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CHEMOTHERAPY SAFE HANDLING: WHAT YOU NEED TO KNOW

Faculty Disclosure

- ♦ There is commercial support for this program.
- ♦ The planner/presenter disclosed the following pertinent financial relationship and how it was resolved:
 - ♦ Martha Polovich, PhD, RN, AOCN is on a speakers bureau for ICU Medical.
 - ♦ Products will be discussed in general terms without preference for any specific brand
- ♦ No off-label use of medications will be discussed.

Objectives

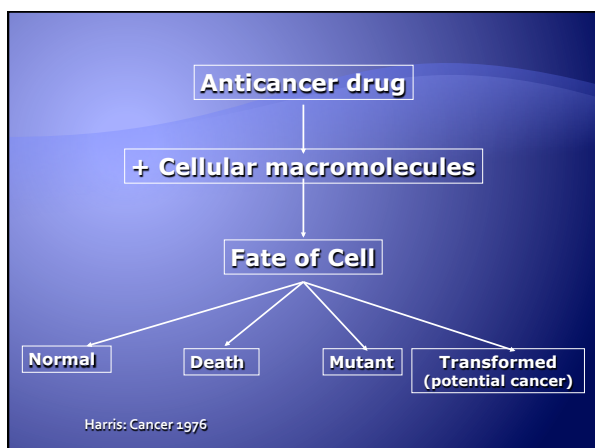
- ♦ Describe the risks to healthcare workers from exposure to hazardous drugs
- ♦ State current recommendations for minimizing exposure to hazardous drugs
- ♦ Discuss the need for interventions to control exposure to hazardous drugs

Definition of Hazardous Drugs

- ♦ Carcinogenicity
- ♦ Teratogenicity
- ♦ Reproductive toxicity
- ♦ Organ toxicity at low doses
- ♦ Genotoxicity
- ♦ Structure or toxicity similar to drugs classified as hazardous

(NIOSH, 2004)

The same mechanisms that kill
cancer cells are toxic to
healthy cells



Patients vs. Health Care Workers Exposure

- | | |
|--|---|
| <ul style="list-style-type: none"> ♦ Patients <ul style="list-style-type: none"> • Therapeutic doses • Few drugs • Over several months | <ul style="list-style-type: none"> ♦ Health care workers <ul style="list-style-type: none"> • Low-doses • MANY drugs • Over several years |
|--|---|

Potential Routes of Exposure

- | | |
|---|---|
| <ul style="list-style-type: none"> ♦ Dermal absorption: <ul style="list-style-type: none"> • Direct drug contact • Contact with contaminated surfaces ♦ Injection: <ul style="list-style-type: none"> • Sharps • Breakage | <ul style="list-style-type: none"> ♦ Ingestion via contaminated: <ul style="list-style-type: none"> • Food, gum • Hand-to-mouth transfer ♦ Inhalation: <ul style="list-style-type: none"> • Aerosols • Vapors |
|---|---|

ASHP, 2006; NIOSH, 2004; Polovich, et. al. (ONS), 2009; Polovich, 2011

Evidence of Exposure

- ♦ Positive florescent scans
- ♦ Positive urine tests for exposure
- ♦ Contaminated vials
(11 studies since 1992)
- ♦ Surface contamination
(16 studies since 1994)

Valanis, et al., 1998

Known Human Carcinogens (IARC Group 1)

- ♦ Arsenic trioxide
- ♦ Azothiaprime
- ♦ Busulfan
- ♦ Chlorambucil
- ♦ Cyclophosphamide
- ♦ Etoposide
- ♦ Melphalan
- ♦ Semustine
- ♦ Tamoxifen
- ♦ Thiotepa
- ♦ Treosulfan
- ♦ MOPP*
- ♦ ECB*

International Agency for Research on Cancer (IARC)
<http://www.iarc.fr/>

Probable Carcinogens (IARC Group 2A)

- ♦ Azacitidine
- ♦ Carmustine
- ♦ Cisplatin
- ♦ Doxorubicin
- ♦ Lomustine
- ♦ Nitrogen mustard
- ♦ Procarbazine
- ♦ Teniposide

International Agency for Research on Cancer (IARC)
<http://www.iarc.fr/>

Possible Carcinogens (IARC Group 2B)

- ♦ Amsacrine
- ♦ Bleomycin
- ♦ Dacarbazine
- ♦ Daunorubicin
- ♦ Mitomycin
- ♦ Mitoxantrone
- ♦ Streptozocin

International Agency for Research on Cancer (IARC)
<http://www.iarc.fr/>

Adverse Outcomes: Occupational HD Exposure

- ♦ Acute symptoms (for example)
 - Nausea
 - Dizziness
 - Nasal sores
- ♦ Reproductive effects
 - Fetal abnormalities
 - Spontaneous abortions/miscarriages
 - Infertility
 - Premature labor, low-birth weight, learning disabilities in offspring
- ♦ Genotoxicity
 - Chromosome 5 or 7 changes
- ♦ Cancer
 - 26 chemotherapy agents & 2 combination regimens are carcinogenic
 - Increased overall cancer risk
 - Leukemia
 - Lymphoma

(Fransman, 2007; Hansen & Olsen, 1994; IARC, 2011; Lawson, 2012; Martin, 2005; McDiarmid, 2010; Skov, 1992; Valanis, 1997)

Which of these is *least* effective?

- ♦ Eliminate the hazard
- ♦ Personal protective equipment
- ♦ Engineering controls
- ♦ Administrative controls
- ♦ Work practice controls

Hierarchy of Controls

Most Effective

- ♦ Eliminate the hazard
- ♦ Engineering controls—machines / equipment that reduce worker exposure
- ♦ Administrative controls—policies that reduce exposure
- ♦ Work practice controls—procedures that reduce exposure
- ♦ Personal protective equipment—gowns, gloves, respirators, face shields

Least Effective

U.S. Dept. of Labor, 1998

What Guidelines Say: Engineering Controls

- ◆ NIOSH 2004:
 - ◆ Use a BSC or isolator designed to contain HDs
 - ◆ Consider using devices such as CSTDs
 - ◆ CSTD use decreases drug contaminants
 - ◆ ASHP HD 2006:
 - ◆ Use a BSC or isolator designed for containment
 - ◆ Consider using CSTD
 - ◆ CSTD use decreases drug contaminants in BSCs
- BSC = Biological Safety Cabinet; CSTD = Closed System Transfer Device

Closed-System Transfer Devices (CSTDs)

- ◆ Provide additional protection during drug preparation and administration
- ◆ Contain aerosols and droplets
- ◆ Are NOT a substitute for PPE and PEC

PEC = Primary Engineering Control

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Closed system basics

- ◆ Several components:
 - ◆ A vial adaptor used during drug preparation
 - ◆ A closed valve or membrane on tubing and syringes
 - ◆ Dry "spike" connection for IV bags

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Closed System Specifics

- ◆ ChemoClave System® (ICU Medical)
- ◆ PhaSeal System™ (BD)
- ◆ Equashield™ (Equashield Medical Ltd.)
- ◆ OnGuard™ (B|Braun)

Recommendations: Personal Protective Equipment

- ◆ **Gloves:**
 - two pair, tested with hazardous drugs
 - powder-free
 - latex, nitrile, neoprene
- ◆ **Gowns:**
 - tested with hazardous drugs
 - disposable, single-use
 - cuffs
 - back closure

Use of Hazardous Drug Precautions

Nurses reporting use of HD precautions 'Always' or 76-99%

Precaution	Preparation (n = 32)	Administration (n = 164)	Disposal (n = 154)	Handling Excreta (n = 120)
Chemotherapy gloves	90%	78%	74%	55%
Double gloves	12%	19%	18%	18%
Chemotherapy gowns	64%	56%	53%	30%
Eye protection	25%	17%	12%	17%
Respirator	6%	4%	5%	9%
Overall precaution use:				
Mean score (0-5*)	2.7	2.0	1.9	1.6

*5 = Always; 4 = 76-99%; 3 = 51-75%; 2 = 26-50%; 1 = 1-25%; 0 = Never (Polovich & Clark, 2012)

Barriers to HD Precaution Use

- ♦ Things that interfere with HD precaution use
- ♦ "Unavailability, inconvenience, expense, difficulty, or time consuming nature of a particular action"
- ♦ Examples:
 - Practical (lack of / unacceptable protective equipment)
 - Psychosocial (worker / peer attitudes)
 - Environmental (safety climate)
 - Situational (time constraints)

(Pender, et al., 2006, p. 53)

Top Barriers to Using PPE*

	Agree
PPE makes me feel too hot	61%
PPE is uncomfortable to wear	54%
PPE makes it harder to get the job done	28%
Others around me don't use PPE	33%
People would think I am overly cautious	19%

As barriers increased,
use of precautions decreased

*Polovich & Clark, 2012

Why Double Gloves?

- ♦ To protect against permeation of some chemotherapy
 - Carmustine
 - Thiotepa
- ♦ To prevent transfer of contamination from outer gloves to hands and other surfaces
 - Gloves are ALWAYS considered contaminated after chemotherapy handling (*at least 5 studies since 1992*)

Why Wear Gowns?

(I'm careful...)

- ◆ To protect clothing from contamination
 - Disposable coated gowns
 - Discard when visibly contaminated, at the end of handling activities or when leaving the handling area
- ◆ To prevent the transfer of contamination from the gown to the environment and clothing

Focus on PPE Discomfort/Interference

- ◆ Select acceptable PPE
 - *Trial* gloves/gowns
 - Provide *options* when possible
- ◆ Make PPE available
 - *Store* in *convenient* locations
 - Provide an *adequate* supply

Workplace Safety Climate

- ◆ Recognized components in healthcare organizations:
 - Safety policies & procedures exist
 - Education & training in safe practice provided
 - Equipment & supplies necessary for safety available
 - Managers provide feedback & support for safety

Focus on Workplace Safety

- ◆ Have written policies & procedures for safe handling
 - **Require** PPE for all HD handling activities
 - **Expect** PPE use
- ◆ Provide education & validate competency for safe handling
- ◆ Talk to one another about chemotherapy safety

Summary: What Can We Do Better?

- ◆ Engineering controls
 - Use a closed-system transfer device
- ◆ Administrative controls
 - Update/enforce safe handling policies
 - Provide appropriate staffing
- ◆ Work practice controls
 - Wear double gloves

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