few hours following the needlestick injury. The nurse needs to carefully evaluate the operating hours of the occupational health unit and the cost effectiveness of nursing coverage versus outsourcing care after hours. Prompt and sensitive surveillance and treatment of health care workers injured by contaminated needles may reduce costs in indemnity and, more important, prolong life. Current recommendations for post HIV exposure surveillance include blood testing immediately following exposure and at 3 and 6 months post exposure.

Hepatitis C

Similar to hepatitis B and HIV, health care workers are exposed to the hepatitis C virus (HCV) from the blood and body fluids of infected individuals. Universal precautions with readily available personal protective equipment is key to prevention. With exposure, prompt treatment of the injury and obtaining baseline blood work from the source and the exposed health care worker are necessary to rule out HCV antibody. Al-Saden (1999) recommended also obtaining a serum glutamic pyruvic transaminase (SGPT) at baseline and repeating at 2 months post exposure in addition to the hepatitis C antibody. The appearance of HCV RNA in blood can vary from 14 to 180 days post exposure, with an average of 45 to 55 days (Jackson, 1994; National Institutes of Health, 1997). In addition, OSHA (1999) recommends follow up testing 6 months post exposure. No cure has been found for HCV, making surveillance especially important to ensure prompt treatment if the disease is transmitted. Because health care workers can become carriers of this virus, surveillance may continue for evaluation of cirrhosis or chronic active hepatitis, depending on the results of the initial laboratory tests. Currently, no vaccine exists for the hepatitis C virus.

The OSHA has responded to the escalating numbers of these dangerous exposures with the Bloodborne Pathogens standard in 1991. More recently, Cal/OSHA developed landmark emergency regulations designed to prevent needlestick injuries among health care workers. Tennessee, Illinois, Maryland, and the state of Washington have safe needle legislation in progress. Other states are expected to follow this important lead (AAOHN, 1999). The occupational health nurse also can provide surveillance of adherence to these standards during regular walkthroughs with the health and safety team.

Measles

Measles, mumps, and rubella are highly contagious diseases that can spread quickly to clients and other health care workers. Surveillance for immunity is the responsibility of the occupational health nurse. The CDC (1991a) recommends all adults born in 1957 or later who do not have a medical contraindication should receive two doses of measles vaccine 1 month apart unless they have a dated record of vaccination with at least one dose of live measles vaccine on or after their first birthday, documentation of physician diagnosed disease, or laboratory evidence of immunity. Most individuals born before 1957 can be considered immune and do not need vaccination. However, serologic studies of hospital workers indicate up to 9.3% of individuals born before 1957 were not immune to measles. In one study, 97 (29%) of 341 health care workers who developed measles in the period from 1985 to 1989 were born before 1957. Therefore, immunity needs to be reviewed carefully with this popu-

lation, and vaccination offered if indicated (CDC, 1991a). Workers who cannot provide evidence of diagnosis, laboratory, or immunization records should be given one dose of measles vaccine when beginning employment, then revaccinated with a second dose not less than 1 month later. If the nurse has conducted careful surveillance of immunity during preplacement, community outbreaks should not present problems. However, review of current employee records during an outbreak can be prudent to ensure the health and safety of the workers.

Mumps

Health care workers should be considered susceptible to mumps unless they have documentation of physician diagnosed mumps, adequate immunization with live mumps vaccine on or after their first birthday, or laboratory evidence of immunity. Individuals who are unsure of their mumps disease or vaccination history should be vaccinated (CDC, 1991a).

Rubella

Health care programs in workplaces need to ensure the vaccination status of every employee is evaluated and rubella vaccination is made available. All hospital personnel who may be at risk for exposure to clients infected with rubella or who may have contact with pregnant clients or workers should be immune. Consideration needs to be given in making rubella immunity a condition for employment (CDC, 1991a). When providing any immunization program, safe nursing practice warrants obtaining sufficient information to determine if workers may be pregnant or immunocompromised, which are contraindications to rubella immunization.

Varicella

Adult varicella infection can result in substantial health care costs. Time off work for an infected health care worker may be considerable, up to 21 days or longer if complications occur. The employer may incur the cost of lost work time for the infected individual and also for any exposed, nonimmune coworkers who remain out of work because of quarantine requirements. Workers' compensation benefits may be applicable depending on state requirements (Lund, 1993). A 1986 study reflected a yearly cost related to varicella exposure of $55,000 for a 580 bed acute care hospital, with the largest cost factor being employee furlough (Weber, 1988). However, expense is not the only issue. More important, varicella increases morbidity and mortality. While less than 2% of reported cases occur in adults, these cases account for 25% of fatal varicella cases (Holmes, 1996).

Approximately 3% of babies whose mothers were infected in the first trimester will have severe fetal abnormalities (Merck and Company, Inc., 1996). The nurse can prevent a serious and expensive epidemic by determining immunity to varicella at the preplacement physical examination. Once again, surveillance begins immediately when a health care worker starts employment.

A reliable history of varicella is a valid measure of immunity. Serologic tests have been used to assess the accuracy of reported histories of varicella. In adults, a positive history of varicella is highly predictive of serologic immunity (97% to 99%). However, the majority of adults who have negative or uncertain histories also are seropositive (71% to 93%) (CDC, 1996). Health care workers without a history of varicella should be tested with an antibody assay. Criteria for assay selection include test sensitivity and specificity, length of time required to obtain results, and availability of the assay. The nurse may consider and select assays in consultation with the physician or laboratory services affiliated with the occupational health unit involved. To establish standing orders and determine practice parameters associated with ordering laboratory tests and administering vaccinations, the nurse should consult the Nursing Practice Act or Board of Registered Nursing in the state(s) involved.

After immunization status is established, the nurse decides if the worker is a candidate for varicella vaccination. Concern exists that vaccine virus may be transmitted to others who may become infected with serious varicella illness. Transmission of vaccine virus from healthy vaccinated individuals has been documented only when a rash occurs post vaccination (one published case in 11 million doses distributed) (CDC, 1996). As a safeguard, institutions may wish to consider precautions for personnel in whom rash develops following vaccination. Routine testing for varicella immunity after two doses of vaccine is not necessary for the management of vaccinated health care workers, because 99% of individuals are seropositive after the second dose. Contraindications to the vaccine are:

- Immunocompromised.
- Pregnant or breastfeeding.
- Allergy to vaccine ingredients.
- Active tuberculosis (TB).
- Recipients of blood, plasma, immune globulin, or varicella zoster immune globulin during the previous 5 months.
- Acute illness.

Available evidence indicates immunity to varicella should be long term, probably life long. At present no formal recommendations exist for additional booster doses (Loomis, 1997).

Influenza

To reduce illnesses and absenteeism during the influenza season and to reduce transmission of influenza between workers and clients, the CDC (1997) recommended the following health care workers receive vaccination in the fall of each year:

- Individuals who attend to clients at high risk for complications of influenza.
- Individuals who are age 65 and older.
- Individuals who have certain chronic medical conditions (e.g., individuals who have chronic disorders of the cardiovascular or pulmonary systems; individuals who required medical follow up or hospitalization within the preceding year because of chronic metabolic disease including diabetes, renal dysfunction, hemoglobinopathies, or immunosuppression including HIV infection).

- Pregnant women who will be in the second or third trimester of pregnancy during influenza season.

Tetanus

Tetanus continues to occur almost exclusively among individuals who are unvaccinated or inadequately vaccinated or whose vaccination histories are unknown. Serologic tests indicate naturally acquired immunity to tetanus toxin does not occur in the United States (CDC, 1991b). Therefore, the occupational health nurse needs to review tetanus immunization history during the preplacement examination. Surveillance ensuring boosters every 10 years can prevent this fatal disease from occurring. The population most at risk for developing tetanus is older adults, who may not have maintained regular immunizations during adulthood. Boosters are recommended following injury if the previous tetanus immunization was more than 5 years ago.

Tuberculosis

The CDC and the American Hospital Association conducted a survey of 729 medical institutions. They reported active TB in health care workers had occurred at 90 (13.1%) of the responding institutions (Rudnick, 1993). The OSHA estimates more than 5 million workers in the United States are exposed to TB in the course of their work in health care settings. Because active TB is endemic in both urban and rural areas of the United States, workers who come into contact with diseased individuals are at 10 times the risk of contracting the disease themselves, as compared to the general population. Until recently, a significant barrier to obtaining occupational data related to TB was the form used to report TB to the CDC did not collect occupational data. The OSHA recognized the significant work related component to the current epidemic, and issued specific guidelines for controlling TB. The CDC has published these guidelines in the *Morbidity and Mortality Weekly Reports* (CDC, 1988, 1997). Currently, OSHA is in the process of proposing a standard that would require employers to protect TB exposed employees (Occupational Exposure to TB, Department of Labor OSHA 29 C.F.R Part 1910 Page 54160).

The primary role of the occupational and environmental health nurse in preventing workplace exposure to TB is unique in its combination of education, disease prevention, early detection, and treatment to maximize a healthy work environment for health care workers (Doyle, 1995). The nurse organizes routine skin test surveillance with purified protein derivative (PPD) to rapidly identify exposure. Frequency of testing is based on risk of exposure. Health care workers with negative skin tests who work in high risk areas should undergo skin test surveillance every 3 to 6 months. In other areas, workers should be retested annually. The booster effect must be considered in conversions and can be eliminated by using two step testing protocols (Doyle, 1995). Isoniazid preventive therapy can be considered for all skin test positive health care workers at high risk for developing TB. These individuals include recent skin test converters and workers who are close contacts of TB clients and individuals with medical conditions such as diabetes, renal failure, or immunosuppression associated with therapy or disease (CDC, 1988, 1997). Tuberculosis skin testing, follow up of exposure incidents, skin test conversions, and removal and case tracking of employees with suspected or confirmed infectious TB are the responsibility of the occupational and environmental health nurse.

The occupational and environmental health nurse also should participate in the many areas of TB prevention. Because the nurse collects exposure data from health care workers, which identifies high hazard procedures, important contributions can be made to the written exposure control plan. Based on data collected from worker interviews, nurses may suggest interventions to eliminate or minimize incidents. Training and education in the use of personal protective equipment is another area in which nurses can add expertise. As a member of the health and safety team, the nurse provides unique surveillance during walkthroughs, inspecting for adherence to OSHA standards.

Latex

An epidemic of latex allergy is plaguing health care workers. The prevalence of latex allergy among health care workers is between 7% and 10%, with atopic workers at even greater risk. It is estimated 8% to 12% of health care workers are latex sensitive (Lipscomb, 1997). Between 1988 and 1992, the Food and Drug Administration received more than 1,000 reports of adverse health effects from exposure to latex, including 15 deaths due to such exposure (OSHA, 1999). Natural rubber latex, derived from the sap of rubber trees, contains proteins that can cause allergies. The powder sprinkled by manufacturers inside the gloves helps them slip easily onto hands and absorbs those proteins. When the gloves are snapped on or off, the powder is aerosolized for workers to inhale (OSHA, 1999). Manifestations of this exposure range from Type IV delayed hypersensitivity to rubber additives, which presents as contact dermatitis, to Type I immunologic responses to residual proteins in gloves and other medical devices (Lipscomb, 1997). In 1997, NIOSH released an Alert document requesting assistance in preventing allergic reactions to natural rubber latex in the workplace, and recommending measures to control exposure (Lipscomb, 1997). Guidelines from the American Academy of Allergy, Asthma, and Immunology (AAAI) (1993) recommend clients with hand dermatitis and exposure to latex be evaluated with a health history review and clinical testing. The AAAI developed a questionnaire to assist in the evaluation of rashes and possible latex reaction (Gliniecki, 1998). The nurse can conduct latex allergy surveillance by administering the questionnaire. If responses indicate sensitivity or allergy, a blood test is ordered to provide additional information. Some hospitals are deciding to become latex free and find the cost of doing so is offset by what they would have spent on indemnity. The nurse should track trends in the workplace, conduct a cost benefit analysis, and make recommendations for the worksite.

Table 1 summarizes preplacement surveillance for health care workers.

Anesthetic Gases

Possible adverse effects of anesthetic agents include hepatotoxicity; reproductive hazards; and perceptual, cognitive, and motor skill impairment. Health surveillance for workers exposed to anesthetic gases includes liver function testing. Safe work practices and proper use and maintenance of mandated anesthetic gas scavenging systems reduces potential for exposure (ACOEM, 1998).

Hazardous Drugs

Many pharmaceutical agents have been reported to be carcinogenic, mutagenic, or teratogenic in animal studies and limited human studies. Studies of occupational exposures have shown detectable levels of antineoplastic and other drugs, such as pentamidine and ribavirin, in the air of hospital pharmacies without ventilation hoods, and in client rooms without environmental control measures. Nurses and pharmacists are particularly susceptible to exposure to antineoplastic agents. Education and strict adherence to effective techniques are necessary to limit exposure. Health care workers involved with the preparation and administration of antineoplastics should be included in medical monitoring programs focusing on hematologic and reproductive systems (ACOEM, 1998).

Ethylene Oxide

Ethylene oxide is a colorless gas used to sterilize temperature sensitive medical instruments. The OSHA requires surveillance for health care workers exposed at or above the action level of .5 parts per million for an 8 hour time weighted average for 30 days or more per year. The standard recommends a chest x-ray every 5 years, pulmonary function tests every 3 years, and an annual evaluation of cardiovascular function (McDiarmid, 1996). Surveillance of this carcinogen should focus on the hematopoietic, reproductive, renal, and nervous systems. Exposure risk areas include autopsy rooms, pathology laboratories, dialysis units, and endoscopy and surgical facilities (ACOEM, 1998).

Formaldehyde

Formaldehyde is an OSHA regulated chemical used as a fixative in pathology and anatomy laboratories, and as a sterilant, especially in renal dialysis units. Health surveillance mandated by the standards requires implementation for all workers exposed at or above the action level (.5 parts per million per 8 hour time weighted average) or above the short term exposure limit (2 parts per million for 15 minutes). Mandated surveillance includes a questionnaire eliciting information about occupational exposures and a smoking and health history, especially allergies and symptoms of pulmonary or skin disease. Examinations are to be performed prior to exposure, annually in those who will use respirators and as needed based on the responses on the questionnaire (McDiarmid, 1996).

TABLE 1
Baseline Health Surveillance at Preplacement

Assessment Goals	Differentials
Determine disease	Tuberculosis
Determine immunity	Hepatitis B, measles, mumps, rubella, and varicella
Determine allergy	Latex allergy questionnaire

Glutaraldehyde

Glutaraldehyde is a commonly used solution for cold sterilization. Absorption may occur by inhalation, dermal contact, or ingestion. Personal protective equipment and ventilation help prevent exposure to workers (ACOEM, 1998).

Radiation

Radiation exposure to health care workers results from two main sources including the scatter from x-ray beams and beta or gamma emissions from clients who are treated with therapeutic implants or undergo nuclear medicine studies (McDiarmid, 1996). Ionizing radiation has cumulative detrimental effects to all living tissue, including fetal tissue. Nonionizing radiation poses thermal and light hazards to skin and eyes. Personnel dosimeters are required for anyone working with high energy beta or gamma emitters and in places in which it is likely for an individual to receive greater than 10% of the applicable dose limits in a year. Dosimeters are distributed and collected on a quarterly basis. The dosimeter (worn as a badge) must be worn when working with radioisotopes. Finger dosimeters are available for those who expect the hands to receive an appreciable radiation dose (Radiation Safety Office, 1999). The OSHA standard for ionizing radiation does not discuss health surveillance, but it does mandate limits for radiation exposure. Prevention includes proper maintenance of radiation equipment, protective equipment in the form of leaded aprons, and monitoring with dosimeters (McDiarmid, 1996).

Lasers

Lasers, a type of electromagnetic radiation increasingly used in health care settings, pose a risk of tissue trauma. The OSHA is developing a hazard information bulletin about surgical smoke to warn workers of the dangers of smoke plume exposure associated with use of lasers and electrosurgical devices in the operating room. The NIOSH released an alert about smoke plume exposure which is associated with headaches and nausea and

TABLE 2

OSHA Information Affecting Health Care Workers

OSHA Standards
Formaldehyde
Ethylene oxide
Bloodborne Pathogens
Occupational Exposures to Hazardous Chemicals in Laboratories
Respiratory Protection
OSHA Guidelines
Safe Handling of Anticancer or Cytotoxic Drugs
Hazardous Drugs
Hazard Communication Standard
Hazardous waste
Violence
OSHA Compliance Directive
Tuberculosis inspections

has carcinogenic effects in high doses. A draft document was circulated in 1998, but it is unclear when OSHA will publish the document (AAOHN, 1999). American National Standards Institute *Standard Z136.3* (1986) addresses a number of safety and specific medical issues pertinent to laser use. A thorough baseline ophthalmologic history and screening examination is crucial to implementation of a good program (ACOEM, 1998). Table 2 provides a summary of OSHA information affecting health care workers.

TAKING CARE OF ALL HEALTH CARE WORKERS

Comprehensive occupational health services should be available to all health care workers including those who work offsite, those who provide home care services, and night shift workers. Occupational and environmental health nurses rapidly are becoming responsible for the care of workers in satellite clinics affiliated with larger health care organizations. Special attention is needed for the health and safety concerns of workers of childbearing age, and those who extend their careers past the traditional age of retirement. Another challenge for the nurse is maintaining contact with health care workers assigned to more than one location in an organization. With technological advances, many health care workers may be working from their homes. To maintain health surveillance as recommended, the nurse needs to have access to computerized records detailing an employee's job responsibilities and means of contact. Management plays a key role in keeping information accurate and supporting the nurse's surveillance schedule to protect the health of the workers.

IN SUMMARY

Health Surveillance for Health Care Workers

A Vital Role for the Occupational and Environmental Health Nurse

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1. Health surveillance for the general health care worker includes surveillance for immunity to infectious diseases such as measles, mumps, rubella, varicella, and hepatitis B.
2. Post exposure surveillance for bloodborne pathogens includes HIV, hepatitis B, and hepatitis C.
3. Periodic surveillance of specialty practice areas as mandated by OSHA include workers exposed to lasers, radiation, formaldehyde, ethylene oxide, hazardous drugs, anesthetic gases, and tuberculosis.

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