Hazard Communication Compliance and Waste Management

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Conflict of Interest Disclosure Statement

- Ms. Feiwell, Dr. Occhionero and Ms. Kissell report no conflicts of interest associated with this course. They have no financial relationships to disclose.
- Dr. Huber serves on the dentalcare.com Advisory Board.

Short Description

Hazard Communication Compliance and Waste Management is a free dental continuing education course that covers a wide range of topics relevant to the oral healthcare professional community.

Course Contents

Overview

Participants in this course will be introduced to OSHA's Hazard Communication Standard, which was updated in 2024 to align with the Globally Harmonized System of Classification and Labeling (GHS). In addition, they will be introduced to the proper management of common hazardous materials found in the dental office. The course is advisory in nature and informational in content. Its purpose is to assist oral healthcare facilities to identify relevant parts of the rule. In addition, it provides guidance to develop and implement an effective HazCom program.

Syllabus: Infection Prevention, Hazardous Waste Management, and Hazard Communication Compliance

The information in this 10-module syllabus is intended (1) to meet initial educational/training requirements for Dental Students, Dental Hygiene Students, and Dental Assistant Students as mandated by OSHA and other federal, state, local and professional organizations, (2) to provide a framework for an in-service training program in oral healthcare settings to meet annual educational/training requirements as mandated by OSHA and other federal, state, local and professional organizations, and (3) to serve as a resource for oral healthcare personnel wishing to review evidence-based information on specific topics related to infection prevention, hazardous waste management, and hazard communication compliance. *READ MORE*

Learning Objectives

Upon completion of this course, the dental professional should be able to:

- Recall the updates to the Hazardous Communications Standard.
- Recognize the OSHA pictograms used to represent the hazardous associated with materials.
- List the six steps of a Hazard Communication (HazCom)Program.
- Identify the 16 sections of a Safety Data Sheet (SDS).
- Discuss the management of hazardous materials used in oral healthcare settings.
- Understand the purpose and general requirements of EPA's Hazardous Waste Standard.
- Understand the process of hazardous waste determination.
- Discuss the principles related to hazardous waste.
- Discuss key elements of hazardous (and universal) waste management.
- Identify hazardous waste generated in the oral healthcare setting.
- Implement best management practices related to hazardous waste generated in oral healthcare settings.

Introduction

The use of chemicals and creation of waste are unavoidable components of almost every aspect

of life. Chemicals are produced in workplaces and are used in workplaces downstream, including oral healthcare settings. While these chemicals have utility and benefits in their applications, they also have the potential to cause adverse effects or events including health and physical hazards.[1]

No one knows exactly how many chemicals may be present in workplaces. The total number of substances that have been registered in the Chemical Abstracts Service Registry exceeds 270 million. In addition, most chemical substances are formulated into mixtures and the exposure of workers to unique chemical mixtures is far greater than the number of individual substances.[1]

To protect workers from hazardous chemicals and to reduce related illnesses and injuries, employers need hazard information and to recommended protective and disposal measures. To assure safe and healthy working conditions, the U.S. Congress enacted the Occupational Safety and Health Act of 1970 to provide platforms for research, information, education, and training in the field of occupational safety and health.[2]

The Act created the Occupational Safety and Health Administration (OSHA), the Occupational Safety and Health Review Commission (OSHRC), and the National Institute of Occupational Safety and Health (NIOSH). The OSHA sets and enforces workplace health and safety standards; the OSHRC reviews enforcement priorities, actions, and cases; and the NIOSH conducts research and makes recommendations to prevent worker injury and illness.

The OSHA developed a Hazard Communication Standard (HazCom Standard), 29 CFR 1910.1200, which was first promulgated in 1983. The latest revision of HCS was published on May 20, 2024 and took effect on July 19, 2024.[2] This revision was done to align the U.S. with the 7th edition, and select provisions of the 8th edition, of the United Nations' Globally Harmonized System of Classification and Labeling of Chemicals (GHS), and international trading partners. The Health and Safety Specialists in each office need to familiarize themselves with the updates in labeling and reclassification of any aerosols, desensitized explosives or flammable gases used in their facilities. In addition, employees should be updated with training on these updates to ensure continued adherence to safety recommendations.[3]

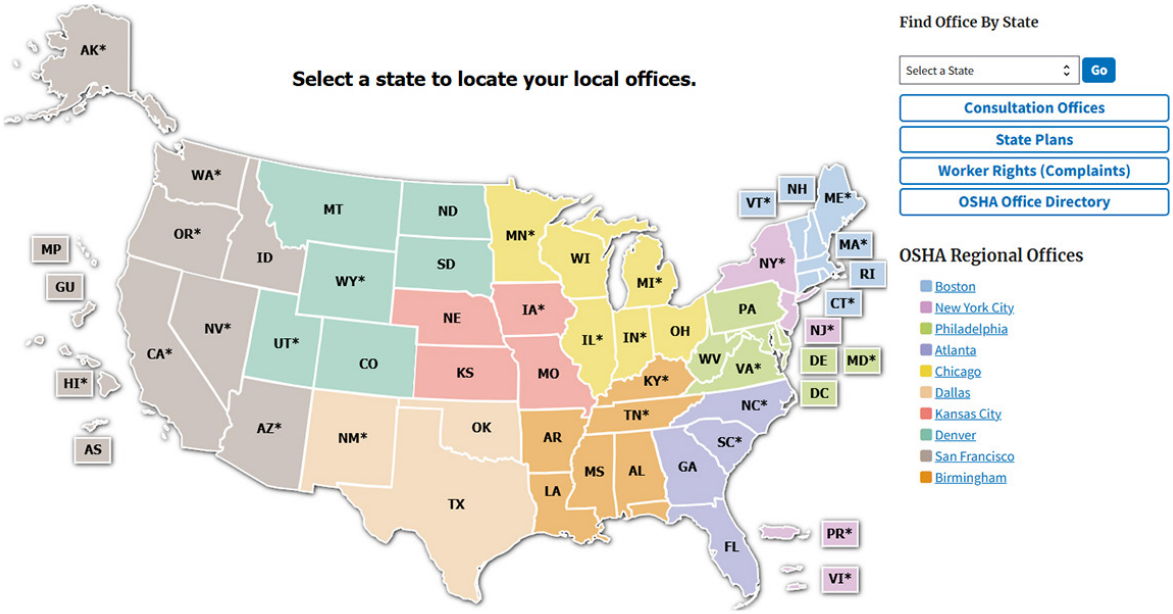

Figure 1. State-by-State Occupational Safety and Health Resource Locator.
Source: *US Department of Labor*

In many states and U.S. territories HCS is enforced by the state agency responsible for the OSHA-approved state plan. Some states operate OSHA-approved state programs that only apply to state and local government employees.[2] State plans must be equal to or at least as effective as Federal OSHA standards and abide by the same classification systems for labels and SDS.[2] The State-by-State Occupational Safety and Health Resource Locator provides program information for specific jurisdictions (Figure 1).

Hazard Communication Standard (HazCom Standard)

OSHA's HazCom Standard 2024 revision continues the downstream flow of information. Chemical manufacturers, importers, and distributors who know the most about the chemicals have the responsibility to determine potential hazards and to convey that information to employers and, ultimately, to the employees using the products.

In the context of HCS, a ***chemical manufacturer*** is an entity that produces hazardous chemicals. An ***importer*** is an entity that receives hazardous chemicals produced in another country for the purpose of supplying them to distributors or directly to employers within the U.S. A ***distributor*** is an entity other than a chemical manufacturer or importer that supplies hazardous chemicals to other distributors and/or to employers.

An ***employer*** is an entity engaged in a business where hazardous chemicals are either used (e.g., a dental practice), distributed, or are produced for use or distribution, including contractors or subcontractors. An ***employee*** is a worker (e.g., healthcare personnel) who may be exposed to hazardous chemicals under normal operating conditions or in foreseeable emergencies. Workers who encounter hazardous chemicals only in non-routine, isolated instances are not covered.

Exposure or exposed to means that an employee, in the course of employment, is subjected (e.g., by inhalation, ingestion, skin contact, or absorption) to a chemical that is a physical or health hazard. ***Foreseeable emergency*** (i.e., accidental or possible) means any potential exposure such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment which could result in an uncontrolled release of a hazardous chemical into the workplace.

It is the responsibility of manufacturers and importers to classify the hazards of chemicals they produce or import. To ***classify*** means they must (1) identify relevant data regarding the hazards of a chemical, (2) review the data to determine the hazards associated with the chemical, and (3) decide whether to classify the chemical as hazardous. A ***hazardous chemical*** is any chemical classified as a health hazard, a physical hazard, or a hazard not otherwise classified.

Health hazard means that the chemical may have one or more of the following hazardous characteristics: it may cause acute toxicity (any route of exposure); skin corrosion or

Table 1. Criteria for Categorizing Flammable Liquids.[4]

Category	Criteria
1	Flash point < 23°C (73.4°F) and initial boiling point ≤ 35°C (95°F)
2	Flash point < 23°C (73.4°F) and initial boiling point > 35°C (95°F)
3	Flash point ≥ 23°C (73.4°F) and initial boiling point ≤ 60°C (140° F)
4	Flash point > 60°C (140°F) and ≤ 93°C (199.4°F)

irritation; serious eye damage or eye irritation; respiratory or skin sensitization; germ cell mutagenicity; carcinogenicity; reproductive toxicity; specific target organ toxicity (single or repeated exposure); or aspiration. These classes may be further divided into hazard categories.

Physical hazard means that the chemical may have one or more of the following hazardous characteristics: it may be explosive; flammable (gases, aerosols, liquids, or solids); oxidizing (liquid, solid or gas); self-reactive; pyrophoric (liquid, solid, or gas); self-heating; organic peroxide; corrosive to metal; gas under pressure; in contact with water emits flammable gases, or combustible (dust). These classes may be further divided into hazard categories.

Hazard categories are important because they are based on the severity of an effect. For example, there are four categories in the hazard class for flammable liquids based on flashpoints (Table 1). The lower the flashpoint, the more severe the effect. Warnings are provided on the labels in the form of precautionary statements and the category itself is available in safety data sheets for the employer's reference.

Hazard not otherwise classified means that the chemical may produce an adverse health effect or physical event based on an evaluation of scientific data during the classification process. However, the evidence does not meet the specified criteria for a health hazard or physical hazard class. The effect either falls below the cut-off or threshold value/ concentration limit of the hazard class or it is under a GHS hazard category that has not been adopted by OSHA.

The chemical manufacturer or importer must determine the hazard class, and when appropriate, the hazard category of each class that applies to the chemical being classified. They must also ensure that the containers of hazardous chemicals are labeled. The ***labels*** must be affixed to, printed on, or attached to the immediate container and to the outside packaging of a hazardous chemical conveying the hazards as well as recommended protective measures (Figure 2).

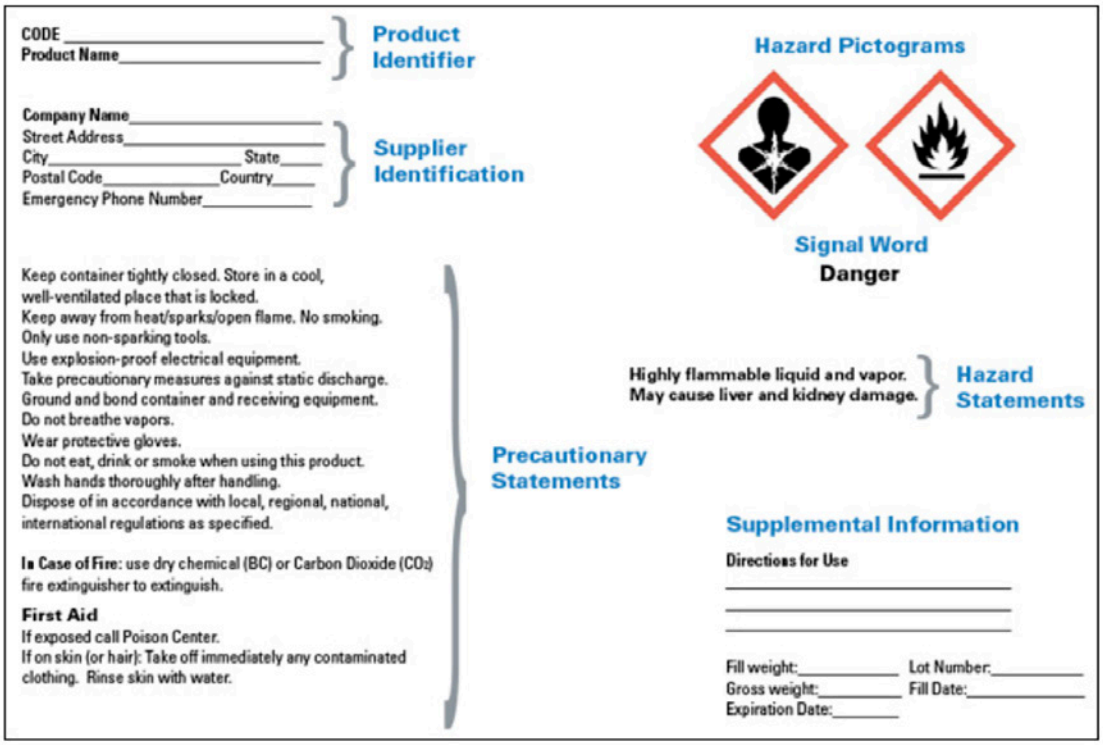

Figure 2. Sample label for hazardous chemicals.[4]

Chemical manufacturers and importers must also prepare ***safety data sheets*** (SDSs) for the hazardous chemicals they produce or import and they are responsible for providing SDSs downstream. Chemical manufacturers, importers, and distributors are responsible for ensuring that their customers (e.g., dental practices) are provided a copy of these SDSs at the time of the first shipment, and when an SDS is updated with new and significant information.[2]

Furthermore, employers (e.g., dental practices) must ensure that the containers they received are labeled and that an SDS is provided for each hazardous chemical in the workplace. They must also establish a HazCom program for their employees (e.g., healthcare personnel). Employees must be trained on the hazards of chemicals in their work area before initial assignment and when new hazards are introduced. The responsibilities for HazCom are illustrated in Figure 3.

Steps to an Effective HazCom Program

Employees (e.g., healthcare workers) are entitled to information about the identities and hazards of the chemicals they are potentially exposed to when working. Employers (e.g., oral healthcare facilities) that have hazardous chemicals in their workplaces are required by OSHA's Hazard Communication Standard, 29 CFR 1910.1200, to implement HCS.[2] An effective HazCom program may be accomplished in six steps (Figure 4).

Learn the Standards and Identify Responsible Staff

OSHA provides online access to the full regulatory text of the HazCom standard, as well as guidance, interpretations, and other relevant materials on its hazard communication website.[1,3,5] The provisions that apply to oral healthcare settings are found primarily in paragraphs (e), (f), (g) and (h); other parts, such as paragraph (c), may provide additional guidance on understanding the requirements (Table 2).[1,3]

In order to have a successful HazCom program, workplace personnel should be engaged both in initial and ongoing activities required for compliance. To address all of the necessary components of an effective program, responsibility for overall program management

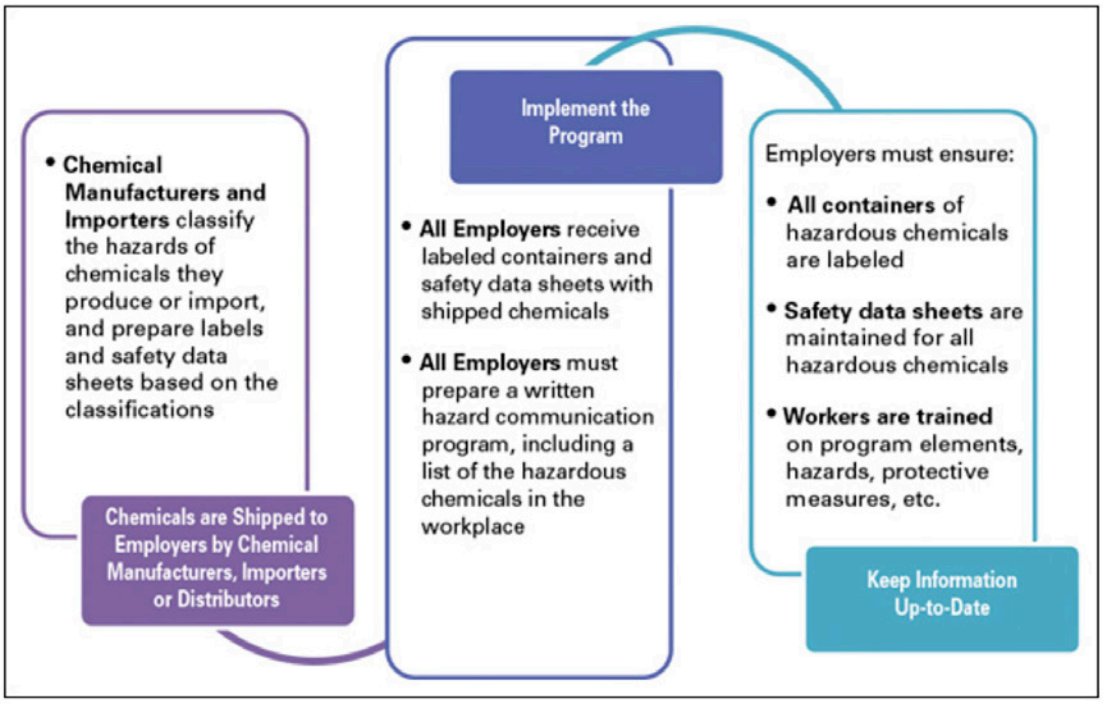

Figure 3. How hazard communication works.[2]

Figure 4. Six Steps to an Effective HazCom Program.[1,3]

Table 2. Organization of HazCom Standard Regulatory Requirements.[1,3]

Paragraphs of the Standard	Appendices to the Standard
(a) Purpose	**Appendix A,** Health Hazard Criteria (Mandatory)
(b) Scope and Application	**Appendix B,** Physical Hazard Criteria (Mandatory)
(c) Definitions	**Appendix C,** Allocation of Label Elements (Mandatory)
(d) Hazard Classification	**Appendix D,** Safety Data Sheets (Mandatory)
(e) Written Hazard Communication Program	**Appendix E,** Definition of "Trade Secret" (Mandatory)
(f) Labels and Other Forms of Warning	**Appendix F,** Guidance for Hazard Classifications re: Carcinogenicity (Non-mandatory)
(g) Safety Data Sheets	
(h) Employee Information and Training	
(i) Trade Secrets	
(j) Effective Dates	

should be assigned to a HazCom Coordinator. The ***HazCom Coordinator*** may then identify additional staff to be responsible for specific activities (e.g., on-the-job training).

Prepare and Implement a Written HazCom Program

Paragraph (e) of the HazCom standard requires employers to prepare and implement a ***written HazCom program***. The main intent is to ensure compliance with paragraphs (f) Labels and Other Forms of Warning; (g) Safety Data Sheets; and (h) Employee Information and Training. There are no requirements for the format, but it should contain a policy statement (Box A) followed by a hierarchical, customized plan applicable to a specific workplace (Boxes B to G)[1,3]

Box A. Policy Statement[1,3]

Prototype
Written HazCom Program

Section A: Policy Statement
To ensure that information about the dangers of all hazardous chemicals used by ***(Name of the Employer)*** is known by all affected workers, the following HazCom program has been implemented. Under this program, workers will be informed of the requirements of HazCom standard, the activities where exposure to hazardous chemicals may occur, and how workers can access this program, as well as labels and SDSs.

This program applies to any hazardous chemical which is known to be present in the workplace in such a manner that workers may be exposed to under normal conditions of use or in a foreseeable emergency. All work areas that involve potential exposure to hazardous chemicals are part of the HazCom program.

(Name of responsible person and/or position) is the HazCom program coordinator, with overall responsibility for the program, including reviewing and updating this plan as necessary.

Copies of the HazCom program are available upon request in ***(identify location)*** for review by any interested parties such as workers, their designated representatives, and OSHA.

Develop and Maintain a List of Hazardous Chemicals

The HCS 2024 mandates that employers develop and maintain a ***list of hazardous chemicals*** known to be present in the workplace. Manufacturers and importers of hazardous chemicals are required to provide labels on all containers shipped. It is also mandated that each label include a ***product identifier*** (i.e., the common, chemical, or brand name of the product). A practical approach to develop and maintain the list is by using the product identifier.

HazCom covers all forms of chemicals (i.e., liquids, solids, gases, vapors, fumes, and mists), whether "contained" or not. If there is no potential for exposure (e.g., the chemical is inextricably bound and cannot be released), the chemical is not covered by the standard, but remember to include chemicals that are generated during work operations. For example, the fume or vapor from a chemical sterilizer is a source of hazardous chemicals (e.g., formaldehyde).

Box B. List of Hazardous Chemicals[1,3]

Section B: List of Hazardous Chemicals
A list of all known hazardous chemicals in the workplace is attached to this document. This list includes the name of each hazardous chemical and the work area(s) in which they are used.

Additional information on each hazardous chemical may be obtained from the labels on the containers and the SDSs, located in ***(identify location)***.

When a new hazardous chemical is received, this list is updated within (x) days. To ensure that the list is updated in a timely manner, the following procedures shall be followed:

Identify procedures to be followed

The hazardous chemical inventory is compiled and maintained by ***(Name of responsible person and/or position and telephone number).***

Ensure Containers are Labeled

Employers are mandated to keep labels on shipped containers and to label secondary containers if used. Labels provide the primary information about hazards and protective information. In addition to the product identifier, ***label elements*** must include pictogram(s), a harmonized signal word, hazard statement(s) for each hazard class and category, precautionary statement(s), and the name, address and phone number of the source of the hazardous chemical (Figure 5).[1,3]

The product identifier is any chemical, common, or trade name or designation that the chemical manufacturer or importer chooses to use on the label. The product identifier on the label must be the same as the one included in the SDS. A ***signal word*** (e.g., "danger" or "warning") indicates the relative level of severity of hazard. The signal word "danger" is used for the more severe hazards, while "warning" is used for the less severe hazards.

A ***hazard statement*** describes the nature, and when appropriate, the degree of hazard. For example, "fatal if swallowed" is a hazard statement for acute oral toxicity. The hazard statement conveys that the chemical is severely toxic, and ingestion of the chemical results in death. For less toxic chemicals, the hazard statement may be "toxic if swallowed" or "harmful if swallowed," which convey a less severe hazard.

A ***pictogram*** may be a symbol plus other graphic elements, such as a border, background pattern, or color that is intended to convey specific information about the hazard. Some pictograms are symbols that resemble the hazardous effect, others are merely meant to attract attention. The eight pictograms designated under HazCom are black symbols on a white background with red diamond borders (Table 3).

When the shipping container is also the container used in the workplace, workers must be made aware of the U.S. Department of Transportation (DOT) pictograms (Table 4), as they may appear on the label in addition to or instead of the pictograms. The symbols have been harmonized as much as possible for hazards covered both by OSHA and DOT. The DOT pictograms are also diamond-shaped, but their backgrounds are of various colors.

Figure 5. Example of required HazCom 2012 label elements.[4]

Table 3. HazCom pictograms.[3]

Flame	Flame Over Circle	Exclamation Mark	Exploding Bomb
 Flammables Self Reactives Pyrophorics Self-heating Emits Flammable Gas Organic Peroxides Desensitized Explosives	 Oxidizers	 Irritant Dermal Sensitizer Acute Toxicity (harmful) Narcotic Effects Respiratory Tract Irritation HNOC (non-mandatory)	 Explosives Self Reactives Organic Peroxides
Corrosion	**Gas Cylinder**	**Health Hazard**	**Skull and Crossbones**
 Corrosives	 Gases Under Pressure	 Carcinogen Respiratory Sensitizer Reproductive Toxicity Target Organ Toxicity Mutagenicity Aspiration Toxicity	 Acute Toxicity (severe)

Table 4. Examples of DOT pictograms.[1]

 • Flammable Gas • Flammable Aerosol	 • Flammable solids • Self-Reactive substances and mixtures	 • Pyrophoric solids • Phyrophoric liquids • Self-heating Substances and mixtures
 • Substances and mixtures, which in contact with water, emit flammable gases	 • Oxidizing gases • Oxidizing liquids • Oxidizing solids	 • Self reactive substances and mixtures (type B) • Organic peroxides
 • Explosives (Division 1.4)	 • Explosives (Division 1.5)	 • Explosives (Division 1.6)
 • Gases under pressure	 • Acute toxicity: Oral • Acute toxicity: Skin • Acute toxicity: Inhalation	 • Corrosive to metals • Skin corrosion/irritation
 • Aquatic toxicity (Acute) • Aquatic toxicity (Chronic)	 • Organic Peroxides	

Precautionary statements describe recommended measures to minimize or prevent adverse effects or events resulting from exposure to a hazardous chemical or improper storage or handling (e.g., do not eat, drink, or smoke when using this product). There are four types of statements: *prevention, response, storage, and disposal.* Supplemental information is permitted as long as it does not conflict with the required information.

Employers are required to ensure that containers of hazardous chemicals in the workplace are labeled. If the containers received from the supplier are used in the workplace, simply maintain the label received from the supplier. The HCS label system is the best and easiest option, but, for secondary containers, other systems (e.g., National Fire Protection Association (NFPA) or Hazardous Materials Identification System (HMIS) are acceptable.[1,3]

The employer must also make sure that the labels are legible and prominently displayed. While the label information must be in English, employers are free to add warnings in other languages if workers would find that helpful. OSHA has prepared QuickCards™ to describe the label elements (OSHA 3492), as well as to illustrate the pictograms (OSHA 3491). These are available on the OSHA website, or can be obtained from your local OSHA area office.[5]

Box C. Labels.[1,3]

Appendix C: Labels

(Name of responsible person and/or position) will verify that all containers received from a distributor for use are clearly labeled in accord with the HCS requirements including a product identifier, pictogram(s), hazard statement(s), signal word, and precautionary statements, as well as the distributor's contact information ***(include name and name and address of supplier)***.

(Name of responsible person and/or position) in each work area will ensure that all secondary containers are labeled with the original distributor's label or with an alternative workplace label. For help with labeling, see ***(name of responsible person and/or position)***.

We are using an in-house labeling system ***(describe any in-house system which conveys required workplace label information). (Name of responsible person and/or position)*** will review our labeling procedures every ***(provide a time period)*** and will update labels as required.

Maintain Safety Data Sheets (SDSs)

Employers must have an SDS in the workplace for each hazardous chemical they use. An important aspect of the HazCom program is to ensure that someone (e.g., the HazCom Coordinator or a designee) is responsible for obtaining and maintaining the SDSs for every hazardous chemical in the workplace. If an SDS is missing, one must be requested from the distributor. To show good faith effort to obtain an SDS, it is prudent to document the request (e.g., keep copy of the letter or e-mail; make a note regarding telephone contact). If the request for an SDS does not produce the information needed, the local OSHA area office should be contacted for assistance. A hazardous chemical for which there is no SDS on file should not be used until the SDS is obtained.[1,3]

The SDSs have 16 internationally agreed upon components or sections that contain information for many different audiences (e.g., employers, workers, safety and health professionals, emergency responders, government agencies, and consumers). Consequently, the sections have been organized so that the information of most use to exposed workers, emergency responders, and others who do not need extensive technical detail is in the beginning of the SDS (Table 5).

For example, a description of a chemical's health effects appears in Section 2 (Hazard identification), but the toxicological data upon which the determination of these effects is based appears in Section 11 (Toxicological information). All of the sections are available to any reader, but there is a difference between what is necessary for a broader audience and

Table 5. Major components of a safety data sheet (HCS Appendix D, Table 1).[1]

The Hazard Communication Standard (HCS) requires chemical manufacturers, distributors, or importers to provide Safety Data Sheets (SDSs) (formerly known as Material Safety Data Sheets or MSDSs) to communicate the hazards of hazardous chemical products. As of June 1, 2015, the HCS will require new SDSs to be in a uniform format, and include the section numbers, the headings, and associated information under the headings below: **Section 1, Identification** includes product identifier; manufacturer or distributor name, address, phone number; emergency phone number; recommended use; restrictions on use. **Section 2, Hazard(s) identification** includes all hazards regarding the chemical; required label elements. **Section 3, Composition/information on ingredients** includes information on chemical ingredients; trade secret claims. **Section 4, First-aid measures** includes important symptoms/effects, acute, delayed; required treatment. **Section 5, Fire-fighting measures** lists suitable extinguishing techniques, equipment; chemical hazards from fire. **Section 6, Accidental release measures** lists emergency procedures; protective equipment; proper methods of containment and cleanup. **Section 7, Handling and storage** lists precautions for safe handling and storage, including incompatibilities.	**Section 8, Exposure controls/personal protection** lists OSHA's Permissible Exposure Limits (PELs); ACGIH Threshold Limit Values (TLVs); and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the SDS where available as well as appropriate engineering controls; personal protective equipment (PPE). **Section 9, Physical and chemical properties** lists the chemical's characteristics. **Section 10, Stability and reactivity** lists chemical stability and possibility of hazardous reactions. **Section 11, Toxicological information** includes routes of exposure; related symptoms, acute and chronic effects; numerical measures of toxicity. Section 12, Ecological information* Section 13, Disposal considerations* Section 14, Transport information* Section 15, Regulatory information* **Section 16, Other information**, includes the date of preparation or last revision. *Note: Since other Agencies regulate this information, OSHA will not be enforcing Sections 12 through 15 (29 CFR 1910.1200(g)(2)). **Employers must ensure that SDSs are readily accessible to employees.** See Appendix D of 29 CFR 1910.1200 for a detailed description of SDS contents.

what might be needed by others designing protective measures or providing medical services. The information in sections 12-15 is not OSHA mandated, but is still required in the SDS to provide useful content on ecological, disposal, and transportation-specific issues involving the regulatory control of other government agencies.

Employers must not only maintain copies of SDSs, they must also ensure that they are readily accessible to workers during their work shifts such as in a binder in a central location, or accessible electronically. However, if access to SDSs is provided electronically, there must be an adequate back-up system in place in the event of a power outage, equipment failure, or other emergency involving the primary electronic system.

Familiarity with the information in each section of an SDS will enable both employers and employees to quickly access this information in case of an emergency. A section-by-section description of the information required for each part of the SDS is available in Appendix D of HCS 2024.[2] OSHA also developed a QuickCard™ on SDSs (OSHA 3493) available on the OSHA Hazard Communication website. The SDSs must be in English, although the employer may maintain copies in other languages.[5]

Informing Other Employers About Hazardous Chemicals in the Workplace

Where there is more than one employer operating on a site (e.g., several dental practices within the same physical setting), employees may be exposed to the chemicals used by each employer. For example, in a physical space with five dentists only one may use nitrous oxide, but because of the facility's open design, all employees may be exposed to nitrous oxide that escapes containment during use.

Box D. Safety Data Sheets.[1,3]

Section D: Safety Data Sheets

(Name of responsible person and/or position) is responsible for establishing and monitoring the company's SDS program. The procedure below will be followed when an SDS is not received at the time of initial shipment:

Describe procedure to be followed here

Copies of SDSs for all hazardous chemicals to which workers are exposed or are potentially exposed will be kept in ***(identify location).*** Workers can access SDSs by ***(insert procedure for access)***.

Note: If alternatives to paper copies of SDSs are used, describe the format used and how workers can access the SDSs.

SDSs will be readily available to all workers in each work area during each work shift. If an SDS is not available, contact ***(name of responsible person and/or position).***

When a revised SDS is received, the following procedure will be followed to replace old SDS:

Describe procedure here

(Name of responsible person and/or position) is responsible for reviewing the SDSs received for safety and health implications, and initiating any needed changes in workplace practices.

Box E. Informing Other Employers About Hazardous Chemicals.[1,3]

Section E: Informing other employers about hazardous chemicals

It is the responsibility of **(name of responsible person and/or position)** to provide other employers with information about hazardous chemicals that their workers may be exposed to in our shared setting.

It is the responsibility of ***(name of responsible person and/or position)*** to obtain information about hazardous chemicals used by other employers to which our workers may be exposed to.

Other employers will be provided with SDSs for hazardous chemicals used by this practice in the following manner:

Describe company policy here

In addition to providing a copy of an SDS to other employers, other employers will be informed of necessary precautionary measures to protect workers exposed to chemicals used in our workplace.

Also, other employers will be informed of the hazard labels used. If alternative workplace labeling systems are used, the other employers will be provided with information to understand the labels used for hazardous chemicals to which their workers may have exposure.

The employers must coordinate and address through the written HazCom program (1) how on-site access to SDSs will be provided to the other employer(s), (2) how such employers will be informed of needed precautionary measures, and (3) how such employers will be informed of the on-site labeling system if it is different from the labels specified for shipped containers under the standard.[1]

Inform and Train Employees

Paragraph (h) of the HCS requires that employers train employees on the hazardous chemicals in the workplace before their initial assignment and when new hazards are introduced.[2,4] The training must be conducted in a manner and language that the employees understand. The standard requires employees to be informed of (1) the general requirements of HazCom 2012, (2) where hazardous chemicals are located, and (3) the various elements of the HazCom program.[3]

Workers must have a general understanding of what information is provided on labels and SDSs, and how to access them. If there are only a few chemicals in the workplace, each one may be discussed individually. Where there are large numbers of chemicals, training may be designed to cover categories of hazards. Workers must be made aware of the protective measures available, how to use or implement these measures, and who they should contact if an issue arises.

1. Training on label elements
   a. Employees should be advised of the type of information that they can expect to see on the labels
      I. Product identifier
         1. How the hazardous chemical is identified. This can be (but is not limited to) the chemical name, code number or batch number.
         2. How to cross-reference the product identifier with the SDS of the product, i.e., the same product identifier must be both on the label and in Section 1 (Identification) of the SDS.
      II. Signal word
         1. Explain that signal words are used to indicate the relative level of severity of hazard and to alert the employee to a potential hazard on the label.
         2. Explain that there are only two signal words, "Danger" and "Warning." Within a specific hazard class, "Danger" is used for the more severe hazards and "Warning" is used for the less severe hazards.
         3. Explain that only one signal word will appear on the label no matter how many hazards a chemical may have. If one of the hazards warrants the signal word "Danger" and another warrant the signal word "Warning," only "Danger" will appear on the label.
      III. Pictogram(s)
         1. Explain that OSHA-required pictograms must be in the shape of a square set at a point and include a black hazard symbol on a white background with a red frame wide enough to be clearly visible.
         2. Explain that OSHA has designated eight pictograms under this standard for application to a hazard category.
         3. Explain that when a chemical has multiple hazards, the label will contain a pictogram for each hazard category.
      IV. Hazard statement(s)
         1. Discuss the nature and degree of the hazard(s). For example: "Causes damage to kidneys through prolonged or repeated exposure when absorbed through the skin."
         2. Explain that all applicable hazard statements appear on the label and employees should always see the same statement for the same hazards, no matter what the chemical is or who produces it.
      V. Precautionary statement(s)
         1. Explain that precautionary statements describe recommended measures to minimize or prevent adverse effects resulting from exposure to a hazardous chemical.
      VI. Name, address and phone number of the chemical manufacturer, importer, or distributor
      VII. How an employee might use the labels in the workplace

1. Explain how the information on the label might be used to quickly locate information on first aid when needed by employees or emergency personnel.
2. Explain how information on the label can be used to ensure proper storage and disposal of hazardous chemicals.

VIII. How the various elements work together on a label
1. Explain that labels display pictograms appropriate for each hazard class, i.e., when a chemical has multiple hazards, different pictograms identify the various hazards.
2. Explain that when there are similar precautionary statements, the one providing the most protective information will be included on the label.

2. Training on the format of the SDS
   a. Explain the standardized 16-section format, including the type of information found in the various sections
      I. For example, the employee should be instructed that with the SDS format, Section 8 (Exposure Controls/ Personal Protection) will always contain information about exposure limits, engineering controls and ways to protect you, including personal protective equipment.
   b. Explain how the information on the label is related to the SDS
      I. Explain that the same product identifier appear both on the label and in Section 1 of the SDS (Identification).
      II. Explain that the precautionary statements are the same on the label and on the SDS.

Employee Information and Training for Hazards of Non-routine Tasks

While workers' initial training addresses the types of exposures likely to be encountered in their usual work routines, there may be other tasks to be performed on occasion that will expose these workers to different hazards that may require novel control measures. Paragraph (e)(1)(ii) mandates that employees be informed of the hazards of non-routine tasks.[2,4] The written program must to address how the employer will handle such situations to ensure that the workers have the necessary information to stay protected.[3]

Box F. Employee Information and Training.[4]

Section F: Employee information and training

(Name of responsible person and/or position) is responsible for employee information and training.

Every worker who will be potentially exposed to hazardous chemicals will receive initial training on the HCS 2024. The training program for new workers is as follows:

Describe how the training will be presented, and what it will include. Describe training format, such as audiovisuals, interactive computer programs, classroom instruction, etc.

Prior to introducing a new chemical hazard into any work area, each worker in that work area will be given information and training as outlined above for the new chemical hazard.

Box G. Hazards of Non-routine Tasks.[1,3]

Section G: Hazards of non-routine tasks

Prior to performing non-routine tasks that are hazardous, each affected worker will be given information by ***(name of responsible person and/or position)*** about the hazardous chemicals they may encounter during such activity. This information will include specific chemical hazards, protective and safety measures the worker should use, and steps that will be taking to reduce the hazards, including ventilation, respirators, the presence of another worker ***(buddy systems)***, and emergency procedures.

Evaluate and Reassess the Program

Although HCS 2024 does not have specific requirements for periodically updating the written HazCom program, it must remain current and relevant.[4] As chemicals are introduced to or eliminated from the

workplace, the inventory list must be updated to ensure that relevant SDSs are on file. The HazCom program should be revised to address changed conditions in the workplace (e.g., new chemicals, new hazards, etc.). In addition, designation of individuals to handle different parts of the program must be current and accurate.

HazCom program coordinators should routinely walk around the workplace to check that containers are labeled as required and that workers are following established work practices to protect themselves from chemical exposure. Proactive monitoring of the workplace is critical to ensure compliance with HCS 2024.

Introduction to Waste Management

The Resource Conservation and Recovery Act (RCRA) of 1976, an amendment to the Solid Waste Disposal Act provides general guidelines for the management of non-hazardous and hazardous solid wastes. The RCRA also set national goals to protect human health and the environment, to conserve energy and natural resources, to reduce the amount of waste generated, and to ensure that wastes are managed in an environmentally sound manner.[6]

While the RCRA provides a framework for the waste management program envisioned by Congress, it gives the federal Environmental Protection Agency (EPA) the authority to develop explicit, legally enforceable requirements for waste management (Title 40, Code of Federal Regulations (CFR), Parts 239-282). The EPA also promulgates guidance documents and policy directives to clarify issues related to the implementation of the RCRA.[7,9,10]

The federal EPA defines any garbage, refuse, sludge, and other discarded material resulting from industrial, commercial, mining, agricultural, healthcare, and community activities as **solid waste**. A solid waste may be semi-solid, liquid, or contained gaseous material.[6,8] Most solid waste generated in oral healthcare settings is **non-hazardous solid waste**, a subset of **municipal solid waste**. Standard methods of collecting, storing, transporting, and disposing such wastes are regulated by state or local jurisdictions. A small percentage of solid waste generated in oral healthcare settings is **hazardous solid waste** derived from **hazardous material**. These may be biological, chemical, radiological, or physical agents used or generated in the workplace, which because of their quantity; concentration; or physical, chemical, or infectious nature pose a hazard to human health or to the environment when improperly handled.[6]

Subsets of hazardous solid waste include **regulated medical waste** and hazardous waste. The federal OSHA and its counterpart state agencies are responsible for developing and enforcing rules for regulated medical waste. These rules are based on anticipated risks of exposure to blood and other potentially infectious material and relate to workers' health and safety. A review of **regulated medical waste management** in oral healthcare settings is presented elsewhere.[10]

Federal EPA regulations (40 CFR, Parts 239-259) identify state and local governments as the primary planning and regulating entities for non-hazardous solid waste management such as household garbage and industrial solid waste. Title 40 CFR, Parts 260-273 establishes a federal program for hazardous solid wastes management from cradle to grave to ensure that hazardous solid wastes are handled in a manner that protects human health and the environment.

This continuing education course focuses on those parts of federal EPA regulations (40 CFR Parts 260-273) that are relevant to developing and implementing an effective **hazardous waste management program** in oral healthcare settings. It is advisory in nature and informational in content. Since state regulatory requirements may be more stringent, the State-by-State Hazardous Waste Resource Locator provides information for specific jurisdictions.[11]

Hazardous Waste Determination

Hazardous waste management begins with a determination whether the material to be discarded is a solid waste (Figure 6). Wastes that

are excluded from the definition of solid waste and/or hazardous waste are not subject to EPA regulations.[9]

If a waste is determined to be a solid waste that is not excluded from the definition of solid and/or hazardous waste, the next step is to determine whether the waste is listed or characteristic. **Listed hazardous waste** means that the material appears on EPA lists F, K, P, or U. Listed hazardous wastes are specific types of wastes from various industrial processes, wastes from specific sectors of industry, or wastes in the form of specific chemical formulations.[6,7,12]

To indicate the reason for listing a waste, the EPA also assigns a hazard code to each waste listed on the F, K, P, and U lists. Hazard codes I (ignitable), C (corrosive), R (reactive) and E (toxicity characteristic waste) reflect typical hazardous properties of specific listed wastes. Codes T (toxic waste) and H (acutely hazardous waste) apply to listed wastes whose constituents pose additional threats to human health and the environment.[6,7,12]

Characteristic hazardous wastes are not listed on the F, K, P, or U lists, but they do exhibit one or more of the following four measurable "characteristic" properties of hazardous wastes: ignitability, corrosivity, reactivity, or toxicity. Characteristically ignitable, corrosive, and reactive hazardous wastes carry EPA waste codes D001, D002, and D003, respectively. Characteristically toxic hazardous wastes carry EPA waste codes D004 through D043.[6,7,12]

Listed Hazardous Wastes

The F-list (40 CFR Part 261.31) identifies seven major categories of wastes from common manufacturing and industrial processes as hazardous. Because the processes generating these wastes occur in different sectors of industry,

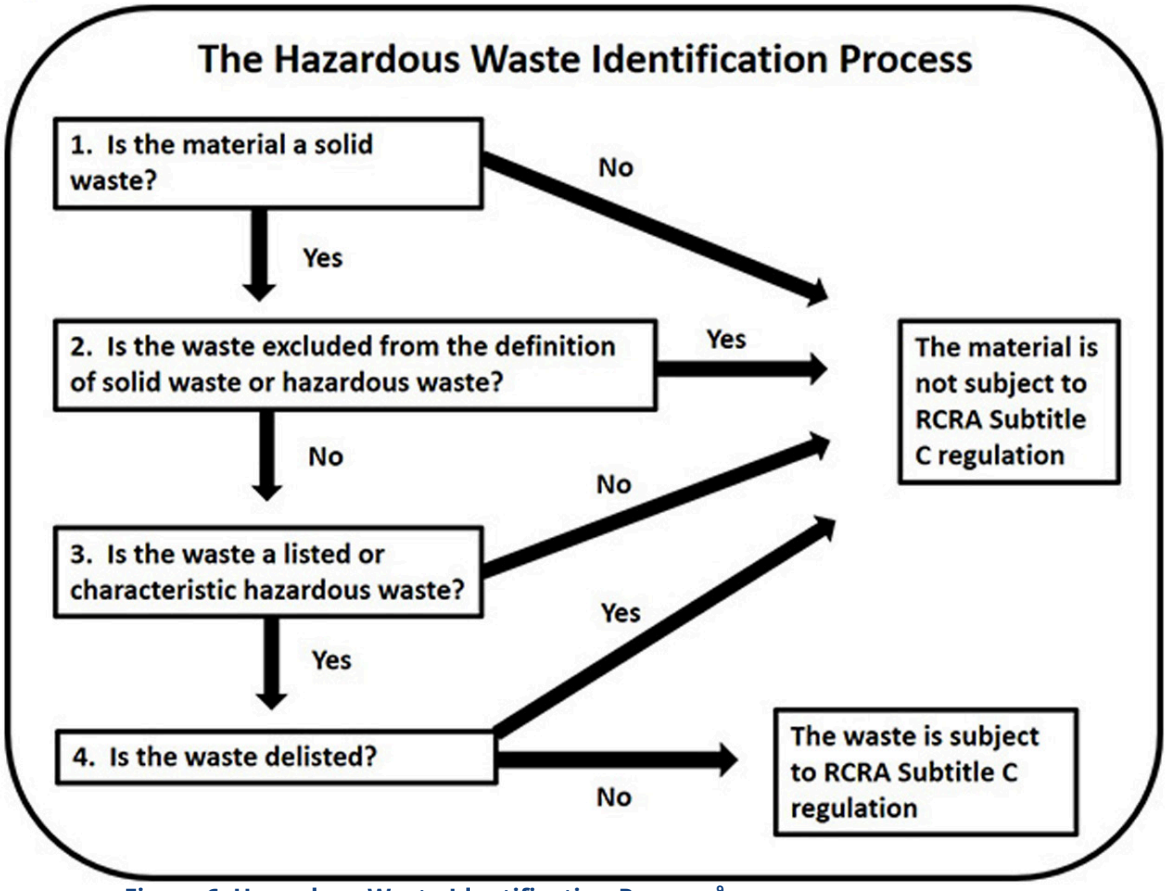

Figure 6. Hazardous Waste Identification Process.[9]

F-listed wastes are considered non-source specific wastes. With the possible exception of non-halogenated solvents such as acetone or xylene (EPA code F003 [I and T]), F-listed wastes are not likely to be found in oral healthcare facilities.[6,7,12]

The **K-list** identifies hazardous wastes from specific sectors of industry and manufacturing and, therefore, K-listed wastes are considered source-specific wastes. To qualify as a K-listed hazardous waste, the waste must fit into one of the 13 major categories on the list and the waste must match one of the detailed K-list waste descriptions (40 CFR Part 261.32). K-listed wastes are not likely to be found in oral healthcare facilities.[6,7,12]

The **P-** and **U-lists** designate as hazardous waste pure and commercial grade formulations of certain chemicals. For a waste to be considered a P- or U-listed waste it must meet the following three criteria: (1) it must contain one of the chemicals listed on the P or U list; (2) the chemical in the waste must be unused; and (3) the chemical in the waste must be 100 percent pure, commercial grade, or the sole active ingredient in a formulation.[6,7,12]

The P-list (40 CFR Part 261.33) identifies over 235 acutely toxic hazardous wastes from discarded commercial chemical products. Examples of P-listed chemicals found in oral healthcare facilities include epinephrine (P042[H]) and nitroglycerin (P081[H and R]). The U-list (40 CFR Part 261.33) identifies over 470 hazardous wastes. Examples of U-listed chemicals that may be found in oral healthcare facilities include formaldehyde (U122[T]) and phenol (U188[T]).[6,7,12]

Characteristic Hazardous Wastes

Ignitable wastes (40 CFR Part 261.21) readily catch fire; are spontaneously combustible; or have a flash point below 140°F (60°C), i.e., the vapor above a pool of liquid will catch fire under a standard set of conditions. Other ignitable wastes include non-liquids that burn under specific conditions (e.g., friction or water absorption), and certain compressed gases and strong oxidizers. Ignitable wastes (D001) in oral healthcare facilities include alcohol and silver nitrate.[6,7,12]

Corrosive wastes (40 CFR Part 261.22) are acids and bases (pH equal to or less than 2 or a pH equal to or greater than 12.5), which can readily dissolve flesh or corrode metal and other materials such as storage tanks, drums, and barrels. Sulfuric acid from automotive batteries is among the most common hazardous corrosive wastes. Examples of corrosive wastes (D002) that may be found in oral healthcare facilities include acetic acid and sodium hydroxide.[6,7,12]

Reactive wastes (40 CFR Part 261.23) readily explode (e.g., discarded munitions) or may undergo violent reactions under normal handling conditions. Other reactive wastes explode or violently react when exposed to heat or water; or generate toxic fumes, gases, or vapors or explosive mixtures when exposed to water. Lithium-sulfur batteries that may be found in oral healthcare facilities are considered reactive wastes (D003).[6,7,12]

Toxic wastes (40 CFR Part 261.24) leaching into groundwater drinking supplies from wastes disposed of in landfills is one of the most common ways the general population can be exposed to hazardous chemicals found in industrial waste. Some toxic wastes generated in oral healthcare facilities may contain lead (D008), mercury (D009), and silver (D011), which are regulated at levels of 5.0 mg/L, 0.2 mg/L and 5.0 mg/L, respectively.[6,7,12,13]

Hazardous Waste Management

Under the RCRA, hazardous waste generators (40 CFR Part 261 and 262) are the first link in the cradle-to-grave hazardous waste management system.[6,8] Because various types of facilities generate different quantities of wastes resulting in varying degrees of risk to human health and the environment, the degree of regulation to which each generator is subjected to depends on how much waste each generator produces every calendar month (Box H).

Universal Waste Management

Universal waste management programs promote the collection and recycling of a certain widely generated subset of hazardous wastes, known as **universal waste**.[14] Currently, there are five types of wastes covered under universal waste regulations: hazardous waste batteries,

Box H. Categories of hazardous waste generators.[6-8]

Categories of hazardous waste generators	Definitions of hazardous waste generator categories	Regulatory requirement
Large quantity generators (LQG)	Facilities that generate: ✓ 1,000 kg or more of hazardous waste per calendar month (approximately 2,200 lbs.) ***or*** ✓ 1 kg or more of acutely hazardous waste per calendar month (approximately 2.2 lbs.)	LQGs and SQGs must: ✓ Identify whether their solid waste is a hazardous waste, and if so, determine the quantity of hazardous waste generated in a calendar month to establish its generator category ✓ Obtain an EPA ID number ✓ Comply with accumulation and storage requirements (including requirements for training and emergency arrangements) ✓ Prepare the hazardous waste for transportation ✓ Track the shipment and receipt of such waste ✓ Meet recordkeeping and reporting requirements
Small quantity generators (SQG)	Facilities that generate: ✓ Greater than 100 kg (approximately 220 lbs.) but less than 1,000 kg of hazardous waste per calendar month ***and*** ✓ Accumulate on-site 6,000 kg or less (approximately 13,200 lbs.) of hazardous waste at any time	
Very small quantity generators (VSQG)	Facilities that generate: ✓ 100 kg or less of hazardous waste per calendar month ***or*** ✓ 1 kg or less of acutely hazardous waste per calendar month.	VSQGs must: ✓ Identify whether their solid waste is a hazardous waste, and if so, determine the quantity of hazardous waste generated in a calendar month to establish its generator category ✓ Comply with waste accumulation quantity li requirement • May not accumulate or store more than 1,000 kg of hazardous waste ✓ Accumulate hazardous wastes in containers a manner that prevents its release into the environment ✓ Deliver their own hazardous waste in their own vehicle or have an approved hazardous waste transporter deliver it to an approved hazardous waste management facility: • Permitted or interim status hazardous waste treatment, storage, and disposal facility (TSDF) • State hazardous waste facility • Municipal solid waste landfill (MSWLF) • Recycling facility • Universal waste facility (see Universal Waste Management section)

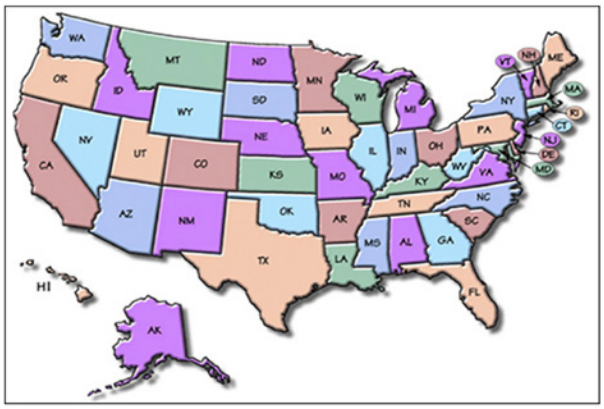

Figure 7. State-by-State Universal Waste Resource Locator.

Figure 8. "Hazardous Waste" Label.

pesticides, mercury-containing equipment, fluorescent lamps, and aerosol cans (40 CFR Part 273). The State-by-State Universal Waste Resource Locator provides information for specific jurisdictions (Figure 7.)

Hazardous Waste Management in Oral Healthcare Settings

Under federal regulations nearly all oral healthcare facilities fall under the EPA's VSQG category, and are regulated as SQGs[16] in the states that do not recognize the VSQG category. States with a VSQG category may also require SQG requirements related to the tracking of and accountability for the waste. The State-by-State Hazardous Waste Resource Locator provides information for specific jurisdictions.[8]

To be in compliance with RCRA hazardous waste rules under federal EPA regulations, VSQG oral healthcare facilities are not required to obtain an EPA ID number, comply with hazardous waste accumulation and storage requirements, follow the manifest system, or meet recordkeeping and reporting requirements, and there is no time limit on how long they may accumulate hazardous waste (as long as the 1,000 kg maximum quantity limit is not exceeded).

However, it is prudent practice to label hazardous waste containers with the words "Hazardous Waste" and the identity of their contents (Figure 8). It is also prudent (not specifically required by EPA) that oral healthcare facilities maintain records (e.g., manifests, billing records, certificates of disposal, or other documents from hazardous waste disposal contractors) demonstrating that they have properly disposed of their waste.

Mercury-containing Waste: Scrap Amalgam

Dental amalgam is a mixture of two nearly equal parts of liquid mercury (D009) and a powder containing silver (D011), tin, copper, zinc and other metals. When amalgam restorations are placed in or removed from teeth, or during chewing, a small amount of mercury vapor is released.[17] Although the vapor may be absorbed by inhalation or ingestion, the FDA considers amalgam restorations safe for adults and children over the age of six.

However, amalgam waste not captured or removed at the dental office is discharged into a sanitary sewer system and transferred to publicly-owned treatment works (POTWs), i.e., sewage treatment plants. POTWs remove about 95 percent of the amalgam waste, which then becomes part of the POTWs sewage sludge. This mercury containing sludge may then be disposed of in landfalls, incinerated, or applied to agricultural land as fertilizer, releasing mercury into the ground water or air. Airborne mercury is eventually deposited onto surface water, land and vegetation. Mercury is a persistent and bio-accumulative pollutant in the environment with well-documented neurotoxic effects on humans.

On June 14, 2017, the EPA finalized specific regulatory guidance to require dental practices to comply with requirements for controlling the discharge of mercury and other metals in dental amalgam into POTWs based on the best available technology.[18] Most dental offices already use some type of basic filtration system (chairside traps, vacuum pump filters); in addition, the EPA regulatory guidance enacted in 2017 required non-exempt dental offices to install amalgam separators by 2020.[18]

Amalgam separators are devices designed to remove amalgam particles from dental office wastewater through sedimentation, filtration, centrifugation, chemical removal by ion exchange or a combination of these technologies. Amalgam separators that meet the International Organization for Standardization (ISO) standard (ISO 11143) can capture over 95 percent of the amalgam waste discharged by dental offices into sanitary sewer systems.[19,20]

The ADA encourages dentists to implement **best management practices** (BMPs) to help reduce the environmental effects of amalgam waste (Box I).

Box I. Best management practices for the disposal of mercury-containing scrap amalgam.[19,20]

- Stock pre-capsulated amalgam alloys in a variety of sizes instead of bulk elemental mercury to minimize the amount of hazardous mercury-containing amalgam waste generated.
- Collect and store used disposable amalgam capsules in a wide-mouthed, airtight container labeled "Hazardous Waste - Amalgam Capsules."
  - Once the container is full, have an approved hazardous waste transporter deliver it to an approved hazardous waste management facility.
  - DO NOT PLACE AMALGAM CAPSULES IN NON-HAZARDOUS OFFICE WASTE OR REGULATED MEDICAL WASTE CONTAINERS.
- Use chairside disposable or reusable traps, vacuum pump filters and an ISO 11143-compliant amalgam separator to capture amalgam particles generated when removing old or carving new amalgam restorations.
  - Chairside trap – when the trap is full, remove trap according to manufacturer's recommendations. If reusable, clean according to manufacturer's recommendations. Place contents and any disposable traps in a wide-mouthed, airtight container labeled "Hazardous Waste – Scrap Amalgam."
  - Once the container is full, have an approved hazardous waste transporter deliver it to an approved hazardous waste management facility. a. DO NOT RINSE DISPOSABLE CHAIRSIDE TRAPS THAT CONTAIN AMALGAM PARTICLES IN THE SINK. b. DO NOT TROW DISPOSABLE CHAIRSIDE TRAPS THAT CONTAIN AMALGAM PARTICLES IN NON-HAZARDOUS OFFICE WASTE OR REGULATED MEDICAL WASTE CONTAINERS.
  - Vacuum pump filter – change filter according to manufacturer's recommendations, put the lid on the filter and place it in the box in which it was originally shipped. Once the box is full, have an approved hazardous waste transporter deliver it to an approved hazardous waste management facility.
    - DO NOT RINSE VACUUM PUMP FILTERS THAT CONTAIN AMALGAM PARTICLES IN THE SINK.
    - DO NOT TROW DISPOSABLE VACUUM PUMP FILTERS THAT CONTAIN AMALGAM IN NON-HAZARDOUS OFFICE WASTE OR REGULATED MEDICAL WASTE CONTAINERS.
  - Amalgam separators -- Follow manufacturer's recommendations for maintenance and recycling procedures.

Silver-containing Waste: Spent X-ray Developer Solution

Used developer solutions are typically considered non-hazardous waste because their silver content is usually below the regulatory level of 5 mg/L. In most jurisdictions, the

Box J. Best management practices for the disposal of spent x-ray developer solution[21]

- Discharge spent developer solution into the sanitary sewer system if the pH is within approved limits.
  - DO NOT DISCHARGE SPENT DEVELOPER SOLUTION INTO A SEPTIC SYSTEM.
  - DO NOT MIX SPENT DEVELOPER SOLUTION WITH FIXER SOLUTION.
- If the pH is not within regulatory limits or the oral healthcare facility is on a septic system, collect and store spent developer solution in a container labeled "Hazardous Waste - Used Developer."
  - Once the container is full, have an approved hazardous waste transporter deliver it to an approved hazardous waste management facility.

solution may be disposed of in the municipal sewer system if the pH is within 6 to 10.[21] The State-by-State Hazardous Waste Resource Locator provides information for specific jurisdictions. Used developer solution should never be disposed of in a septic system, it will destabilize the system.[8]

If the x-ray processing system the facility uses mixes the spent developer and fixer and renders the solution hazardous waste, consider changing the equipment. It is also of note that unused developer solutions typically contain 1 to 5 percent hydroquinone. While this chemical is not considered hazardous waste by the EPA, it is neither listed nor characteristic, many state and local jurisdictions restrict its disposal. Consult the State-by-State Hazardous Waste Resource Locator.[8]

Silver-containing Waste: Spent X-ray Fixer Solution

The x-ray fixer is typically a weak acid solution. During the fixing process, light-sensitive silver-halide crystals present on radiographic films are released as silver-thiosulfate. The concentration of silver in spent fixer solutions is in the range of 3,000 to 8,000 mg/L, while the regulatory level of silver is 5 mg/L.[21] In the environment, free-ionic silver acts as an enzyme inhibitor by interfering with metabolic processes within organisms.

On-site treatment of spent fixer solutions minimizes the risk of toxicity. The best option for an average practice is the use of a Chemical Recovery Cartridge (CRC). CRCs are canisters filled with another metal, usually steel wool. The iron dissolves in the fixer solution and interacts with the silver, i.e., the silver plates-out on the iron. To minimize the amount of silver from spent fixer from entering sanitary sewer or septic systems follow best management practices (Box K).

Box K. Best management practices for the disposal of spent x-ray fixer solution[21]

- Use a CRC to capture silver from the spent fixer solution and collect the silver-iron residue in a container.
  - Label the hazardous waste container "Hazardous Waste – Silver Residue."
    - Once the container is full, have an approved hazardous waste transporter deliver it to an approved hazardous waste management facility.
      - DO NOT DISCARD SPENT FIXER INTO SANITARY SEWER OR SEPTIC SYSTEMS.
      - DO NOT PLACE CRC INTO MUNICIPAL GARBAGE.
- The de-silvered fixer solution can be diluted with water and disposed of in sanitary sewer or septic systems.
  - The x-ray developer is an aqueous solution with a slightly basic pH due to the presence of potassium hydroxide. Environmental risks are minimal unless exposure is to concentrated solution.
    - The spent developer may be mixed with the de-silvered fixer, diluted with water, and discharged into sanitary sewer or septic systems.
- Many cleaner solutions for x-ray developer systems contain chromium (D007), a toxic substance.
  - DO NOT DISCHARGE CHROMIUM-CONTAINING CLEANERS INTO SANITARY SEWER OR SEPTIC SYSTEMS.
    - Ask the supplier for a cleaner that is chromium-free.

Silver-containing Waste: Undeveloped Radiographic Film

Undeveloped films contain high levels of silver and must be treated as hazardous waste. Collect and store unused film in a wide-mouthed, airtight container labeled "Hazardous Waste – Unused X-ray Film." Once the container is full, have an approved hazardous waste transporter deliver it to an approved hazardous waste management facility.[22] Developed radiographic films have little residual silver and may be disposed of as non-hazardous office waste for recycling or disposal.

Lead Containing Waste: Lead Foil in Radiographic Film Packets and Lead Aprons

Elemental lead found in the lead foil of radiographic packets, leaded aprons or thyroid collars must be treated as hazardous waste as lead is a leachable toxin that can contaminate the soil and groundwater in landfill sites. Collect and store lead foils in a wide-mouthed, airtight container labeled "Hazardous Waste – Lead Foil." Have an approved hazardous waste transporter deliver full containers of lead foils and unwanted leaded safety devices to an approved hazardous waste management facility for recycling or disposal.[22]

Chemical Waste: Disinfectants and Sterilants

EPA-registered intermediate-level hospital disinfectants include chlorine-containing products, quaternary ammonium compounds with alcohol, phenolics, and iodophors. FDA-registered sterilants/high-level disinfectants include glutaraldehyde, glutaraldehyde with phenol, hydrogen peroxide, and hydrogen peroxide with peracetic acid. Chemiclaves may use formaldehyde. Some of these chemicals are P- or U-listed while others may be characteristic hazardous wastes.[23]

Information to determine if a chemical (including disinfectant and sterilant) is hazardous can be obtained from the Safety Data Sheet (SDS) provided by the supplier of the product. In some jurisdictions disposal into a sanitary sewer system is permitted if a product is first treated, for example Cidex OPA, an aldehyde, treated with glycine. To minimize the environmental effects of disinfectants and sterilants, follow best management practices (Box L).

Box L. Best management practices for the use of and disposal of chemical disinfectants and sterilants[23]

- Ensure office personnel have read the SDS for all chemicals (including the SDS for chemical disinfectants and sterilants) used in the oral healthcare facility and are trained to handle hazardous chemicals.
- Avoid the use of chemical disinfectants and sterilants, especially halogenated products (i.e., those containing chlorine or iodine), and glutaraldehydes) when other alternatives are available.
  - Follow manufacturers' recommendations on treatment and disposal of waste disinfectants and sterilants.
    - DO NOT POUR CHEMICAL DISINFECTANT AND STERILANTS INTO A SEPTIC SYSTEM.
    - Paper or cloth products impregnated with disinfectants and sterilants may be disposed of as non-hazardous office waste.
    - Rinse empty disinfectant and sterilant containers with water, remove or deface labels to indicate the container no longer contains hazardous chemicals, and discard as non-hazardous office waste.
- Use steam and dry heat to sterilize heat-tolerant instruments and devices.
  - Replace chemiclaves with autoclaves to avoid the use of formaldehyde.

Pharmaceutical Wastes

In general, the disposal of expired and other drugs is regulated by the federal EPA and/or its counterpart state agencies if the sole active ingredient in the pharmaceutical in question is a hazardous waste (e.g., epinephrine [P042]), the pharmaceutical contains some other ingredient that results in the pharmaceutical to exhibit a characteristic of hazardous waste (e.g., contains enough alcohol [D001] to be flammable), or the material is otherwise regulated by your state environmental agency. Disposal of controlled substances is regulated by the U.S. Drug Enforcement Administration (DEA).[24,25]

Hazardous pharmaceutical wastes are most commonly treated by incineration and the resulting ash is disposed of in a permitted hazardous waste landfill. The federal EPA recommends that non-hazardous and non-controlled drugs should be incinerated in accordance with state and local environmental regulations. No drugs should be disposed of into the sanitary sewer, septic systems or in the municipal trash to avoid impacts to the environment and health of the public.[26,27,28]

The disposal of controlled or scheduled drugs under the Controlled Substance Act must be managed according to the regulations issued by the DEA. Oral healthcare practitioners registered with the DEA may destroy unused controlled substances in accordance with state guidelines, which require appropriate documentation.[25]

BMP for the disposal of pharmaceutical waste – a ten-step blueprint for healthcare facilities is presented elsewhere.[28]

Summary

Oral healthcare personnel are entitled to working conditions that do not pose a risk of serious harm. OSHA HCS 2024 provides the framework for building a chemical safety and health management program in oral healthcare settings. In addition, to comply with RCRA and EPA, dental offices must determine if they generate hazardous wastes and then dispose of these wastes following the federal and state regulations. By understanding the hazards and using available information to identify proper control and disposal measures, employers can minimize or prevent health and physical hazards in their facilities.

Course Test Preview

To receive Continuing Education credit for this course, you must complete the online test. Please go to: *www.dentalcare.com/en-us/ce-courses/ce697/start-test*

1. Which federal agency sets and enforces workplace health and safety standards?

A. NIOSH
B. OSHRC
C. OSHA
D. U.S. Congress

2. It is the responsibility of the _____ to classify the hazards of a chemical.

A. distributor
B. employer who purchases the chemical
C. employee who uses the chemical
D. manufacturers and importers

3. Which is the exception to the steps to classify a chemical that the chemical manufacturer or importer must accomplish?

A. identify relevant data regarding the hazards of a chemical
B. review those data to determine the hazards associated with the chemical
C. decide whether the chemical should be classified as hazardous
D. perform human exposure studies to determine risk

4. Which characteristics are not considered health hazards that a hazardous chemical may cause?

A. acute toxicity; skin corrosion or irritation; serious eye damage or eye irritation; respiratory or skin sensitization
B. unpleasant smell or taste
C. germ cell mutagenicity; carcinogenicity; reproductive toxicity
D. specific target organ toxicity ; or aspiration

5. Which is not a hazardous characteristic that would present a physical hazard ?

A. explosive or flammable
B. self-reactive or self-heating
C. gas under pressure
D. Stable or inert while in storage.

6. It is the responsibility of _____ to ensure that labels are affixed to, printed on, or attached to the immediate (primary) container and to the outside packaging of a hazardous chemical conveying the hazards as well as recommended protective measures.

A. the chemical manufacturer or importer
B. the distributor
C. the employee (e.g., healthcare personnel)
D. the employer (e.g., the dental practice)

7. _____ must prepare safety data sheets (SDSs) for the hazardous chemicals and are responsible for providing SDSs downstream.

A. Distributors
B. Employers (e.g., Dental practice)
C. Chemical manufacturers and importers
D. Employees (e.g., healthcare personnel)

8. Which task falls outside of the responsibility of employers (e.g., dental practices)?

A. ensure the containers they received are labeled and that an SDS is provided for each hazardous chemical in the workplace
B. establish a HazCom program for their employees (e.g., healthcare personnel)
C. classify the hazardous chemicals that they receive.
D. ensure that employees are trained on the hazards of chemicals in their work area before initial assignment and when new hazards are introduced

9. Which information is not required to be listed on labels for the product identifier?

A. pictogram(s) and a signal word
B. expiration date
C. hazard statement(s) and precautionary statement(s)
D. the name, address and phone number of the source of the hazardous chemical

10. A _____ indicates the relative level of severity of a hazard.

A. hazard statement
B. signal word
C. pictogram
D. precautionary statement

11. Which statement related to SDSs is incorrect?

A. Employers must have an SDS in the workplace for each hazardous chemical they use.
B. If an SDS is missing, one must be requested from the distributor.
C. A hazardous chemical, for which there is no SDS on file, should not be used until the SDS is obtained.
D. It is permissible to use a hazardous chemical while awaiting receipt of the SDS from the distributor.

12. Which statement is incorrect with respect to the interaction of employees with the HazCom standard?

A. All employees must undergo written testing on an annual basis.
B. Employers must train employees on the hazardous chemicals in the workplace.
C. The training must be conducted in a manner and language that the employees understand.
D. Employees must be informed of (1) the general requirements of HazCom standard, (2) where hazardous chemicals are located, and (3) the various elements of the HazCom program.

13. Which is uncharacteristic of wastes found in oral healthcare facilities?

A. Examples of ignitable wastes include alcohol and silver nitrate.
B. Examples of corrosive wastes include acetic acid and sodium hydroxide.
C. Reactive wastes leaching into groundwater from landfills is a common way to be exposed to hazardous chemicals.
D. Some toxic wastes generated in oral healthcare facilities may contain lead, mercury, and silver.

14. Which statement accurately describes the waste produced under a VSQG classification?

A. VSQGs generate >10 kg of acutely hazardous waste per calendar month.
B. VSQGs generate 100-1000kg of hazardous waste per calendar month
C. VSQGs generate ≤100 kg of hazardous waste per calendar month
D. VSQGs may accumulate and store up to 6,000 kg of hazardous waste.

15. Which statement inaccurately describes the VSQG category for hazardous wastes management in oral healthcare facilities?

A. Under federal regulations nearly all oral healthcare facilities fall under the VSQG category.
B. Some states do not recognize the EPA's VSQG category and in those states dental offices are regulated as SQGs.
C. Some states require that VSQGs follow SQG requirements related to the tracking of and accountability for the waste.
D. Oral healthcare facilities that fall under the VSQG category are required to obtain an EPA ID number.

16. Which is not included among the best management practices for the disposal of mercury-containing scrap amalgam?

A. Stocking pre-capsulated amalgam alloys in a variety of sizes.
B. Collecting and storing used disposable amalgam capsules in a container labeled "Hazardous Waste - Amalgam Capsules."
C. Using chairside disposable or reusable traps, vacuum pump filters, or an amalgam separator to capture amalgam particles. amalgam
D. The rinsing of reusable chairside mercury traps in the sink.

17. Which statement incorrectly depicts best management practices for the disposal of spent x-ray developer solution?

A. Never discharge spent developer solution into the sanitary system.
B. If the the oral healthcare facility is on a septic system, collect and store spent developer solution in a labeled container
C. Full containers of spent developer, can be transported to an approved hazardous waste management facility.
D. Discharge spent developer solution into the sanitary sewer system if the pH is within approved limits.

18. Which statement inaccurately reflects best management practices for the disposal of spent x-ray fixer solution?

A. Use a CRC to capture silver and collect the silver-iron residue in a labeled container.
B. Avoid mixing fixer and developer together during disposal
C. Dilute the de-silvered fixer solution with water and discharge it into a sanitary sewer or septic system.
D. The CRC may be disposed of as municipal waste.

19. Which statement does not represent best management practices for the disposal of chemical disinfectants and sterilants?

A. Ensure office personnel are trained to handle all hazardous chemicals used in the oral healthcare facility.
B. Rinse empty containers with water, remove or deface labels, and discard as non-hazardous office waste.
C. Replace chemiclaves with autoclaves to avoid the use of formaldehyde.
D. Rinse empty containers with water, leave labeling, and discard as regulated hazardous waste.

20. Which is not considered a best management practice for the disposal of pharmaceutical agents?

A. Federal EPA and/or its counterpart state agencies regulate drug disposal if the sole active ingredient is a listed hazardous waste.

B. If a drug contains some ingredient in sufficient quantity to be considered a hazardous waste, EPA regulates the disposal.

C. Non-hazardous and non-controlled drugs may be disposed of into sanitary sewer or septic systems.

D. Disposal of controlled substances is regulated by the U.S. Drug Enforcement Administration (DEA).

References

1. OSHA. Hazard Communication: Small Entity Compliance Guide for Employers That Use Hazardous Chemicals. OSHA 3695-03 2014. Accessed January 24, 2025.
2. United States Department of Labor. Occupational Safety and Health Act of 1970. Public Law 91-596 84 STAT. 1590, 91st Congress, S.2193. Amended through January 1, 2004. Accessed January 20, 2025.
3. Federal Register/Vol. 89, No. 98/Monday, May 20, 2024/Rules and Regulations
4. https://www.osha.gov/contactus/bystate
5. https://www.osha.gov/publications/bytype/quickcards Accessed January 25, 2025.
6. EPA. Resource Conservation and Recovery Act (RCRA) Orientation Manual – 2014.
7. EPA. Resource Conservation and Recovery Act (RCRA) Orientation Manual – 2014.
8. EPA. Links to Hazardous Waste Programs and U.S. State
9. EPA. Resource Conservation and Recovery Act (RCRA) Regulations. Hazardous Waste - Title 40 CFR Parts 260 through 273.
10. Environmental Protection Agency (EPA). Criteria for the Definition of Solid Waste and Solid and Hazardous Waste Exclusions.
11. Huber M, Terézhalmy GT. Regulated Medical Waste Management. dentalcare.com. 2020 Aug 30.
12. EPA. Defining Hazardous Waste: Listed, Characteristic and Mixed Radiological Wastes.
13. EPA. Defining Hazardous Waste: Listed, Characteristic and Mixed Radiological Wastes.
14. EPA. Universal waste.
15. https://www.envcap.org/srl/index.php
16. Healthcare Environmental Resource Center. Dental offices hazardous wastes – hazardous waste.
17. EPA. Mercury in dental amalgams.
18. Dental Effluent Guidelines Documents | US EPA
19. ADA. Amalgam Separators and Waste Best Management
20. Healthcare Environmental Resource Center. Dental offices managing specific wastes – Dental amalgam in wastewater.
21. Healthcare Environmental Resource Center. Dental offices managing specific wastes – x-ray wastes.
22. ADA Council on Scientific Affairs. Managing silver and lead waste in dental offices. JADA 134:1095-1096, 2003.
23. Healthcare Environmental Resource Center. Managing specific wastes – Sterilants and disinfectants.
24. Healthcare Environmental Resource Center. Managing specific wastes – pharmaceutical wastes.
25. U.S. Department of Justice. DEA. Title 21 United States Code (USC) Controlled Substance Act
26. EPA. Management of Hazardous Waste Pharmaceuticals.
27. EPA. Management Standards for Hazardous Waste Pharmaceuticals and Amendment to the P075 Listing for Nicotine. Federal Register / Vol. 84, No. 36 / Friday, February 22, 2019 / Final Rule.
28. Managing pharmaceutical waste - a 10-step blueprint for healthcare facilities in the United States

Additional Resources

- No Additional Resources Available

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