

NEEDLE-STICK INJURIES

An Occupational Health Hazard for Nurses

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ABSTRACT

Needle-stick injuries are a potentially dangerous occupational health hazard to nurses. The diseases that can be transmitted through these injuries are numerous and can be serious and even fatal. Studies have shown that needle-stick injuries are common occurrences among nurses, yet they continue to happen and nurses frequently fail to report them. Implications for occupational health nurses and preventive measures are discussed.

INTRODUCTION

Hospital occupational illness and injury has recently been the focus of concern for many researchers at health care institutions (Lewy, 1981; Wilkinson, 1984). For years manufacturing and other industry administrators have maintained occupational and employee health programs. However, the National Institute of Occupational Safety and Health (NIOSH,

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1975) reported only 8% of hospitals had these programs. Within the past few years hospital administrators have realized that the health of their employees is a valuable resource which needs to be protected. Hospital employees are exposed to numerous hazards within their work setting. Recently, researchers have responded to these problems by identifying the risks prevalent in various areas and, with occupational health nurses, have designed employee health programs that might reduce these risks. Occupational health problems that can affect hospital personnel include physical, chemical, biological, and psycho-

logical hazards that are controlled with varying degrees of effectiveness. Of particular concern are the potential exposures to a variety of infections due to needle-stick injuries sustained by hospital personnel in the course of normal practice.

BACKGROUND

The health service industry is the third largest and one of the most rapidly growing employer groups in the United States. It is estimated that this workforce includes close to six million workers (Bureau of Labor Statistics, 1985). In 1983, hospitals alone employed over three million workers; over two million of these were women (Handbook of Labor Statistics, 1980).

Hospitals have lagged behind industry in providing occupational health and safety programs to their employees. This is evident in the injury and illness rates of the health service industry when compared to other service industries. Illness and injury and lost workdays in the health services industry total 38.8% and 40%, respectively, of the combined rates for all other service industries (Bureau of Labor Statistics, 1980). Data from the Bureau of Labor Statistics (BLS) show that from 1958 through 1970, the injury frequency rate for medical and other health services increased from

8.1/100 in 1958, to 9.3/100 in 1970, a 14.8% increase. In addition to the health service industry statistics, the NIOSH (1975) report showed that public hospitals had an injury frequency rate of 21.4 by 1970 which exceeded the 15.2 rate of manufacturing industries for the same year (NIOSH, 1975).

While sprains and strains are the most costly injuries both to the employee and the hospital administration (Washington State Department of Labor and Industries, 1982), puncture wounds are by far the most frequent and can be no less serious or even fatal. Puncture wounds were identified in the NIOSH (1976) report as the leading type of occupational injury among the hospitals surveyed. The magnitude of needle-stick injuries in hospital employees is further compounded by the fact that the majority of this type of injury is managed within the hospital as "first-aid" type injuries. They are neither reportable to the Department of Labor Statistics, nor do many of them result in lost time from work. Further masking of the magnitude of the problem of needle-stick injuries may be that many of these injuries are being underreported by hospital personnel (Hamory, 1983; Timianka, 1979).

The United States Department of Health and Human Services reports 1,400,200 registered nurses employed in this country, with 835,674 of these registered nurses employed in hospitals (Todd, 1985). The largest group of hospital employees suffering needle-stick injuries are those in nursing services, the largest single employee group in hospitals (American Nurses' Association, 1984). Of that group, registered nurses have the highest incidence of needle sticks and puncture wounds since they administer virtually all injections and intravenous therapy (Osterman, 1975). Hospitals, perhaps by virtue of their function of supplying health care to patients, have been considered, in the past, clean and safe places in which to work. It is now widely recognized that hospitals are hazardous environments in which to work (Wilkinson, 1984).

The American Nurses' Association reports that 96.1% of registered nurses are female, many of whom are of child bearing age (American Nurses' Association, 1984). The exposure to infectious diseases from needle-stick injuries can have potentially devastating teratogenic effects on a developing fetus if the nurse is pregnant or becomes pregnant during the course of an infectious disease. The NIOSH study reported less than 40% of

the hospitals surveyed required early reporting of pregnancy, and less than 15% reassigned pregnant workers to safer working conditions (NIOSH VI, 1975).

The trend in health care administration in hospitals is moving toward admitting the more seriously ill patients, while the less seriously ill are being managed on an outpatient basis or by private physician practices. In addition, hospital stays are shorter and patients are being discharged earlier than has been practiced in the past. The care nurses are now required to give demands a higher level of acuity, more vigorous management, and more advanced technology. For these reasons it can be expected that nurses will be exposed to more, rather than fewer risks of accidental needle-stick injuries in the future.

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A review of the health care literature reveals little evidence of programs within hospitals aimed at the prevention of hospital acquired infections from needle-stick injuries. While the potential seriousness of these injuries is acknowledged by administrators of health care institutions, little has been done to control the problem. Ironically, the majority of needle-stick injuries are preventable. Still they occur, and nurses frequently fail to report them (Hamory, 1983; Temianka, 1979). Why these preventable injuries continue to occur is puzzling.

A wide variety of diseases are known to be transmitted through blood products. Since nurses are in frequent contact with blood products, they may be at high risk for acquiring these diseases. In addition, many patients are admitted to hospitals with misdiagnosed or undiagnosed diseases. Frequently, these patients are admitted for other problems and asymptomatic blood borne diseases may go completely

undetected. Activities related to needle-stick injuries include improperly disposing of needles into penetrable receptacles, recapping of needles, administering medications, drawing blood samples (Ruben, Norden, Rockwell, & Hruska, 1983), clean up of procedure trays, and needles being improperly handled by other employees (Jacobson, Burke, & Conti, 1983).

HEPATITIS EXPOSURE

The major concern among hospital employees, particularly nurses, is exposure to hepatitis B and non-A/non-B hepatitis infections and, more recently, Acquired Immune Deficiency Syndrome (AIDS). Hepatitis B is the most pervasive and common transmissible diseases within the hospital setting. For several decades the hepatitis B virus has been considered a formidable hazard to hospital personnel. Since the 1950s the use of blood and its derivatives has steadily increased, further magnifying the potential exposure to this disease (Schneider, 1979). Hepatitis B infection, formerly called "serum hepatitis," can be transmitted through blood transfusions and needle puncture wounds. Non-A/non-B hepatitis is also associated with blood products and blood transfusions. Hepatitis A is usually transmitted through enteric secretions, and hepatitis B through parenteral transmission. Either disease can be transmitted by both routes; however, tests for hepatitis B antigen in the blood identifies only 20% to 50% of infected blood and fails to identify Hepatitis A altogether (Statement on hepatitis B antigen carriers, 1974).

ACQUIRED IMMUNE DEFICIENCY SYNDROME (AIDS) EXPOSURE

While it is well known that hepatitis B is a major hazard to hospital personnel, there is increasing fear of the transmission of AIDS by the same routes. Those patients at risk for hepatitis B infection closely correspond to those at risk for manifesting AIDS, e.g., intravenous drug abusers, homosexuals, hemophilia patients, and transfusion recipients (Hirsch, Wormser, Schooley, et al., 1985; Rhame, 1984).

Scientists now know that a virus (HTLV-III/LAV) is the cause of AIDS. The disease itself is not transmissible but the virus is. It is the virus that predisposes individuals to the development of AIDS. The Center for Disease Control estimates that approximately two million people in the United States are infected with the

virus. However, not all of those infected will be diagnosed as having AIDS ("AIDS: Meeting the Challenge," 1986). AIDS is transmitted predominantly by two routes: sexual contact and blood products. It is not known to be transmissible by casual contact. Because health care workers may be inadvertently exposed to the blood of AIDS patients, particular care should be taken in handling needles used on these patients. This is especially true in light of the fact that there are two documented cases of the AIDS virus having been transmitted through accidental needle-stick injuries (*Morbidity and Mortality Weekly Report*, 1985).

While the risk of acquiring AIDS and hepatitis may incite fear in the minds of hospital personnel handling secretions from these patients or caring for them, other less common diseases have been documented as being transmitted through percutaneous inoculation. Although many of the diseases are curable, some have very long latency periods and are incurable.

MALARIA

In 1971, 57 cases of malaria were acquired in the United States. Of those cases, nine were acquired through blood transfusions, 46 were needle induced in narcotic addicts who shared syringes, and one case occurred in a medical student who accidentally pricked himself with a needle contaminated with blood from a Vietnam veteran with fatal malaria (Cannon, Walker, & Dismukes, 1972).

ROCKY MOUNTAIN SPOTTED FEVER

Rocky Mountain spotted fever, a fatal disease if left untreated, has been reported to have developed in a physician who accidentally stuck himself with a needle contaminated with the blood of a farmer who later died of the disease (Sexton, Gallis, McRae, & Cate, 1975).

TUBERCULOSIS

Historically, tuberculosis has been one of the most common threats to hospital personnel. While the major route of the spread of tuberculosis has been by airborne droplet nuclei, it has also been shown to be acquired through the accidental needle-stick injuries (Sahn & Pierson, 1974). Since the advent of effective medication against the disease, the incidence and prevalence of tuberculosis in the general population has declined. This relaxed attitude about the

disease may result in untreated and undiagnosed tuberculosis in some hospitalized patients. Frequently these patients are admitted to hospitals for other reasons and not diagnosed for several days, after which the care giver may already have been exposed.

HERPES SIMPLEX

Herpes simplex infection is no less of a concern to hospital physicians and nurses. Hambrick (1962) described six cases of primary herpes simplex of the fingers (herpetic whitlow) acquired by two surgical residents and four student nurses attributable to lacerations and needle puncture wounds. The sources of the infection were from respiratory secretions of four surgical patients without clinical evidence of herpes infection. Because herpes virus is not always

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clinically apparent, trivial trauma such as needle-stick injury or miniscule breaks in the skin can be a portal of entry for the disease to the unsuspecting victim.

CREUTZFELD-JAKOB DISEASE

Of growing concern among health care personnel is a little known and not well understood viral organism called Creutzfeld-Jakob disease. This disease manifests itself in a mid-life presenile dementia. It affects men and women equally and culminates in death within two years. The organism resists destruction by normal means of inactivation. It has been seen in combination with other neurological diseases including multiple sclerosis, vasculitis, hepatocellular degeneration, post-traumatic syndrome, cerebrovascular accidents and Alzheimer's disease. It is postulated that a probable portal of entry is a break in the body's integumentary system (Gajdusek, Gibbs, Asher et al, 1977). Further study of known cases of Creutzfeld-Jakob disease by

Gajdusek, et al. (1977) suggested a possible incubation period of between 15 months to several decades. These frightening revelations have prompted some hospitals and nursing homes to deny admission to patients suspected of having the disease. Further, some anesthesiologists, surgeons, and pathologists have refused to participate in surgical procedures, biopsies, and autopsies of these patients.

TETANUS AND SYPHILIS

The list of diseases that are capable of being transmitted through needle-stick injuries is by no means exhaustive. Tetanus and syphilis have been identified as being transmissible through needle-stick injuries. In addition, the possibility of infection from acid-fast, fungal, and protozoan organisms should not be overlooked, especially when the source of the needle-stick is from an immunosuppressed patient (Temianka, 1979).

FREQUENCY RATES OF NEEDLE-STICK INJURIES

In the reports of published studies that addressed the frequency rates of needle-stick injuries among hospital personnel, striking differences were observed in results and so were the methods of obtaining the data. Reed, Anderson and Hodges (1980) in a one-year prospective study reported an incidence rate of 7.5/100 employee years worked among those at risk. Two thirds of the classifiable incidents among nursing personnel were due to carelessness; hypodermic needles accounted for 58% of the injuries, and one third occurred on medical wards.

McCormick and Maki (1981) reported an annual incidence rate for needle-stick injuries of 9.3/100 nurses based on 286 reported sticks over a 47-month period. In their study registered nurses reported 45.3% of the injuries and 79.4% occurred on patient care units. Over 56% of the injuries occurred while disposing of used needles, administering injections or infusions, and recapping used needles.

Jacobson, et al. (1980) report an annual incidence rate of 9.6 per 100-bed year. Nursing personnel accounted for 68.8% of the injuries that were attributed to personal carelessness.

Ruben and his associates, in a prospective study over a four-year period, reported an average annual incidence rate of 16 wounds per 100 persons in a 450-bed hospital. Of the 579 incidents

Steps, Both Environmental and Personal, That the OHN Can Take Toward Reducing Needle-Stick Exposures

1. Review incidence reports to determine the frequency and incidence of needle-stick injuries;
2. Encourage the reporting of all accidental puncture wounds so that appropriate prophylactic measures can be taken;
3. Conduct studies to determine the causes of needle-stick injuries (i.e., recapping, disposing, etc.);
4. Identify those nursing units which may be high risk areas;
5. Evaluate present methods of needle disposal;
6. Investigate alternative methods of needle disposal that are being used at other institutions;
7. Re-evaluate present policy of needle use and disposal;
8. Conduct ongoing education programs warning of the hazards of needle-stick injuries and of precautions that can be taken to avert the injuries.

reported, nurses were involved in 66% of the injuries with an average annual rate of 23 per 100 nurses (Ruben et al., 1983).

In a survey of 1429 employees in a 390-bed hospital, who were considered to be in high risk areas, Hamory (1983) found that 10.5% suffered a puncture wound within a three-month period, for an annual rate of 42 per 100 employee years. Nursing services led the list of puncture wounds with 65% of the total.

More alarming findings were reported by Neuberger, Harris, Kundin, Bischone, and Chin (1984). In a 29-month retrospective study on needle-stick injuries in a major university teaching hospital they found an average annual incidence rate of 12.4/100 registered nurses. The investigation was conducted using workers' compensation reports and included only needle-stick injuries resulting from hypodermic needles which had previously been used on a patient or had

been discarded in patient care areas. Puncture wounds from sterile needles and other sharp objects were excluded from the study.

While reported studies on needle-stick injuries differ in their findings, some estimates of the magnitude of the problem can be conservatively postulated from the review of the literature. Assuming an annual incidence rate for puncture wounds of 9.5 per 100 employees, with 60% of the injuries occurring in nurses, and 75% involving needles ($9.5/100 \times 0.60 \times 0.75$), it can be estimated that the annual incidence rate for nurses who accidentally incur a needle stick injury will be 4.27 per 100 nurses. Multiplying that figure times the 835,647 nurses employed in hospitals ($4.27 \times 835,647$), and the 1,404,200 total employed nurses ($4.27 \times 1,404,200$), it can be conservatively estimated that between nearly 36,000 to 60,000 injuries from needle sticks will occur in nurses during

a one year period. Adding to that figure the 40% non-reporting rate identified by Hamory (1983), the figures escalate to between 50,000 and 84,000 needle-stick injuries per year among United States nurses.

IMPLICATIONS FOR OCCUPATIONAL HEALTH NURSES

Occupational health nurses who work in health care institutions and hospital administrators need to be aware of the potential diseases that can result from the seemingly insignificant needle-stick. The best defense against needle-stick injuries is prevention. The OHN is in a key position to present management with documented data on needle-stick injuries so that vigorous efforts can be made to minimize the number of this type of injury. Nurses themselves need to be reminded of the possible consequences of accidental exposure to diseases that can be acquired through needle-stick injuries.

The OHN must develop a clear understanding of the problem of needle-stick injuries and of what motivates behavior change in order to develop and manage an effective injury prevention program. Unless the OHN has free rein over funds for program development, he or she has the responsibility to convince management that a preventive program is needed. Management then must exercise that responsibility by committing support and resources necessary for protecting nurses and other health care providers from exposures that can be potentially devastating.

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