PROV: Antimicrobial Stewardship (AMS) for Providers and Pharmacists

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	

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.

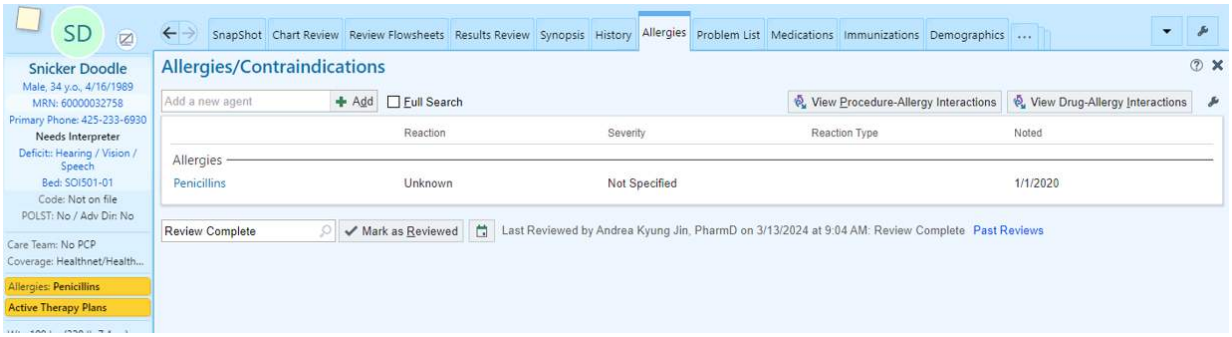
Introduction

How should you conduct a Penicillin Allergy Assessment?

Click **start** to learn the process.

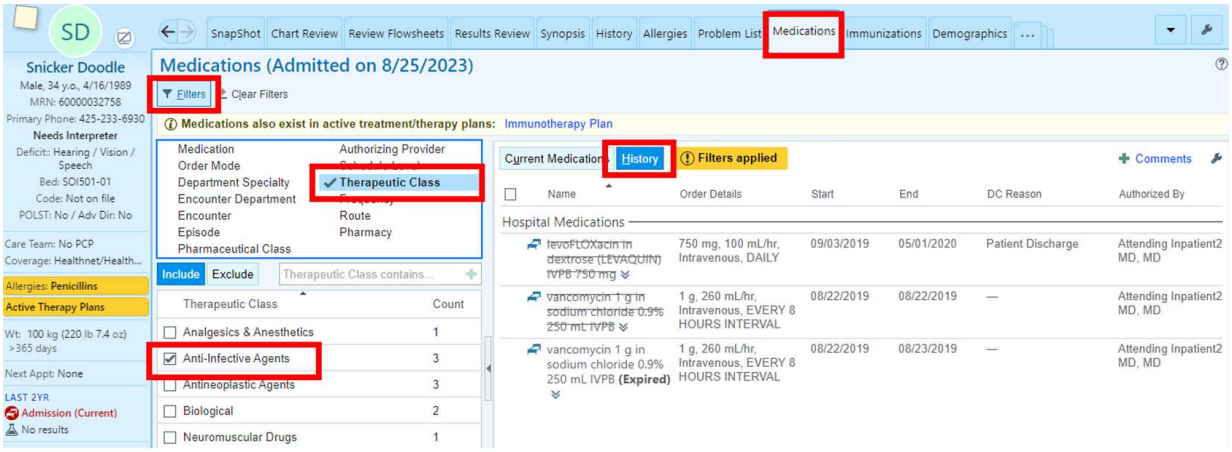
Step 1

Review patient's allergy



Step 2

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



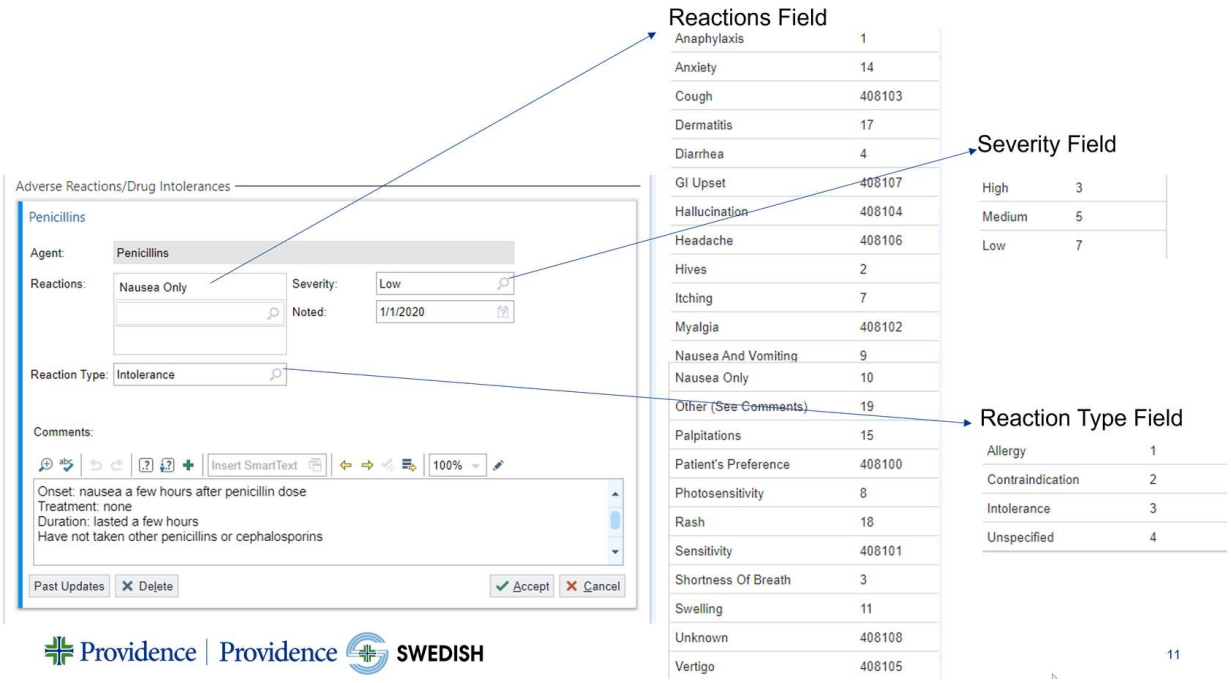
Step 3

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



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

SUBMIT

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

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

*PEN-FAST Scoring

PEN	PENiciliin Allergy Reports By Patient	Points
F	Five years or less since reaction	2 points
A	Anaphylaxis or angioedema or Severe cutaneous adverse reaction	2 points
S		
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.

PDF

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)				

Cardiac	• Coronary artery bypass • Valve replacement	Cefazolin Vancomycin can be considered in high-risk cases	Vancomycin + Select one: Gentamicin or Levofloxacin	Cefazolin + Vancomycin	Vancomycin+ Select one: Gentamicin or Levofloxacin
	• Cardiac device insertion procedure (e.g., pacemaker implantation) • TAVR	Cefazolin	Vancomycin	Cefazolin + Vancomycin	Vancomycin
	Ventricular assist devices	Cefazolin or cefepime Add fluconazole for concern of post-operative fungal infection	Vancomycin + Levofloxacin Add fluconazole for concern of post-operative fungal infection	Vancomycin + Cefazolin or cefepime Add fluconazole for concern of post-operative fungal infection	Vancomycin + Levofloxacin Add fluconazole for concern of post-operative fungal infection

CONTINUE

Penicillin Allergy Workflow

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

CONTINUE

Knowledge Check

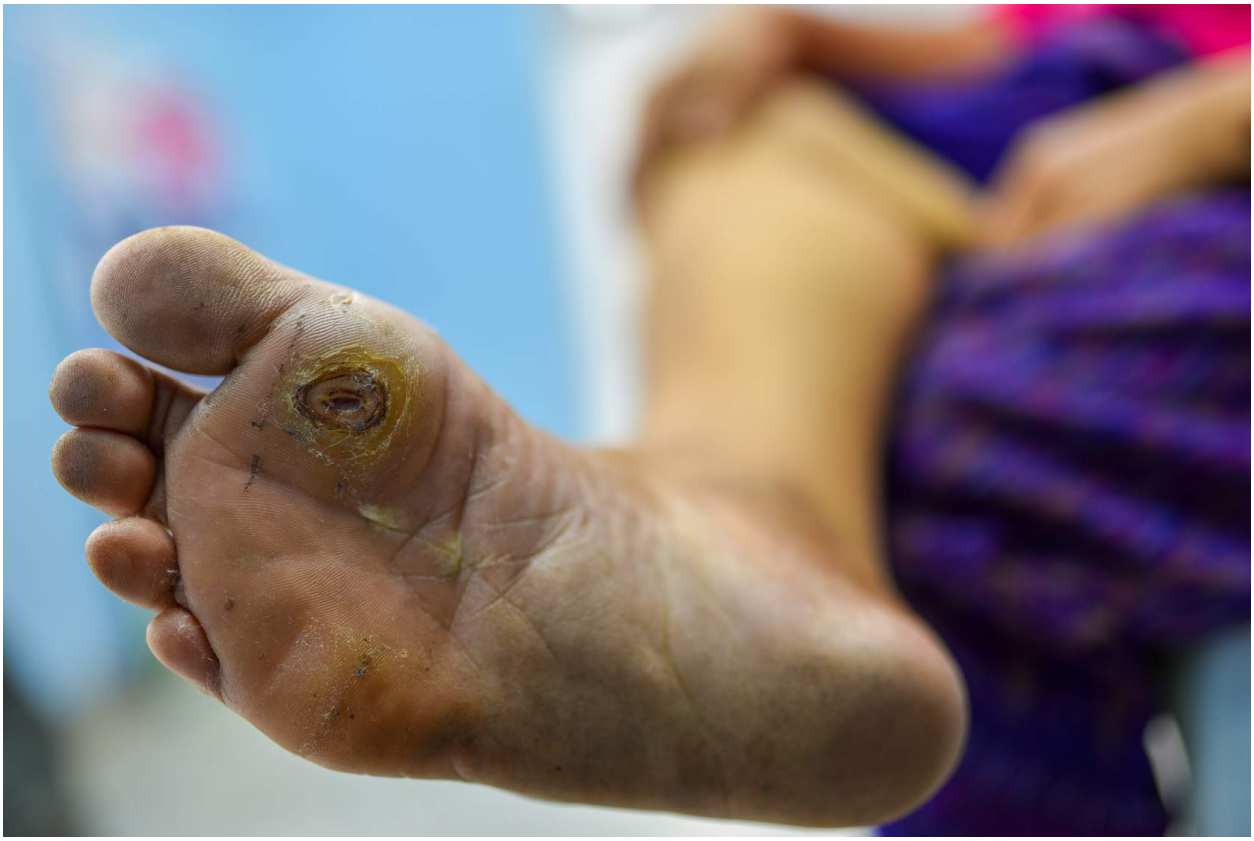
Penicillins share similar R1 sidechains with which Cephalosporins?

- Cefazolin
- Ceftriaxone
- Cefepime
- None of the above

SUBMIT

Empiric Diabetic Foot Infection (DFI) Treatment

Diabetes-Related Foot Infections (DFI)

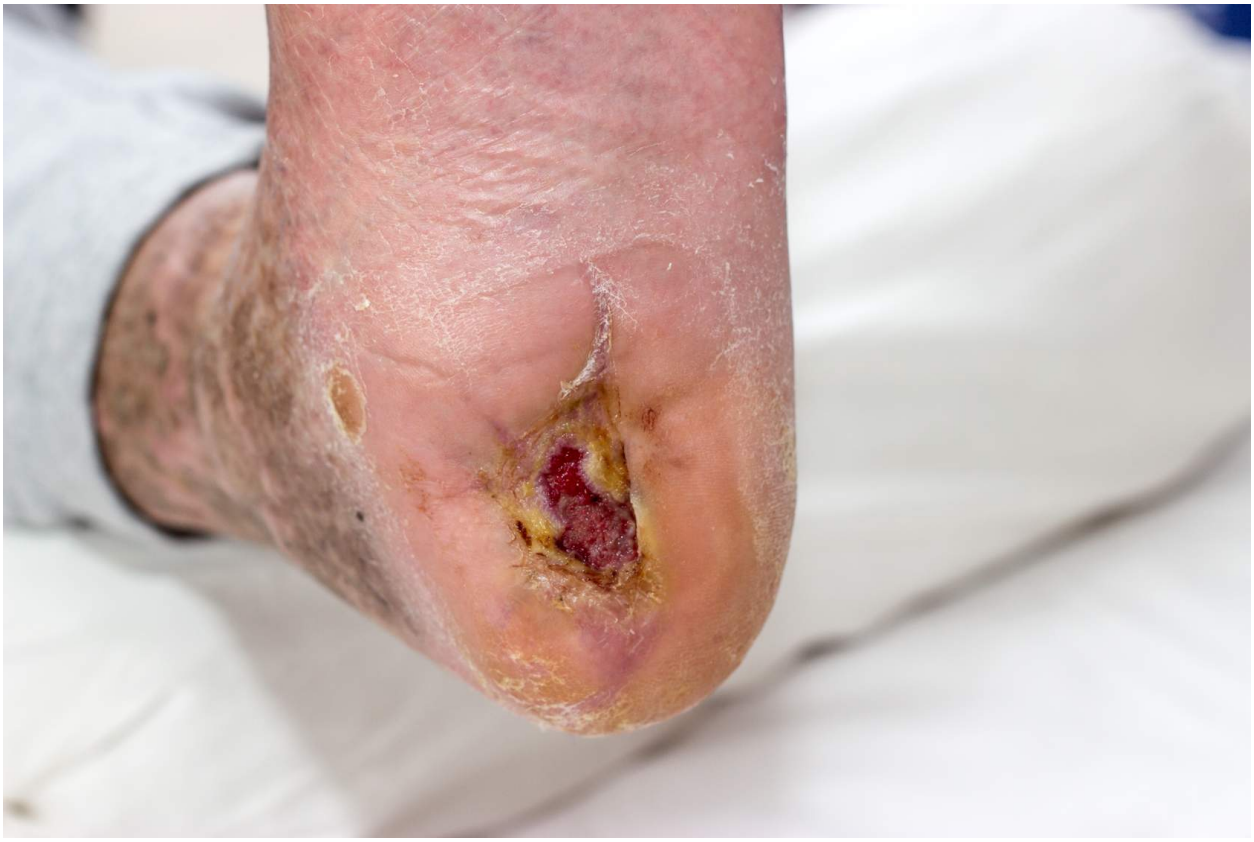


- DFIs are the most frequent diabetes-related cause of hospitalization and amputation
    - Ndosi et al (2017): 12-month outcomes of adults after antibiotic treatment for DFI 45.5% ulcer healed, 9.6% ulcer redeveloped, 17.4% lower extremity amputated, 15.5% had died

- 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



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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	Infected: At least two present: • Local swelling or induration • Erythema > 0.5 but < 2 cm around wound • Local tenderness or pain • Local increased warmth • Purulent discharge And no other cause of an inflammatory response of the skin (e.g. gout, acute charcot neuroarthropathy, fracture, thrombosis, or venous stasis)
Moderate	Infection with no systemic manifestations and involving: • Erythema extending ≥ 2 cm from wound margin and/or • Tissue deeper than skin and subcutaneous tissues (e.g. tendon, muscle, joint, and bone) Infection involving bone (osteomyelitis)
Severe	Any foot infection with associated systemic manifestations (SIRS) as manifested by ≥ 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

2

- ○ 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

Resected	2-5 Days	Oral **or** Initial Parenteral, then switch to Oral
Debridement (soft tissue)	1-2 Weeks	
Positive culture/histology *after* 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

SUBMIT

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℉ (38℃)
  - 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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Oral Antibiotic Options Based Upon Organisms

To review the table, please download the PDF below.

PDF

Oral Antibiotic Options based upon Organisms.pdf

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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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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

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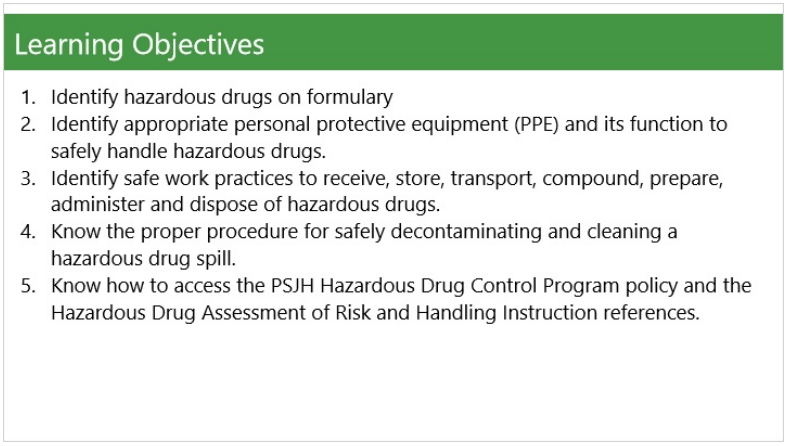
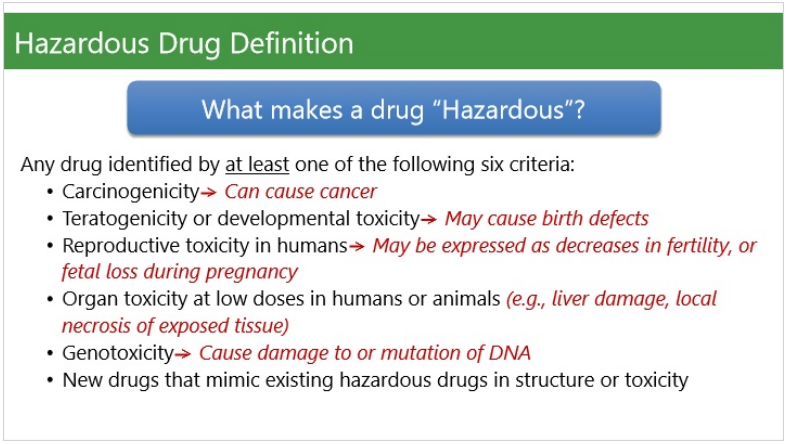
1.1 Untitled Slide

1.2 Untitled Slide

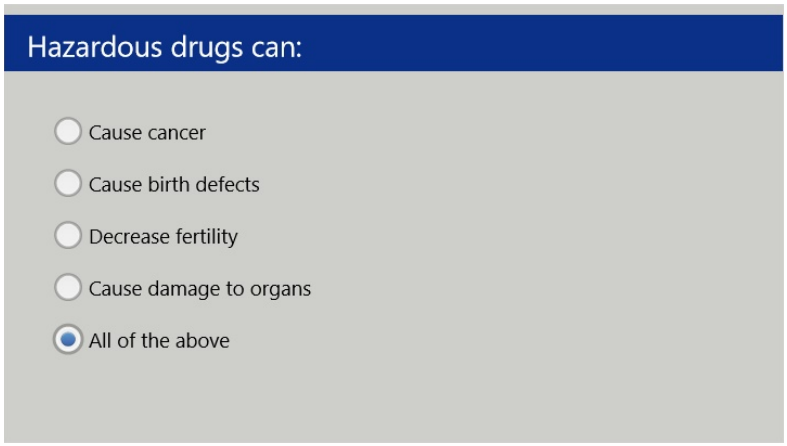


1.3 Untitled Slide



1.4 Hazardous drugs can:

(Multiple Choice, 10 points, 1 attempt permitted)



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

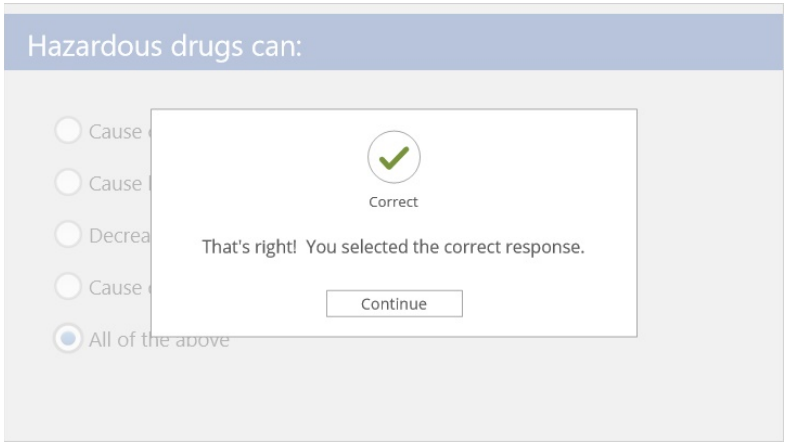
Feedback when correct:

That's right! You selected the correct response.

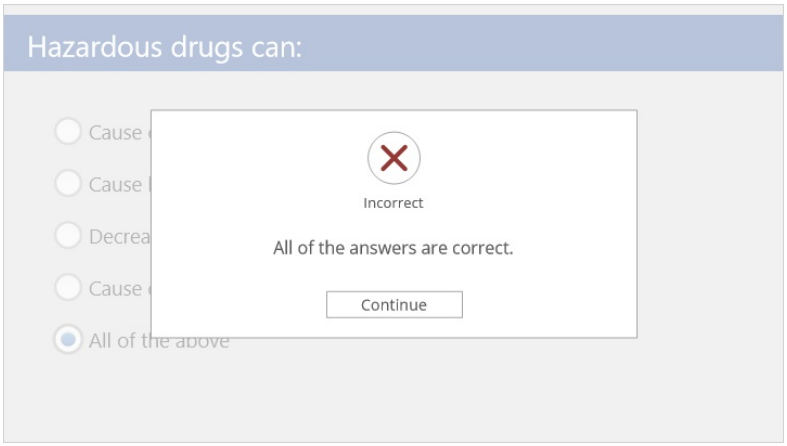
Feedback when incorrect:

All of the answers are correct.

Correct (Slide Layer)



Incorrect (Slide Layer)



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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.

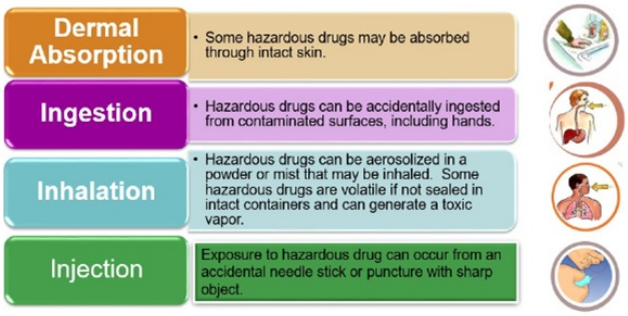
Chronic (long-term effects) of exposure include:

- 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:



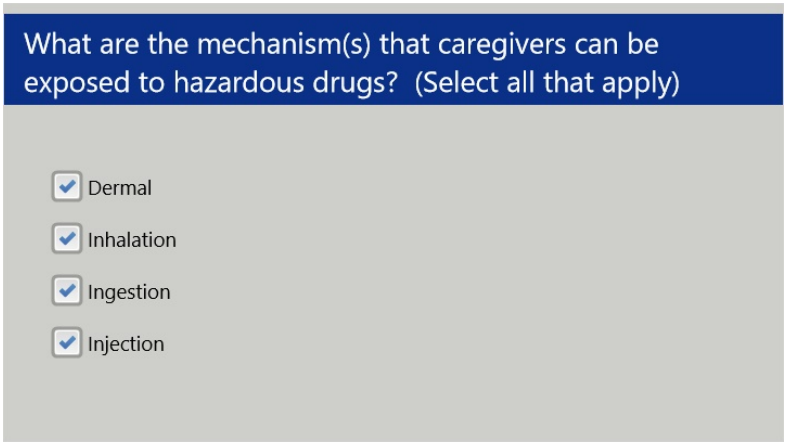
1.7 Untitled Slide

Exposure Prevention

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

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)



Correct	Choice
X	Dermal
X	Inhalation
X	Ingestion
X	Injection

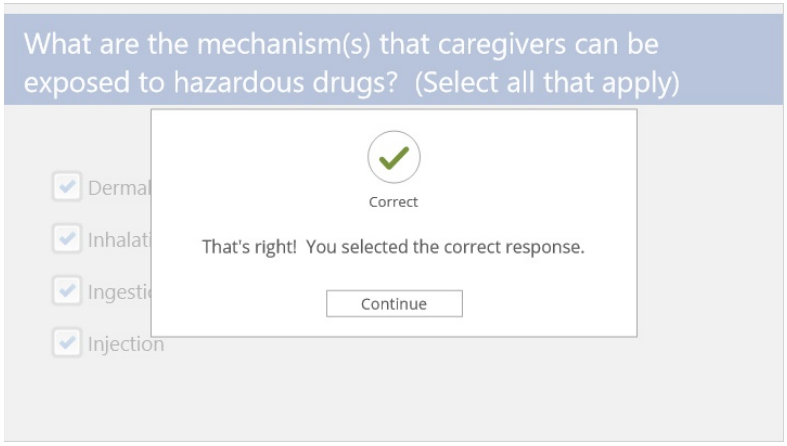
Feedback when correct:

That's right! You selected the correct response.

Feedback when incorrect:

All of the answers are correct.

Correct (Slide Layer)



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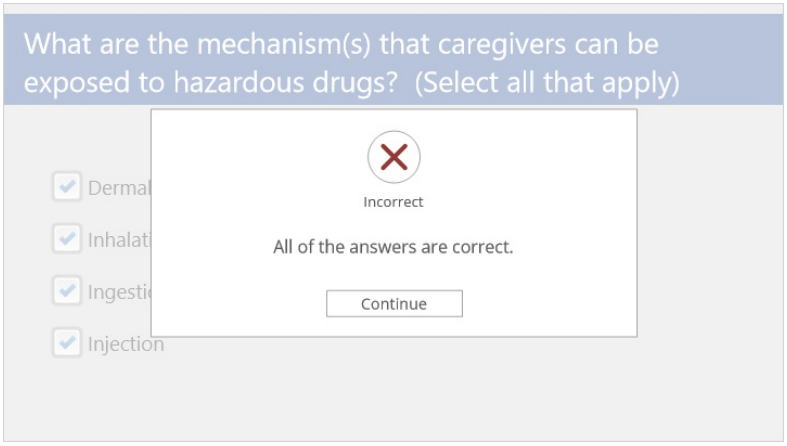

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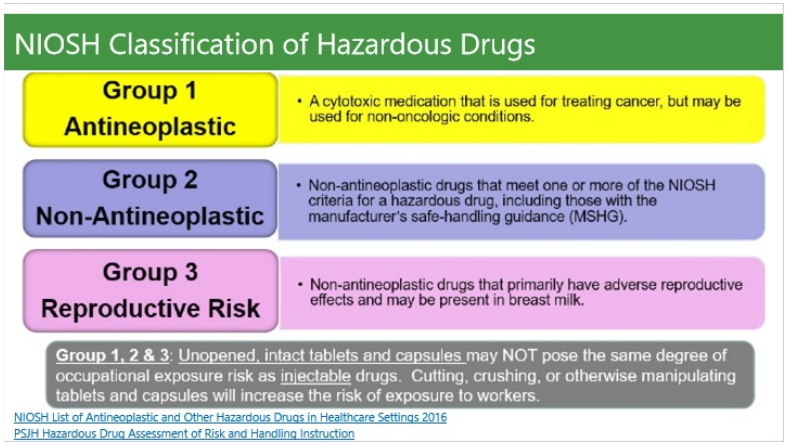

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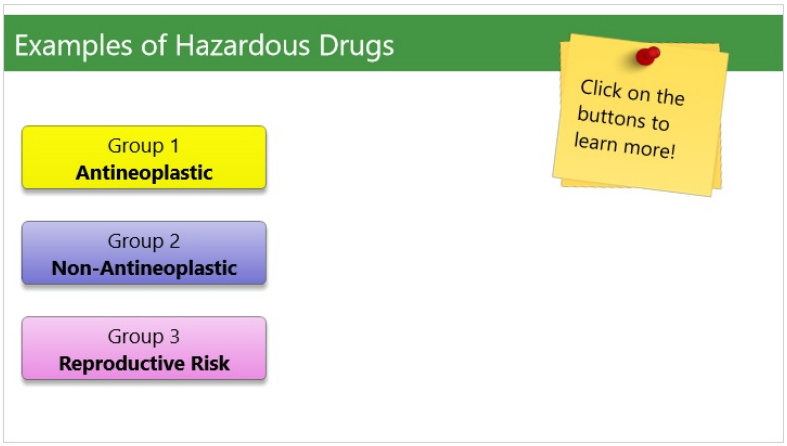
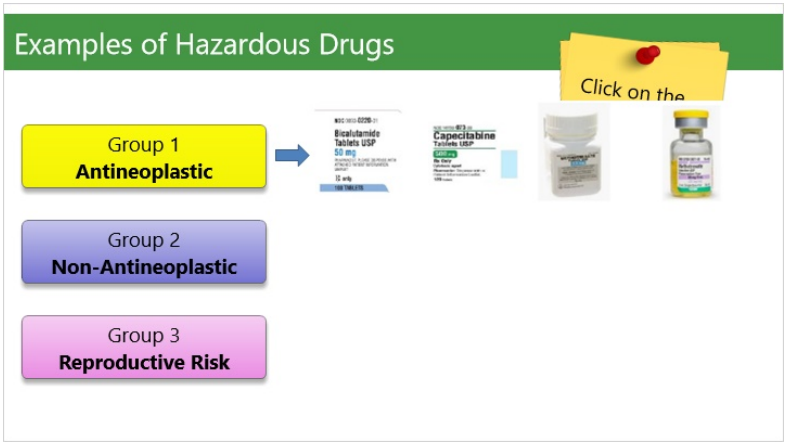
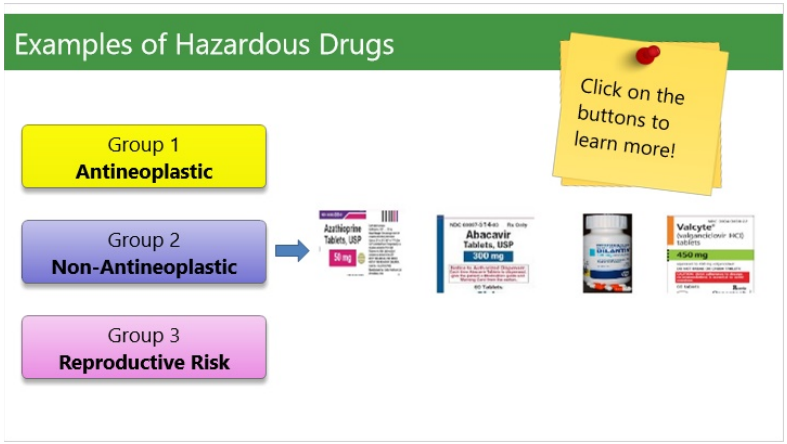


Group 1 (Slide Layer)



Group 2 (Slide Layer)



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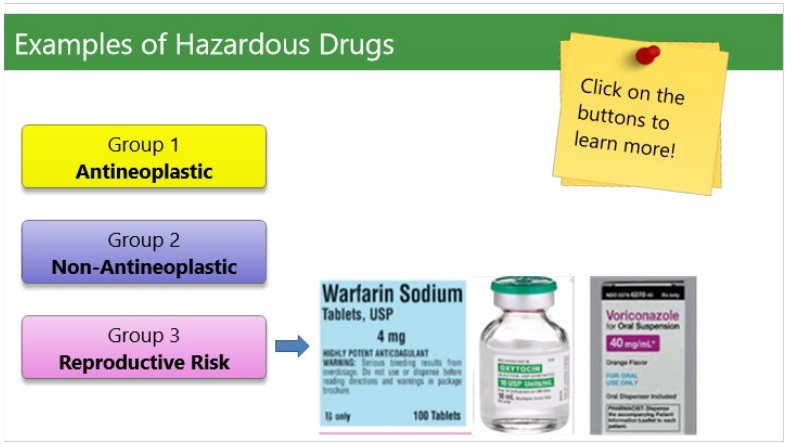
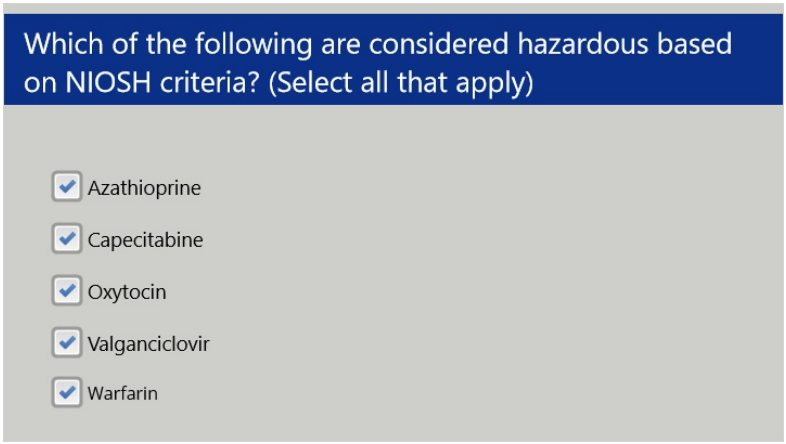


1.11 Which of the following are considered hazardous based on NIOSH criteria? (Select all that apply)

(Multiple Response, 10 points, 1 attempt permitted)



Correct	Choice
X	Azathioprine
X	Capecitabine
X	Oxytocin
X	Valganciclovir

X	Warfarin

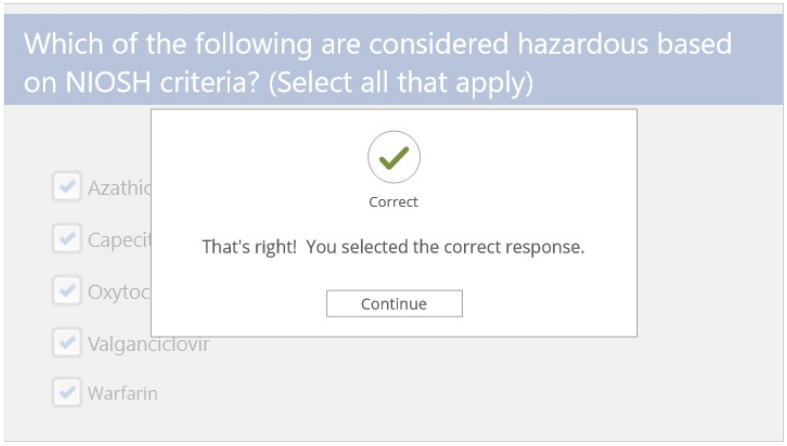
Feedback when correct:

That's right! You selected the correct response.

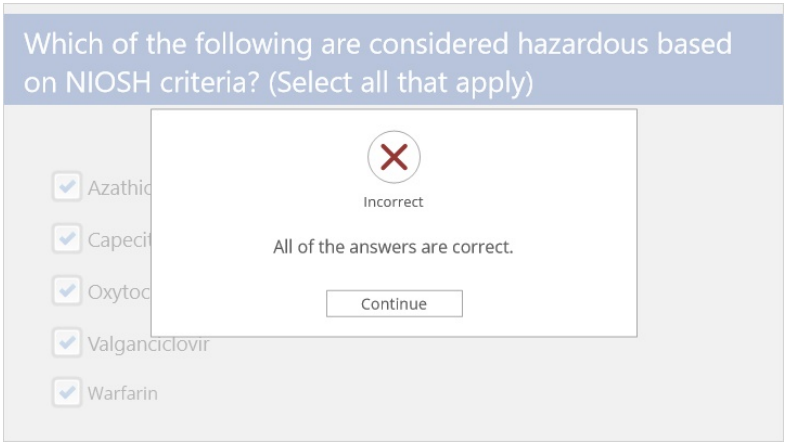
Feedback when incorrect:

All of the answers are correct.

Correct (Slide Layer)



Incorrect (Slide Layer)



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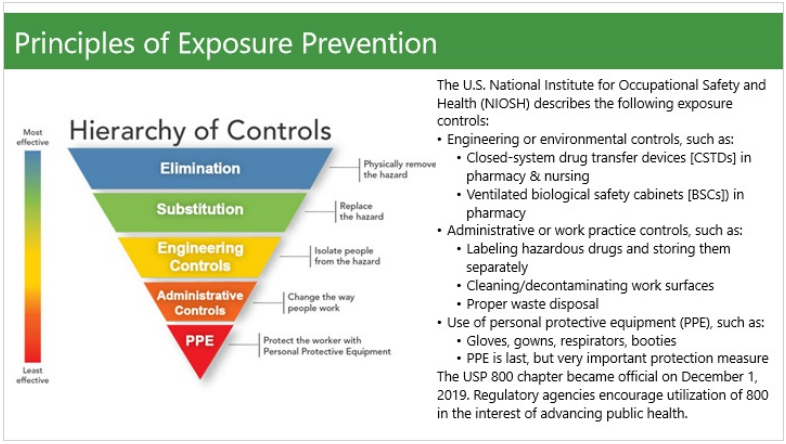

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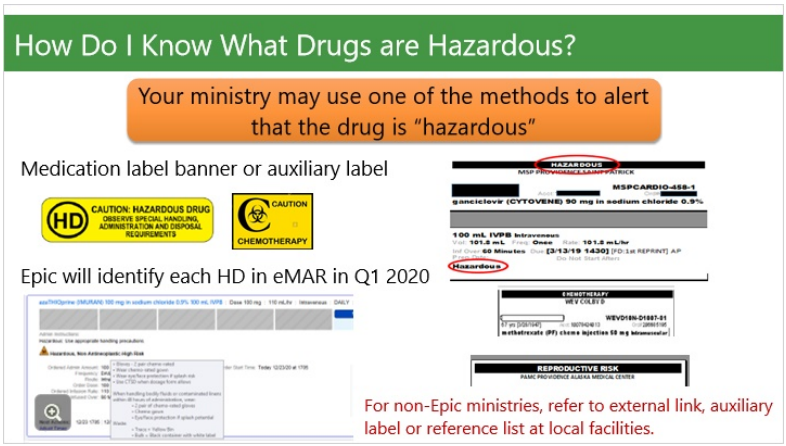

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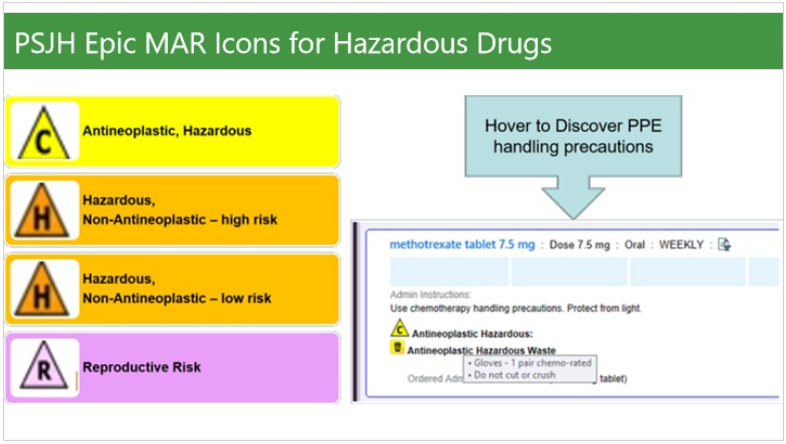

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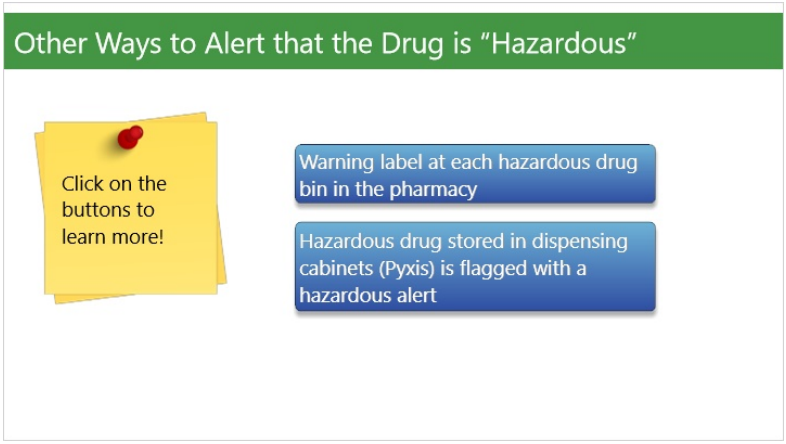
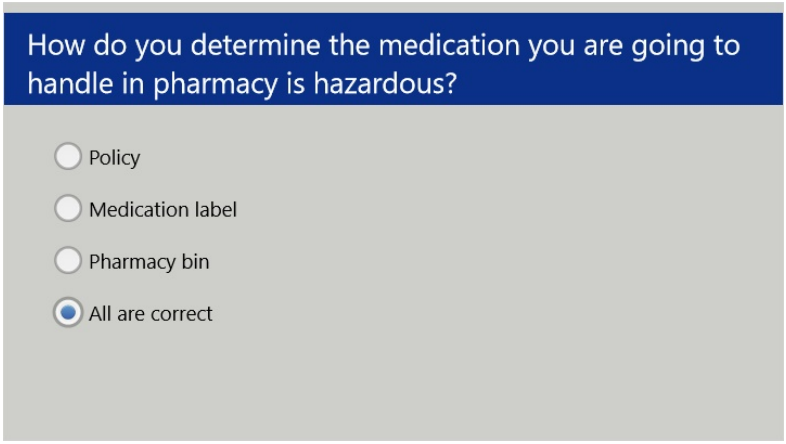


1.16 How do you determine the medication you are going to handle in pharmacy is hazardous?

(Multiple Choice, 10 points, 1 attempt permitted)



Correct	Choice
	Policy
	Medication label
	Pharmacy bin
X	All are correct

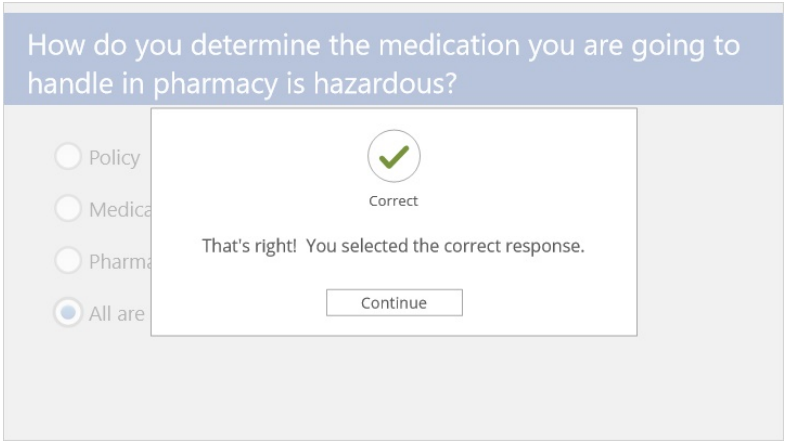
Feedback when correct:

That's right! You selected the correct response.

Feedback when incorrect:

All of the responses are correct.

Correct (Slide Layer)



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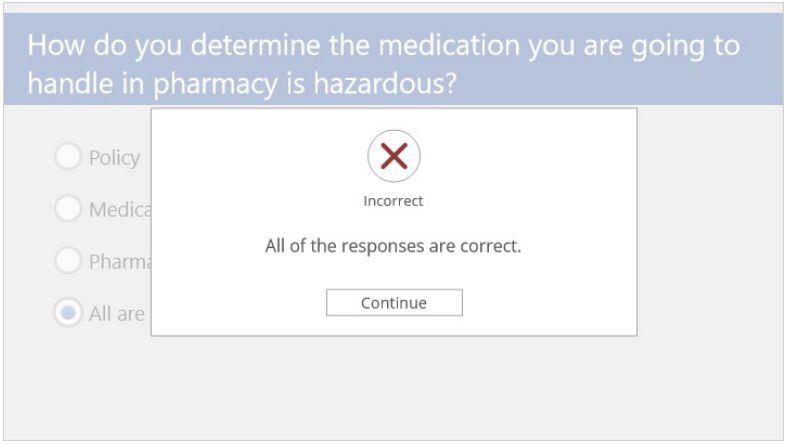

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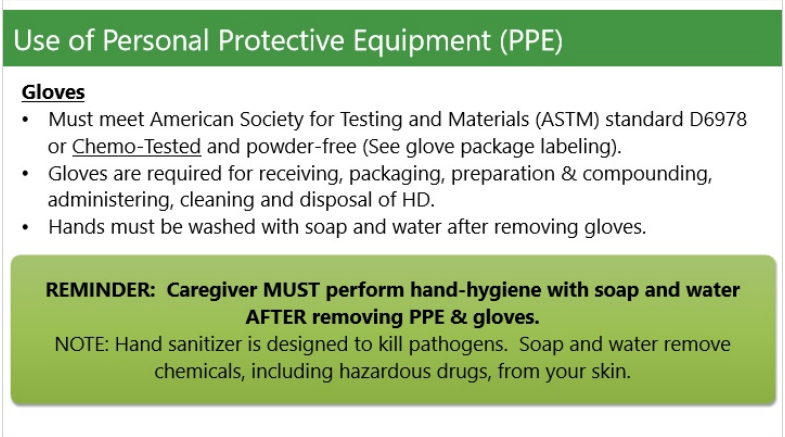
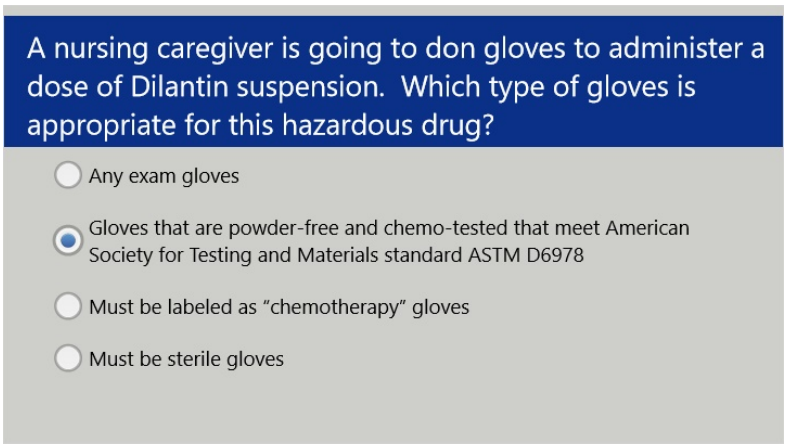
1.18 Untitled Slide



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)



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:

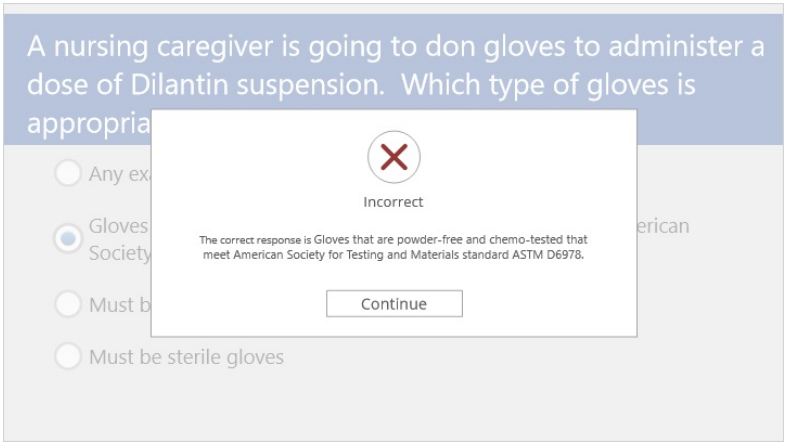
That's right! You selected the correct response.

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)

Incorrect (Slide Layer)



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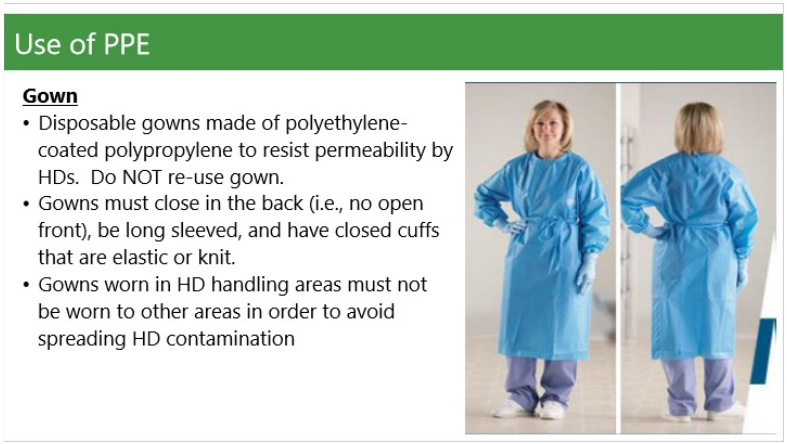

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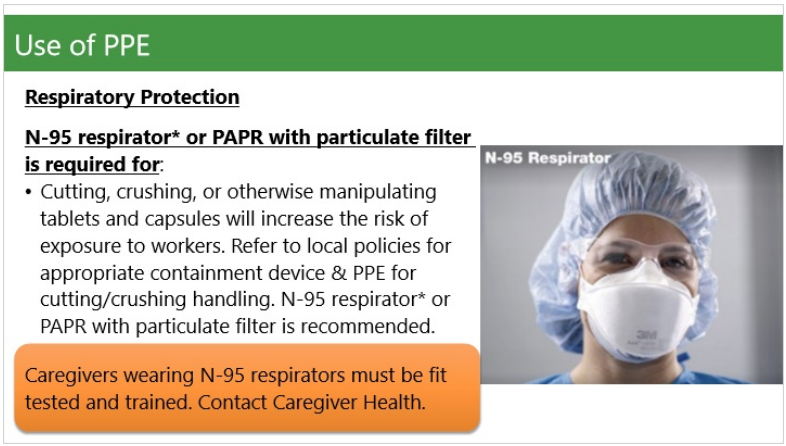
1.22 Untitled Slide



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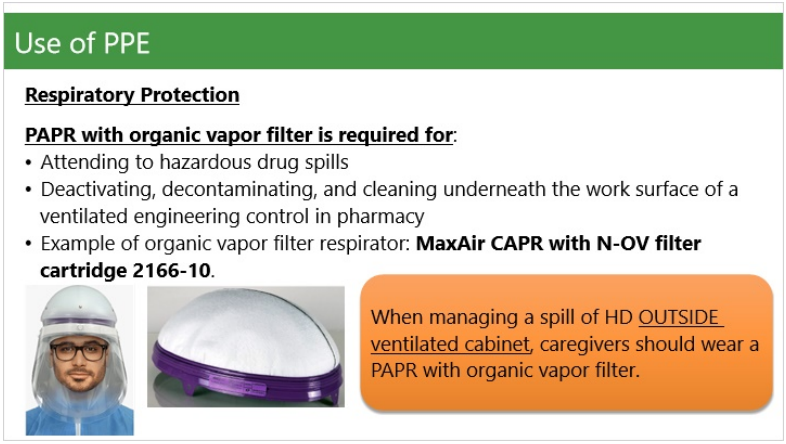


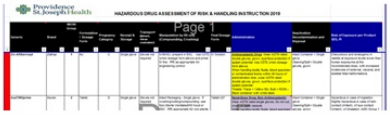
1.24 Untitled Slide

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

PSJH PPE Guide for HD Handling

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 Peridox or other oxidizing agents)	Not required				
Pharmacy	Repackaging Intact dosage forms (e.g., tablets, capsules, prefilled syringes, etc.)	1 pair				
Pharmacy	Cutting, crushing or otherwise manipulating tablets or capsules • MUST be in ventilated engineering in Pharmacy only	2 pairs	Yes		Surgical mask	Yes
Pharmacy	Compounding non-sterile oral liquids, suppositories, topical preparations • MUST be in ventilated engineering in Pharmacy only	2 pairs	Yes		Surgical mask	Yes
Pharmacy	Compounding Sterile IV, SC, IM, IT, IP, injectable preparations in Pharmacy only • MUST be prepared in BSC or CACI • Use CSTD as dosage form allows Cleaning of the HD clean room in pharmacy and BSC Cleaning under work tray (outside) of BSC	2 pairs sterile 2 pair sterile 2 pair sterile	Yes Yes Yes		Surgical mask *PAPR/CAPR*	Yes *Double shoe covers in HD clean room*
Nursing	Administration • Intact dosage forms – **Do NOT Cut or Crush** (e.g., tablets, capsules) • Oral liquid, suspension • IV, SC, IM, IT, IP, injectable **Use CSTD when dosage form allows	1 pair 2 pairs 2 pairs	 Yes Yes	 If splash potential If splash potential		
Nursing, CNA, EVS	Handling bodily fluids, blood specimen or contaminated linens within 48 hours of administration time	2 pairs	Yes	If splash potential		
Pharmacy, Nursing, EVS	Spill Management *(per Local Policy)*	2 pairs	Yes	Yes	*PAPR/CAPR with organic vapor cartridges*	Yes

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

1.26 Untitled Slide

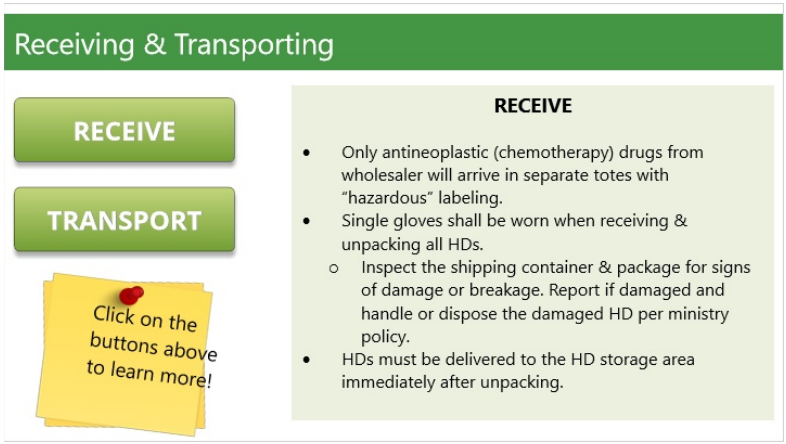
Receiving & Transporting

RECEIVE

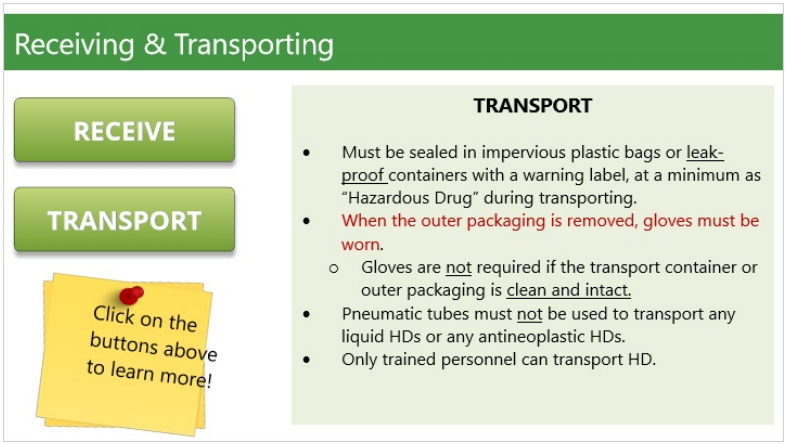
TRANSPORT

Click on the buttons above to learn more!

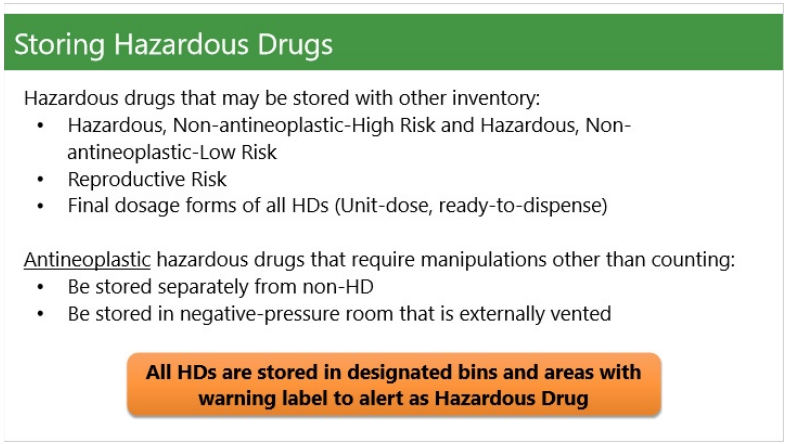
Receive (Slide Layer)



Transport (Slide Layer)



1.27 Untitled Slide



1.28 Untitled Slide

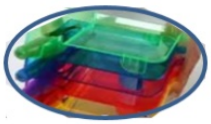
Packaging Hazardous Drugs

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

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.

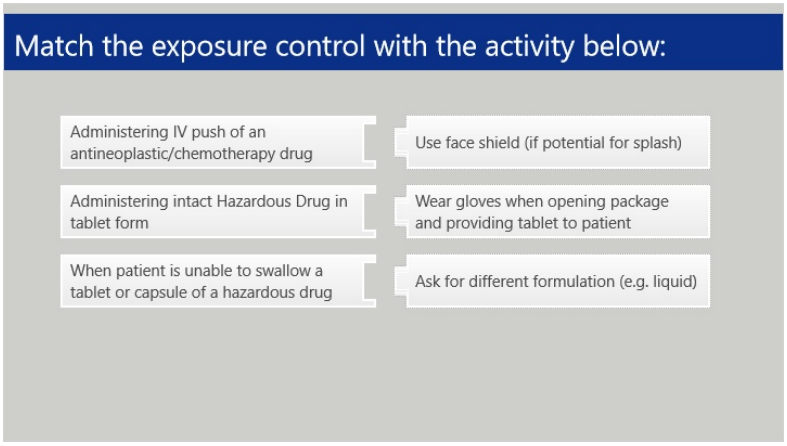
Closed System Transfer Devices (CSTD*) must be used for administration of antineoplastic hazardous drugs and hazardous, non-antineoplastic-high risk drugs when the dosage form allows, including all injection routes.

- 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)



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)

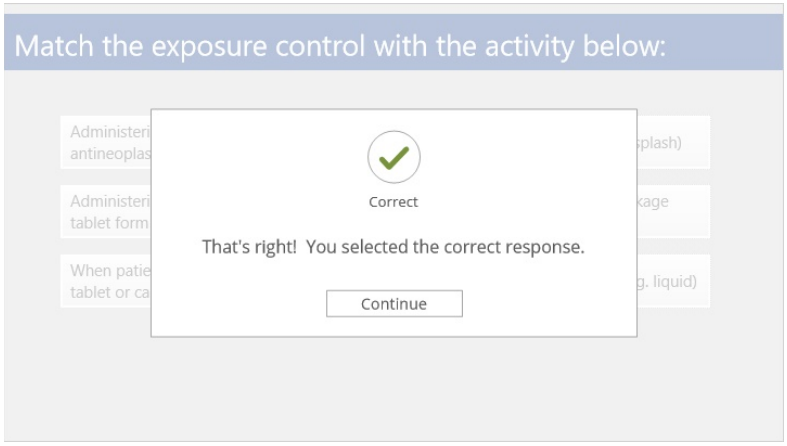
Feedback when correct:

That's right! You selected the correct response.

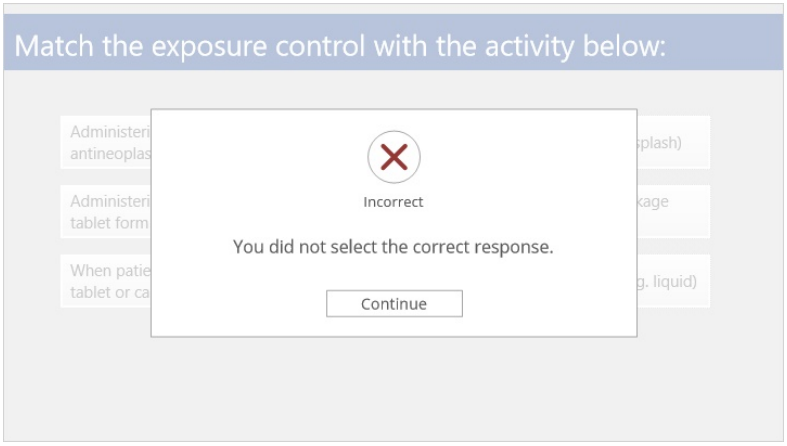
Feedback when incorrect:

You did not select the correct response.

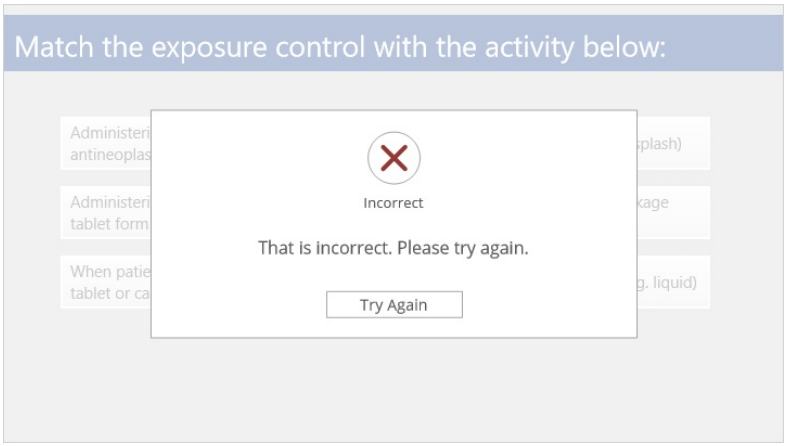
Correct (Slide Layer)



Incorrect (Slide Layer)



Try Again (Slide Layer)



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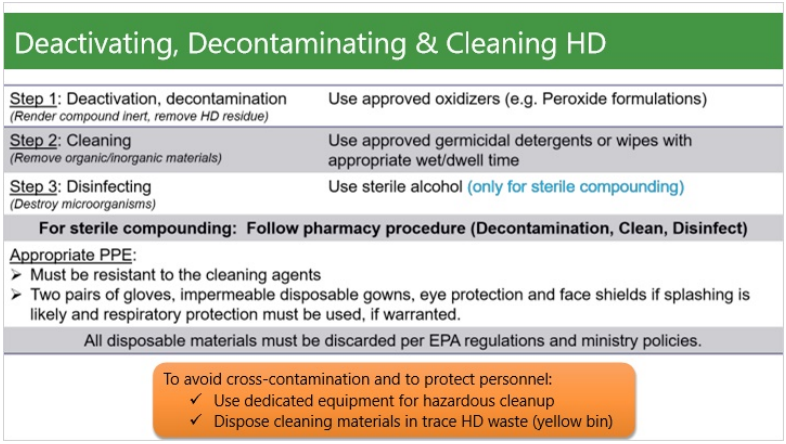
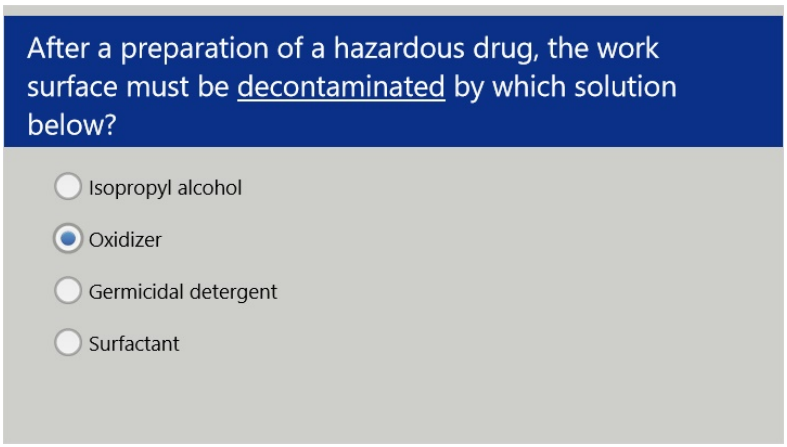


1.36 Untitled Slide

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)



Correct	Choice
	Isopropyl alcohol
X	Oxidizer
	Germicidal detergent
	Surfactant

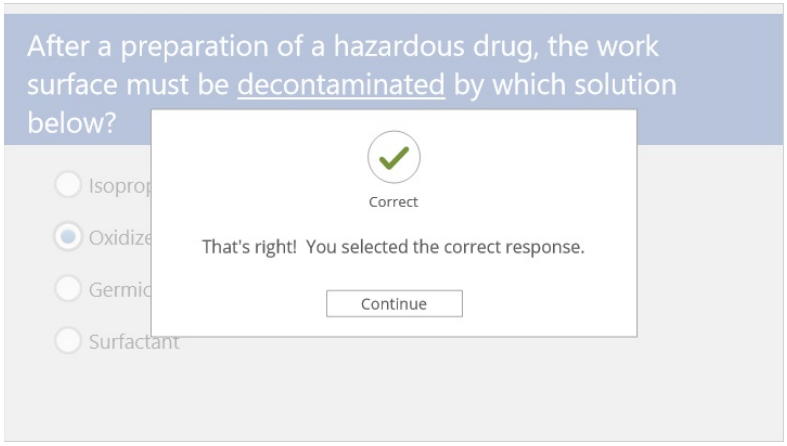
Feedback when correct:

That's right! You selected the correct response.

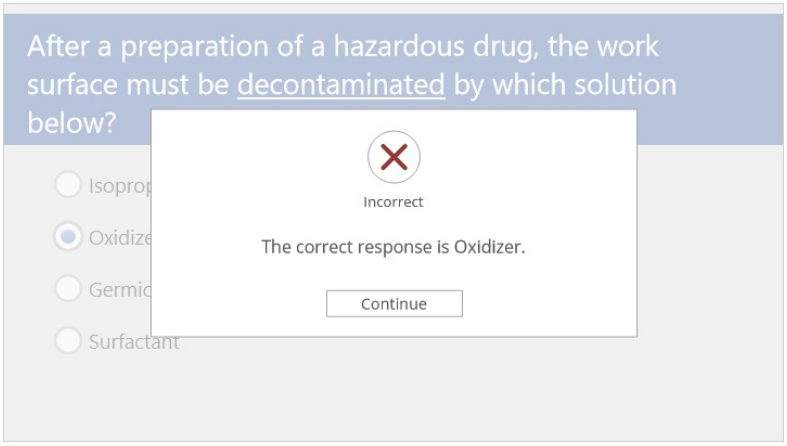
Feedback when incorrect:

The correct response is Oxidizer.

Correct (Slide Layer)

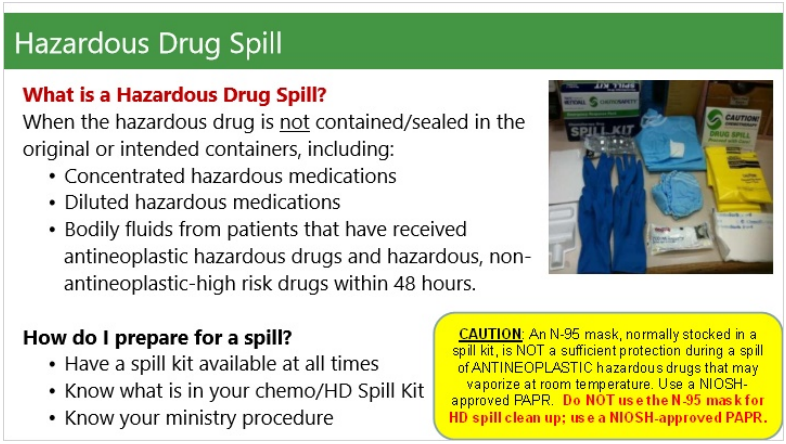


Incorrect (Slide Layer)

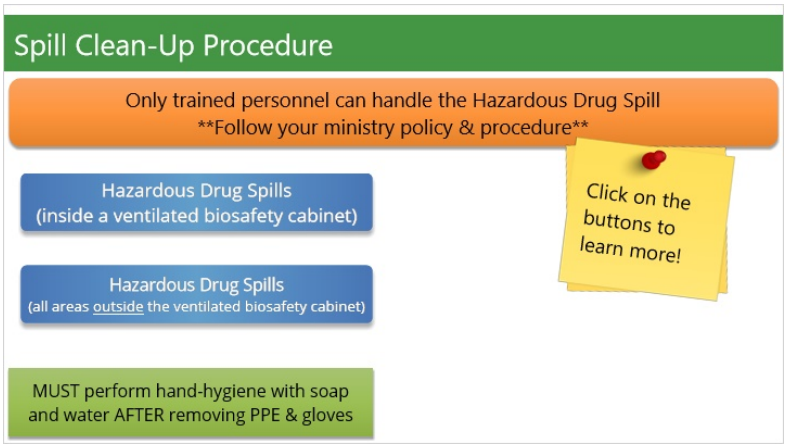


1.38 Untitled Slide

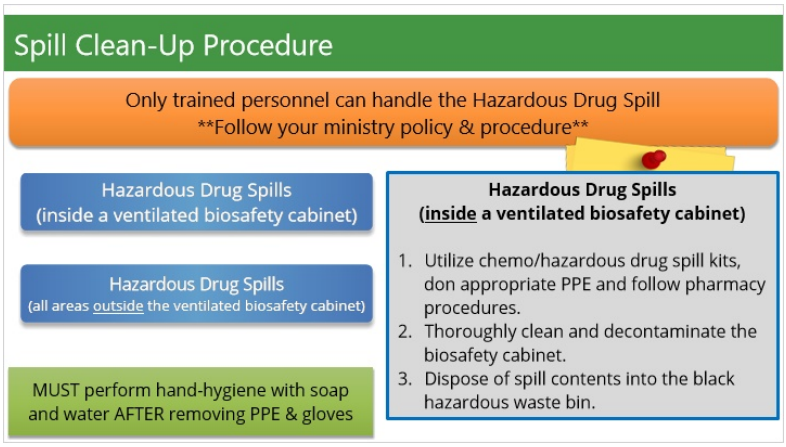
1.39 Untitled Slide



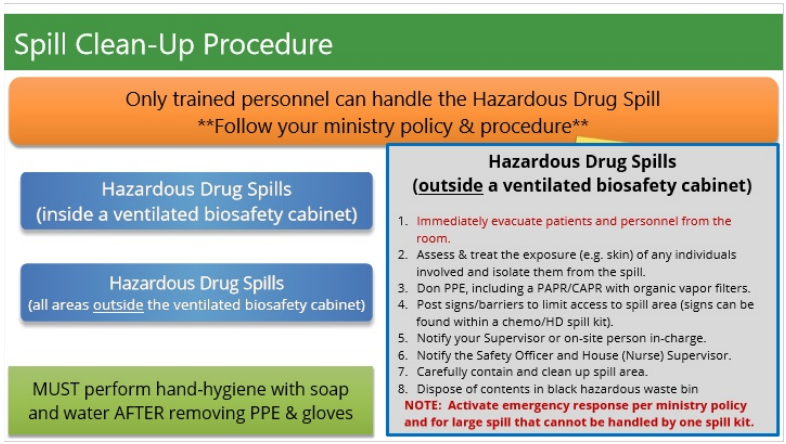
1.40 Untitled Slide



inside (Slide Layer)

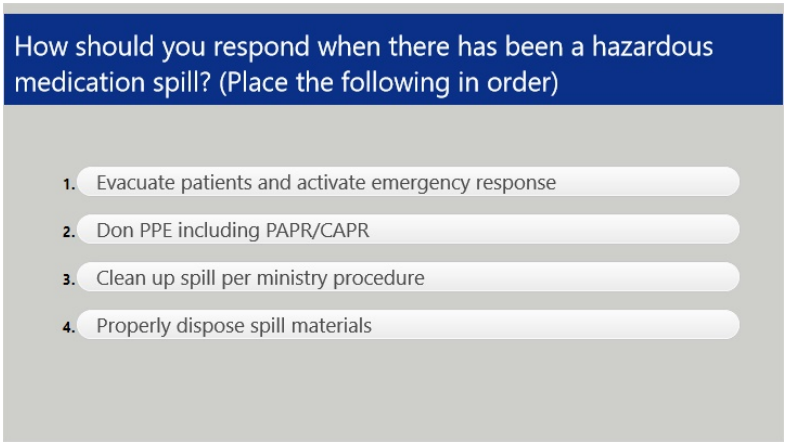


outside (Slide Layer)



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)



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

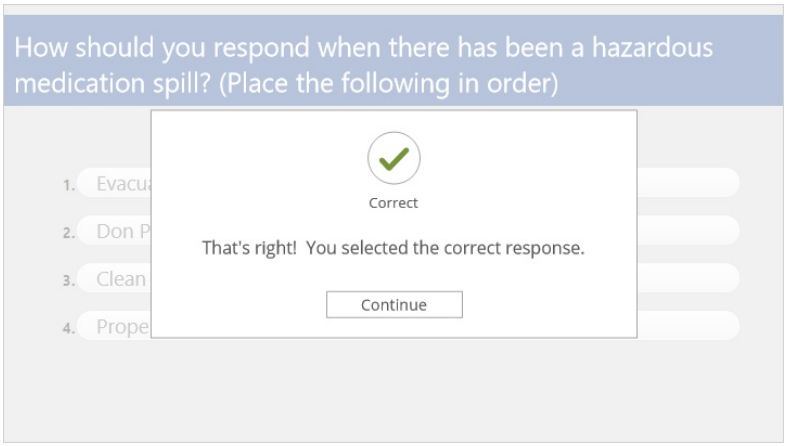
Feedback when correct:

That's right! You selected the correct response.

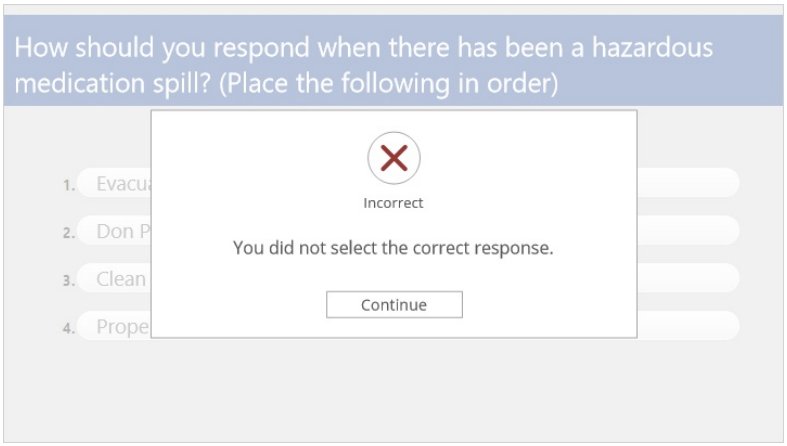
Feedback when incorrect:

You did not select the correct response.

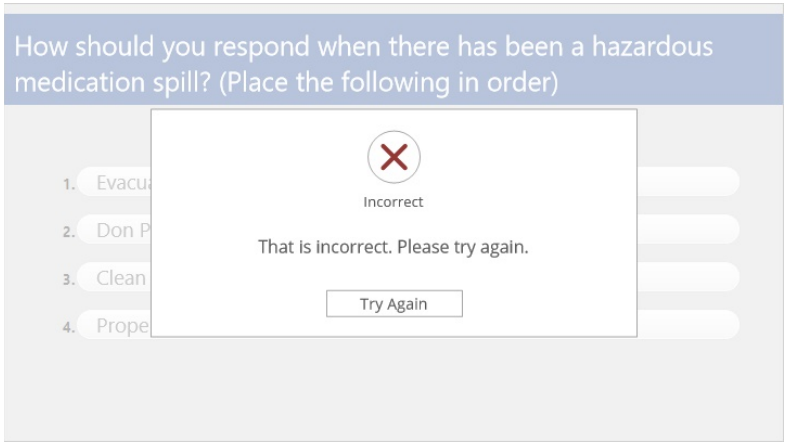
Correct (Slide Layer)



Incorrect (Slide Layer)

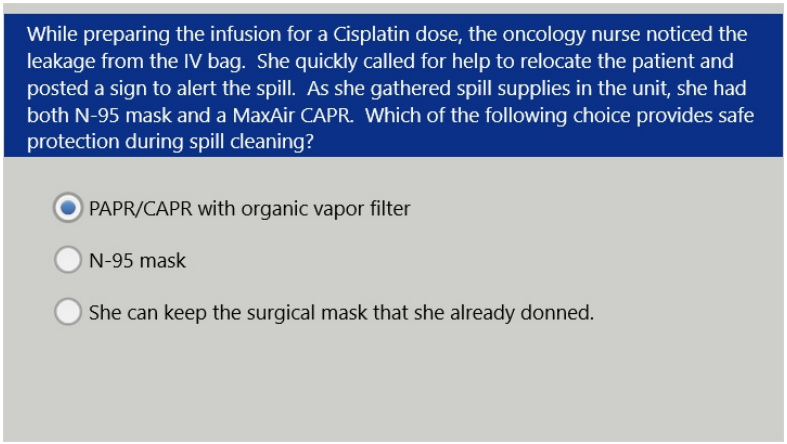


Try Again (Slide Layer)



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)



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

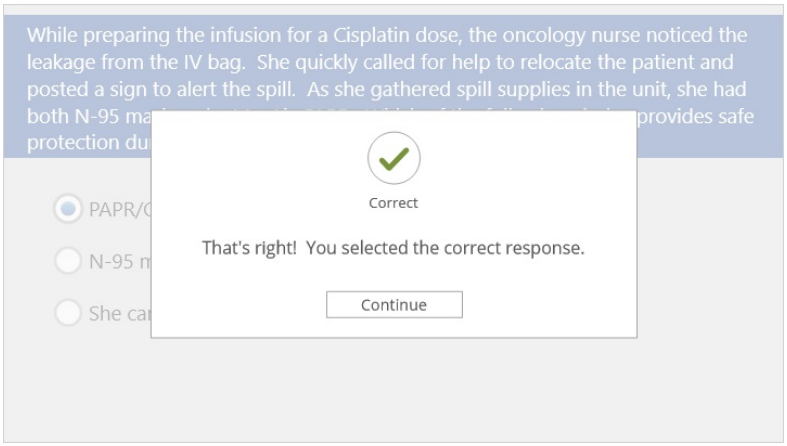
Feedback when correct:

That's right! You selected the correct response.

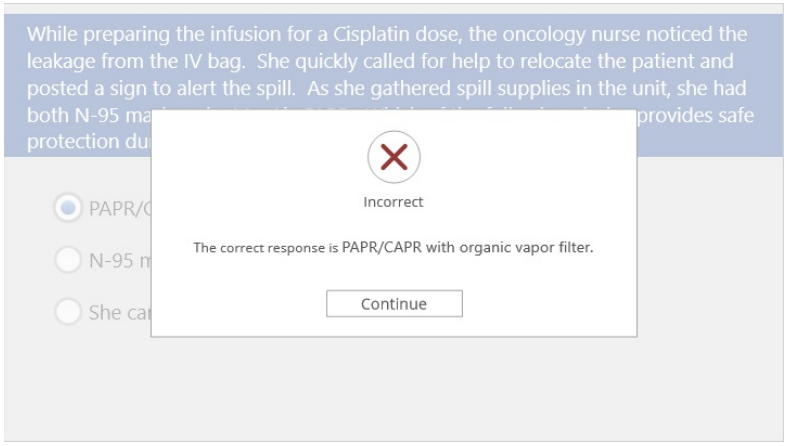
Feedback when incorrect:

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

Correct (Slide Layer)

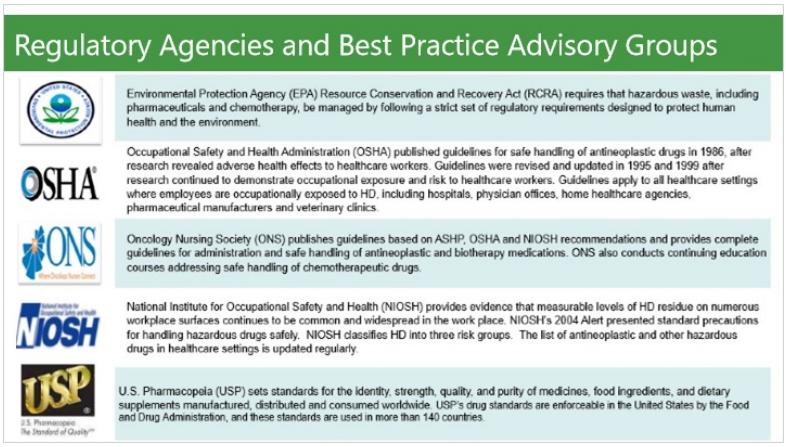


Incorrect (Slide Layer)

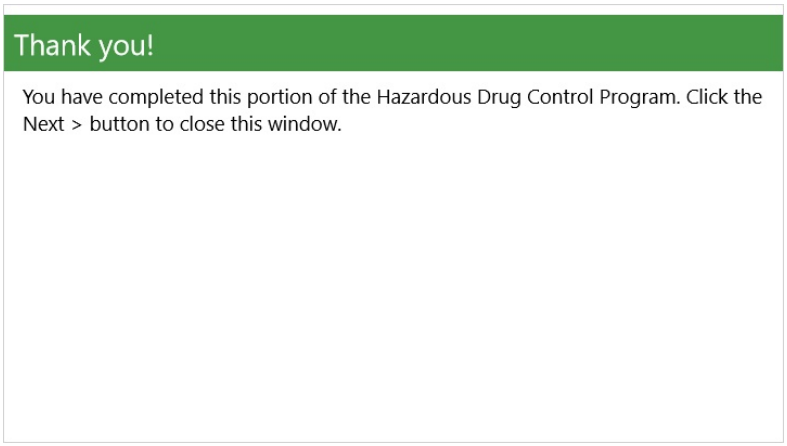


1.43 Untitled Slide

1.44 Untitled Slide

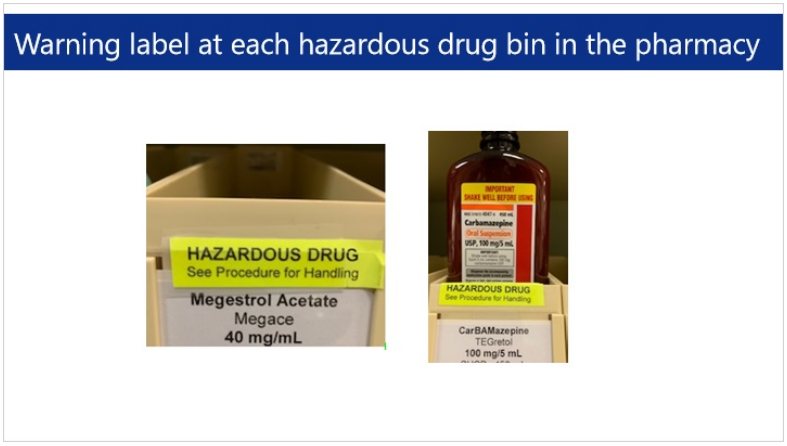


1.45 Untitled Slide

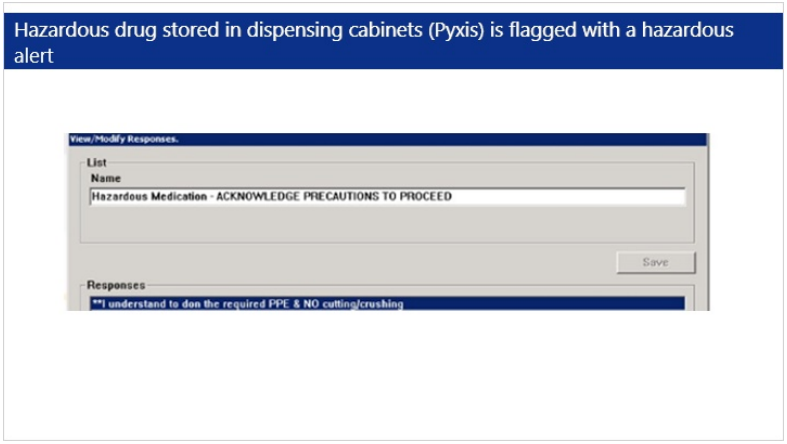


2. Lightboxes

2.1 Warning Label



2.2 Pyxis



3. Waste bins

3.1 Blue

3.2 Yellow

Trace Antineoplastic Waste (Yellow Bin):
PPE, Cleaning wipes, empty or ≤ 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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5. Consensus Statement on the Handling of Hazardous Drugs, the Accreditation Commission for Health Care / Pharmacy Compounding Accreditation Board and the International Academy of Compounding Pharmacists, March 2017
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7. ISOPP Standards of Practice *J Oncol Pharm Practice* (2007) Supplement to 13: 1–81
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9. NIOSH List of Antineoplastic and Other Hazardous Drugs in Healthcare Settings 2016
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11. Toolkit for Safe Handling of Hazardous Drugs for Nurses in Oncology. Oncology Nursing Society (ONS), 2018.
12. USP 800 Hazardous Drugs – Handling in Healthcare Settings, *PF* 40(3) [September 2017]