This Chapter is designed to assist you in identifying high priority chemicals used in the pharmacy that have been illuminated with the H2E Prioritization Tool and either substituting less toxic chemicals or, in the case of therapeutic agents, minimizing waste generation. These chemicals are problematic with respect to toxicity, regulatory status, and volume.

<table>
<thead>
<tr>
<th>PRIORITY CHEMICAL</th>
<th>USE</th>
<th>ELIMINATION/REDUCTION TIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyclophosphamide</td>
<td>Therapeutic Agent</td>
<td>□ Work carefully when preparing to reduce waste.</td>
</tr>
<tr>
<td>Daunorubicin</td>
<td>Therapeutic Agent</td>
<td>□ Work carefully when preparing to reduce waste.</td>
</tr>
<tr>
<td>Di-(ethylhexyl) phthalate (DEHP)</td>
<td>Intravenous bags and tubing Respiratory therapy/Gastrointestinal tubing</td>
<td>□ Substitute non-PVC products.</td>
</tr>
<tr>
<td>Epinephrine</td>
<td>Therapeutic agent</td>
<td>□ Ensure proper management of expired, unused and partially used drug. □ Is considered a hazardous chemical waste when disposed of.</td>
</tr>
<tr>
<td>Lindane</td>
<td>Lice &amp; Scabies treatment</td>
<td>□ Substitute permethrins, pyrethrins, crotamiton and/or fine toothed comb.</td>
</tr>
<tr>
<td>Mercury (as Thimerosal™) or phenylmercuric acetate</td>
<td>Preservative in nasal sprays, vaccines, contact lens solutions, insulin, thermometers.</td>
<td>□ Use single dose vials or treatment units. □ Work with purchasing department to identify and purchase vaccines that do not contain mercury as a preservative. □ Send letters to manufacturers, Group Purchasing Organizations requesting mercury-free formulations. See Mercury Chapter for examples.</td>
</tr>
<tr>
<td>Nicotine</td>
<td>Therapeutic Agent</td>
<td>□ Reduce waste generation.</td>
</tr>
<tr>
<td>Nitroglycerin</td>
<td>Therapeutic Agent</td>
<td>□ Reduce waste generation.</td>
</tr>
<tr>
<td>Phenol</td>
<td>Therapeutic Agent Preservative</td>
<td>□ Use alternatives for both active ingredient or preservative,</td>
</tr>
<tr>
<td>Propane/isobutane</td>
<td>Aerosol propellant</td>
<td>□ Use non-aerosols when available.</td>
</tr>
<tr>
<td>Selenium sulfide</td>
<td>Shampoos</td>
<td>□ Use alternative when possible.</td>
</tr>
<tr>
<td>Warfarin sodium</td>
<td>Therapeutic Agent</td>
<td>□ Reduce waste generation.</td>
</tr>
</tbody>
</table>
WASTE MINIMIZATION AND TREATMENT RECOMMENDATIONS

Pharmaceutical waste can be generated anywhere in the hospital due to spills and breakage, but will most likely occur in the nursing units, surgery suites, emergency room and, most commonly, in the pharmacy itself. Pharmaceutical waste will occur in the following situations:

- Breakage and spills
- Partially used syringes, vials, creams, ointments, liquids
- Compounding residues, especially during IV preparation
- Outdated drugs, including samples, if not properly managed.
- Discontinued, unused preparations
- Unused re-packs (unit dosed items)
- Discontinued in-dated pharmaceuticals
- Patients personal medications

The Pharmacy Department is unique in the area of hazardous chemical waste minimization in that pharmacy personnel usually do not have the option to select a less hazardous chemical, from a waste perspective, to get the job done. However, clinicians can be alerted by the pharmacy of its efforts to decrease the most hazardous chemicals and suggest efficacious substitutes for them. For example, in the treatment of head lice, malathion, (Ovide\textsuperscript{1}, Medicis\textsuperscript{2}) while still a relatively toxic chemical, is a safer prescription alternative to lindane.\textsuperscript{2} Safer still mechanical removal of lice and nits using a fine toothed comb. Usually, in most applications the therapeutic effectiveness must, of course, take precedence. Generally then, hazardous waste minimization efforts in the Pharmacy Department must usually focus on waste reduction rather than substitution of a less toxic item. The following strategies can be employed to accomplish this goal.

Chemotherapy Waste Management

- Much confusion exists around proper chemotherapy waste management. Check the waste acceptance protocols of vendors offering “chemotherapy waste” containers. Most will accept only EMPTY vials, syringes and IV bags and paraphernalia, often known as “residue or trace” chemotherapy waste. Bulk chemotherapy waste, e.g. any remaining contents that could be removed by normal means, must be evaluated as a possible hazardous chemical waste and stored in a hard plastic container labeled “Hazardous Waste.” (see the Hazardous Chemical Waste Identification section of this plan). This waste should be disposed of with other chemically hazardous waste generated by the facility. See Appendix F for identification of U-listed chemotherapy agents.

- Professional judgment also suggests that prudent risk management of non-listed but equally toxic chemotherapy agents would involve inclusion of these items in the chemical hazardous waste stream. Again, these wastes stream should not be confused with “red-bag” or infectious hazardous waste.

Improve inventory control.

- Determine min/max order points for each item stocked in the Pharmacy Department ensure that inventory is purchased in appropriate quantities and used prior to expiration.

- Purchase vials and similar items in the smallest available package size needed based on usage. If pharmaceuticals routinely expire due to the size of the carton available, notify your group purchasing organization and request that they negotiate for more appropriate manufacturer packaging.

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\textsuperscript{1} Syringes containing epinephrine, which are contaminated through patient contact, must be treated as regulated medical waste under the Blood Borne Pathogens Act.

\textsuperscript{2} Retail Pharmacy News, August 2000, p. 14.
Chemical Minimization Plan

- Rotate potentially hazardous waste such as epinephrine syringes out of emergency carts and into more active areas such as the Emergency Room or Operating Suites prior to outdating (three months or more dating is recommended for emergency carts).

**Outdated Inventory Management.**

- Routinely remove outdated pharmaceuticals from patient care areas including clinics through monthly audits by pharmacy personnel.

- Ship outdated pharmaceuticals to a qualified reverse distributor every three to five months. If outdates are sorted at the pharmacy, non-returnable items become waste at the facility and must be managed as such, thereby possibly increasing the hazardous waste generator status of the facility. The EPA considers an outdated drug to remain a product until the decision is made to discard it. At that time and place, the product becomes a waste and must be managed as such. Due to the constantly changing nature of manufacturers’ return policies, by shipping all outdates as product to the reverse distributor, maximum credit can be obtained for the pharmacy and the reverse distributor becomes the waste generator if the item cannot be returned to the manufacturer. The facility does have the responsibility of choosing a reverse distributor that understands the EPA regulations and complies with them.3

**Mercury Reduction**

Where possible, mercury-containing products should be eliminated. In the case of mercury-based preservatives, the use of single dose vials or treatment units may significantly reduce the number of products containing mercury. Manufacturers have begun reformulating vaccines and other preparations using other preservative agents and should be encouraged to continue their efforts. For more information on mercury, refer to the Mercury Chapter.

**I.V Preparation**

Whenever possible, waste from I.V. preparation should be kept to a minimum by using the appropriate size stock vial, especially when preparing chemotherapy or other highly toxic preparations. Spillage should be kept to a minimum by encouraging efficient compounding procedures.

**Patient Care Areas**

Nursing personnel should be alerted to the dangers of spills and breakage of highly toxic pharmaceuticals. Med carts and other dosage preparation areas should be kept free of loose vials and ampules to avoid breakage. When breakage does occur, procedures should be in place to avoid personnel or patient exposure and to insure appropriate spill cleanup and waste management.

**Patients’ Personal Medications**

Medications brought to the facility by the patient are the personal property of the patient and should be returned to the patient or the patient’s representative at the time of discharge. If the prescription has been discontinued or dosage changed, information to that effect should be communicated to the patient with instructions to dispose of the medication at the patient’s residence.

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