What happens during a NIOSH HHE of an oncology clinic?

A National Institute for Occupational Safety and Health team walks nurses through a health hazard evaluation and explains its recommendations.

Engineering and administrative controls are effective ways to reduce exposure or shield employees from hazards.

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Although chemotherapy drugs can be lifesaving for patients with cancer, they can be toxic to nurses and other health care personnel who handle them. Nurses should protect themselves through the use of proper handling techniques. A regular review of safe chemotherapy drug handling practices and evaluation of the effectiveness of housekeeping can ensure the safety of patients and clinic employees. The National Institute for Occupational Safety and Health (NIOSH), a part of the Centers for Disease Control and Prevention (CDC), investigates possible workplace health hazards by conducting a health hazard evaluation (HHE). Employees, employers, or union representatives can request an HHE of their workplace to investigate health and safety concerns.

The NIOSH team contacts the requestor and discusses the problems and possible solutions. This discussion may result in NIOSH sending the requestor information, referring the requestor to a more appropriate agency, or making a site visit (which may include environmental sampling and medical testing). If NIOSH makes a site visit, the clinic receives a report that includes recommendations specific to the issues identified in the site visit, as well as general guidance for following good occupational health practices.

As an oncology nurse, you may be exposed to chemotherapy drugs through direct skin contact, skin absorption, a needlestick or sharps injury,

unintentional ingestion from hand-to-mouth contact, or inhalation.[1,2] Inhalation and skin exposure can occur during preparation, administration, or disposal of chemotherapy drugs, or by touching contaminated surfaces. Workplace exposures to chemotherapy drugs may cause acute health effects including hair loss, headache, acute irritation, and/or hypersensitivity.[3,4] Studies have also found reproductive effects (eg, increased fetal loss, congenital malformations and abnormalities, low birth weight, infertility) resulting from workplace exposures to chemotherapy drugs.[5,6] Finally, an increased risk of genotoxic and carcinogenic effects has been demonstrated in health care workers, and the International Agency for Research on Cancer identified some chemotherapy drugs as group 1 carcinogens.[7-9] No occupational exposure limits are established for chemotherapy drugs, so reducing exposures as much as possible is extremely important (see **Occupational exposure limits**). Adhering to proper work practices will reduce your risk of adverse effects from workplace exposures to chemotherapy drugs.[10]

NIOSH was asked to evaluate an oncology clinic in Florida that employed 54 people. Clinic employees were concerned about potential exposures to chemotherapy drugs and potentially related health effects, such as upper respiratory symptoms, rash, diarrhea, and headache. In this article, the authors discuss their HHE of this clinic and their recommendations to the clinic to protect its employees and patients.

SITE VISITS

Our evaluation included two site visits to the oncology clinic. During the first visit, we measured the face velocity at the class 2 biological safety cabinet (BSC) in which chemotherapy drugs were mixed. The face velocity indicates airflow into the BSC from the workspace. Surface and hand wipe samples were collected and analyzed for total platinum (**Figure 1, Figure 2**). Platinum-containing chemotherapy drugs include cisplatin, oxaliplatin (Eloxatin, generics), carboplatin, and others. Fourteen employees (10 clinical staff members and 4 administrative staff members) were interviewed as part of our evaluation. In addition, we reviewed the Occupational Safety and Health Administration (OSHA) Form 300 Log of Work-Related Injuries and Illnesses from the previous 2 years.

At the second clinic visit, we collected surface wipe samples from locations similar to those analyzed in the first visit. Surface wipe samples were also collected to detect cyclophosphamide (Cytoxan, generics), ifosfamide (Ifex, generics), and doxorubicin (Doxil, generics) at the beginning of the workday (before the chemotherapy drugs were unpacked) and at the end of the workday (after the last chemotherapy treatment was completed and before nightly housekeeping) to evaluate the clinic's cleaning procedures and employee work practices.

EVALUATION RESULTS

Housekeeping services were provided by the hospital, which leased the space to the oncology clinic. Clinic employees and the employer expressed concerns that cleaning and chemotherapy drug waste disposal practices were inadequate. Most of the surface-wipe samples contained platinum, but two hand wipes collected from nurses who had recently handled these drugs had no platinum on the first clinic visit. Surface-wipe samples from locations throughout the clinic contained cyclophosphamide and ifosfamide, which suggests inadequate work practices and housekeeping. Cyclophosphamide was found in the checkout area, an area that should not have chemotherapy drug contamination. Furthermore, one sample location remained positive for cyclophosphamide for all 3 days of our second visit to the clinic, which suggests this drug was not being effectively removed in one cleaning. None of the surface-wipe samples detected doxorubicin; however, its recovery may have been poor because these samples had

Occupational exposure limits

National Institute for Occupational Safety and Health (NIOSH) investigators use both mandatory (legally enforceable) and recommended occupational exposure limits (OELs) to make their recommendations after evaluating a workplace for hazards posed by exposures. OELs are quantitative guidelines for chemical, physical, and biological agent exposure limits.

OELs were developed by federal agencies and safety and health organizations to prevent the occurrence of adverse health effects from workplace exposures. Generally, OELs suggest levels of exposure that most employees may experience for up to 10 hours per day, 40 hours per week, for a working lifetime, without experiencing adverse health effects.

Currently, no OELs have been established for the chemotherapy drugs for which NIOSH sampled at the Florida oncology clinic in the evaluation discussed in the accompanying article. All drugs should be evaluated individually based on the available evidence on their adverse health effects, carcinogenicity, teratogenicity, and other factors.

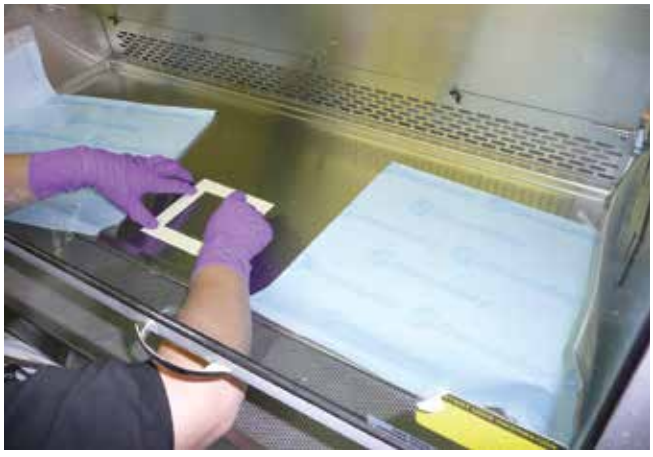

FIGURE 1. Obtaining a surface wipe sample from the biological safety cabinet

FIGURE 2. Obtaining a hand wipe sample from a clinic employee

been frozen for approximately 7 months awaiting development of an analytical method (Gregory A. Burr, CIH, e-mail communication, October 7, 2011).

Our inspection of the class 2 BSC indicated it was operating properly; it was certified annually. The average face velocity of the BSC met the CDC recommendation of at least 100 linear feet per minute.[11]

Four employees reported having runny nose, sneezing, eye irritation, or headache that improved on their days off work. One employee reported experiencing a recurring rash with a burning sensation on the nose after handling chemotherapy drug waste. Because upper respiratory symptoms are nonspecific and common in the general population, we cannot determine if these symptoms were associated with chemotherapy drug exposures. All employees who were interviewed reported they were adequately trained on how to safely prepare, administer, and dispose of chemotherapy drugs. However, a few employees reported inadequate training on potential short- and long-term health effects of chemotherapy drug exposure.

Clinic employees said they did not wear personal protective equipment (PPE) consistently. They wore double gloves, goggles, and chemotherapy-protective gowns when preparing chemotherapy drugs, but some employees did not always wear double gloves or chemotherapy-protective gowns when administering the drugs to patients. In addition, some employees voluntarily wore a filtering facepiece respirator or a surgical mask to avoid contaminating the chemotherapy drugs or to protect the patients; however, some of them reported using their surgical masks more than one time. We did not observe any activities during our evaluation that required using respiratory protection.

Due to inconsistent use of PPE and the presence of chemotherapy drug residue in the clinic, our HHE report concluded that clinic employees were at risk of acute and chronic health effects from exposure to chemotherapy drugs. Our recommendations included improving employee work practices and housekeeping, starting a medical surveillance program for employees, providing annual training, and requiring the use of appropriate PPE when handling chemotherapy drugs.

NIOSH RECOMMENDATIONS

Many of our recommendations for this oncology clinic can be utilized to reduce hazards at any workplace. The hierarchy of a controls approach groups actions by how effectively they reduce or remove hazards. The most effective way to reduce exposure or shield employees from hazards is to eliminate hazardous materials and processes or install engineering controls. Until such controls are in place, or if they are not effective or feasible, administrative measures and diligent use of PPE may be needed. Additional information on preventing occupational exposure to antineoplastic and other hazardous drugs in health care settings is available at www.cdc.gov/niosh/docs/2004-165/.[10]

As a result of the HHE of this oncology clinic, our report included the following recommendations to improve the health and safety of employees handling chemotherapy drugs.

Engineering controls

- Carry chemotherapy drug bags and related equipment to the administration area in a sealed plastic bin to prevent spills and minimize contact with potentially contaminated surfaces. Clean the plastic bin after each use.
- Place a physical indicator (or sign) on the biological safety cabinet to identify the proper sash height to ensure that

airflow into the hood is at least 100 linear feet per minute. The physical indicator would also serve as another way to identify the proper sash height in the event that the BSC sash alarm is malfunctioning.

Administrative controls

- Organize a health and safety committee that includes managers and employees to routinely discuss health and safety concerns.
- Initiate a medical surveillance program and provide annual training for employees who handle chemotherapy drugs, including waste disposal.
- Review cleaning procedures with employees. Dispose of chemotherapy drugs and disposable administration equipment in approved chemotherapy waste bags. Clean up chemotherapy drug spills quickly using the proper spill kit. Test kits using fluorescein dye can be used to assess the techniques of clinic employees who prepare, handle, or clean up chemotherapy drugs.
- Instruct employees and cleaning staff to clean work surfaces after chemotherapy drugs are used, and at the end of each day. Establish janitorial policies and procedures for each clinic area where chemotherapy drugs are handled, and clearly communicate these policies and procedures with the cleaning contractor.
- Observe employee and patient activities in the checkout area to determine where chemotherapy drug cross-contamination may occur.
- Clean BSCs with a deactivating agent and disinfectant at the beginning and end of each work shift, before and after each activity, and after spills. The American Society of Health-System Pharmacists notes that strong oxidizing agents such as sodium hypochlorite solution may effectively deactivate many chemotherapy drugs.[12] Use a thiosulfate-based solution after cleaning with sodium hypochlorite to neutralize its corrosive effect to surfaces. US Pharmacopeia and National Formulary guidelines require a final cleaning with a residue-free disinfecting agent, such as sterile 70% isopropyl alcohol.[13]
- Report workplace safety or health concerns to your supervisor. Follow up with a health care provider who is knowledgeable about occupational diseases.
- Do not consume food or beverages in work areas where chemotherapy drugs are handled.

Personal protective equipment

- Wear a chemotherapy-protective gown, goggles, and double chemotherapy-protective gloves when preparing and administering chemotherapy drugs.
- Gloves should be tested and certified for use when handling chemotherapy drugs by the American Society for Testing and Materials and labeled as chemotherapy gloves.[14] Nonlatex chemotherapy protective gloves are preferred because of the risk for latex sensitivity. Gloves should be changed every 30 minutes or when torn, punctured, or contaminated. Wash your hands immediately after removing the gloves.
- Protective gowns should be disposable and made of polyethylene-coated polypropylene (nonlinting and nonabsorbent) or other laminate materials. Gowns should have a closed front, long sleeves, and elastic or knit closed cuffs. Dispose of gowns after each use.
- Wear eye and face protection whenever there is the potential for chemotherapy drugs to splash in the face or eyes.
- If respirators are worn voluntarily, follow the OSHA respiratory protection standard (29 CFR 1910.134), and provide Appendix D of the standard.[15] Store respirators properly and replace them when they become visibly clogged or difficult to breathe through.

DISCUSSION

After the final report has been issued, the HHE program routinely conducts a follow-up evaluation to learn how useful the findings of the HHE were to the workplace, if recommendations addressed workplace concerns, and to identify any challenges faced by the workplace when implementing recommendations. Through this process and in communications with the oncology clinic, we learned

Resources and links

Chemotherapy Drug Exposures at an Oncology Clinic—Florida
www.cdc.gov/niosh/hhe/reports/pdfs/2009-0148-3158.pdf.

Health hazard evaluation (HHE) reports
www.cdc.gov/niosh/hhe/

National Institute for Occupational Safety and Health (NIOSH) HHE program information
www.cdc.gov/niosh/hhe/HHEprogram.html

NIOSH HHE Followback Activities
www.cdc.gov/niosh/hhe/followback/default.html

To request a HHE or information about the program
www.cdc.gov/niosh/hhe/request.html.

that many of the recommendations made as a result of this HHE were implemented. Changes included retraining all clinic employees on how to properly handle chemotherapy drugs, improving housekeeping practices, updating policies and procedures for hazardous drug exposures, and increasing use of personal protective equipment specifically made to be protective against chemotherapy drug exposures. Visit www.cdc.gov/niosh/hhe/followback/default.html for more information about the NIOSH HHE follow-up activities.

Nurses or other oncology staff who have health and safety concerns about their workplace should alert their management and occupational health and safety representatives, if available. Resources for addressing occupational health and safety concerns are available through the NIOSH HHE program. An employee can request an HHE if he or she is currently employed at the workplace of concern. An HHE can also be requested by the employer or an officer of a labor union that represents employees at the facility.

NIOSH will not reveal the names of the persons who made the request to the employer if they indicate this on the request form. The Occupational Safety and Health Act and the Federal Mine Safety and Health Act prohibit employers from retaliating or punishing employees for making HHE requests or cooperating with NIOSH investigators (see Section 11[c] of the Occupational Safety and Health [OSHA] Act or Section 105[c] of the Mine Safety and Health [MSHA] Act). The US Department of Labor is responsible for enforcing these antidiscrimination provisions. If discrimination is suspected, the employee should contact an OSHA or MSHA office immediately. To request a HHE or for more information about the HHE program, visit www.cdc.gov/niosh/hhe/request.html.

Health hazard evaluations are conducted to investigate possible workplace health hazards, according to a federal law. After requesting a HHE, the requestor may receive information or a referral to a more appropriate agency, or a site evaluation by a comprehensive team of experts may be conducted. A report with specific recommendations and general guidelines for good occupational health practices is sent to the evaluated clinic. HHE reports are available on the CDC Web site. ■

Disclaimer: Mention of company or product names does not imply endorsement by the National Institute for Occupational Safety and Health.

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