Precautions & Handling of Hazardous Chemotherapeutic Agents

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Precautions & Handling of Hazardous Chemotherapeutic Agents

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Miami Cancer Institute | Baptist Hospital of Miami
January 11, 2020
Objectives

- Review NIOSH listed hazardous drugs (HDs) requiring handling precautions in hospital and community settings

- Discuss the importance and highlight proper handling and disposal of hazardous chemotherapy as outlined in USP <800>

- Review counseling points for precautions and handling of oral chemotherapy agents at home
Pre-Assessment Questions

- True or False
  - Patients on oral chemotherapy do not need to wear gloves during administration

- True or False
  - Oral chemotherapy is safe to dispose in the everyday trash, as long as it is in its original container

- True or False
  - Precautions during every day handling are to protect the hazardous drug, not the user
What is a Hazardous Drug (HD)?

- Term first used by ASHP in 1990
- National Institute for Occupational Safety and Health (NIOSH) definition:
  - Any drug (or active pharmaceutical ingredient) that is identified as having ≥ 1 of the following:
    - Carcinogenicity
    - Teratogenicity (or developmental toxicity)
    - Reproductive toxicity in humans
    - Organ toxicity (at low doses in humans or animals)
    - Genotoxicity
    - Drug that mimics an existing hazardous drug in structure or toxicity

NIOSH List of Antineoplastic and Other Hazardous Drugs in Healthcare Settings 2016
Why do we care about HDs?

- ~8 million US healthcare workers are potentially exposed to HDs
  - Contamination can occur during transport, compounding, cleaning and administration
  - May lead to absorption by healthcare workers

- Consider HD use at home causing contamination
  - Oral chemotherapy
Types of Exposure

- Dermal contact and absorption
- Inhalation
- Injection
- Ingestion
Patient Care Areas

- Contamination also extends beyond the pharmacy and into patient care areas
  - Not only patients in these areas

- Avoiding surface contamination
  - Surface contamination has been definitively linked to hand contamination
What are the potential risks?

- **Acute effects**
  - Hair loss
  - Cardiac toxicity
  - Kidney damage
  - Hearing loss
  - Nausea
  - Rashes

- **Long term effects**
  - Cancer
  - Reproductive outcomes
  - Infertility

NIOSH List of Antineoplastic and Other Hazardous Drugs in Healthcare Settings 2016
Who is at risk?

Anyone handling hazardous drugs is at risk of exposure.

- Pharmacists
- Pharmacy Technicians
- Nurses
- Physicians
- Surgeons
- Physician Assistants
- Respiratory Therapists
- Home Health Aides
- Nurses’ Aides
- Housekeeping
- Janitorial Services
- Environmental Services
- Veterinarians
- Veterinarian Technicians
- Veterinarian Assistants

NIOSH List of Antineoplastic and Other Hazardous Drugs in Healthcare Settings 2016
The Evolution of Safe Handling

1979
Falck et al.

2004
NIOSH issued alert

2008
USP <797>

2012
NIOSH HD list updated

1983
ASHP published its first guideline on HDs

2006
ASHP guideline on handling HDs

2010
NIOSH HD list updated

2016
USP <800>
NIOSH List of Antineoplastic and Other Hazardous Drugs in Healthcare Settings, 2016


The National Institute for Occupational Safety and Health (NIOSH) Alert: Preventing Occupational Exposures to Antineoplastic and Other Hazardous Drugs in Health Care Settings was published in September 2004. In Appendix A of the Alert, NIOSH identified a sample list of major...
NIOSH HD List

- HDs are categorized into three groups:
  - Group 1: Antineoplastic drugs
  - Group 2: Non-antineoplastic drugs
  - Group 3: Reproductive risk

- NIOSH notes that many drugs in group 1 and 2 also carry reproductive risk

- Document provides guidance for personal protective equipment (PPE) and ventilated engineering controls
NIOSH HD List

- Drugs with safe-handling guidelines from the manufacturer are automatically put on the list

- NIOSH internal committee performs an initial review of all new FDA drug approvals and new warnings on existing drugs for a 2-year period

- This is followed by an expert panel that reviews the proposals (additions or deletions)
September 25th, 2019

The manufacturers of trabectedin (Yondelis®), inotuzumab ozogamicin (Besponsa™), and polatuzumab vedotin (Polivy™) recommend that they be handled as hazardous drugs. Therefore, NIOSH considers these drugs to be included in Table 1 of the NIOSH list of hazardous drugs. For additional information, see the package inserts for these drugs.

<table>
<thead>
<tr>
<th>Drug</th>
<th>AHFS Classification</th>
<th>Links</th>
<th>Date Approved</th>
</tr>
</thead>
<tbody>
<tr>
<td>trabectedin (Yondelis®)</td>
<td>10:00 Antineoplastic Agents</td>
<td>DailyMed</td>
<td>October 23, 2015</td>
</tr>
<tr>
<td>inotuzumab ozogamicin (Besponsa™)</td>
<td>10:00 Antineoplastic Agents</td>
<td>DailyMed</td>
<td>August 17, 2017</td>
</tr>
<tr>
<td>polatuzumab vedotin (Polivy™)</td>
<td>10:00 Antineoplastic Agents</td>
<td>DailyMed</td>
<td>June 10, 2019</td>
</tr>
</tbody>
</table>

https://www.cdc.gov/niosh/docs/2016-161/default.html
NIOSH Recommendations

- Each organization should create its own list of drugs considered to be hazardous, based on drugs in its formulary.

- Primarily because reliance on lists of HDs provided by NIOSH quickly becomes outdated.
  - If you use a drug that is not included in the list, check the available literature to see whether the unlisted drug should be treated as a HD.
Handling and Disposal in Healthcare settings
United States Pharmacopeia (USP)

- USP is the only independent, not-for-profit, nongovernmental pharmacopeia in the world
  - Develop and revise standards
    - Standards are enforceable by the FDA and state boards of pharmacy
    - Identity, strength, quality and purity
      - Medicines
      - Food ingredients
      - Dietary supplements

https://www.usp.org/compounding/general-chapter-hazardous-drugs-handling-healthcare
United States Pharmacopeia (USP)

- Important chapters to know about
  - USP <795>
    - Non-sterile compounding
  - USP <797>
    - Sterile compounding
  - USP <800>
    - HD handling in healthcare settings
  - USP <825>
    - Compounding radiopharmaceutical drugs

- Revisions for <795> and <797> have been released
USP <800>

- Describes the practice & quality standards for handling HDs
  - Philosophy: no acceptable level of exposure to HDs
  - Purpose is to promote the protection of:
    - Patients
    - Healthcare worker safety
    - Environment

- Applies to all healthcare personnel who handle HDs and all entities that store, prepare, transport, or administer them

- Introduces element of containment
Management of HDs must include:

- A list of HDs
- Facility and engineering controls
- Competent personnel
- Safe work practices
- Proper use of personal protective equipment (PPE)
- Policies for HD waste segregation and disposal
Maintain a HD List

- Must use NIOSH list as a basis

- Agents on the NIOSH list that must follow USP <800>
  - HD active pharmaceutical ingredients
  - All antineoplastics that require manipulation

- Other agents on the NIOSH list
  - Perform risk assessment
  - If no risk assessment performed, must handle as hazardous and according to USP <800> requirements

- Entity must review their list at least every 12 months

USP Compounding Expert Committee. USP General Chapter <800>
Assessment of Risk

Consider the following:

- Category of HD based on NIOSH
- Dosage form
- Risk of exposure
- Packaging
- Any manipulation that might be required

Examples of assessments of risk can be found online

- National Community Pharmacy Association
Facilities

- Restrict access to areas where HDs are handled
  - Protects persons not involved in HD handling

- Designated areas must be available for:
  - Receipt and unpacking
  - Storage of HDs
  - Nonsterile HD compounding (if performed by the entity)
  - Sterile HD compounding (if performed by the entity)

- Also use dedicated equipment
  - Ex: designated counting tray for HDs
Receipt & Storage

- Antineoplastic HDs and all HD APIs must be unpacked in an area that is neutral/normal or negative pressure
  - Do not unpack in sterile compounding areas or in positive pressure areas

- HDs and APIs requiring manipulation must be stored separately from non hazardous medications in an externally ventilated, negative-pressure pressure room with at least 12 air changes per hour (ACPH)

USP Compounding Expert Committee. USP General Chapter <800>
Engineering Controls

- Required to protect the preparation from cross-contamination and microbial contamination (if sterile compounding)

- Engineering controls for containment
  - Primary
  - Secondary
  - Supplemental
Engineering Controls

- **Containment primary engineering control (C-PEC)**
  - Ventilated device designed to minimize worker and environmental HD exposure

- **Required:**
  - **Class II Biological Safety Cabinets (BSC)**
    - OR
  - **Compounding Aseptic Containment Isolator (CACI)**
Class II BSCs

Class II, Type A2
Air In-flow 70% Recirculated vs. 30% Exhausted

Class II, Type B1
Air In-flow 30% Recirculated vs. 70% Exhausted

Class II, Type B2
Air Inflow 0% Recirculated vs. 100% Exhausted

https://www.nuaire.com/how-class-two-bsc-work
CACI

- Compounding aseptic containment isolator (CACI)

[Image of a CACI machine]
Engineering Controls

- **Containment secondary engineering control (C-SEC)**
  - The room in which the C-PEC is placed, which must:
    - Be externally vented
    - Be physically separated (i.e., a different room from other preparation areas)
    - Have an appropriate air exchange (e.g., ACPH)
    - Have a negative pressure
Engineering Controls

- **Supplemental engineering controls**
  - **Closed system transfer devices (CSTD)**
    - MUST be used when administering antineoplastic HDs when the dosage form allows
      - Not mandated for use in compounding
    - CSTDs known to be physically or chemically incompatible with a specific HD must not be used for that HD

USP Compounding Expert Committee. USP General Chapter <800>
Personal Protective Equipment (PPE)

- Provides worker protection to reduce exposure to hazardous drug (HD) aerosols and residues
- Appropriate PPE must be worn when handling HDs, including during:
  - Receipt
  - Storage
  - Transport
  - Compounding (sterile & nonsterile)
  - Administration
  - Deactivation/decontamination, cleaning and disinfecting
  - Spill control
  - Waste disposal

USP Compounding Expert Committee. USP General Chapter <800>
Chemotherapy Gloves

- Must meet American Society for Testing and Materials (ASTM) standard D6978
- Should be worn when handling all HDs
  - Including non-antineoplastics & for reproductive risk HDs
- Must be powder free
- Inspect prior to use
- When used for sterile compounding, outer gloves must be sterile
- Should be changed every 30 minutes unless otherwise recommended by the manufacturer
Chemotherapy Gloves
Chemotherapy Gowns

- Must be disposable and shown to resist permeability
- Must close in the back, be long sleeved, and have closed cuffs that are elastic or knit
- Lab coats, scrubs or other absorbent materials are not appropriate
- Potentially contaminated clothing must not be taken home under any circumstance

USP Compounding Expert Committee. USP General Chapter <800>
Head, Hair, Shoe and Sleeve Covers

- Provide protection from contact with HD residue

- When compounding HDs, a 2\textsuperscript{nd} pair of shoe covers must be donned before entering the cleanroom and doffed when exiting

- Shoe covers worn in HD handling areas must not be worn to other areas
Eye and Face Protection

- Appropriate eye and face protection must be worn when there is a risk for spills or splashes of HD Administration in the surgical suite or cleaning a spill

- Goggles & face shields
Personal Protective Equipment (PPE)

Coverall or “Bunny Suit”
Consider adopting bunny suits to ensure overall protection for staff, while minimizing cross-contamination to adjacent locations and colleagues.

Image courtesy of Fred Massoomi
Disposal of Used PPE

- Consider all PPE worn when handling HDs contaminated

- Place them in appropriate waste container per local, state, and federal regulations
## Personal Protective Equipment

<table>
<thead>
<tr>
<th>PPE</th>
<th>Sterile Compounding</th>
<th>Non-Sterile Compounding</th>
<th>Cleaning</th>
<th>Unpacking Orders</th>
<th>Administering</th>
<th>Cleaning up Spills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gowns</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>Per institutional SOPs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head / Hair Covers</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>Per institutional SOPs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shoe Covers</td>
<td>2 pairs</td>
<td>2 pairs</td>
<td></td>
<td>Per institutional SOPs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemotherapy gloves</td>
<td>2 pairs (outer must be sterile)</td>
<td>2 pairs</td>
<td>2 pairs</td>
<td>✓</td>
<td>2 pairs</td>
<td>Per institutional SOPs</td>
</tr>
<tr>
<td>Eye / Face Protection</td>
<td>Per institutional SOPs</td>
<td></td>
<td>If splashing likely</td>
<td>Per institutional SOPs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respiratory Protection</td>
<td>Per institutional SOPs</td>
<td></td>
<td>Yes when cleaning under surface of C-PEC</td>
<td>Yes if HDs not contained in plastic</td>
<td>Per institutional SOPs</td>
<td>Yes when spills to large for a spill kit</td>
</tr>
</tbody>
</table>

Smith A. USP <800> What you need to know. Illinois Pharmacy Association USP Compounding Expert Committee. USP General Chapter <800>
Disposal

- All personnel who perform routine custodial waste removal/cleaning activities in HD handling areas
  - Must be trained in appropriate procedures!
    - To protect themselves and the environment

- Disposal of all HD waste (including unused HDs and trace-contaminated PPE) must comply with all applicable federal, state, and local regulations
Disposal of HDs

For TRACE (Empty) Chemotherapy Waste with biohazardous/infectious waste symbol
- Trace PPE
- Empty Chemo IV Bags
- Empty Chemo Vials

Anything that is not considered EMPTY is disposed in BLACK Container
What about cleaning?

- Must establish written procedures for decontamination, deactivation and cleaning
  - For sterile compounding, also disinfection

- Must wear appropriate PPE
  - 2 pairs of gloves and impermeable disposable gowns

- Wet wipe approach
4 Step Cleaning Process

- All areas and reusable equipment where HDs are handled must be deactivated/decontaminated & cleaned

<table>
<thead>
<tr>
<th>Cleaning Step</th>
<th>Purpose</th>
<th>Example Agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deactivation</td>
<td>Render compound inert or inactive</td>
<td>• Sodium hypochlorite or EPA registered oxidizer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Peroxide formulations</td>
</tr>
<tr>
<td>Decontamination</td>
<td>Remove HD residue</td>
<td>• Sterile alcohol</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sterile water</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Peroxide</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sodium hypochlorite</td>
</tr>
<tr>
<td>Cleaning</td>
<td>Remove organic and inorganic material</td>
<td>• Germicidal detergent</td>
</tr>
<tr>
<td>Disinfection</td>
<td>Destroy microorganisms</td>
<td>• Sterile alcohol and/or EPA-registered disinfectant</td>
</tr>
</tbody>
</table>
Deactivation & Decontamination

- Carefully selected agent
  - Hazardous byproducts
  - Respiratory effects
    - Some solutions may require the addition of respiratory protection
  - Caustic damage to surfaces
    - Sodium hypochlorite causes corrosion
      - MUST be neutralized with sodium thiosulfate or by following with another agent (ex: sterile alcohol) to remove it

USP Compounding Expert Committee. USP General Chapter <800>
Cleaning & Disinfecting

- **Cleaning**
  - Removal of contaminants and HD residue
  - Detergents or solvents

- **Disinfection**
  - Kills microorganisms
  - Used after cleaning
  - Sterile compounding areas

USP Compounding Expert Committee. USP General Chapter <800>
Spills

- MUST be contained and cleaned immediately
  - By qualified personnel with appropriate PPE

- Facility dependent processes
  - Must have a clear policy and checklist
    - Document competence of personnel, circumstances and management of spills
      - Spill kits
      - Respirators (if too large for a spill kit)
Spill Kit Example
Oral Chemotherapy Handling and Disposal
Oral Chemotherapy

- Traditional oral chemotherapy agents available since 1950s
- Prescriptions of oral chemotherapy are becoming more common
- Make up around 25% of the oncology market
- Convenient but not just any pill
  - Still requires extra caution
Oral Chemotherapy

Handling Oral Chemo Safely At Home

Oral chemotherapy: Handling Safely at Home | Dana-Farber Cancer Institute

https://www.dana-farber.org/chemotherapy/oral-chemotherapy/
Safe Handling at Home

- **Principles of safe handling**
  - Keep in original container
  - Storage
    - Store in a cool, dry place and away from sunlight
    - Safe space away from children and pets
  - Wash hands before and after handling
  - Do not crush, break or chew
  - Stay consistent with administration
  - Do not dispose in the toilet or in the garbage

- **Incorporate these key items in your counseling**

https://www.dana-farber.org/chemotherapy/oral-chemotherapy/
Wearing Gloves at Home

- Gloves help protect caregivers from absorbing chemotherapy through the skin
  - Some package inserts recommend gloves to be used
  - Should be worn any time chemotherapy is handled by someone other than the patient

- Patients do not need to wear gloves when taking their medication
  - Washing hands thoroughly before and after handling will help minimize exposure to other household members

https://www.dana-farber.org/chemotherapy/oral-chemotherapy/
Don’t Forget!

Topical Chemotherapy

- Applied to the skin
- Cream, gel, or ointment
- Example: 5-fluorouracil
- Consider recommending the use of gloves when applying topical agents
Oral/Topical Chemotherapy Disposal

- Improper disposal pollutes the water and ground and is toxic to plants, animals and humans

- Only a few drug manufacturers provide instructions on oral chemotherapy disposal
  - Celgene, the maker of lenalidomide, thalidomide, and pomalidomide provides patients with packaging material to return unused medications
Oral/Topical Chemotherapy Disposal

- Most cities have a hazardous waste disposal policy that patients can follow
  - Most fire/police stations and retail pharmacies will not dispose of oral chemotherapy

- Different options for patients
  - Contact dispensing pharmacy for disposal
  - Hazardous waste pick up through state of Florida
  - Drug take back site or program
Oral/Topical Chemotherapy Disposal

- Drug take back site or program
- Patients can locate an authorized collection location in their area online
  - [https://apps2.deadiversion.usdoj.gov/pubdispsearch/spring/main?execution=e1s1](https://apps2.deadiversion.usdoj.gov/pubdispsearch/spring/main?execution=e1s1)
Oral/Topical Chemotherapy Disposal

https://apps2.deadiversion.usdoj.gov/pubdispsearch/spring/main?execution=e1s1
DEA National Drug Take-Back Day

- April 25, 2020
- Liquid medications and IV medications are not accepted
- Results of October 2019
  - Total Law Enforcement Participation: 4,896
  - Total Collection Sites: 6,174
  - Total Weight Collected: 882,919 lbs. (441.5 Tons)

https://www.oncolink.org/blogs/2019/10/tomorrow-is-national-prescription-drug-take-back%E2%80%8B-day/
Assessment Questions

➢ True or False
  ● Patients on oral chemotherapy do not need to wear gloves during administration

➢ True or False
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Thank You!

We all have that one guy that takes USP 800 way too seriously

Questions?
Email: paulams@baptisthealth.net
References


Beginning on October 1, 2014, all sterile compounding shall be performed in accordance with the minimum practice and quality standards of the following chapters of the United States Pharmacopeia (USP):

- (a) Chapter 797, Pharmaceutical Compounding-Sterile Preparations;
- (b) Chapter 71, Sterility Tests;
- (c) Chapter 85, Bacterial Endotoxins Test;
- (d) Chapter 731, Loss on Drying.