Handle with care: The known and unknown risks to nurses who handle hazardous drugs

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HOW OFTEN do you handle potentially hazardous drugs? What precautions do you take to protect yourself from exposure? After 4 years of study, our team concludes that nurses handle hazardous drugs more frequently than they think, the exposure potential is high, and nurses inaccurately perceive that their personal health risk is low. In this article, we summarize our knowledge to date, the unanswered questions, and recommendations to protect nurses in the future.

The use of potentially hazardous drugs is on the rise across healthcare settings.

For more than 40 years, nurses have prepared and administered drugs that were known carcinogens. Historically, these drugs were used in cancer treatment. Yet such antineoplastic drugs as cyclophosphamide, methotrexate, and mitroxantrone also are used to treat multiple sclerosis, lupus, and other autoimmune diseases. The rapid rise in demand for infusion centers has led such diverse companies as Walgreens Pharmacy and Schnucks Supermarkets to build outpatient infusion centers. It is unclear whether nurses across settings have been trained in safe drug-handling procedures or to wear personal protective equipment (PPE) appropriately.

How can nurses learn which of the drugs they are preparing and administering are potentially hazardous? In 2004, the National Institute for Occupational Safety and Health (NIOSH) issued an alert to healthcare providers stating, "Working with or near hazardous drugs in healthcare settings may cause skin rashes, infertility, miscarriage, birth defects, and possibly leukemia or other cancers." The alert included a list of drugs that should be treated as potentially hazardous. Annually updated, the list includes drugs administered outside the cancer setting, including fluconazole, oxytocin, and warfarin. The list classifies each drug with the documented or theoretical health risk.

Nurses report more frequent drug exposure than previously understood.

In a 2010 study of 402 outpatient oncology nurses, we found a high (16.9%) rate of self-reported unintentional skin or eye exposure to chemotherapy in the past year. Several workplace factors were associated with lower exposure risk: fewer patients cared for per shift, favorable staffing and resource adequacy, and performance of two-nurse verification of all chemotherapy doses. These findings lead us to conclude that handling of potentially hazardous drugs remains a substantial problem for nurses, and there are important workplace factors that influence nurses' safety and health.

Nurses perceive their personal health risk as low and do not always use PPE adequately.

As a follow-up to our prior study, in 2012 we partnered with an outpatient infusion clinic and asked nurses to report any chemotherapy spills that occurred in a 6-month period. For nurses who experienced a spill, we used pharmacokinetic techniques to detect chemotherapy drug levels in nurses' urine. In this sample of 40 outpatient oncology nurses, we found a high incidence of employee exposure to antineoplastic drugs through spills. Several nurses who were exposed showed detectable levels of antineoplastic drugs in their urine, and even nurses who did not report exposure had detectable levels of one drug (docetaxel). Very few of the nurses expressed personal concern about the spill. Not one of the nurses involved with a spill reported wearing PPE as recommended by NIOSH. We observed a similar trend—that workplace factors (such as workloads) influenced the report of spills.

There are important unanswered research questions.

There is evidence to support a link between unintentional chemotherapy drug exposure and adverse health outcomes for nurses. The NIOSH 2004 alert summarized the documented and theoretical risks to workers who handle drugs classified as potentially hazardous. They include acute headaches, nausea, respiratory, or skin reactions; difficulties in conceiving; miscarriage; and such cancers as leukemia. We don't know the exact doses of exposure or number of events that generate health problems. It will be difficult to get this information in the near future, as there is no national registry to track chemotherapy drug exposures and subsequent health problems. Unlike radiology, where radiation badges are used to monitor exposures, we currently have no standard method to detect chemotherapy drug exposures and recommend control meas-

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A pathbreaking program

In 2007, patient-safety nurse researchers at the University of Missouri Health Care (MUHC) gathered a steering group to guide development of a rapid response system to care for caregivers. During team development, this group provided social support to colleagues in distress until the formal team was deployed.

In 2009, MUHC implemented a second victim support infrastructure to provide emotional support for clinicians, student learners, and volunteers. In this first-of-its-kind intervention, a comprehensive support infrastructure called the forYOU Team offers immediate emotional and social support for clinicians on a 24/7 basis. The team addresses the individual's unique needs using an evidence-based, three-tiered model. The menu of comprehensive emotional support ranges from on-demand immediate emotional first aid to professional counseling services. (See **www.muhealth.org/foryou** for more information.)

risk management at the University of Missouri Health Care System in Columbia.

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ures. Despite 40 years of knowledge about these risks, we have no tested interventions to improve nurses' use of PPE when handling chemotherapy drugs.

In July 2014, NIOSH awarded our team a 4-year, $2.3 million grant to study the problem. The Drug Exposure Feedback and Education for Nurses' Safety (DEFENS) study will enroll more than 300 nurses at 11 of the nation's leading cancer centers. We will obtain plasma levels to screen for the presence of hazardous drugs, compare two educational interventions, and monitor whether use of PPE increases. We will track chemotherapy drug spills and test for their presence in nurses' plasma. Our goal is to improve our understanding of when and how drug spills occur and what strategies are effective in increasing nurses' awareness of the problem. We also will examine how workplace factors and behaviors that promote safety influence these untoward events.

Let's extend the science of patient safety to include nurses' safety.

The patient safety movement started with an awareness campaign, a shift to a blame-free culture, and adoption of management principles congruent with high-reliability industries, such as aviation and nuclear power. There are steps nurses can take to improve their safety. First, we recommend nurses review the 2004 NIOSH Preventing Occupational Exposure to Antineoplastic and Other Hazardous Drugs in Health Care Settings alert and the 2014 list of hazardous drugs. Second, nurses can review institutional policies and procedures to assure that PPE that meets NIOSH's recommendations is readily available for workers who handle chemotherapy drugs. Exposed workers involved in spills should complete safety reports and notify supervisors so learning can occur and procedures can be revised. We are encouraged that several states are following Washington in passing laws that require employers to provide PPE to workers who handle chemotherapy drugs. With these steps, we can translate the healthcare industry's focus on patient safety to ensure that nurses are protected. ★

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