

# Sequential Wipe Testing for Hazardous Drugs: A Quality Improvement Project

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**BACKGROUND:** Monitoring for the presence of hazardous drug (HD) residue is recommended as part of a comprehensive HD safety program. However, a single wipe test provides limited information without the ability to evaluate interventions.

**OBJECTIVES:** This quality improvement project was designed to evaluate the benefits of performing sequential HD wipe testing during a six-month period in an ambulatory cancer center.

**METHODS:** Four areas in the pharmacy department and two areas in the infusion department were selected for testing, which was conducted at three time points. Cyclophosphamide, doxorubicin, 5-fluorouracil, methotrexate, and paclitaxel were tested using liquid chromatography coupled with tandem mass spectrometry.

**FINDINGS:** The initial test demonstrated HD contamination on the legs of the IV pole and the pharmacy transport bin. All other areas were below the limit of detection. Changes were made to cleaning practices in the pharmacy and infusion departments prior to the subsequent tests at the three- and six-month time points, which produced levels below the limit of detection.

## KEYWORDS

chemotherapy; hazardous drugs; safety; USP <800>; nursing; contamination

## DIGITAL OBJECT IDENTIFIER

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**DANGERS ASSOCIATED WITH OCCUPATIONAL EXPOSURE** to hazardous drugs (HDs) have been well documented and include reproductive toxicities (spontaneous abortions, fetal abnormalities, impaired fertility, learning disabilities in offspring of exposed mothers), acute toxicities (nausea, vomiting, nasal irritation, rash), and an increased risk of cancer development (Connor et al., 2014; Fransman et al., 2014; Nassan et al., 2021; Ratner et al., 2010; Roussel et al., 2019; Valanis et al., 1993a, 1993b). During the compounding of HDs, handling contaminated vials and using vial pressurization techniques can result in environmental contamination, particularly inside the containment primary engineering control (C-PEC) or biologic safety cabinet (BSC) (Power & Coyne, 2018). During drug administration, the priming, connecting, and disconnecting of IV tubing, along with spills and loose connections, significantly contribute to the presence of contamination in patient care areas (Eisenberg, 2016, 2018; Hon & Abusitta, 2016; Polovich & Olsen, 2018; Power et al., 2014).

## HD Guidelines and Standards

Because of these risks, safe handling guidelines have been published by the National Institute for Occupational Safety and Health, the American Society of Health-System Pharmacists, and the Oncology Nursing Society (ONS) (National Institute for Occupational Safety and Health, 2016; Polovich & Olsen, 2018; Power & Coyne, 2018; U.S. Pharmacopeial Convention [USP], 2019). In 2016, the USP, a nonprofit scientific organization focused on medication standards, published the USP General Chapter <800> (referred to as USP <800>), with best practice recommendations and standards addressing HD safety for compounding and administration (USP, 2020). USP standards are enforceable, although the specific enforcement agency or entity depends on the state (Polovich, 2017). A summary of USP <800> can be found in Table 1.

However, despite practice guidelines and the use of closed-system drug transfer devices (CSTDs), studies continue to demonstrate HD contamination in pharmacy and drug administration areas (Bartel et al., 2018; Chauchat et al., 2019; Palamini, Gagné, et al., 2020; Salch et al., 2019; Walton et al., 2020). Surface contamination is a significant concern because dermal absorption may lead to uptake, as evidenced by subsequent urinary excretion (Hon et al., 2014, 2015). In one study, contamination was found on the hands of hospital employees who were not directly involved in patient care, with 55% testing above the limit of detection (LOD) for HDs in their urine (Hon et al., 2015).