SECTION EDITOR: SALLY L. LUSK, PhD, RN, FAAN

Postexposure Prophylaxis for HIV Exposed Health Care Workers

A significant number of workers (more than 8 million) are employed in hospitals and other health care settings. The National Institute for Occupational Safety and Health (NIOSH) (1999) estimates 600,000 to 800,000 needlestick injuries occur each year in the United States. Approximately half of these are unreported. Data from a University of Virginia database, EPINet, obtained from a number of hospitals, suggest a rate of 30 worker needlestick injuries per 100 beds per year (EPINet, 1999).

Exposures to bloodborne pathogens through needlestick injuries may cause infection. The most serious of these are hepatitis B virus (HBV), Human Immunodeficiency Virus (HIV), and hepatitis C virus (HCV). These potentially life threatening infections are preventable.

A needlestick injury also causes considerable emotional distress for health care workers, their colleagues, and their families, even if no infection occurs (NIOSH, 1999). Counseling may be required to cope with these stress reactions (Armstrong, 1995).

Obviously, prevention of these injuries is the number one goal, and attention has been directed to promoting use of less hazardous needles. The recently published *NIOSH Alert: Preventing Needlestick Injuries in Health Care Settings* (1999) contains many suggestions for prevention and a section to use as a poster or as copies to distribute to workers. Occupational and environmental health nurses responsible for health care workers are encouraged to download this Alert from the website (http://www.cdc.gov/niosh/2000-108.html) and use it as a guide for prevention programs.

However, even by following the recommendations in the Alert, accidental injuries still will occur, and plans for management of workers exposed to HIV must be in place (McClinsey, 1999). Treatment following these injuries is the focus of the research studies reviewed in this column. The CDC issued guidelines related to postexposure prophylaxis (PEP) with antiretroviral drugs (CDC, 1996). Efficacy of the treatments is assessed in the two reports reviewed here, providing information critical to designing postexposure treatment programs.

Dr. Robbins has critically reviewed these studies and, based on the results and her extensive knowledge of the field, identified implications for practice. Occupational and environmental health nurses responsible for programs related to the health and safety of health care workers will be aided by use of her suggestions and by the NIOSH Alert (1999).

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BACKGROUND

The Centers for Disease Control and Prevention (CDC) report a total of 55 definite and an additional 136 possible cases of occupationally acquired HIV infection in the United States (CDC, 1996). These cases are a serious reminder of the risk for health care workers in the United States.

A CASE CONTROL STUDY OF HIV SEROCONVERSION IN HEALTH CARE WORKERS AFTER PERCUTANEOUS EXPOSURE (CARDO, 1997)

Synopsis

Cardo (1997) conducted a case control analysis using data collected from health care workers exposed to HIV in the workplace during the time period from 1987 through August 1994. The objective of the study was to determine risk factors for transmission of HIV to health care workers after percutaneous exposure to HIV infected blood. In addition, the study examined the efficacy of postexposure prophylaxis (PEP) with antiretroviral drugs.

A total of 33 cases were included in this analysis. Cases were identified through reports to national surveillance systems for occupationally acquired HIV infection operated by the CDC. This was in cooperation with state and local laboratories and health departments in the United States, France, the United Kingdom, and Italy. A total of 665 controls were identified from a multitude of institutions in the United States through a passive, voluntary, CDC surveillance project started in 1983 called the CDC Needlestick Study.

Health care worker data used in the analysis included age, gender, occupation, work location, and use of antiretrovirals postexposure. Information on the source patient included the stage of HIV disease at the time of the health care worker's exposure, use of antiretroviral drugs, and whether the source patient was still alive within 2 months of the health care worker's exposure. Information also was collected on the injury including type of device involved, type of procedure performed, urgency of the procedure, use of gloves, visible blood, and type of wound.

Findings from logistic regression modeling identified several risk factors associated with HIV transmission including deep injury, injury involving devices visibly contaminated with blood, needles placed in the source patient's vein or artery, and terminal illness of the source patient. For the analysis of efficacy of PEP, the researchers found after controlling for the risk factors noted above, the odds of HIV infection among health care workers who used zidovudine PEP were reduced by approximately 81% (95% confidence interval for reduction of 48% to 94%).

Critique

Several limitations were found in this study. First, the number of cases (i.e., health care workers who seroconverted following a worksite HIV exposure) was small. Second, the use of a case control study design to evaluate drug efficacy is not optimal. It has been argued the more optimal placebo controlled design to answer the PEP efficacy question would require prohibitively large numbers of occupationally exposed health care workers in each group (because of the low seroconversion rate following occupational HIV exposure) and so cannot be done. Additional limitations are that case data were collected retrospectively (i.e., following seroconversion) from review of incident reports and various other records (e.g., medical records), whereas data on controls were collected prospectively, using standardized protocols developed for the CDC Needlestick Study discussed earlier. Therefore, data for controls were collected close to the time of needlestick injury and before knowledge of seroconversion outcome. However, data for cases were collected historically after seroconversion already had occurred.

Strengths of the study include strong effect measures and data consistent with the understanding of the mechanism by which antiretrovirals inhibit early HIV replication, minimize viral load, reduce perinatal transmission of HIV, and prolong time to AIDS development in HIV infected individuals (D'Amico, 1999; Sperling, 1996). In part on the basis of this study, the Public Health Service and International AIDS Society recommended PEP for health care workers following certain types of high risk occupational exposures.

DURATION OF TIME BETWEEN EXPOSURE AND SEROCONVERSION IN HEALTH CARE WORKERS WITH OCCUPATIONALLY ACQUIRED INFECTION WITH HIV (CIESIELSKI, 1997)

Synopsis

In this descriptive study, Ciesielski (1997) reported on the time to seroconversion in health care workers exposed to HIV in the workplace, including the potential of postexposure prophylaxis (PEP) to delay the antibody response. The researchers

used data reported to the CDC through December 1994 on 41 health care workers known to have occupationally acquired HIV. To be included in this study, each health care worker had to have a serum specimen negative for HIV antibodies up to 1 year before or 1 month after the occupational exposure event and a subsequent positive antibody test within 1 year following the workplace exposure. Of the 41 health care workers who met these criteria and were included in the study, 38 (93%) had been exposed to HIV infected blood.

A total of 31 (76%) of the health care workers tested positive for HIV antibodies within 6 months after occupational exposure. Four of the total 41 health care workers took postexposure zidovudine. The four who took zidovudine reported acute retroviral syndromes within 6 weeks of exposure and HIV seroconversion by 6 months. Not all health care workers experienced retroviral syndrome prior to seroconversion. One health care worker did not test positive for antibodies until 9.5 months postexposure. DNA sequence analysis of the virus confirmed the original exposure event. This health care worker was simultaneously infected with hepatitis C virus from the same source patient and experienced a prolonged seroconversion period for HCV antibody as well. The researchers suggested this particular study subject may have had an unknown immune defect or that an HIV/HCV interaction may have occurred.

Critique

Limitations to this descriptive study relate to the use of retrospective data. First, the researchers reported that many study participants did not have follow up blood testing at regular intervals, and therefore, it was difficult to evaluate precisely the time to seroconversion using the recorded data. Second, during the study time frame, three generations of HIV antibody tests were used, each with a different sensitivity. Third generation antibody tests allow detection as early as 2 weeks after infection, much sooner than the first and second generation antibody tests used in the early part of this historical data set. In spite of this, the finding of demonstrable antibodies in serum of the majority of health care workers within 6 months following workplace exposure is consistent with previous studies documenting seroconversion by 6 months in 95% of HIV infected individuals with nonworkplace related infections (Busch, 1997).

Implications for Occupational and Environmental Health Nurses

The two studies reviewed in this column provide data with important implications for occupational health nursing practice in the area of care for health care workers exposed to HIV:

- Postexposure prophylaxis has been shown to decrease the risk of HIV infection. The Public Health Service has published detailed recommendations for use of PEP following workplace exposures to HIV (CDC, 1996).
- Postexposure prophylaxis does not delay HIV antibody detection in health care workers destined to develop infection. Therefore, the current Public Health Service recommendations for duration of follow up and client education related to potential transmission seem valid.
- Although PEP appears protective, this protection is not absolute and zidovudine PEP failures have been reported.
- Most of the current data were collected prior to widespread use of the newer combination therapies for PEP. Therefore, occupational health nurses need to be diligent in monitoring the safety, tolerability, and effectiveness of the newer combined regimens of PEP.
- The CDC elected to close the HIV Postexposure Prophylaxis Registry, and therefore, it is very important for occupational health nurses to maintain accurate, comprehensive records on HIV workplace exposures. In the absence of a national registry, these records serve as data sources for future research to inform practice.

In addition, the CDC decision to close the HIV Postexposure Prophylaxis Registry means nurses in the workplace need to search out and review data from smaller studies for use in decision making. Smaller studies generally have less power to detect significant differences, but can be informative. An example is the work by D'Amico (1999) in which effects of zidovudine PEP on the development of HIV cytotoxic T lymphocyte responses in 20 HIV exposed health care workers and 20 controls are described. All of this emphasizes the significant role occupational and environmental health nurses have in the protection and care of the approximately 2 million health care workers in the United States considered at risk for bloodborne exposures to HIV.

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by Wendie A. Robbins, PhD

CE Answers

Returning to Work Through Job Accommodation: A Case Study

March 1999

1. D	6. A
2. B	7. C
3. C	8. B
4. A	9. C
5. D	10. A

NOTE TO READERS: CLARIFICATION

The article titled, "Ergonomics: CTD Management Evaluation Tool," in the January 2000 issue of the *AAOHN Journal* (Vol. 48, No. 1, pp. 17-24) describes a tool developed within the Occupational Safety and Health Administration. The Agency considers the CTD Management Evaluation Tool an internal draft document and, therefore, copies are not available to the public as offered in the article.