

# Hazardous Drug Contamination

## Presence of bathroom contamination in an ambulatory cancer center

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**BACKGROUND:** Many hazardous drugs (HDs) are excreted in urine and feces, and evidence has shown that bathrooms of patients receiving chemotherapy at home are contaminated with HDs. However, little information exists on bathroom contamination in ambulatory clinics where HDs are administered.

**OBJECTIVES:** This project aimed to determine the presence of HD residue in the patient and staff bathrooms of an ambulatory cancer center.

**METHODS:** A quality improvement project was initiated to examine potential contamination by the HDs 5-fluorouracil and oxaliplatin in a patient bathroom and a secured badge-access staff bathroom in the infusion department of an ambulatory comprehensive cancer center. Twice-daily wipe testing was conducted on the floor in front of the toilet and the flush handle for five consecutive days.

**FINDINGS:** Sixty-five percent of the samples from the floor of the patient bathroom were positive for at least one of the HDs. In the staff bathroom, 35% of the floor samples were positive for at least one HD. None of the flush handle samples were above the level of detection.

### KEYWORDS

hazardous drugs; contamination; safe handling; ambulatory cancer center

### DIGITAL OBJECT IDENTIFIER

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**HAZARDOUS DRUGS (HDs) ARE DEFINED BY THE** National Institute for Occupational Safety and Health (NIOSH, 2016) as having any of the following properties: carcinogenicity, genotoxicity, teratogenicity, reproductive toxicity, organ toxicities at low doses, and structure and toxicity profile of new drugs that mimic drugs previously determined to be hazardous. Studies in healthcare workers (HCWs) who compounded or administered HDs during the 1980s and 1990s demonstrated many adverse health effects ranging from nausea and vomiting to reproductive issues and spontaneous abortions (Fransman et al., 2007; Hemminki et al., 1985; Lawson et al., 2012; Lorente et al., 2000; Martin, 2005; Shortridge et al., 1995; Valanis et al., 1997). Currently, there are no acceptable levels of exposure to HDs, and NIOSH (2016) recommends the ALARA (as low as reasonably achievable) principle, which is used in radiation safety.

Environmental surface contamination with HDs has been described in a number of recent studies (Arnold & Kaup, 2019; Chauchat et al., 2019; Friese et al., 2015; Walton et al., 2020). In the standard on HD safety, USP General Chapter <800>, the U.S. Pharmacopeial Convention (USP, 2017) recommends performing an initial baseline wipe test and repeating at least every six months to help evaluate the potential source(s) of exposure and determine the effectiveness of practices and engineering controls. Research has suggested that environmental contamination can lead to dermal HD uptake with subsequent excretion (Hon et al., 2015). Many commonly used parenteral HDs are excreted in urine as an active drug or metabolites (Micromedex, 2020), and studies in hospitals have found HD residue in patient bathrooms (Böhlandt et al., 2017; Walton et al., 2020).

Two studies of patients receiving chemotherapy at home have also shown the presence of HD in the urine of family members sharing the same bathroom (Yuki et al., 2013, 2015). Unlike residential bathrooms, patient bathrooms in ambulatory clinics are subject to a high volume of patients receiving HDs. These bathrooms may also be used by HCWs. The lack of information on HD contamination in patient bathrooms and the effectiveness of standard cleaning procedures prompted a quality improvement project.

A multiphase quality improvement project was initiated to determine the presence of HD contamination in a patient bathroom and a staff bathroom in an ambulatory infusion department. Phase 1 involved wipe testing for HDs. If contamination was identified, phase 2 would consist of examining