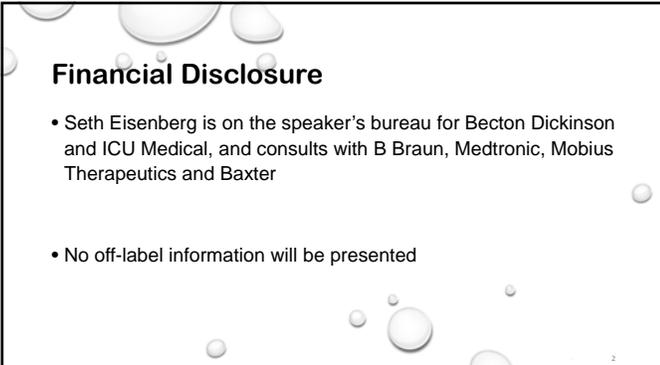


Hazardous Drugs and USP <800>

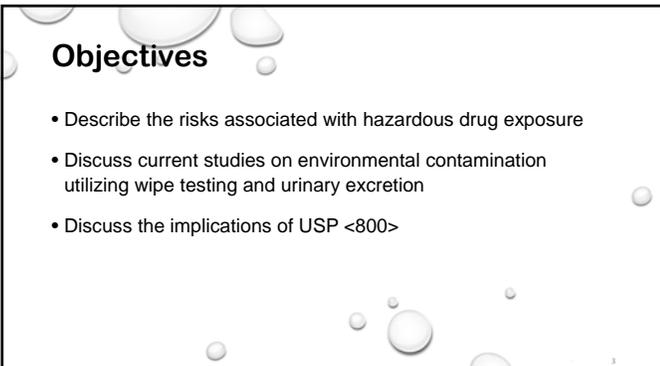
Seth Eisenberg RN OCN BMTCN



Financial Disclosure

- Seth Eisenberg is on the speaker's bureau for Becton Dickinson and ICU Medical, and consults with B Braun, Medtronic, Mobius Therapeutics and Baxter
- No off-label information will be presented

2



Objectives

- Describe the risks associated with hazardous drug exposure
- Discuss current studies on environmental contamination utilizing wipe testing and urinary excretion
- Discuss the implications of USP <800>

3

Definition

- Hazardous Drugs (HDs) are defined by NIOSH (the National Institute for Occupational Safety and Health) as having one or more of the following characteristics:
 - Carcinogenicity (causes cancer)
 - Teratogenicity or other developmental toxicity (causes birth defects)
 - Reproductive toxicity
 - Organ toxicity at low doses
 - Genotoxicity (causes genetic mutations)
 - Structure mimicking existing HDs (similar in chemical structure)

No minimum acceptable levels of exposure to HDs has been established

Connor, T. 2016

Acute risks associated with exposure

- Lightheadedness
- Headache
- Dizziness
- Hair Loss
- Abdominal pain
- Nausea and vomiting
- Local skin or mucous membrane reactions
- Nasal sores
- Contact dermatitis and eczema

Valanis et al, 1993

Reproductive risks associated with exposure

- Congenital abnormalities
- Spontaneous abortions
- Menstrual cycle changes
- Infertility
- Premature labor
- Low-birth weight
- Miscarriages
- Learning disabilities in offspring

Hemminki 1985; Stucker 1990; Shortridge 1995; Valanis 1997; Fransman 2007; Valanis 1999; Martin 2005; Ratner 2010

Genotoxic risks associated with exposure

Researcher	Year	Findings
McDiarmid, M. et al	2010	Abnormalities in chromosome 5 in exposed vs non exposed personnel (p = .01)
Ladiera, C. et al	2014	Elevated frequency of micronuclei in exposed vs non exposed personnel (p <.001)
Moretti, M. et al	2015	Chromosomal aberrations in exposed vs non exposed (p <.0001) Elevated frequency of micronuclei in exposed vs non-exposed (p <.0001)

Cancer risks associated with exposure

Known carcinogens

- Arsenic
- Busulfan
- Chlorambucil
- Cyclophosphamide
- Melphalan
- Thiotepea

Probable carcinogens

- Azicitudine
- Carmustine (BCNU)
- Cisplatin
- Doxorubicin
- **Mitomycin**
- Nitrogen mustard
- Procárbazine
- Etoposide

IARC Website: <http://monographs.iarc.fr/ENG/Monographs/PDFs/index.php>; Retrieved 4/6/17

Environmental Contamination

- Recent studies continue to demonstrate widespread HD contamination in healthcare settings

Researcher	Year	Findings
Hon, C-Y. et al	2013	36% of 438 wipe tests in pharmacy and administration areas were positive Areas included calculators, chairs, pens, printers keyboards and mouse
Hon, C-Y. et al	2014	20% of hand wipes (n=110 multidisciplinary staff) were positive Highest level was on staff who were not administering HDs
Hon, C-Y. et al	2015	55% of 201 urine samples (n=103) were positive Highest concentration in unit clerks and staff who were not administering HDs
Viegas, S. et al	2014	37% of 327 wipe tests in pharmacy and administration areas were positive Areas included infusion pumps, tables and door handles

Guidelines Versus Standards

Guidelines = Recommendations	Standards = Requirements
-------------------------------------	---------------------------------

- Examples:
 - NIOSH
 - ASHP
 - ONS
- Not enforceable

- Examples:
 - Department of Health
 - CMS
 - The Joint commission
- Are enforceable

USP <800> will be enforced by each state's Board of Pharmacy or designated agency, CMS (under COPs), the FDA, and likely The Joint Commission

USP Chapter 800 (USP <800>)

- "This chapter applies to **all healthcare personnel** who handle HD preparations and all entities that store, prepare, transport, or administer HDs (e.g., pharmacies, hospitals and other healthcare institutions, patient treatment clinics, physicians' practice facilities..."

USP <800>

- Includes (but not limited to):
 - Pharmacists
 - Pharmacy technicians
 - Nurses
 - Physicians and physician assistants

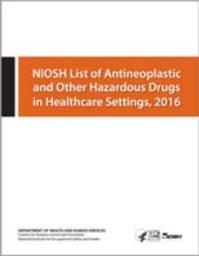
USP <800>

- Does not provide information specific to the OR setting, or for performing ophthalmologic procedures
- Does not provide exemptions for HD use in other settings
- Harmonization between current ASORN guidelines and USP <800> will be required

USP <800> Requirements
 An Overview

USP <800> Requirements
Hazardous Drug List:

- Create a facility-specific list of hazardous drugs that is accessible by all staff
- List must be:
 - Reviewed annually
 - Updated when newly-approved HDs are incorporated into the practice setting



USP <800> Requirements
Training:

- Training must be provided to all staff who may have contact with HDs prior to initial work assignment, and annually thereafter
- Must cover:
 - Summary of policies and procedures
 - Proper use of PPE and other equipment (e.g., Closed System Transfer Devices)
 - Exposure response
 - Managing spills
 - Disposal of bags, tubing, syringes, and PPE

USP <800> Requirements
Hazard Communication Program:

- Establish policies and procedures to ensure worker safety
- Describe in writing how the standard will be implemented
- Provide training for all personnel who may be exposed to HDs prior to handling
- Obtain written confirmation that all personnel of reproductive capability understand the risks associated with hazardous drugs



Photograph: © 2017 S. Eisenberg

USP <800> Requirements
HD Storage:

- HDs must be stored in an externally ventilated, negative-pressure room with at least 12 air changes per hour
- Refrigerated antineoplastic HDs must be stored in a dedicated refrigerator in a negative pressure area with at least 12 air changes per hour [e.g., storage room, buffer room, or containment segregated compounding area (C-SCA)].

USP <800> Requirements
HD Transport:

- The use of a pneumatic tube system is prohibited for transporting liquid HDs
- Must be transported in containers that can minimize breakage or leakage



ST#25 RM#G5708
Photograph: ©2017 S. Eisenberg

19

USP <800> Requirements
Compounding:

- Sterile and nonsterile HDs must be compounded within a C-PEC (e.g. biologic safety cabinet) located in a separate area (C-SEC).



Photograph: ©2017 S. Eisenberg

20

USP <800> Requirements
Compounding:

- The C-SEC used for sterile and nonsterile compounding must:
 - Be externally vented through high-efficiency particulate air (HEPA) filtration and physically separate from other preparation areas
 - Have an appropriate air exchange per hour, and a negative pressure relative to all adjacent areas

21

USP <800> Requirements
Administration:

- Requires use of Closed System Transfer Devices (CSTDs) "when the dosage form allows." (p10, section 14)
- However, no distinction is made between the OR setting vs traditional infusion areas
 - There is no accounting for workflow differences or how the HD is being used

22

USP <800> Requirements
Closed System Transfer Devices:

A CSTD can be defined as a device that "prohibits the transfer of environmental contaminants into the system and the escape of hazardous drug or vapor concentrations outside the system."¹

There are 2 components to a CSTD:

1. A vial adaptor to prevent aerosols and vapors from escaping the vial
2. A device for transferring HD from the vial to the bag or directly to the patient

¹ Connor, McLaughlin, & Vanderbroocke, 2007, p. 28.

23

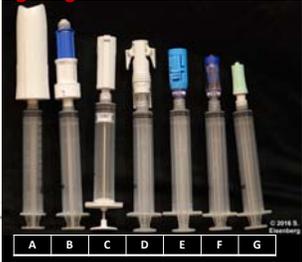
USP <800> Requirements
Closed System Transfer Devices:

- Are considered "supplemental engineering controls" and do not replace *containment primary engineering controls* (e.g., biologic safety cabinet) or personal protective equipment (PPE)
- Although required for administration, CSTDs are **recommended** for compounding

24

USP <800> Requirements
Examples of CSTDs for transferring drug and administration:

- A. Corvida Halo
- B. BD Phaseal
- C. Equashield II
- D. B Braun OnGuard
- E. ICU Medical ChemoLock
- F. ICU Medical Spiros
- G. BD/CareFusion Texium



USP <800> Requirements
Personal Protective Equipment (PPE)

- Two pairs of **ASTM 6978-05-tested** chemotherapy gloves
- Cuffs must be long enough to cover the cuff of the gown
- Must not be worn >30 minutes unless otherwise noted by manufacturer
- Sterile chemotherapy gloves are available for OR use



Photograph: ©2017 S. Eisenberg 26

USP <800> Requirements
Personal Protective Equipment (PPE):

- Chemotherapy-resistant gown
 - "Single-use" and disposable
 - Solid front and closable in the back
 - Elastic or knit cuffs
 - Must be able to resist HD permeability
 - Sterile chemotherapy-resistant gowns are available

There are currently no standards for gowns; ask the manufacturer for testing information



Photograph: ©2017 S. Eisenberg 27

USP <800> Requirements
Personal Protective Equipment (PPE):

- “Appropriate eye and face protection must be worn when there is a risk of splashing...” (p 7, section 7.4)
 - Specifically uses “OR” as an example
- When required, goggles must be used for eye protection as face shields alone are not considered adequate
- Shoe covers worn in areas where HDs are handled must be removed prior to leaving the area

USP <800> Requirements
Disposal:

- All PPE used in handling of HDs is considered “trace contaminated and must be disposed of in properly labelled HD waste containers” (normal trash not allowed)



Photograph: ©2017 S. Eisenberg

USP <800> Requirements
Cleaning:

- USP <800> differentiates between deactivation, decontamination, cleaning and disinfection

Cleaning Step	Purpose	Comments
Deactivation	To make HD inactive	Includes products containing peroxide, bleach, etc.
Decontamination	To remove HD residue	Includes products tested to be effective, e.g., alcohol, water, peroxide or bleach
Cleaning	To remove organic and inorganic material	Includes germicidal products
Disinfection (sterile areas)	To kill microorganisms	Includes disinfectants and/or sterile alcohol

USP <800> p10, table 5.

USP <800> Requirements
Spill Kits:

- Spill kits designed specifically for HD spills must be immediately available, along with staff trained in spill management
- Spills must be cleaned as soon as possible



Photograph: ©2017 S. Eisenberg

USP <800> Requirements
Standard Operating Procedures Covering:

- Hazard communication and occupational safety programs
- Designation of HD areas
- Receipt and storage
- Compounding and dispensing
- Use and maintenance of proper engineering controls (e.g., C-PECs, C-SECs, and CSTDs)

USP <800> p111-12, section 17

USP <800> Requirements
Standard Operating Procedures Covering:

- Hand hygiene and use of PPE based on activity (e.g., receipt, transport, compounding, administration, spill, and disposal)
- Deactivation, decontamination, cleaning, and disinfection
- Transport
- Administering
- Environmental monitoring (e.g., wipe sampling) and medical surveillance
- Disposal and spill control

USP <800> p111-12, section 17

Summary

- USP <800> will have a significant impact on many areas of HD handling
- Facilities will need to perform a gap analysis to determine areas in need of improvement in time for the July 1, 2018 date
- USP <800> will be enforced

34
