



PROV: Antimicrobial Stewardship (AMS) for Providers and Pharmacists

☰ Objectives

☰ Penicillin Allergy, De-labeling, & Cross-Reactivity with Cephalosporins

☰ Empiric Diabetic Foot Infection (DFI) Treatment

☰ IV to Enteral (PO) Antibiotics for Gram-Negative Bacteremia Secondary to Urinary Tract Infection

☰ References

☰ Conclusion

Objectives

Upon completion of this course, the caregiver will be able to:

1

Apply new literature regarding penicillin allergies, de-labeling strategies, and cross-reactivity with cephalosporins

2

Incorporate changes to diabetic foot guidelines into clinical practice

3

Evaluate Providence system practice guidelines for treatment of urosepsis with gram negative rod bacteria and apply to clinical practice

CONTINUE

Penicillin Allergy, De-labeling, & Cross-Reactivity with Cephalosporins

What is a Drug Allergy?

A drug allergy is a clinically significant adverse reaction mediated by immunoglobulin E (IgE) that is reproducible when re-exposed to the drug.

- Drug allergens are multivalent, meaning they have multiple binding sites for antibodies, such as proteins.
- Drug allergens can also haptenate an endogenous protein, meaning they can make other proteins antigenic.
- Clinically significant reactions include laryngeal edema, bronchospasm, anaphylaxis, and possible cardiovascular collapse

There are other significant, immunologically-mediated adverse drug reactions in addition to IgE-mediated allergies. These reactions can be mild in nature (dermatitis) to severe (Stevens-Johnson Syndrome).

Unfortunately, the majority of drug allergies documented in the medical record are actually non-allergic reactions and are not immunologically mediated

CONTINUE

Classification of Hypersensitivity Reactions

Type	Mediator	Pathophysiology	Presentation	Typical Onset
I	IgE antibody	Allergen binds to IgE on mast cells causing mast cell activation & release of inflammatory mediators	Anaphylaxis, hypotension, urticaria, shortness of breath, chest tightness	Within 30 minutes to < 2 hours
II	Cytotoxic IgG & IgM antibodies	Drug antigen-specific antibody (IgG or IgM) binds to cells, activates complement system & initiates cytolysis	Drug-induced hemolytic anemia, thrombocytopenia, granulocytopenia	> 72 hours
III	IgG & IgM immune complex	Antigen-antibody complexes form & deposit in tissues, leading to inflammatory reaction	Serum sickness: Fever, rash, lymphadenopathy, arthralgia	> 72 hours
IV	T Cell-mediated	Antigens bind to T lymphocytes which	Delayed maculopapular rash, contact dermatitis,	> 72 hours

	(delayed)	release of cytokines & recruit effector cells	DRESS, AGEP, SJS, TEN	
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CONTINUE

Penicillin Allergy Challenges



Most patients who have a penicillin allergy are not actually allergic to penicillin.

- About 10% of all patients in the United States carry a label of penicillin allergy

- Less than 10% of those patients who are tested for penicillin allergies are found to be at risk for acute reactions to penicillins
- Only about 1% of the general population are actually allergic to penicillin

If a patient is falsely believed to be allergic to penicillin or other beta-lactam antibiotics, a number of challenges arise:

1

Broader spectrum antibiotics tend to be used, often including options with increased risk of toxicity and side effects (i.e. vancomycin, fluoroquinolones, aminoglycosides, and aztreonam). These broader agents can often be inferior to the narrower agents, with higher toxicities as well as poorer efficacy. For example, vancomycin has been shown to have inferior outcomes compared to anti-staphylococcal beta-lactams for MSSA

2

Use of broader spectrum antibiotics also increases the risk for patients acquiring resistant pathogens such as methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant *Enterococcus* species (VRE), and *C. difficile* colitis

3

Antimicrobial allergy label is associated with increased length of stay, higher ICU admission rate, increased antimicrobial use, higher readmission rate, and higher mortality

CONTINUE

Knowledge Check

What are some challenges associated with a penicillin allergy label?

- Broader spectrum antibiotics tend to be used, often including options with increased risk of toxicity and side effects
- Increases risk for patients acquiring resistant pathogens by using broader spectrum agents
- Associated with increased length of stay, higher ICU admission rate, increased antimicrobial use, higher readmission rate, and higher mortality
- All of the above

SUBMIT



Complete the content above before moving on.

Penicillin Allergy Assessment

Instructions: Select the Start button or the directional arrows below. You must review all to continue.

Introduction

How should you conduct a Penicillin Allergy Assessment?

Click **start** to learn the process.

Step 1

Review patient's allergy

The screenshot displays a medical software interface for a patient named Snicker Doodle. The top navigation bar includes tabs for Snapshot, Chart Review, Review Flowcharts, Results Review, Synopsis, History, Allergies (selected), Problem List, Medications, Immunizations, and Demographics. The left sidebar shows patient information: Snicker Doodle, Male, 34 y.o., 4/16/1989, MRN: 60000032758, Primary Phone: 425-233-6930. It also lists 'Needs Interpreter' with a deficit in hearing/vision/speech, bed number SOI501-01, and other details. The main content area is titled 'Allergies/Contraindications' and features a table with columns for Reaction, Severity, Reaction Type, and Noted. A table entry shows 'Penicillins' with 'Unknown' severity and 'Not Specified' reaction type, noted on '1/1/2020'. Below the table, there are controls for 'Review Complete', 'Mark as Reviewed', and a timestamp: 'Last Reviewed by Andrea Kyung Jin, PharmD on 3/13/2024 at 9:04 AM: Review Complete'. A 'Past Reviews' link is also present.

Reaction	Severity	Reaction Type	Noted
Penicillins	Unknown	Not Specified	1/1/2020

Review Complete Mark as Reviewed Last Reviewed by Andrea Kyung Jin, PharmD on 3/13/2024 at 9:04 AM: Review Complete [Past Reviews](#)

Step 2

Review Medication History for other beta-lactams and/or cephalosporins

The screenshot displays a medical software interface for a patient named Snicker Doodle. The patient's information includes: Male, 34 y.o., 4/16/1989, MRN: 6000032758, Primary Phone: 425-233-6930. The patient is admitted on 8/25/2023. The interface shows a navigation bar with tabs for Snapshot, Chart Review, Review Flowsheets, Results Review, Synopsis, History, Allergies, Problem List, Medications, Immunizations, and Demographics. The Medications tab is selected. A filter menu is open, showing options for Medication, Order Mode, Department Specialty, Encounter Department, Encounter, Episode, Route, Pharmacy, and Pharmaceutical Class. The Therapeutic Class filter is selected, and the Anti-Infective Agents sub-filter is checked. The table below shows the medication history for the patient.

Name	Order Details	Start	End	DC Reason	Authorized By
tevoFLOXacin in dextrose (LEVAQUIN) IVPB 750 mg	750 mg, 100 mL/hr, Intravenous, DAILY	09/03/2019	05/01/2020	Patient Discharge	Attending Inpatient2 MD, MD
vancomycin 1 g in sodium chloride 0.9% 250 mL IVPB	1 g, 260 mL/hr, Intravenous, EVERY 8 HOURS INTERVAL	08/22/2019	08/22/2019	—	Attending Inpatient2 MD, MD
vancomycin 1 g in sodium chloride 0.9% 250 mL IVPB (Expired)	1 g, 260 mL/hr, Intravenous, EVERY 8 HOURS INTERVAL	08/22/2019	08/23/2019	—	Attending Inpatient2 MD, MD

Step 3

Conduct Patient Allergy Interview

Interview Questions	Response
What was the name of medication you are allergic to?	
How old were you when the reaction occurred? [How long ago did the reaction occur]	Reaction & Severity
Describe what happened.	Onset (in comments)
How was the reaction treated? [Drug discontinuation, diphenhydramine, IM epinephrine, urgent medical care/hospitalization]	Treatment (in comments)
How long did the reaction last?	Duration (in comments)
Have you taken drugs similar to penicillins? [e.g. Augmentin, Keflex, Omnicef, Ceftriaxone/Rocephin, Cefepime]	Other Beta-lactams / Cephalosporins tolerated since (in comments)

Step 4

Update Allergy in Epic

The screenshot shows the 'Adverse Reactions/Drug Intolerances' interface in Epic. The main window displays details for a reaction to Penicillins, with 'Nausea Only' as the reaction and 'Intolerance' as the reaction type. The severity is set to 'Low'. A list of other reactions is shown on the right, and a severity scale is also visible.

Reactions Field

Anaphylaxis	1
Anxiety	14
Cough	408103
Dermatitis	17
Diarrhea	4
GI Upset	408107
Hallucination	408104
Headache	408106
Hives	2
Itching	7
Myalgia	408102
Nausea And Vomiting	9
Nausea Only	10
Other (See Comments)	19
Palpitations	15
Patient's Preference	408100
Photosensitivity	8
Rash	18
Sensitivity	408101
Shortness Of Breath	3
Swelling	11
Unknown	408108
Vertigo	408105

Severity Field

High	3
Medium	5
Low	7

Reaction Type Field

Allergy	1
Contraindication	2
Intolerance	3
Unspecified	4

Adverse Reactions/Drug Intolerances - Penicillins

Agent: Penicillins

Reactions: Nausea Only Severity: Low Noted: 1/1/2020

Reaction Type: Intolerance

Comments:

Onset: nausea a few hours after penicillin dose
 Treatment: none
 Duration: lasted a few hours
 Have not taken other penicillins or cephalosporins

Buttons: Past Updates, Delete, Accept, Cancel



Complete the content above before moving on.

Knowledge Check

Which allergy history reflects an allergy / allergic reaction to amoxicillin?

- Amoxicillin caused nausea & diarrhea
- Family history of amoxicillin allergy

- Headache
- None of the above

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 Complete the content above before moving on.

De-Labeling Strategies

Penicillin	Risk	De-labeling Strategy
Intolerance (e.g. GI symptoms, headache)	Low	De-label penicillin allergy in Electronic Medical Record (EMR). In ministries where de-labeling is not preferred, a comment describing the intolerance is reasonable. Patient education / counseling
Family history or history of tolerating penicillin/amoxicillin	Low	De-label penicillin allergy in Electronic Medical Record (EMR) In ministries where delabeling is not

		<p>preferred, a comment describing the intolerance is reasonable.</p> <p>Patient education / counseling</p>
<p>For Ministries that are able to: ≤ 2 points on *PEN-FAST Scoring</p>	<p>Low</p>	<p>For Ministries that are able to: Penicillin Test Dose Challenge (If available) If test dose challenge is negative, remove penicillin allergy label</p>

*PEN-FAST Scoring

PEN	PENicillin Allergy Reports By Patient	Points
F	Five years or less since reaction	2 points
A	Anaphylaxis or angioedema or	2 points
S	Severe cutaneous adverse reaction	
T	Treatment required for reaction	1 point

CONTINUE

Cross-Reactivity and Practice Updates

- The risk of cross-reactivity amongst beta-lactams is lower than previous reports have suggested
- In 2022, the American Academy of Allergy, Asthma, and Immunology (AAAAI) & the American College of Allergy, Asthma, and Immunology (ACAAI) published joint recommendations that support the following:
 - For patients with history of an unverified non-anaphylactic penicillin allergy, a cephalosporin can be administered without testing or additional precautions
 - For patients with a history of anaphylaxis to penicillin, the use of a structurally dissimilar R1 side chain cephalosporin (e.g. cefazolin, ceftriaxone, cefepime) can be administered without additional testing or additional precautions

Cross-Reactivity with Cephalosporins Table

To review the table, please download the PDF below.



Cross-reactivity with Cephalosporins.pdf

278.5 KB



CONTINUE

Upcoming changes to Surgical Antibiotic Prophylaxis Guidelines

Both cefazolin and ceftriaxone have different sidechains from penicillin. These agents can be safely used in the majority of the reactions to penicillin, including reactions such as anaphylaxis or laryngeal edema.

Cefazolin is a commonly used pre/post procedural antibiotic that is often substituted with a non-beta-lactam antibiotic in patients with penicillin allergies. Studies have shown that cefazolin hypersensitivity reactions are selective and not associated with penicillins, meaning a patient could react to cefazolin but then tolerate penicillin without problem. It also shares no similarity in side chains with any other FDA approved beta-lactam. There is very low cross-reactivity risk for cefazolin as compared to other early generation cephalosporins.



NOTE: Regimens may specify options as “OR” (e.g., metronidazole + select one: levofloxacin OR vancomycin and gentamicin). Consultation with antimicrobial stewardship pharmacist or an ID provider is strongly encouraged if clinical uncertainty exists.

	Procedure	Recommended agents: MRSA negative or unknown*	Recommended agents: Severe allergy to cephalosporins** and MRSA negative	Recommended agents: MRSA positive or history of MRSA past 5 years	Recommended agents: Severe allergy to cephalosporins** and MRSA positive or history of MRSA past 5 years
Breast	Breast, skin, soft tissue, including associated	Cefazolin	Vancomycin	Cefazolin + Vancomycin	Vancomycin

axillary surgeries (breast biopsy, mastectomy, axillary/sentinel node biopsy and dissection)				
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Cardiac	<ul style="list-style-type: none"> • Coronary artery bypass • Valve replacement 	<p>Cefazolin</p> <p>Vancomycin can be considered in high-risk cases</p>	<p>Vancomycin +</p> <p>Select one: Gentamicin or Levofloxacin</p>	<p>Cefazolin + Vancomycin</p>	<p>Vancomycin+</p> <p>Select one: Gentamicin or Levofloxacin</p>
	<ul style="list-style-type: none"> • Cardiac device insertion procedure (e.g., pacemaker implantation) • TAVR 	<p>Cefazolin</p>	<p>Vancomycin</p>	<p>Cefazolin + Vancomycin</p>	<p>Vancomycin</p>
	<p>Ventricular assist devices</p>	<p>Cefazolin or cefepime</p> <p>Add fluconazole for concern of post-operative fungal infection</p>	<p>Vancomycin + Levofloxacin</p> <p>Add fluconazole for concern of post-operative fungal infection</p>	<p>Vancomycin + Cefazolin or cefepime</p> <p>Add fluconazole for concern of post-operative fungal infection</p>	<p>Vancomycin + Levofloxacin</p> <p>Add fluconazole for concern of post-operative fungal infection</p>

CONTINUE

Penicillin Allergy Workflow

Click each shape below to reveal the next step in the Penicillin allergy workflow.

Patient reports
Penicillin allergy

CONTINUE

Knowledge Check

Penicillins share similar R1 sidechains with which Cephalosporins?

- Cefazolin
- Ceftriaxone
- Cefepime
- None of the above

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Empiric Diabetic Foot Infection (DFI) Treatment

Diabetes-Related Foot Infections (DFI)



- DFIs are the most frequent diabetes-related cause of hospitalization and amputation
 - Ndosì et al (2017): 12-month outcomes of adults after antibiotic treatment for DFI 45.5% ulcer healed, 9.6% ulcer redeveloped, 17.4% lower extremity amputated, 15.5% had died

- Management is key due to a large proportion of patients living with diabetes today
 - International Diabetes Federation: ~537 million adults with diabetes in 2021

- DFIs often polymicrobial – anaerobes and ...
 - Non-tropical climates (North America): commonly Gram-positive cocci in antibiotic-naïve
 - Staphylococcus (MSSA, MRSA, coagulase-negative), Streptococcus (Group A Strep, Group B Strep)

- Tropical, warm/wet climates (Asia, Africa): increased prevalence of Gram-negatives
 - Including *Pseudomonas aeruginosa*



CONTINUE

DFI Guidelines Update

Instructions: Select the arrow icon at the bottom right of each card to learn more. You must review all to continue.

Previous Guidelines

- 2012 Infectious Diseases Society of America (IDSA) Clinical Practice Guideline
- 2019 International Working Group on the Diabetic Foot (IWGDF) Guideline Update

Current Methods

- Combined intersociety guideline with multidisciplinary panel
- Published October 2, 2023
- 25 evidence-based recommendations
- GRADE framework
 - Recommendation



Complete the content above before moving on.

Classification of Infection

IDSA Classification	Clinical classification of infection, definitions
Uninfected	No systemic or local symptoms or signs of infection
Mild	<p>Infected: At least two present:</p> <ul style="list-style-type: none"> • Local swelling or induration • Erythema > 0.5 but < 2 cm around wound • Local tenderness or pain • Local increased warmth • Purulent discharge <p>And no other cause of an inflammatory response of the skin (e.g. gout, acute charcot neuroarthropathy, fracture, thrombosis, or venous stasis)</p>
Moderate	<p>Infection with no systemic manifestations and involving:</p> <ul style="list-style-type: none"> • Erythema extending \geq 2 cm from wound margin and/or • Tissue deeper than skin and subcutaneous tissues (e.g. tendon, muscle, joint, and bone) <p>Infection involving bone (osteomyelitis)</p>
Severe	Any foot infection with associated systemic manifestations (SIRS) as manifested by \geq 2 of the following:

- Temperature > 38°C or < 36°C
- Heart rate > 90 beats/min
- Respiratory rate > 20 breaths/min or PaCO₂ < 4.3 kPA (32 mmhg)
- White blood cell count > 12,000/mm³ or > 10% immature (band) forms

Infection involving bone (osteomyelitis)

CONTINUE

2023 Updates on Empiric Pseudomonas Coverage

Instructions: Select to expand each section below. You must select all sections to continue.

2012 IDSA Guidelines —

Recommendation 21. (c) Empiric therapy directed at *Pseudomonas aeruginosa* is usually unnecessary except for patients with risk factors for true infection with this organism. (Strong; Low).

- *Pseudomonas* risk factors – high community prevalence, warm climate, frequent water exposure

2019 IWGDF Guidelines

Recommendation 18. Empiric treatment aimed at *Pseudomonas aeruginosa* is not usually necessary in temperate climates but consider it if *P aeruginosa* has been isolated from cultures of the affected site within the previous few weeks, or in tropical/subtropical climates (at least for moderate or severe). (Weak; Low)

2023 IWGDF/IDSA Guidelines

Recommendation 15. **Do not empirically target antibiotic therapy against *Pseudomonas aeruginosa* in cases of DFI in temperate climates**, but use empirical treatment of *P. aeruginosa* if it has been *isolated from cultures of the affected site within the previous few weeks*, in a person with moderate or severe infection who resides in Asia or North Africa. (Best Practice Statement) "macerated ulcer or warm climate"



Complete the content above before moving on.

Sepsis Order Set – Diabetic Foot Infection

Please note that there will soon be changes to the order sets that will reflect the new guidelines. They may look like these below depending on your institution, some ministries may have chosen different options due to local resistance patterns.

No Penicillin Allergy

- cefepime (MAXIPIME) 2 g in sterile water 20 mL syringe (100 mg/mL)
2 g, Intravenous, EVERY 8 HOURS INTERVAL, First dose today at 1415, For 7 days
Keep in refrigerator. Give IV push over 3-5 minutes.
Indications: Diabetic Foot Infection, Sepsis
- vancomycin
 - vancomycin in NS (VANCOCIN) IVPB 1,250 mg
1,250 mg (rounded from 1,247.5 mg = 25 mg/kg × 49.9 kg), Intravenous, Administer over 90 Minutes, ONCE, today at 1415, For 1 dose
Keep in refrigerator.
Indications: Diabetic Foot Infection, Sepsis
 - vancomycin per pharmacy
PHARMACY CONSULT, Starting today at 1353
Sign, Indications: Diabetic Foot Infection, Sepsis, For 7 days
- metronIDAZOLE in saline (FLAGYL) IVPB 500 mg
500 mg, Intravenous, Administer over 1 Hours, EVERY 8 HOURS INTERVAL, First dose today at 1415, For 7 days
Store at room temperature.
Indications: Diabetic Foot Infection, Sepsis

Severe Penicillin Allergy (anaphylaxis, angioedema, Stevens-Johnson syndrome)

- meropenem (MERREM) 500 mg in sodium chloride 0.9% syringe (50 mg/mL)
500 mg, Intravenous, Administer over 5 Minutes, EVERY 6 HOURS INTERVAL, First dose today at 1415, For 7 days
Keep in refrigerator. Administer IV push slowly over 3-5 minutes. Do NOT administer doses over 1000 mg via IV push.
Indications: Diabetic Foot Infection, Sepsis
- vancomycin
 - vancomycin in NS (VANCOCIN) IVPB 1,250 mg
1,250 mg (rounded from 1,247.5 mg = 25 mg/kg × 49.9 kg), Intravenous, Administer over 90 Minutes, ONCE, today at 1415, For 1 dose
Keep in refrigerator.
Indications: Diabetic Foot Infection, Sepsis
 - vancomycin per pharmacy
PHARMACY CONSULT, Starting today at 1354
Sign, Indications: Diabetic Foot Infection, Sepsis, For 7 days

CONTINUE

Duration/Route of Antimicrobial Therapy

Soft Tissue DFI

Infection Severity	Duration of Therapy	Route of Therapy
Mild (Class 2)	1-2 Weeks (10 days after debridement)	Oral
Moderate - Severe (Class 3-4)	2-4 Weeks	Oral or Initial Parenteral, then switch to Oral

Bone/Joint Involvement (Osteomyelitis)

Infection Severity	Duration of Therapy	Route of Therapy
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Resected	2-5 Days	Oral or Initial Parenteral, then switch to Oral
Debridement (soft tissue)	1-2 Weeks	
Positive culture/histology <i>after</i> bone resection	3 Weeks	
No surgery or bone necrosis	6 Weeks	

CONTINUE

Knowledge Check

When should *Pseudomonas aeruginosa* be covered empirically for Diabetic Foot Infections?

- A. Recent history of *Pseudomonas aeruginosa* isolated in previous wound cultures
- B. Lives in a temperate climate such as N. America
- C. Lives in a warm climate such as Asia or N. Africa
- D. A & C



E.A & B

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Complete the content above before moving on.

IV to Enteral (PO) Antibiotics for Gram-Negative Bacteremia Secondary to Urinary Tract Infection

Antimicrobial Stewardship & Optimization in Gram Negative Bacteremia

Instructions: Select to expand each section below. You must select all sections to continue.

Transition for IV to Enteral (PO) —

- Safe to transition from IV to PO antibiotics for gram negative rod bacteremia, especially for urinary sources
- Consensus that longer initial course of IV therapy before transitioning to PO antibiotics does not increase treatment success rates

De-escalation to Narrower Spectrum Agent —

- Avoiding unnecessary antimicrobial class switches if possible (i.e. IV ceftriaxone → PO fluoroquinolone)
- Avoid fluoroquinolones (if possible) to minimize untoward effects such as tendinitis/tendon rupture, peripheral neuropathy, CNS & cardiac effects, and risk of C.difficile infection.

Duration of Therapy —

- Studies have demonstrated noninferiority for shorter versus longer durations (i.e. 7 days vs 14 days) of antibiotic therapy for patients with uncomplicated gram negative rod bloodstream infections
- Bacteremia secondary to complicated urological conditions may require a longer treatment duration depending on adequacy of source control & other patient-specific factors



Complete the content above before moving on.

Patient Criteria

Appropriate for Enteral (PO)

- Improving clinically
 - HR <100
 - Systolic Blood Pressure > 90 mmHg & not requiring vasopressor support
- Hemodynamically stable for at least 24 hours
 - Temp < 100.4°F (38°C)
 - Respiratory rate < 24

- O2 >90% (or returned to patient's baseline)
 - Baseline mental status
 - WBC < 11 & Bands < 10%
- Tolerating food/enteral feedings or taking/tolerating other critical oral medications

Inappropriate for Enteral (PO)

- Nothing by mouth (NPO) status with or without NG suction
- Continuous NG suctioning
- Active gastrointestinal (GI) bleeding, GI obstructions, ileus/suspected ileus, or no active bowel sounds
- Inability to swallow
- Patient refuses to take oral medications
- Severe nausea & vomiting
- GI transit time is too short or long for absorption (e.g. severe diarrhea, inflammatory bowel disease, gastroparesis, short bowel syndrome, or malabsorption syndrome)
- Patient receiving vasopressors

CONTINUE

Knowledge Check

What are INAPPROPRIATE criteria to transition a patient to enteral (PO) antibiotics? **Select all that apply.**

- Hemodynamically stable without adjunctive agents
- On a norepinephrine infusion for blood pressure support
- Tolerating a full liquid diet
- Active GI Bleed

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Complete the content above before moving on.

Oral Antibiotic Options Based Upon Organisms

To review the table, please download the PDF below.



Oral Antibiotic Options based upon Organisms.pdf
333.1 KB



CONTINUE

Oral Dosing Recommendations



The dosing recommendations below are for patients with normal renal function.

Instructions: Select the arrow icon at the bottom right of each card to learn more. You must review all to continue.

Amoxicillin/
clavulanate

875/125mg TID (can consider
2000/125mg TID if XR tab
available)

Amoxicillin

1000mg TID (can consider QID
in severe cases or in cases of
obesity)

Cefadroxil

1000mg BID

Cefixime

200mg BID

Cefpodoxime

400mg BID

Cephalexin

1000mg TID or QID

Ciprofloxacin

500-750mg BID

Levofloxacin

750mg daily

Sulfamethoxazole- Trimethoprim

1-2 DS tabs BID (can consider
5mg/kg q12h for patients less
than 100kg)



Complete the content above before moving on.

Knowledge Check

I attest that I have reviewed the Antimicrobial Stewardship Education and have understand the materials reviewed.

True

False

SUBMIT



Complete the content above before moving on.

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CONTINUE

Conclusion

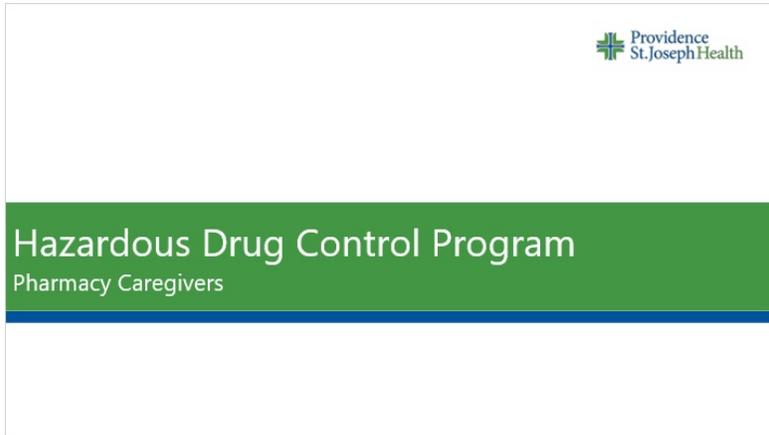
Congratulations! You have completed the *Antimicrobial Stewardship (AMS) for Providers and Pharmacists* module.

Click 'Exit Course' above to close this window.

Hazardous Drug Control Program Pharmacy

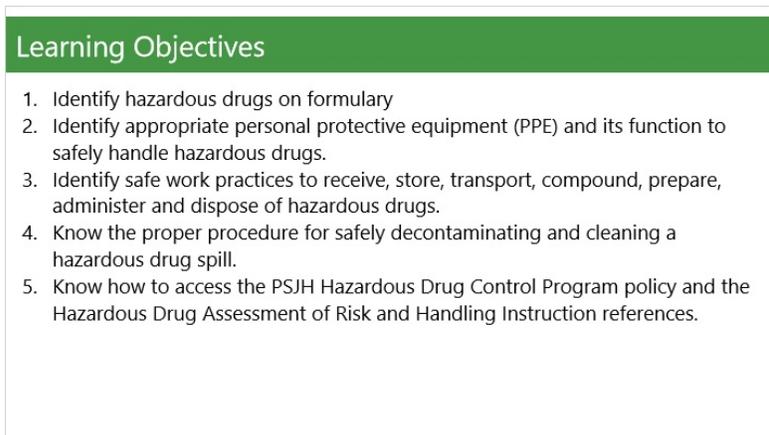
1. Untitled Scene

1.1 Untitled Slide



The slide features the Providence St. Joseph Health logo in the top right corner. The main title 'Hazardous Drug Control Program' is displayed in white text on a green background, with the subtitle 'Pharmacy Caregivers' below it. A blue horizontal line is positioned at the bottom of the slide.

1.2 Untitled Slide



The slide has a green header with the title 'Learning Objectives'. Below the header is a list of five numbered objectives.

1. Identify hazardous drugs on formulary
2. Identify appropriate personal protective equipment (PPE) and its function to safely handle hazardous drugs.
3. Identify safe work practices to receive, store, transport, compound, prepare, administer and dispose of hazardous drugs.
4. Know the proper procedure for safely decontaminating and cleaning a hazardous drug spill.
5. Know how to access the PSJH Hazardous Drug Control Program policy and the Hazardous Drug Assessment of Risk and Handling Instruction references.

1.3 Untitled Slide

Hazardous Drug Definition

What makes a drug "Hazardous"?

Any drug identified by at least one of the following six criteria:

- Carcinogenicity → *Can cause cancer*
- Teratogenicity or developmental toxicity → *May cause birth defects*
- Reproductive toxicity in humans → *May be expressed as decreases in fertility, or fetal loss during pregnancy*
- Organ toxicity at low doses in humans or animals (*e.g., liver damage, local necrosis of exposed tissue*)
- Genotoxicity → *Cause damage to or mutation of DNA*
- New drugs that mimic existing hazardous drugs in structure or toxicity

1.4 Hazardous drugs can:

(Multiple Choice, 10 points, 1 attempt permitted)

Hazardous drugs can:

- Cause cancer
- Cause birth defects
- Decrease fertility
- Cause damage to organs
- All of the above

Correct	Choice
	Cause cancer
	Cause birth defects
	Decrease fertility
	Cause damage to organs
X	All of the above

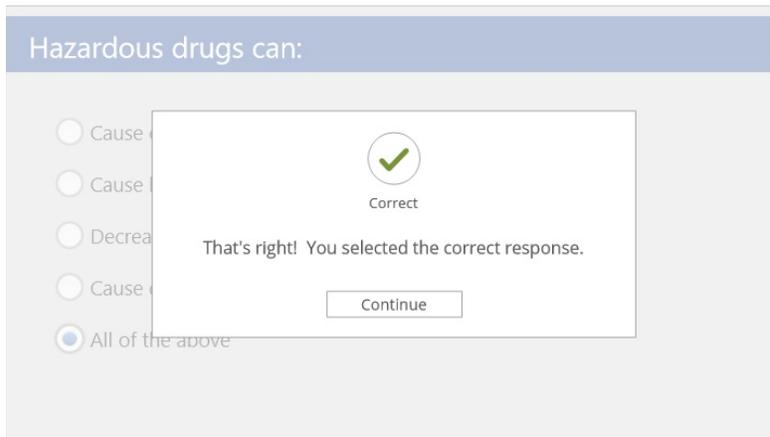
Feedback when correct:

That's right! You selected the correct response.

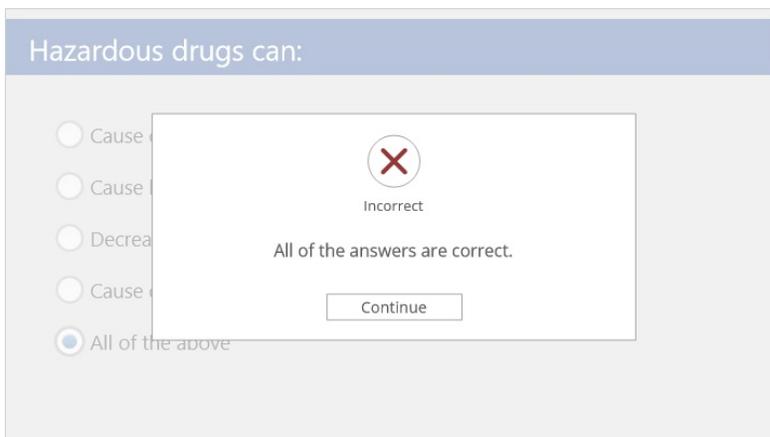
Feedback when incorrect:

All of the answers are correct.

Correct (Slide Layer)



Incorrect (Slide Layer)



1.5 Untitled Slide

Potential Health Effects from Exposure to Hazardous Drugs

Studies in the last 40 years evaluating the urine, blood, degree of chromosomal alterations, and/or reproductive risk in health care workers have demonstrated that exposure to hazardous drugs can cause acute and chronic systemic effects^{1,2,7,8}.

Examples of acute (short-term) reactions:

- skin rashes, allergic reactions, mucosal sores, nausea and vomiting, eye irritation, headaches, flu-like symptoms, hair loss.

Chronic (long-term effects) of exposure include:

- infertility, reproductive dysfunction, and chromosomal abnormalities possibly leading to cancer.

1.6 Untitled Slide

Exposure Routes

Hazardous drugs can enter and affect your body in any of these ways:

Dermal Absorption	<ul style="list-style-type: none">• Some hazardous drugs may be absorbed through intact skin.	
Ingestion	<ul style="list-style-type: none">• Hazardous drugs can be accidentally ingested from contaminated surfaces, including hands.	
Inhalation	<ul style="list-style-type: none">• Hazardous drugs can be aerosolized in a powder or mist that may be inhaled. Some hazardous drugs are volatile if not sealed in intact containers and can generate a toxic vapor.	
Injection	<ul style="list-style-type: none">• Exposure to hazardous drug can occur from an accidental needle stick or puncture with sharp object.	

1.7 Untitled Slide

Exposure Prevention

By preventing exposure from all four routes, you can work with hazardous drugs SAFELY.

Prevent Dermal Absorption	<ul style="list-style-type: none">• Clean potentially contaminated surfaces (vials, countertops)• Use safe practices for handling contaminated body fluids, clothing, dressings, linens• Wear gloves designed for hazardous drug protection	
Prevent Ingestion	<ul style="list-style-type: none">• Wash hands with soap and water• Clean work surfaces properly to avoid spreading contamination	
Prevent Inhalation	<ul style="list-style-type: none">• Compound hazardous drugs in ventilated cabinets (Pharmacy BSC)• Use closed system transfer devices for compounding & administering IVD as instructed• Use self-contained pill crushing devices• Wear a respirator when working with hazardous drugs outside of containment (ex, spill clean-up)	
Prevent Injection	<ul style="list-style-type: none">• Use needleless IV systems, like Luer-lock connections• Use safety needles and dispose promptly in sharps containers	

1.8 What are the mechanism(s) that caregivers can be exposed to hazardous drugs? (Select all that apply)

(Multiple Response, 10 points, 1 attempt permitted)

What are the mechanism(s) that caregivers can be exposed to hazardous drugs? (Select all that apply)

- Dermal
- Inhalation
- Ingestion
- Injection

Correct	Choice
X	Dermal
X	Inhalation
X	Ingestion
X	Injection

Feedback when correct:

That's right! You selected the correct response.

Feedback when incorrect:

All of the answers are correct.

Correct (Slide Layer)

What are the mechanism(s) that caregivers can be exposed to hazardous drugs? (Select all that apply)

Dermal
 Inhalation
 Ingestion
 Injection


Correct

That's right! You selected the correct response.

Incorrect (Slide Layer)

What are the mechanism(s) that caregivers can be exposed to hazardous drugs? (Select all that apply)

Dermal
 Inhalation
 Ingestion
 Injection


Incorrect

All of the answers are correct.

1.9 Untitled Slide

NIOSH Classification of Hazardous Drugs

Group 1 Antineoplastic	• A cytotoxic medication that is used for treating cancer, but may be used for non-oncologic conditions.
Group 2 Non-Antineoplastic	• Non-antineoplastic drugs that meet one or more of the NIOSH criteria for a hazardous drug, including those with the manufacturer's safe-handling guidance (MSHG).
Group 3 Reproductive Risk	• Non-antineoplastic drugs that primarily have adverse reproductive effects and may be present in breast milk.

Group 1, 2 & 3: Unopened, intact tablets and capsules may NOT pose the same degree of occupational exposure risk as injectable drugs. Cutting, crushing, or otherwise manipulating tablets and capsules will increase the risk of exposure to workers.

[NIOSH List of Antineoplastic and Other Hazardous Drugs in Healthcare Settings 2016](#)
[PSJH Hazardous Drug Assessment of Risk and Handling Instruction](#)

1.10 Untitled Slide

Examples of Hazardous Drugs

Group 1
Antineoplastic

Group 2
Non-Antineoplastic

Group 3
Reproductive Risk

Click on the buttons to learn more!

Group 1 (Slide Layer)

Examples of Hazardous Drugs

Group 1
Antineoplastic

Group 2
Non-Antineoplastic

Group 3
Reproductive Risk

Click on the buttons to learn more!

Group 2 (Slide Layer)

Examples of Hazardous Drugs

Group 1
Antineoplastic

Group 2
Non-Antineoplastic

Group 3
Reproductive Risk

Click on the buttons to learn more!

Group 3 (Slide Layer)

Examples of Hazardous Drugs

Group 1
Antineoplastic

Group 2
Non-Antineoplastic

Group 3
Reproductive Risk

Click on the buttons to learn more!



The image shows three examples of hazardous drugs. On the left, there are three colored buttons: a yellow button for 'Group 1 Antineoplastic', a purple button for 'Group 2 Non-Antineoplastic', and a pink button for 'Group 3 Reproductive Risk'. An arrow points from the pink button to three images of medications: a box of Warfarin Sodium Tablets, USP 4 mg (100 tablets), a vial of Oxycodone Hydrochloride 10 mg/30 mL, and a box of Voriconazole for Oral Suspension 40 mg/mL (100 tablets).

1.11 Which of the following are considered hazardous based on NIOSH criteria? (Select all that apply)

(Multiple Response, 10 points, 1 attempt permitted)

Which of the following are considered hazardous based on NIOSH criteria? (Select all that apply)

- Azathioprine
- Capecitabine
- Oxytocin
- Valganciclovir
- Warfarin

Correct	Choice
X	Azathioprine
X	Capecitabine
X	Oxytocin
X	Valganciclovir

X

Warfarin

Feedback when correct:

That's right! You selected the correct response.

Feedback when incorrect:

All of the answers are correct.

Correct (Slide Layer)

Which of the following are considered hazardous based on NIOSH criteria? (Select all that apply)

- Azathioprine
- Capecitabine
- Oxytocin
- Valganciclovir
- Warfarin


Correct
That's right! You selected the correct response.
Continue

Incorrect (Slide Layer)

Which of the following are considered hazardous based on NIOSH criteria? (Select all that apply)

- Azathioprine
- Capecitabine
- Oxytocin
- Valganciclovir
- Warfarin


Incorrect
All of the answers are correct.
Continue

1.12 Untitled Slide

Principles of Exposure Prevention

The U.S. National Institute for Occupational Safety and Health (NIOSH) describes the following exposure controls:

- Engineering or environmental controls, such as:
 - Closed-system drug transfer devices (CSTDs) in pharmacy & nursing
 - Ventilated biological safety cabinets (BSCs) in pharmacy
- Administrative or work practice controls, such as:
 - Labeling hazardous drugs and storing them separately
 - Cleaning/decontaminating work surfaces
 - Proper waste disposal
- Use of personal protective equipment (PPE), such as:
 - Gloves, gowns, respirators, booties
 - PPE is last, but very important protection measure

The USP 800 chapter became official on December 1, 2019. Regulatory agencies encourage utilization of 800 in the interest of advancing public health.

1.13 Untitled Slide

How Do I Know What Drugs are Hazardous?

Your ministry may use one of the methods to alert that the drug is "hazardous"

Medication label banner or auxiliary label

Epic will identify each HD in eMAR in Q1 2020

For non-Epic ministries, refer to external link, auxiliary label or reference list at local facilities.

1.14 Untitled Slide

PSJH Epic MAR Icons for Hazardous Drugs

Hover to Discover PPE handling precautions

methotrexate tablet 7.5 mg : Dose 7.5 mg : Oral : WEEKLY

Admin Instructions:
Use chemotherapy handling precautions. Protect from light.

Antineoplastic Hazardous:
Antineoplastic Hazardous Waste
• Gloves - 1 pair chemo-rated
Ordered Adm: Do not cut or crush tablet

1.15 Untitled Slide

Other Ways to Alert that the Drug is "Hazardous"

Click on the buttons to learn more!

Warning label at each hazardous drug bin in the pharmacy

Hazardous drug stored in dispensing cabinets (Pyxis) is flagged with a hazardous alert

1.16 How do you determine the medication you are going to handle in pharmacy is hazardous?

(Multiple Choice, 10 points, 1 attempt permitted)

How do you determine the medication you are going to handle in pharmacy is hazardous?

- Policy
- Medication label
- Pharmacy bin
- All are correct

Correct	Choice
	Policy
	Medication label
	Pharmacy bin
X	All are correct

Feedback when correct:

That's right! You selected the correct response.

Feedback when incorrect:

All of the responses are correct.

Correct (Slide Layer)

How do you determine the medication you are going to handle in pharmacy is hazardous?

- Policy
- Medical
- Pharmacy
- All are

Correct

That's right! You selected the correct response.

Continue

Incorrect (Slide Layer)

How do you determine the medication you are going to handle in pharmacy is hazardous?

- Policy
- Medical
- Pharmacy
- All are

Incorrect

All of the responses are correct.

Continue

1.17 Untitled Slide



1.18 Untitled Slide

Use of Personal Protective Equipment (PPE)

Gloves

- Must meet American Society for Testing and Materials (ASTM) standard D6978 or Chemo-Tested and powder-free (See glove package labeling).
- Gloves are required for receiving, packaging, preparation & compounding, administering, cleaning and disposal of HD.
- Hands must be washed with soap and water after removing gloves.

REMINDER: Caregiver MUST perform hand-hygiene with soap and water AFTER removing PPE & gloves.

NOTE: Hand sanitizer is designed to kill pathogens. Soap and water remove chemicals, including hazardous drugs, from your skin.

1.19 A nursing caregiver is going to don gloves to administer a dose of Dilantin suspension. Which type of gloves is appropriate for this hazardous drug?

(Multiple Choice, 10 points, 1 attempt permitted)

A nursing caregiver is going to don gloves to administer a dose of Dilantin suspension. Which type of gloves is appropriate for this hazardous drug?

- Any exam gloves
- Gloves that are powder-free and chemo-tested that meet American Society for Testing and Materials standard ASTM D6978
- Must be labeled as "chemotherapy" gloves
- Must be sterile gloves

Correct	Choice
	Any exam gloves
X	Gloves that are powder-free and chemo-tested that meet American Society for Testing and Materials standard ASTM D6978
	Must be labeled as "chemotherapy" gloves
	Must be sterile gloves

Feedback when correct:

That's right! You selected the correct response.

Feedback when incorrect:

The correct response is Gloves that are powder-free and chemo-tested that meet American Society for Testing and Materials standard ASTM D6978.

Correct (Slide Layer)

A nursing caregiver is going to don gloves to administer a dose of Dilantin suspension. Which type of gloves is appropriate?

Any exam gloves

Gloves that are powder-free and chemo-tested that meet American Society for Testing and Materials standard ASTM D6978.

Must be nitrile

Must be sterile gloves

Correct

That's right! You selected the correct response.

Continue

Incorrect (Slide Layer)

A nursing caregiver is going to don gloves to administer a dose of Dilantin suspension. Which type of gloves is appropriate?

Any exam gloves

Gloves that are powder-free and chemo-tested that meet American Society for Testing and Materials standard ASTM D6978.

Must be nitrile

Must be sterile gloves

Incorrect

The correct response is Gloves that are powder-free and chemo-tested that meet American Society for Testing and Materials standard ASTM D6978.

Continue

1.20 Untitled Slide

Use of PPE

Gown

- Disposable gowns made of polyethylene-coated polypropylene to resist permeability by HDs. Do NOT re-use gown.
- Gowns must close in the back (i.e., no open front), be long sleeved, and have closed cuffs that are elastic or knit.
- Gowns worn in HD handling areas must not be worn to other areas in order to avoid spreading HD contamination



1.21 Untitled Slide

Use of PPE

Eye and Face Protection (goggles, face shield)

- When there is a potential for splashing of liquid, spit up/vomit.
- When compounding/preparation not done in a ventilated control device.
- Safety glasses do not provide protection against splashes

Head & Shoe Covers

- Required for HD compounding and during spill clean-up to contain HD residue to specific area.
- A second pair of shoe covers must be donned before entering the pharmacy HD Buffer room and doffed when exiting the HD Buffer Room.



1.22 Untitled Slide

Use of PPE

Respiratory Protection

N-95 respirator* or PAPR with particulate filter is required for:

- Cutting, crushing, or otherwise manipulating tablets and capsules will increase the risk of exposure to workers. Refer to local policies for appropriate containment device & PPE for cutting/crushing handling. N-95 respirator* or PAPR with particulate filter is recommended.



Caregivers wearing N-95 respirators must be fit tested and trained. Contact Caregiver Health.

1.23 Untitled Slide

Use of PPE

Respiratory Protection

PAPR with organic vapor filter is required for:

- Attending to hazardous drug spills
- Deactivating, decontaminating, and cleaning underneath the work surface of a ventilated engineering control in pharmacy
- Example of organic vapor filter respirator: **MaxAir CAPR with N-OV filter cartridge 2166-10.**



When managing a spill of HD OUTSIDE ventilated cabinet, caregivers should wear a PAPR with organic vapor filter.

1.24 Untitled Slide

How to Find Instructions for PPE

The PSJH USP 797/800 Workgroup developed the [PSJH Hazardous Drug Assessment of Risk and Handling Instruction](#) as guidelines for hazardous drug handling.

The Assessment of Risk includes:

- Type of HD per NIOSH classifications and risk of exposure
- Dosage forms
- PPE instruction for receiving, transport, compounding/manipulation, administration, decontamination/cleaning and disposal of HD



1.25 Untitled Slide

PPE Quick Reference by Activity & HD Type

Work Group	Activity Description and Dosage Form	Gloves	Gown	Face & Eye Shield	Mask/Respirator	Hair & Shoe Covers
Antineoplastic Hazardous – and – Hazardous, Non-antineoplastic - High Risk						
Pharmacy	Receiving/Unpacking Undamaged or Intact Tablet/Capsule	1 pair				
Pharmacy	Receiving/Unpacking Damaged Liquid, Injectable *Treat as HD spill	2 pairs	Yes	Yes	PAPR/CAPR with organic vapor filter	Yes
Pharmacy	Transport in sealed impervious, leak-proof container or bag and the HD container is decontaminated (with Pacidox or other oxidizing agents)	Not required				
Pharmacy	Repackaging Intact dosage forms (e.g. tablets, capsules, pre-filled syringes, etc.)	1 pair				
Pharmacy	Cutting, crushing or otherwise manipulating tablets or capsules	2 pairs	Yes		Surgical mask	Yes
Pharmacy	Compounding non-sterile oral liquids, suppositories, topical preparations	2 pairs	Yes		Surgical mask	Yes
Pharmacy	• MUST be in ventilated engineering in Pharmacy only	2 pairs sterile	Yes		Surgical mask	Yes
Pharmacy	Compounding Sterile IV, SC, IM, IT, IP, injectable preparations in Pharmacy only	2 pairs sterile	Yes		Surgical mask	Yes
Pharmacy	• MUST be prepared in BSC or CACI	2 pairs sterile	Yes		Surgical mask	Yes
Pharmacy	• Use CSTD as dosage form allows	2 pair sterile	Yes		PAPR/CAPR	Yes
Pharmacy	Cleaning of the HD clean room in pharmacy and BSC	2 pair sterile	Yes		PAPR/CAPR	Yes
Pharmacy	Cleaning under work tray (outside) of BSC	2 pair sterile	Yes		PAPR/CAPR	Yes
Nursing	Administration	1 pair				
Nursing	• Intact dosage forms – Do NOT Cut or Crush (e.g. tablets, capsules)	2 pairs	Yes		If splash potential	
Nursing	• Oral liquid, suspension	2 pairs	Yes		If splash potential	
Nursing	• IV, SC, IM, IT, IP, injectable	2 pairs	Yes		If splash potential	
Nursing	• Use CSTD when dosage form allows	2 pairs	Yes		If splash potential	
Nursing/CNA, CNA, Pharmacy, IVS	Handling bodily fluids, blood specimen or contaminated linens within 48 hours of administration time	2 pairs	Yes		If splash potential	
Pharmacy	Spill Management (per Local Policy)	2 pairs	Yes	Yes	PAPR/CAPR with organic vapor cartridge	Yes

Gloves = Chem-Tested ASTM D6978 gloves, Gown = Disposable, made of polyethylene-coated polypropylene or other laminate materials

1.26 Untitled Slide

Receiving & Transporting

RECEIVE

TRANSPORT



Click on the buttons above to learn more!

Receive (Slide Layer)

Receiving & Transporting

RECEIVE

TRANSPORT

Click on the buttons above to learn more!

RECEIVE

- Only antineoplastic (chemotherapy) drugs from wholesaler will arrive in separate totes with "hazardous" labeling.
- Single gloves shall be worn when receiving & unpacking all HDs.
 - Inspect the shipping container & package for signs of damage or breakage. Report if damaged and handle or dispose the damaged HD per ministry policy.
- HDs must be delivered to the HD storage area immediately after unpacking.

Transport (Slide Layer)

Receiving & Transporting

RECEIVE

TRANSPORT

Click on the buttons above to learn more!

TRANSPORT

- Must be sealed in impervious plastic bags or leak-proof containers with a warning label, at a minimum as "Hazardous Drug" during transporting.
- **When the outer packaging is removed, gloves must be worn.**
 - Gloves are not required if the transport container or outer packaging is clean and intact.
- Pneumatic tubes must not be used to transport any liquid HDs or any antineoplastic HDs.
- Only trained personnel can transport HD.

1.27 Untitled Slide

Storing Hazardous Drugs

Hazardous drugs that may be stored with other inventory:

- Hazardous, Non-antineoplastic-High Risk and Hazardous, Non-antineoplastic-Low Risk
- Reproductive Risk
- Final dosage forms of all HDs (Unit-dose, ready-to-dispense)

Antineoplastic hazardous drugs that require manipulations other than counting:

- Be stored separately from non-HD
- Be stored in negative-pressure room that is externally vented

All HDs are stored in designated bins and areas with warning label to alert as Hazardous Drug

1.28 Untitled Slide

Packaging Hazardous Drugs

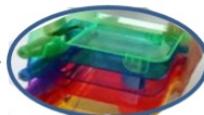
Tablets and capsules of antineoplastic HDs must not be placed in automated counting or packaging machines - creates powdered contaminants.

- If not available packaged from manufacturer, antineoplastic must be hand-packaged (bubble packs)

Packaging must protect the hazardous drug from damage, contamination, leakage and degradation.

Use dedicated equipment, counting trays, spatulas for all HD.

Decontaminate & clean after each use.



1.29 Untitled Slide

Compounding Hazardous Drugs - Pharmacy

Sterile and non-sterile hazardous drugs must be compounded in the engineering controls (e.g. ventilated biosafety cabinet, containment ventilated enclosure or a powder hood) in a negative-pressure room.

The preparations must be decontaminated to remove HD residues, by wiping container/bag with approved oxidizing agent before they are removed from the engineering controls and placed into a clean transport bag.

- *Avoid contamination to the outside of the transport bag*

Follow instructions for PPE in [PSJH Hazardous Drug Assessment of Risk and Handling Instruction](#)

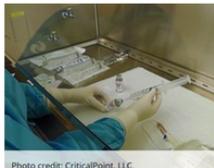


Photo credit: CriticalPoint, LLC



1.30 Untitled Slide

Hazardous Drug Compounding Tips

Hazardous drug aseptic technique: First air is VERTICAL from top to bottom of the engineering control.

Use negative pressure compounding if a Closed System Transfer Device (CSTD*) is not used. Avoid pressurizing the vial content to prevent leakage.

***Closed-system drug-transfer device (CSTD):** A drug-transfer device that mechanically prohibits the transfer of environmental contaminants into the system and the escape of HD or vapor concentrations outside the system.

1.31 Untitled Slide

Hazardous Drug Compounding Tips

Use **CSTD** as containment during compounding **injection** formulations of antineoplastic and hazardous, non-antineoplastic-high risk drugs.

- **Hazardous, Non-antineoplastic-High Risk Drugs:** Hazardous drugs that may pose higher exposure risks than others in the same groups and should be handled as antineoplastic hazardous drugs.
 - Examples: AzaTHIOprine , Cyclosporine, Ganciclovir, Lenalidomide, Mycophenolate Mofetil, Palifermin, Sirolimus, Tacrolimus, Thalidomide, ValGANciclovir.

1.32 Untitled Slide

Preparing Hazardous Drugs – Nursing

If a patient cannot swallow a HD tablet/capsule and the hazardous drug needs to be split, opened or crushed

- Nursing will follow instructions for PPE or check with pharmacy before manipulation.

If crushing a hazardous drug tablet is permitted per handling instructions → Nursing will use a self-contained, pill-crushing device with plastic sleeve to contain any dust or particles generated.



1.33 Untitled Slide

Nursing Administration of Hazardous Drugs

Appropriate **PPE** must be worn when administering specific dosage forms of HDs, i.e. intact tablet vs. liquid vs. injection formulations

- Follow instruction for PPE in [PSJH Hazardous Drug Assessment of Risk and Handling Instruction](#).

Closed System Transfer Devices (CSTD*) must be used for administration of antineoplastic hazardous drugs and hazardous, non-antineoplastic-high risk drugs when the dosage form allows, including all injection routes.

- Reduce risk of leaking by
 - Double-checking the connections
 - Double-checking the luer lock connections

*Closed-system drug-transfer device (CSTD): A drug-transfer device that mechanically prohibits the transfer of environmental contaminants into the system and the escape of HD or vapor concentrations outside the system.

1.34 Match the exposure control with the activity below:

(Matching Drag-and-Drop, 10 points, 3 attempts permitted)

Match the exposure control with the activity below:

Administering IV push of an antineoplastic/chemotherapy drug	Use face shield (if potential for splash)
Administering intact Hazardous Drug in tablet form	Wear gloves when opening package and providing tablet to patient
When patient is unable to swallow a tablet or capsule of a hazardous drug	Ask for different formulation (e.g. liquid)

Correct	Choice
Administering IV push of an antineoplastic/chemotherapy drug	Use face shield (if potential for splash)
Administering intact Hazardous Drug in tablet form	Wear gloves when opening package and providing tablet to patient
When patient is unable to swallow a tablet or capsule of a hazardous drug	Ask for different formulation (e.g. liquid)

Feedback when correct:

That's right! You selected the correct response.

Feedback when incorrect:

You did not select the correct response.

Correct (Slide Layer)

Match the exposure control with the activity below:

Administer (antineoplas... splash)

Administer (tablet form... kage)

When patient (tablet or ca... g. liquid)


Correct
That's right! You selected the correct response.
Continue

Incorrect (Slide Layer)

Match the exposure control with the activity below:

Administer (antineoplas... splash)

Administer (tablet form... kage)

When patient (tablet or ca... g. liquid)


Incorrect
You did not select the correct response.
Continue

Try Again (Slide Layer)

Match the exposure control with the activity below:

Administer (antineoplas... splash)

Administer (tablet form... kage)

When patient (tablet or ca... g. liquid)


Incorrect
That is incorrect. Please try again.
Try Again

1.35 Untitled Slide

Deactivating, Decontaminating & Cleaning HD	
Step 1: Deactivation, decontamination <i>(Render compound inert, remove HD residue)</i>	Use approved oxidizers (e.g. Peroxide formulations)
Step 2: Cleaning <i>(Remove organic/inorganic materials)</i>	Use approved germicidal detergents or wipes with appropriate wet/dwell time
Step 3: Disinfecting <i>(Destroy microorganisms)</i>	Use sterile alcohol (only for sterile compounding)
For sterile compounding: Follow pharmacy procedure (Decontamination, Clean, Disinfect)	
Appropriate PPE:	
➢ Must be resistant to the cleaning agents	
➢ Two pairs of gloves, impermeable disposable gowns, eye protection and face shields if splashing is likely and respiratory protection must be used, if warranted.	
All disposable materials must be discarded per EPA regulations and ministry policies.	
To avoid cross-contamination and to protect personnel: ✓ Use dedicated equipment for hazardous cleanup ✓ Dispose cleaning materials in trace HD waste (yellow bin)	

1.36 Untitled Slide

Disposal of Hazardous Drug Waste	
Dispose in containers that comply with the Pharmaceutical Waste Policy and EPA RCRA (Resource Conservation and Recovery Act) regulations and ministry pharmaceutical waste policy → See disposal instructions in PSJH Hazardous Drug Assessment of Risk and Handling Instruction .	
Pharmaceutical Waste (Blue Bin):	
Trace Antineoplastic Waste (Yellow Bin):	
Bulk/RCRA Waste (Black Bin):	
Continue to follow your ministry policy for disposal of other NON-HD per EPA/RCRA regulations	

1.37 After a preparation of a hazardous drug, the work surface must be decontaminated by which solution below?

(Multiple Choice, 10 points, 1 attempt permitted)

After a preparation of a hazardous drug, the work surface must be decontaminated by which solution below?

- Isopropyl alcohol
- Oxidizer
- Germicidal detergent
- Surfactant

Correct	Choice
	Isopropyl alcohol
X	Oxidizer
	Germicidal detergent
	Surfactant

Feedback when correct:

That's right! You selected the correct response.

Feedback when incorrect:

The correct response is Oxidizer.

Correct (Slide Layer)

After a preparation of a hazardous drug, the work surface must be decontaminated by which solution below?

Isopropyl alcohol

Oxidizer

Germicide

Surfactant


Correct

That's right! You selected the correct response.

Incorrect (Slide Layer)

After a preparation of a hazardous drug, the work surface must be decontaminated by which solution below?

Isopropyl alcohol

Oxidizer

Germicide

Surfactant


Incorrect

The correct response is Oxidizer.

1.38 Untitled Slide

Immediate Treatment After Direct Skin or Eye Contact with Hazardous Drugs

1. Call for help, if needed.
2. Immediately remove contaminated clothing.
3. Flood affected eye with water or isotonic eyewash for at least 15 minutes.
4. Clean affected skin with soap and water; rinse thoroughly.
5. Obtain medical attention.
6. Contact Caregiver Health to document exposure.



NOTE: Supplies for emergency treatment (e.g., soap, eyewash, sterile saline for irrigation) should be immediately located in any area where hazardous drugs are compounded or administered.

1.39 Untitled Slide

Hazardous Drug Spill

What is a Hazardous Drug Spill?
When the hazardous drug is not contained/sealed in the original or intended containers, including:

- Concentrated hazardous medications
- Diluted hazardous medications
- Bodily fluids from patients that have received antineoplastic hazardous drugs and hazardous, non-antineoplastic-high risk drugs within 48 hours.



How do I prepare for a spill?

- Have a spill kit available at all times
- Know what is in your chemo/HD Spill Kit
- Know your ministry procedure

CAUTION: An N-95 mask, normally stocked in a spill kit, is **NOT** a sufficient protection during a spill of ANTINEOPLASTIC hazardous drugs that may vaporize at room temperature. Use a NIOSH-approved PAPR. **Do NOT use the N-95 mask for HD spill clean up; use a NIOSH-approved PAPR.**

1.40 Untitled Slide

Spill Clean-Up Procedure

Only trained personnel can handle the Hazardous Drug Spill
Follow your ministry policy & procedure

Hazardous Drug Spills
(inside a ventilated biosafety cabinet)

Hazardous Drug Spills
(all areas outside the ventilated biosafety cabinet)

MUST perform hand-hygiene with soap and water AFTER removing PPE & gloves

Click on the buttons to learn more!

inside (Slide Layer)

Spill Clean-Up Procedure

Only trained personnel can handle the Hazardous Drug Spill
Follow your ministry policy & procedure

Hazardous Drug Spills
(inside a ventilated biosafety cabinet)

Hazardous Drug Spills
(all areas outside the ventilated biosafety cabinet)

MUST perform hand-hygiene with soap and water AFTER removing PPE & gloves

**Hazardous Drug Spills
(inside a ventilated biosafety cabinet)**

1. Utilize chemo/hazardous drug spill kits, don appropriate PPE and follow pharmacy procedures.
2. Thoroughly clean and decontaminate the biosafety cabinet.
3. Dispose of spill contents into the black hazardous waste bin.

outside (Slide Layer)

Spill Clean-Up Procedure

Only trained personnel can handle the Hazardous Drug Spill
****Follow your ministry policy & procedure****

Hazardous Drug Spills
(inside a ventilated biosafety cabinet)

Hazardous Drug Spills
(all areas outside the ventilated biosafety cabinet)

MUST perform hand-hygiene with soap and water AFTER removing PPE & gloves

Hazardous Drug Spills
(outside a ventilated biosafety cabinet)

1. Immediately evacuate patients and personnel from the room.
2. Assess & treat the exposure (e.g. skin) of any individuals involved and isolate them from the spill.
3. Don PPE, including a PAPR/CAPR with organic vapor filters.
4. Post signs/barriers to limit access to spill area (signs can be found within a chemo/HD spill kit).
5. Notify your Supervisor or on-site person in-charge.
6. Notify the Safety Officer and House (Nurse) Supervisor.
7. Carefully contain and clean up spill area.
8. Dispose of contents in black hazardous waste bin

NOTE: Activate emergency response per ministry policy and for large spill that cannot be handled by one spill kit.

1.41 How should you respond when there has been a hazardous medication spill? (Place the following in order)

(Sequence Drag-and-Drop, 10 points, 3 attempts permitted)

How should you respond when there has been a hazardous medication spill? (Place the following in order)

1. Evacuate patients and activate emergency response
2. Don PPE including PAPR/CAPR
3. Clean up spill per ministry procedure
4. Properly dispose spill materials

Correct Order
Evacuate patients and activate emergency response
Don PPE including PAPR/CAPR
Clean up spill per ministry procedure
Properly dispose spill materials

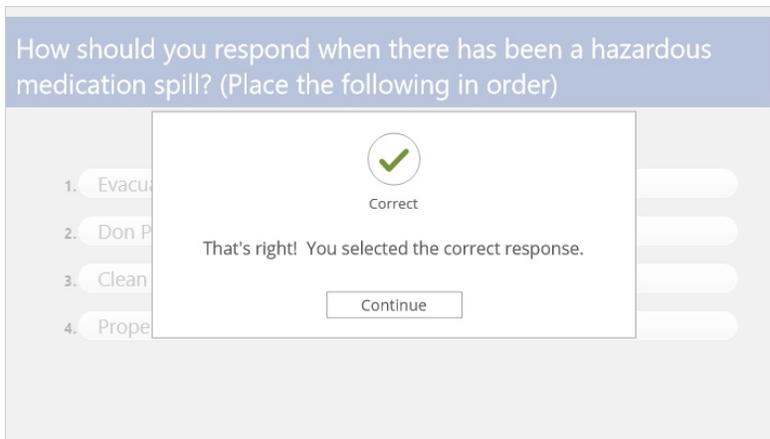
Feedback when correct:

That's right! You selected the correct response.

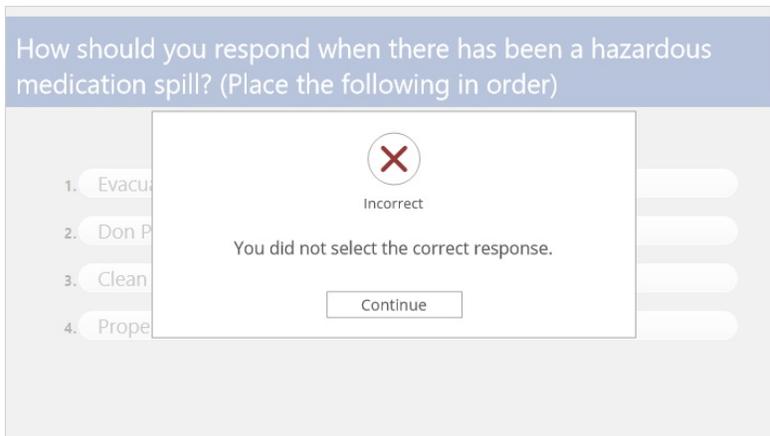
Feedback when incorrect:

You did not select the correct response.

Correct (Slide Layer)



Incorrect (Slide Layer)



Try Again (Slide Layer)

How should you respond when there has been a hazardous medication spill? (Place the following in order)

1. Evacuate
2. Don P
3. Clean
4. Prope

Incorrect

That is incorrect. Please try again.

Try Again

1.42 While preparing the infusion for a Cisplatin dose, the oncology nurse noticed the leakage from the IV bag. She quickly called for help to relocate the patient and posted a sign to alert the spill. As she gathered spill supplies in the unit, she had both N-95 mask and a MaxAir CAPR. Which of the following choice provides safe protection during spill cleaning?

(Multiple Choice, 10 points, 1 attempt permitted)

While preparing the infusion for a Cisplatin dose, the oncology nurse noticed the leakage from the IV bag. She quickly called for help to relocate the patient and posted a sign to alert the spill. As she gathered spill supplies in the unit, she had both N-95 mask and a MaxAir CAPR. Which of the following choice provides safe protection during spill cleaning?

- PAPR/CAPR with organic vapor filter
- N-95 mask
- She can keep the surgical mask that she already donned.

Correct	Choice
X	PAPR/CAPR with organic vapor filter
	N-95 mask
	She can keep the surgical mask that she already donned.

Feedback when correct:

That's right! You selected the correct response.

Feedback when incorrect:

The correct response is PAPR/CAPR with organic vapor filter.

Correct (Slide Layer)

The screenshot shows a quiz interface with a question about spill protection. The question text is: "While preparing the infusion for a Cisplatin dose, the oncology nurse noticed the leakage from the IV bag. She quickly called for help to relocate the patient and posted a sign to alert the spill. As she gathered spill supplies in the unit, she had both N-95 masks and a PAPR. Which of the following provides safe protection during the spill?" The options are: PAPR/CAPR with organic vapor filter, N-95 mask, and She can keep the surgical mask that she already donned. A white dialog box is overlaid on the screen, containing a green checkmark icon, the word "Correct", the text "That's right! You selected the correct response.", and a "Continue" button.

Incorrect (Slide Layer)

While preparing the infusion for a Cisplatin dose, the oncology nurse noticed the leakage from the IV bag. She quickly called for help to relocate the patient and posted a sign to alert the spill. As she gathered spill supplies in the unit, she had both N-95 masks and gloves. She also had a respirator that provides safe protection during the spill.

PAPR/CAPR with organic vapor filter.

N-95 mask and gloves.

She called for help to relocate the patient and posted a sign to alert the spill.

Incorrect

The correct response is PAPR/CAPR with organic vapor filter.

Continue

1.43 Untitled Slide

Resources for Hazardous Drug Control

- [PSJH-PHARM-1309 PSJH Hazardous Drug Control Program](#)
- HD Assessment of Risk: [PSJH Hazardous Drug Assessment of Risk and Handling Instruction](#)
- PPE Guide: [PSJH PPE Guide for Handling HD](#)
- Safety Data Sheets (SDS) <https://app.maxcomsc.com/maxcomsc/maxcom.jsp>



- [USP 800 Hazardous Drugs – Handling in Healthcare Settings](#), PF 40(3) [September 2017]

1.44 Untitled Slide

Regulatory Agencies and Best Practice Advisory Groups

	Environmental Protection Agency (EPA) Resource Conservation and Recovery Act (RCRA) requires that hazardous waste, including pharmaceuticals and chemotherapy, be managed by following a strict set of regulatory requirements designed to protect human health and the environment.
	Occupational Safety and Health Administration (OSHA) published guidelines for safe handling of antineoplastic drugs in 1986, after research revealed adverse health effects to healthcare workers. Guidelines were revised and updated in 1995 and 1999 after research continued to demonstrate occupational exposure and risk to healthcare workers. Guidelines apply to all healthcare settings where employees are occupationally exposed to HD, including hospitals, physician offices, home healthcare agencies, pharmaceutical manufacturers and veterinary clinics.
	Oncology Nursing Society (ONS) publishes guidelines based on ASHP, OSHA and NIOSH recommendations and provides complete guidelines for administration and safe handling of antineoplastic and biopharmacy medications. ONS also conducts continuing education courses addressing safe handling of chemotherapeutic drugs.
	National Institute for Occupational Safety and Health (NIOSH) provides evidence that measurable levels of HD residue on numerous workplace surfaces continues to be common and widespread in the work place. NIOSH's 2004 Alert presented standard precautions for handling hazardous drugs safely. NIOSH classifies HD into three risk groups. The list of antineoplastic and other hazardous drugs in healthcare settings is updated regularly.
	U.S. Pharmacopoeia (USP) sets standards for the identity, strength, quality, and purity of medicines, food ingredients, and dietary supplements manufactured, distributed and consumed worldwide. USP's drug standards are enforceable in the United States by the Food and Drug Administration, and these standards are used in more than 140 countries.

1.45 Untitled Slide

Thank you!

You have completed this portion of the Hazardous Drug Control Program. Click the Next > button to close this window.

2. Lightboxes

2.1 Warning Label

Warning label at each hazardous drug bin in the pharmacy



2.2 Pyxis

Hazardous drug stored in dispensing cabinets (Pyxis) is flagged with a hazardous alert



The screenshot shows a software window titled "View/Modify Responses". It contains a "List" section with a "Name" field containing the text "Hazardous Medication - ACKNOWLEDGE PRECAUTIONS TO PROCEED". Below the list is a "Responses" section with a text input field containing the text "I understand to don the required PPE & NO cutting/crushing". A "Save" button is located to the right of the responses field.

3. Waste bins

3.1 Blue

Pharmaceutical Waste (Blue Bin):
Non-antineoplastic, non RCRA



3.2 Yellow

Trace Antineoplastic Waste (Yellow Bin):
PPE, Cleaning wipes, empty or \leq 3% remaining antineoplastic HD (IVPB/tubing), CSTD



3.3 Black

Bulk/RCRA Waste (Black Bin):
Spill materials, $>$ 3% remaining antineoplastic HD
(no sharps in black bins)



4. Untitled Scene

4.1 Untitled Slide

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