



2017 Custom Safety Program (CSP) Update - **Instructions**

1. Please read this instruction document carefully, and print the pages that pertain to your practice.
 - * The items that are listed under *Special Policies* on the following page may or may not apply to your practice. If they do not, there is no need to print those pages.
2. Replace your existing Safety Manual **Table of Contents** with the copy provided (8 pages), and indicate the Special Policies that apply to the practice (sections 5.00 – 5.90).
3. Replace the revised policy pages, as described below:

3.06 HBV Vaccination

The first sentence of this policy clarifies that even those employees whose only exposure to blood or other potentially infectious materials is through handling patient specimens, or rendering first aid, should be offered the hepatitis B vaccination series.

- Please replace policy page 3.05-3.06 in the Exposure Control section of your Safety Manual.

6.03b Patient Management

Under the second bullet point in this section, the statement now reads that, *if available*, a HEPA filter may be placed in the room with a patient suspected of having an active TB infection. A HEPA filtration unit, or other ventilation equipment is not required if the practice does not expect to treat patients with active TB disease.

The last bullet point has also been revised to state that patients who are exhibiting signs and symptoms of active TB disease should be referred to a healthcare provider (who has appropriate engineering controls in place) to be tested for TB infection.

- Please replace the policy page (6.03b) – 6.03c in the Tuberculosis Exposure Control section of your Safety Manual.

(6.03f) Indications for two-step tuberculin skin tests (TSTs)

We have added information regarding the possible need to perform a BAMT in place of baseline skin tests if it has been less than 5 years since an employee received BCG vaccine. BCG vaccine can cause a false-positive TB skin test result within 5 years of administration.

- Replace the Indications table between policy pages 6.03f and 6.03g.

Special Policies

5.01c Drugs That Should Be Handled as Hazardous

The NIOSH Hazardous Drug List has been revised.

- If this policy is included in the Special Policies section of your Safety Manual, please replace the 2-page list of hazardous drugs.

5.44 Nitrous Oxide Safety

This policy section has been added to help employees to work safely with nitrous oxide. Policies include engineering controls, work practices, administrative controls, and personal protective equipment.

- If nitrous oxide is used in your practice, please print and insert these pages in the Special Policies section of your Safety Manual.

Important 2017 Documents Available in the Member Services area of our website:

- **2017 Safety Audit Plan**

You may use this PDF workbook to assess your practice's compliance level, and identify activities that are necessary to fully implement your safety policies. We recommend annual completion of the Audit Plan, but you may work on it in segments throughout a twelve-month period, rather than all at once.

Please note that if you participate in the Management Consulting Program, it is not necessary to complete the Audit Plan. Your Compliance Consultant will provide monthly activities for you to complete to ensure your practice's compliance.

- **2017 Employee Safety Orientation Handbook & Instructions**

The Employee Safety Orientation (ESO) Handbook should be provided to new employees or to existing employees who have not yet received proper training. A short training test is included at the end of the handbook to document completion and understanding of the material. The ESO handbook is designed to provide a brief overview of safety policies so that employees can begin working safely, and then after completion of initial training, they may begin participating in monthly Compliance Training, as applicable to their duties.



TABLE OF CONTENTS - 2017 Safety Manual

User's Introduction

Member Services

Staff Training

Implementation Guide - Safety Manual Policies & Procedures

Section	Title
1.00	General Safety Policies
1.01	Safety Training Coordinator and Safety Committee
1.01a	Safety Training Coordinator & Safety Committee Designation
1.02	Authority, Access and Resources
1.03	Employee Participation
1.04	Employee Training Policy
1.05	Sanctions for Noncompliance
1.06	Types of Sanctions
1.07	Multi-Employer Workplaces
1.08	Hazard Prevention and Control
1.09	Hazard Identification and Assessment
1.10	Safety Program Evaluation
1.11	Safety Meetings
1.12	Employee Bulletin Board
1.13	Signage
1.14	Accident Reporting
1.15	Record Keeping
1.15a	Training Records
1.15b	Accident Records
1.15c	Medical Records
1.15d	Confidentiality of Medical Records
1.15e	Access to Employee Exposure and Medical Records
1.15f	OSHA Inspection and/or Citation Records
1.16	Equipment Safety
1.17	Spill Control Policy
1.18	Walking and Work Surfaces
1.19	Electrical Safety
1.19a	Electrical Shock
1.19b	Electrical Fire
1.20	Emergency Action Plan
1.20a	Fire Detection and Reporting
1.20b	Fire Evacuation
1.20c	Fire Extinguishers
1.20d	Fire Drills
1.20e	Employee Alarms

1.21	Utility Failure
1.22	Severe Weather
1.23	Earthquakes
1.24	Emergency First Aid (Emergency Eyewash Station)
1.25	Workplace Violence Protection
1.25a	Reporting and Response
1.25b	Engineering Controls
1.25c	Administrative Controls/Work Practice Controls
1.25d	Managing Potential Conflict
1.26	Security Management
1.27	Workplace Harassment
1.28	Preventing Workplace Harassment
1.28a	Employee Responsibilities
1.28b	Reporting Procedures
1.29	Corrective Actions
1.30	Examples of Workplace Harassment
1.31	Recordkeeping
1.35	Seasonal Influenza Safety
1.36	Seasonal, Avian and Pandemic Influenza
1.37	Clinical Presentation
1.38	Modes of Transmission
1.39	Infection Control Procedures
1.39a	Standard Precautions
1.36b	Transmission-Based Precautions
1.40	Administrative and Work Practice Controls
1.40a	Patient Screening
1.40b	Respiratory Hygiene/Cough Etiquette
1.40c	Hand Hygiene
1.41	Healthcare Worker Vaccination
1.42	Pandemic Influenza Preparation
1.43	Pandemic Influenza Response Coordinator/Committee
1.44	Absenteeism
1.45	Inventory of Protective Items
1.46	Infection Control Methods
1.46a	Engineering Controls
1.46b	Administrative Controls
1.46c	Work Practice Controls
1.46d	Personal Protective Equipment
1.47	Pandemic Influenza Vaccine
1.48	Prophylaxis and Treatment for Healthcare Workers
1.49	Additional Resources for Pandemic Influenza Planning

2.00	Hazard Communication Plan
2.01	Hazard Classification/Chemical Inventory
2.02	Safety Data Sheets
2.03	Hazard Labeling System
2.04	Chemical Spill Response
2.05	Waste Management
2.06	Hazard Assessment
2.07	PPE Selection, Provision, Use and Accessibility
2.08	Labcoats, Gowns, Etc.
2.09	Protective Eyewear and Masks
2.10	Gloves
2.10a	Latex Allergy
2.10b	Signs and Symptoms of Latex Allergy
2.10c	Protection from Latex Allergy
2.10d	Diagnosis and Treatment of Latex Allergy
2.11	Maintenance and Replacement of PPE
2.12	Multi-Employer Worksite
2.12a	Practice to Contract Employer(s)
2.12b	Contract Employer(s) to Practice

3.00	Exposure Control Plan
3.00a	Program Management
3.00b	Availability and Review of Exposure Control Plan
3.01	Exposure Determination
3.01a	Exposure Determination – Job Classifications
3.02	Methods of Compliance
3.02a	Standard Precautions
3.02b	Engineering Controls
3.02c	Work Practice Controls
3.02d	Personal Protective Equipment
3.02e	Housekeeping
3.02f	Needlestick Safety
3.02g	Annual Review & Update
3.02h	Consideration of New Safer Medical Devices
3.02i	Implementation of Safer Medical Devices
3.02j	Sharps Injuries
3.02k	Sharps Injury Log
3.02l	Safer Medical Device Consideration Form
3.02m	Sharps Injury Log (Form)
3.03	Spill Control
3.04	Instrument Sterilization
3.05	Equipment Disinfection
3.06	HBV Vaccination

- 3.07 Post Exposure Follow-Up
 - 3.07a Post-Exposure Response Checklist
 - 3.07b Recordkeeping
 - 3.07c Post-Exposure Prophylaxis

4.00 Medical Waste Management Plan

- 4.01 Classes of Waste Generated
- 4.02 Handling and Storage
 - 4.02a General Waste
 - 4.02b Medical Waste
 - 4.02c Sharps
 - 4.02d Transport of Waste
- 4.03 Treatment and Disposal
- 4.04 Medical Waste Reduction
- 4.05 Requirements from the Department of Transportation
- 4.06 Bloodborne Pathogens and Medical Waste Training
- 4.07 Hazardous Materials Training
- 4.08 General Awareness
- 4.09 Function-Specific Training
 - 4.09a Preparing Hazardous Materials for Transportation
 - 4.09b Shipping Papers/Manifest
- 4.10 Safety Training

SPECIAL POLICIES

- **5.00 Hazardous Drug Safety and Health Plan (HDSHP)**
 - 5.01 Hazardous Drugs
 - 5.01a Hazardous Drugs (Chemical/Generic Names) Identification
 - 5.01b Material Safety Data Sheets (MSDSs) and Hazard Labeling
 - 5.01c Sample Hazardous Drug List
 - 5.02 Personnel
 - 5.03 Conditions for Exposure
 - 5.03a Exposure Activities
 - 5.03b Exposure Routes
 - 5.04 Ventilation Equipment
 - 5.05 Personal Protective Equipment
 - 5.06 Warning Signs and Posted Information
 - 5.07 Hazardous Drug Receiving and Storage
 - 5.08 Hazardous Drug Preparation
 - 5.09 Hazardous Drug Administration
 - 5.10 Alternative Methods of Preparation and Administration
 - 5.11 Spill Management
 - 5.12 Waste Management for Hazardous Drugs
 - 5.13 Authorized Employees

- 5.14 Medical Surveillance Program
- 5.15 Program Elements
- 5.16 Medical Examinations
- 5.17 Health Changes/Program Review
- 5.18 Medical Surveillance Records

- **5.20** **Lockout / Tagout Procedures**
 - 5.21 Equipment Listing
 - 5.22 Affected Employees
 - 5.23 Authorized Personnel
 - 5.24 Employee Training
 - 5.25 Lockout/Tagout Instructions

- **5.30** **Chemical Hygiene Plan**
 - 5.31 Basic Rules and Procedures

- **5.32** **Magnetic Resonance Imaging (MRI) Safety**
 - 5.32a MR Safety Officer
 - 5.32b MR Personnel
 - 5.33 MR Zones
 - 5.33a Controlling Access to MR Zones
 - 5.33b Equipment
 - 5.33c Screening Patients, Visitors, Others
 - 5.33d Emergencies in MR Zones
 - 5.33e Firefighting Equipment/Personnel
 - 5.33f Quench Plan (Cryogen-Related Issues)
 - 5.34 Employee Screening and Training
 - 5.34a Pregnancy-Related Issues
 - 5.35 Acoustic Noise

- **5.40** **Ionizing Radiation**
 - 5.41 Types of Exposure
 - 5.42 Radiation Exposure Control
 - 5.43 Radiation Checklist

- **5.44** **Nitrous Oxide Safety**
 - 5.45 Health Effects
 - 5.46 Dental Operatory
 - 5.47 General Workplace Controls
 - 5.47a Engineering Controls
 - 5.47b Work Practices
 - 5.47c Administrative Controls
 - 5.47d Air Monitoring
 - 5.48 Medical Surveillance
 - 5.49 Hazard Communication

- **5.50** **Occupational Exposure to Formaldehyde**
 - 5.51 Permissible Exposure
 - 5.52 Exposure Monitoring
 - 5.53 Medical Removal Protection
 - 5.54 Engineering Controls, Work Practice Controls and PPE
 - 5.55 Training

- **5.60** **Laser Safety**
 - 5.61 Classification of Lasers
 - 5.62 Laser Safety Officer
 - 5.63 Standard Operating Procedures
 - 5.64 The Nominal Hazard Zone
 - 5.65 The Laser Treatment Controlled Area
 - 5.66 Associated Non-Beam Hazards
 - 5.67 Engineering Controls
 - 5.68 Personal Protective Equipment
 - 5.69 Medical Surveillance
 - 5.70 Employee Training
 - 5.71 Facility and Equipment Audits

- **5.75** **Liquid Nitrogen Safety**
 - 5.76 Health Effects
 - 5.77 Exposure Controls
 - 5.77a Proper Use and Storage of Containers
 - 5.77b Handling Precautions
 - 5.78 Personal Protective Equipment
 - 5.79 Spill Clean-Up and Disposal

- **5.80** **Compressed Gas Safety**
 - 5.81 Storage of Compressed Gas
 - 5.82 Oxygen Safety

- **5.83** **Occupational Exposure to Glutaraldehyde**
 - 5.84 Health Effects
 - 5.85 Exposure Limits
 - 5.86 Exposure Monitoring
 - 5.87 General Use of Glutaraldehyde Solutions and Exposure
 - 5.88 Exposure Controls

- **5.90** **Ergonomics Program**
 - 5.91 Employee Training and Reporting
 - 5.92 MSD Management
 - 5.93 Job Hazard Analysis
 - 5.94 Reducing MSD Hazards
 - 5.95 Record Keeping
 - 5.96 Job Hazard Analysis Tools

5.96a	Table W-1 - Basic Screening Tool
5.96b	Video Display Terminal Workstation Checklist
5.96c	Sample Letter for MSD Incident Medical Evaluation
5.97	Safe Patient Handling Policy
5.98	Resources

6.00 **Tuberculosis Exposure Control Plan**

6.01	Assignment of Responsibility
6.02	Exposure Determination
6.03	Administrative Controls
6.03a	Patient Identification and Screening
6.03b	Patient Management
6.03c	Risk Classifications
6.03d	TB Risk Assessment
6.03e	Employee TB Screening
6.03f	Interpretation of Tuberculin Skin Tests Indications for two-step tuberculin skin tests (TSTs)
6.03g	Employee Training
6.03h	Recordkeeping
6.04	Environmental Controls
6.04a	Ventilation/Air-Cleaning Procedures
6.04b	Filter Maintenance
6.05	Respiratory Protection Plan
6.05a	Selection
6.05b	Physical Assessment and Fit Testing
6.05c	Employee Training
6.05d	Respirator Storage and Maintenance
6.06	Problem Evaluation
6.06a	Contact Investigation - Known Source
6.06b	Potential Ongoing Transmission
6.06c	Contact Investigation - Unknown Source
6.06d	Employee Medical Follow-Up

7.00 **Laws**

OSHA's Hazard Communication Standard, Final Rule
 Access to Employee Exposure and Medical Records,
 29 CFR 1910.1020
 Occupational Exposure to Bloodborne Pathogens, Final Rule

* The OSHA regulations referenced above are available for download or printing from Eagle Associates' website: www.eagleassociates.net, in the Member Services – Safety Archive area.

8.00**Forms**

Form 101	Safety Suggestion Form
Form 102	Training Log
Form 103	Individual Training Log
Form 104	Medical Records Acknowledgment
Form 105	Medical Records Release Form
Form 106	Work-Site Analysis
Form 107	Bulletin Board Notice
Form 201	Hazard Assessment Form
Form 201a	PPE Hazard Assessment/Selection
Form 202	Chemical Inventory Form
Form 203	Safety Data Sheet Request Letter
Form 300	OSHA Form 300-Log of Work-Related Injuries and Illnesses
Form 301	OSHA Form 301-Injury and Illness Incident Report
Form 302	Hepatitis B Vaccine Declination Statement
Form 303	Disclosure and Consent for Hepatitis B Vaccine Administration
Form 304	Employee Post-Exposure Consent Form
Form 305	Source Individual Consent for Blood Sample & Testing
Form 306	Influenza Vaccine Consent/Declination Form
Form 307	Sample Letter for Post-Exposure Medical Evaluation
Form 601	Tuberculin Skin Test Disclosure & Consent Form
Form 602	BAMT Disclosure & Consent Form
Form 603	Annual Tuberculosis Symptom Screen
Form 604	TB Risk Assessment Worksheet

These forms may be found within the policy sections of the Safety Manual, and are included in the forms section to provide clean copies if it is necessary to revise recorded information:

Section 1.01a	Safety Training Coordinator and Safety Committee
Section 3.01	Exposure Determination
Section 3.01a	Exposure Determination - Job Classifications
Section 3.02l	Safer Medical Device Consideration Form
Section 3.02m	Sharps Injury Log

3.05 Equipment Disinfection

Equipment that may have become contaminated with blood or other potentially infectious materials shall be examined prior to servicing or shipping and shall be decontaminated as necessary unless it has been determined that proper decontamination of the product is not feasible. A readily visible label displaying the international biohazard symbol shall be attached to the equipment and state which portions remain contaminated. Information on contaminated equipment shall be conveyed to all affected employees, the servicing representative and/or the manufacturer, as appropriate, prior to handling, servicing, or shipping so that appropriate precautions will be taken. Personal protective equipment (i.e., gloves, protective eyewear, etc.) shall be provided to service personnel who work on the equipment inside the facility.

3.06 HBV Vaccination

All employees having occupational exposure to blood or other potentially infectious materials, including handling of patient specimens or rendering first aid, are offered the hepatitis B vaccination free of charge. The vaccination is made available within ten working days of initial work assignment unless the employee has either previously received the complete hepatitis B vaccination series, antibody testing has revealed that the employee is immune, or the vaccine is contraindicated for medical reasons. A form is available in section 8.00 if you wish to document disclosure and consent of those employees receiving the vaccine. Use of this form is optional. The form includes check boxes as a reminder to provide a Vaccine Information Statement regarding Hepatitis B Vaccine with each dose that is administered.

Post-vaccination antibody (titer) testing will be performed one to two months after completion of the vaccination series. This result helps to determine the appropriate post-exposure prophylaxis. The CDC recommends revaccination of individuals whose tests reveal an inadequate antibody response. Doses of the vaccine will be offered until an adequate antibody response is produced. However, if the individual does not respond to two full vaccination series they shall be medically evaluated.

The vaccination series and subsequent antibody response testing is documented in each individual employee's medical record. Any employee declining vaccination has been counseled on the benefits and safety of the vaccine and has signed the mandatory statement, as specified in Appendix A to section 1910.1030, Hepatitis B Vaccine Declination. A declination form is provided within section 8.00.

Designated first aid providers who have not previously received the hepatitis B vaccine will be offered the vaccination series if they render assistance in any situation involving the presence of blood or other potentially infectious material, regardless of whether an exposure incident occurred. In addition, such employees will be provided an appropriate post-exposure evaluation, prophylaxis and treatment following an exposure incident.

Indications for two-step tuberculin skin tests (TSTs)

Situation	Recommended Testing
No previous TST result	Two-step baseline TST
Previous negative TST result >12 months before new employment	Two-step baseline TST
Previous documented negative TST result \leq 12 months before new employment	Single TST needed for baseline testing; this test will be the second-step
\geq 2 previous documented negative TSTs but most recent TST >12 months before new employment	Single TST; two-step testing is not necessary
Previous documented positive TST result	No TST; HCW should complete TB symptom screen
Previous undocumented positive TST result*	Two-step baseline TST(s)
Previous BCG vaccination*	Two-step baseline TST(s)

* A previous TST is not a contraindication to a subsequent TST, unless the test was associated with severe ulceration or anaphylactic shock, which are substantially rare adverse events. If a previous TST result is not documented, administer two-step TSTs or offer a blood assay for *Mycobacterium tuberculosis*.

* A positive TST reaction as a result of BCG wanes after 5 years. If baseline testing must be done within the 5-year period following BCG administration, a BAMT may be performed in place of a two-step tuberculin skin test. BAMT that uses *M. tuberculosis*-specific antigens are not expected to result in false-positive results in persons vaccinated with BCG.

Sources: Aventis Pasteur. Tuberculin purified protein derivative (Mantoux) Tubersol® diagnostic antigen. Toronto, Ontario, Canada: Aventis Pasteur; 2001. Parkdale Pharmaceuticals. APLISOL (Tuberculin purified protein derivative, diluted [stabilized solution]). Diagnostic antigen for intradermal infection only. Rochester, MI: Parkdale Pharmaceuticals; 2002. Froeschle JE, Ruben FL, Bloh AM. Immediate hypersensitivity reactions after use of tuberculin skin testing. *Clin Infect Dis* 2002; 34:E12-3.

patient, or the facility is otherwise not equipped to immediately treat suspected or known TB patients, the patient shall be referred to another facility (i.e., a hospital or another practice that has the capability for proper isolation, diagnostic evaluation and treatment of TB). Referral policies limit the risk of exposure to staff as well as other patients in the facility.

The following guidelines will be implemented in treating suspected TB patients:

- The patient will be provided with a surgical mask to wear while in the practice. The patient should be instructed to wear it throughout his/her visit. The patient should also be provided with tissues and instructed to cover his/her mouth and nose when coughing or sneezing (while their mask is removed). Surgical masks are provided to prevent the individual's respiratory secretions from entering the air.
- The patient must be placed in a separate waiting room area (a designated exam room may be used for this purpose), apart from other patients, as quickly as possible. If available, a portable HEPA air filter may be placed in the room in which the patient is isolated.
- Appropriate staff will be immediately notified that the patient is available so that the patient's treatment can be completed as soon as possible.
- To protect staff members and others, a patient who is exhibiting signs and symptoms of an active TB infection should be referred to a clinic with appropriate engineering controls in place to be evaluated for TB disease.

6.03c Risk Classifications

Risk classifications shall be used to determine the need for a TB screening program for HCWs and the frequency of screening. The three risk classifications are low risk, medium risk, and potential ongoing transmission.

- **Low Risk**
Outpatient facilities that have treated fewer than three TB patients in the previous year shall be classified as low risk. Settings in this classification do not knowingly treat patients with infectious TB disease or perform cough-inducing or aerosol-generating procedures.

Screening Frequency - All newly hired HCWs will have a baseline two-step tuberculin skin test (TST) or one blood assay for *M. tuberculosis* (BAMT) result. Serial (annual) TST or BAMT screening is not necessary unless an unexpected exposure to *M. tuberculosis* occurs. In the

5.01c Drugs That Should Be Handled As Hazardous

The following NIOSH List of Antineoplastic and other Hazardous Drugs in Healthcare Settings 2016 includes three groups of drugs: antineoplastic drugs, non-antineoplastic drugs that meet one or more criteria for a hazardous drug, and drugs that primarily pose a reproductive risk to men and/or women. Please note that the list is not inclusive, as new drugs may have come onto the market since the listing was updated.

A bacavir	Cyclosporine	G anciclovir
Abiraterone	Cytarabine	Ganirelix
Acitretin		Gemcitabine
Ado-trastuzumab emtansine	D abrafenib	Gemtuzumab ozogamicin
Afatinib	Dacarbazine	Gonadotropin, chorionic
Alefacept	Dactinomycin	Goserelin
Alitretinoin	Dasatinib	
Altretamine	Daunorubicin	H istrelin
Ambrisentan	Degarelix	Hydroxyurea
Amsacrine	Decitabine	
Anastrozole	Deferiprone	I catibant
Apomorphine	Degarelix	Idarubicin
Arsenic trioxide	Dexrazoxane	Ifosfamide
Axitinib	Diethylstilbestrol	Imatinib
Azacitidine	Dinoprostone	Irinotecan
Azathioprine	Divalproex	Ixabepilone
	Docetaxel	Ixazomib
B acillus Calmette-Guerin (BCG)†	Doxorubicin	
Belinostat	Dronedarone	L eflunomide
Bendamustine	Dutasteride	Lenalidomide
Bexarotene		Letrozole
Bicalutamide	E ntecavir	Leuprolide
Bleomycin	Enzalutamide	Liraglutide recombinant
Bortezomib	Epirubicin	Lomitapide
Bosentan	Ergonovine/ Methylergonovine	Lomustine
Bosutinib	Eribulin	
Brentuximab vedotin	Erlotinib	M acitentan
Busulfan	Eslicarbazepine	Mechlorethamine
	Estradiol	Medroxyprogesterone acetate
C abergoline	Estramustine	Megestrol
Cabazitaxel	Estrogen/ progesterone combinations	Melphalan
Cabozantinib	Estrogens, conjugated	Mentropins
Capecitabine	Estrogens, esterified	Mercaptopurine
Carbamazepine	Estropipate	Methimazole
Carboplatin	Etoposide	Methotrexate
Carfilzomib	Everolimus	Methyltestosterone
Carmustine	Exemestane	Mifepristone
Cetorelix		Mipomersen
Chlorambucil		Misoprostol
Chloramphenicol	F inasteride	Mitomycin
Choriogonadotropin	Fingolimod	Mitotane
Cidofovir	Floxuridine	Mitoxantrone
Cisplatin	Fluconazole	Mycophenolate mofetil
Cladribine	Fludarabine	Mycophenolic acid
Clofarabine	Fluorouracil	
Clomiphene	Fluoxymesterone	N afarelin
Clonazepam	Flutamide	Nelarabine
Colchicine	Fosphenytoin	Nevirapine
Crizotinib	Fulvestrant	Nilotinib
Cyclophosphamide		

Omacetaxin
Ospemifene
Oxaliplatin
Oxycarbazepine
Oxytocin

Paclitaxel
Palifermin
Paliperidone
Pamidronate
Panobinostat
Paroxetine
Pasireotide
Pazopanib
Peginesatide
Pemetrexed
Pentetate calcium trisodium
Pentostatin
Pertuzumab
Phenoxybenzamine
Phenytoin
Pipobroman
Plerixafor
Pomalidomide
Ponatinib
Pralatrexate
Procarbazine
Progesterone
Progestins
Propylthiouracil

Raloxifene
Rasagiline
Regorafenib
Ribavirin
Riociguat
Risperidone
Romidepsin

Sirolimus
Sorafenib
Spironolactone
Streptozocin
Sunitinib

Tacrolimus
Tamoxifen
Televancin
Temazepam
Temozolomide
Temsilolimus
Teniposide
Teriflunomide
Testosterone
Thalidomide
Thioguanine
Thiotepa
Tofacitinib
Topiramate
Topotecan
Toremifene

Trametinib
Tretinoin
Trifluridine/tipiracil
(combination only)
Triptorelin

Ulipristal
Uracil mustard

Valganciclovir
Valporate/valproic acid
Valrubicin
Vandetanib
Vemurafenib
Vigabatrin
Vinblastine
Vincristine
Vinorelbine
Vismodegib
Voriconazole
Vorinostat

Warfarin

Zidovudine
Ziprasidone
Ziv-aflibercept
Zoledronic acid
Zonisamide

5.44 NITROUS OXIDE SAFETY

Purpose:

This set of policies is designed to enable employees to work safely with Nitrous Oxide. Included are policies for engineering controls, work practices, administrative controls, and personal protective equipment.

5.45 Health Effects

Studies in several animal species have raised concern about the possible effects of nitrous oxide exposure in humans. In general, studies demonstrate reproductive and developmental abnormalities in animals exposed to high concentrations of N₂O. In one study, spontaneous abortion was observed in rats at 1000 ppm or more. According to NIOSH, similar concentrations of 1000 ppm have been found in operating rooms and in dental operatories not equipped with scavenging systems.

Studies report fetal resorption in rats exposed to nitrous oxide at high doses. When nitrous oxide was administered at 45% to 50% and 21% to 25% oxygen to pregnant rats for 2, 4, and 6 days starting at day 8 of gestation, surviving fetuses from these rats demonstrated rib and vertebral defects. Another study also reported an increase in fetal deaths and a smaller number of offspring in rats exposed to levels ranging from 1,000 to 15,000 ppm of nitrous oxide.

There are also studies involving human subjects. A recent study reported that female dental assistants exposed to unscavenged N₂O for 5 or more hours per week had a significantly increased risk of reduced fertility compared with non-exposed female dental assistants. The exposed assistants had a 59% decrease in probability of conception for any given menstrual cycle compared with the non-exposed assistants. For dental assistants who used scavenging systems during N₂O administration, the probability of conception was not significantly different from that of the non-exposed assistants. Studies suggest that exposure to high levels of unscavenged N₂O can impair fertility and scavenging equipment is important in protecting the reproductive health of women who work with the gas. The study revealed that the mean time to conception among the women who worked with scavenged N₂O was similar to that among the non-exposed women, but it was much longer among the women who worked with unscavenged N₂O for 5 or more hours a week.

One study examined the relationship between occupational exposure to N₂O and spontaneous abortion in female dental assistants. Duration of exposure was a surrogate for exposure data. Nitrous oxide exposure was divided into two separate variables: scavenged hours (hours of exposure per week in the presence of scavenging equipment) and unscavenged hours of exposure per week. Women who worked with N₂O at least 3 hours per week in offices not using scavenging equipment had an increased risk of spontaneous abortion adjusted for age, smoking, and number of amalgams prepared per week. This finding was not observed among

workers in offices where scavenging equipment was in use. The authors concluded, "Scavenging equipment can make large differences in exposure levels at moderate cost and appears to be important in protecting the reproductive health of women who work with nitrous oxide."

Several summaries of the epidemiologic studies of exposure to N₂O have been published. They report a consistent excess of spontaneous abortion in exposed women. Other summaries of the epidemiologic studies do not establish a cause-effect relationship. Evidence for congenital abnormalities is less strongly associated with exposure.

5.46 Dental Operatory

Mixtures of N₂O and oxygen have been used in dentistry as general anesthetic agents, analgesics, and sedatives for more than 100 years. The usual analgesia equipment used by dentists includes a N₂O and O₂ delivery system, a gas mixing bag, and a nasal mask with a positive pressure relief valve. The analgesia machine is usually adjusted to deliver more of the analgesic gas mixture than the patient can use.

Analgesia machines for dentistry are designed to deliver up to 70 percent (700,000 ppm) N₂O to a patient during dental surgery. The machine restricts higher concentrations of N₂O from being administered to protect the patient from hypoxia. In most cases, patients receive between 30 and 50 percent N₂O during surgery. The amount of time N₂O is administered to a patient depends on the dentist's judgment of patient needs and the complexity of the surgery. The most common route of N₂O delivery and exhaust is through a nasal scavenging mask applied to the patient.

Based on variations in dental practices and other factors in room air, N₂O concentrations can vary considerably for each operation, and also vary over the course of each operation. Some dentists administer N₂O at higher concentrations at the beginning of the operation, then decrease the amount as the operation progresses. Others administer the same amount of N₂O throughout the operation. When the operation is completed, the N₂O is turned off. Some dentists turn the N₂O on only at the beginning of the operation, using N₂O as a sedative during the administration of local anesthesia, and turn it off before operating procedures.

Unless the procedure is performed under general anesthesia in an OR, halogenated anesthetics are not administered, nor does the patient undergo laryngoscopy and tracheal intubation. In the typical dental office procedure, the nasal mask is placed on the patient, fitted, and adjusted prior to administration of the anesthetic agent. The mask is designed for the nose of the patient since access to the patient's mouth is essential for dental procedures.

A local anesthetic, if needed, is typically administered after the N₂O takes effect. The patient's mouth is opened and the local anesthetic is injected. The dental procedure begins after the local anesthetic takes effect. The patient opens his/her mouth but is instructed to breathe through the nose. Nonetheless, a certain amount of mouth breathing frequently occurs. The

dentist may periodically stop the dental procedure for a moment to allow the patient to close the mouth and breath deeply to re-establish an appropriate concentration of N₂O in the patient's body before resuming the procedure. Depending on the nature of the procedure, high velocity suction is regularly used to remove intraoral debris and, when used, creates a negative air flow and captures some of the gas exhaled by the patient.

At the end of the procedure, the nosepiece is left on the patient while the N₂O is turned off and the oxygen flow is increased. The anesthetic mixture diffuses from the circulating blood into the lungs and is exhaled. Scavenging is continued while the patient is eliminating the N₂O.

5.47 General Workplace Controls

Occupational exposures can be controlled by the application of a number of well-known principles, including engineering and work practice controls, administrative controls, and monitoring. These principles may be applied at or near the hazard source, to the general workplace environment, or at the point of occupational exposure to individuals. Controls applied at the source of the hazard, including engineering and work practice controls, are generally the preferred and most effective means of control. Exposure may be controlled by some or all of the following: (1) effective anesthetic gas scavenging systems that remove excess anesthetic gas at the point of origin; (2) effective general or dilution ventilation; (3) good work practices on the part of the health-care workers, including the proper use of controls; (4) proper maintenance of equipment to prevent leaks; and (5) periodic personnel exposure and environmental monitoring to determine the effectiveness of the overall waste anesthetic gas control program.

5.47a Engineering Controls

The piped systems for the in-plant transfer and distribution of nitrous oxide shall be designed, installed, maintained, and operated in accordance with Compressed Gas Association Pamphlet G-8.1-2013.

The collection and disposal of waste anesthetic gases is essential for reducing occupational exposures. Engineering controls such as an appropriate anesthetic gas scavenging system are the first line of defense and the preferred method of control to protect employees from exposure to anesthetic gases. An effective anesthetic gas scavenging system traps waste gases at the site of overflow from the breathing circuit and disposes of these gases to the outside atmosphere. The heating, ventilating, and air conditioning (HVAC) system also contributes to the dilution and removal of waste gases not collected by the scavenging system or from other sources such as leaks in the anesthetic apparatus or improper work practices.

The exhalation of residual gases by patients may result in significant levels of waste anesthetic gases when appropriate work practices are not used at the conclusion of the anesthetic or

inadequate ventilation exists in the PACU. A non-recirculating ventilation system can reduce waste gas levels in this area. Waste gas emissions to the outside atmosphere must meet local, state, and Environmental Protection Agency (EPA) regulatory requirements.

A scavenging system consists of five basic components:

- A **gas collection assembly** such as a collection manifold or a distensible bag (i.e., Jackson-Rees pediatric circuit), which captures excess anesthetic gases at the site of emission, and delivers it to the transfer tubing.
- **Transfer tubing**, which conveys the excess anesthetic gases to the interface.
- The **interface**, which provides positive (and sometimes negative) pressure relief and may provide reservoir capacity. It is designed to protect the patient's lungs from excessive positive or negative scavenging system pressure.
- **Gas disposal assembly tubing**, which conducts the excess anesthetic gases from the interface to the gas disposal assembly.
- The **gas disposal assembly**, which conveys the excess gases to a point where they can be discharged safely into the atmosphere. Several methods in use include a non-recirculating or recirculating ventilation system, a central vacuum system, a dedicated (single-purpose) waste gas exhaust system, a passive duct system, and an adsorber.

In general, a machine-specific interface must be integrated with a facility's system for gas removal. The interface permits excess gas to be collected in a reservoir (bag or canister) and limits the pressure within the bag or canister. A facility's gas disposal system receives waste anesthetic gases from the interface and should vent the waste gases outside the building and away from any return air ducts or open windows, thus preventing the return of the waste gases back into the facility.

Removal of excess anesthetic gases from the anesthesia circuit can be accomplished by either **active** or **passive** scavenging. When a vacuum or source of negative pressure is connected to the scavenging interface, the system is described as an active system. When a vacuum or negative pressure is not used, the system is described as a passive system. With an active system there will be a negative pressure in the gas disposal tubing. With a passive system, this pressure will be increased above atmospheric (positive) by the patient exhaling passively, or manual compression of the breathing system reservoir bag.

Use of a central vacuum system is an example of an active system: The waste anesthetic gases are moved along by negative pressure. Venting waste anesthetic gas via the exhaust grille or exhaust duct of a nonrecirculating ventilation system is an example of a passive system: The anesthetic gas is initially moved along by the positive pressure from the breathing circuit until it reaches the gas disposal assembly.

Active Systems - Excess anesthetic gases may be removed by a central vacuum system or an exhaust system dedicated to the disposal of excess gases. When the waste anesthetic gas scavenging system is connected to the central vacuum system, exposure levels may be effectively controlled. The central vacuum system must be specifically designed to handle the

large volumes of continuous suction from scavenging units. If a central vacuum system is used, a separate, dedicated gas disposal assembly tubing should be used for the scavenging system, distinct from the tubing used for patient suctioning (used for oral and nasal gastric sources as well as surgical suctioning).

Similarly, when a dedicated exhaust system (low velocity) is used, excess gases can also be collected from one or more ORs and discharged to the outdoors. The exhaust fan must provide sufficient negative pressure and air flow so that cross-contamination does not occur in the other ORs connected to this system. Active systems are thought to be more effective than passive systems at reducing excess waste anesthetic gas concentrations because leaks in the scavenging system do not result in an outward loss of gas.

Passive Systems - HVAC systems used in health-care facilities are of two types: nonrecirculating and recirculating. Nonrecirculating systems, also termed "one-pass" or "single-pass" systems, take in fresh air from the outside and circulate filtered and conditioned air (i.e., controlled for temperature and humidity) through the room. Whatever volumes of fresh air are introduced into the room are ultimately exhausted to the outside. Waste anesthetic gases can be efficiently disposed of via this nonrecirculating system.

When a nonrecirculating ventilation system serves through large-diameter tubing and terminating the tubing at the room's ventilation exhaust as the disposal route for excess anesthetic gases, disposal involves directing the waste gases grille. The sweeping effect of the air flowing into the grille carries the waste gases away. Because all of the exhausted air is vented to the external atmosphere in this type of system, the excess anesthetic gases can be deposited into the exhaust stream either at the exhaust grille or further downstream in the exhaust duct.

Concern for fuel economy has increased the use of systems that recirculate air. Recirculating HVAC/ventilation systems return part of the exhaust air back into the air intake and recirculate the mixture through the room. Thus, only a fraction of the exhaust air is disposed of to the outside. To maintain minimal levels of anesthetic exposure, air which is to be recirculated must not contain anesthetic gases. Consequently, recirculating systems employed as a disposal pathway for waste anesthetic gases must not be used for gas waste disposal. The exception is an arrangement that transfers waste gases into the ventilation system at a safe distance downstream from the point of recirculation to ensure that the anesthetic gases will not be circulated elsewhere within the building.

Under certain circumstances a separate duct for venting anesthetic gases directly outside the building without the use of a fan, may be an acceptable alternative. By this technique, excess anesthetic gases may be vented through the wall, window, ceiling, or floor, relying only on the slight positive pressure of the gases leaving the gas collection assembly to provide the flow. However, several limitations are apparent. A separate line would be required for each OR to prevent the cross-contamination with anesthetic gases among the ORs. A safe disposal site would be necessary. The possible effects of variations in wind velocity and direction would require a means for preventing a reverse flow in the disposal system. Occlusion of the outer

portion of such a passive system by ice or by insect or bird nests is also possible. The outside opening of a through-wall, -window, -ceiling, or -floor disposal assembly should be directed downward, shielded, and screened to prevent the entrance of foreign matter or ice buildup. Despite these limitations, the separate duct without the use of a fan may be ideal in older facilities constructed with windows that cannot be opened and in the absence of nonrecirculating air conditioning.

Adsorbers can also trap most excess anesthetic gases. Canisters of varying shapes and capacities filled with activated charcoal have been used as waste gas disposal assemblies by directing the gases from the gas disposal tubing through them. Activated charcoal canisters will effectively adsorb the vapors of halogenated anesthetics, but not N₂O. The effectiveness of individual canisters and various brands of charcoal vary widely. Different potent inhaled volatile agents are adsorbed with varying efficiencies. The efficiency of adsorption also depends on the rate of gas flow through the canister. The canister is used where portability is necessary. The disadvantages are that they are expensive and must be changed frequently. Canisters must be used and discarded in the appropriate manner, as recommended by the manufacturer.

General or Dilution Ventilation - An effective room HVAC system when used in combination with an anesthetic gas scavenging system should reduce, although not entirely eliminate, the contaminating anesthetic gases. If excessive concentrations of anesthetic gases are present, then airflow should be increased in the room to allow for more air mixing and further dilution of the anesthetic gases. Supply register louvers located in the ceiling should be designed to direct the fresh air toward the floor and toward the health-care workers to provide dilution, and removal of the contaminated air from the operatory or PACU. Exhaust register louvers should be properly located (usually low on the wall near the floor level) in the room to provide adequate air distribution. They should not be located near the supply air vents because this will short-circuit the airflow and prevent proper air mixing and flushing of the contaminants from the room.

The dental office or operatory should have a properly installed N₂O delivery system. This includes appropriate scavenging equipment with a readily visible and accurate flow meter (or equivalent measuring device), a vacuum pump with the capacity for up to 45 L/min of air per workstation, and a variety of sizes of masks to ensure proper fit for individual patients. A common nasal mask consists of an inner and a slightly larger outer mask component. The inner mask has two hoses connected that supply anesthetic gas to the patient. A relief valve is attached to the inner mask to release excess N₂O into the outer mask. The outer mask has two smaller hoses connected to a vacuum system to capture waste gases from the patient and excess gas supplied to the patient by the analgesia machine. The nasal mask should fit over the patient's nose as snugly as possible without impairing the vision or dexterity of the dentist. Gases exhaled orally are not captured by the nasal mask. A flow rate of approximately 45 L/min has been recommended as the optimum rate to prevent significant N₂O leakage into the room air.

A newer type of mask is a frequent choice in dental practice: a single patient use nasal hood. This mask does not require sterilization after surgery because it is used by only one patient and is disposable.

In a dental operator, a scavenging system is part of a high-volume evacuation system used with a dental unit. The vacuum system may dispose of a combination of waste gases, oral fluid, and debris, and is not limited to waste gas removal. The exhaust air of the evacuation system should be vented outside the building and away from fresh-air inlets and open windows to prevent re-entry of gas into the operator.

The general ventilation should provide good room air mixing. In addition, auxiliary (local) exhaust ventilation used in conjunction with a scavenging system has been shown to be effective in reducing excess N₂O in the breathing zone of the dentist and dental assistant, from nasal mask leakage and patient mouth breathing. This type of ventilation captures the waste anesthetic gases at their source. However, there are practical limitations in using it in the dental operator. These include proximity to the patient, interference with dental practices, noise, and installation and maintenance costs. It is most important that the dentist not work between the patient and a free-standing local exhaust hood. Doing so will cause the contaminated air to be drawn through the dentist's breathing zone. These auxiliary ventilation systems are not now commercially available.

5.47b Work Practices

Work practices, as distinct from engineering controls, involve the way in which a task is performed. Appropriate work practices can be a vital aid in reducing the exposures of OR personnel to waste anesthetic agents. In contrast, improper anesthetizing techniques can contribute to increased waste gas levels, such as an improperly selected and fitted face mask. General work practices recommended for anesthetizing locations include the following:

- A complete anesthesia apparatus checkout procedure should be performed each day before the first case. An abbreviated version should be performed before each subsequent case. The FDA Anesthesia Apparatus Checkout Recommendations should be considered in developing inspection and testing procedures for equipment checkout prior to administering an anesthetic.
- If a face mask is to be used for administration of inhaled anesthetics, it should be available in a variety of sizes to fit each patient properly. The mask should be pliable and provide as effective a seal as possible against leakage into the surrounding air.
- Before removing the mask or other airway management device, one should administer non-anesthetic gases/agents so that the washed-out anesthetic gases can be removed by the scavenging system. The amount of time allowed for this should be based on clinical assessment and may vary from patient to patient. When possible, flushing of the breathing system should be achieved by exhausting into the scavenging system rather than into the room air.

Work practices also contribute significantly to the efficacy of managing waste gas exposure. It is, therefore, important to do the following:

- Monitor airborne concentrations of waste gases by sampling, measuring, and reporting data to the institution's administration. Air monitoring for waste anesthetic gases should include both personal sampling (i.e., in a health-care worker's breathing zone) and area sampling.
- Assist in identifying sources of waste/leaking gases and implementing corrective action.
- Determine if the scavenging system is designed and functioning properly to remove the waste anesthetic gases from the breathing circuit, and ensure that the gases are vented from the workplace in such a manner that occupational re-exposure does not occur (e.g., smoke trail tests of exhaust grilles used with passive scavenging systems).
- Ensure that ventilation systems provide sufficient room air exchange to reduce ambient waste gas levels.
- Prior to first use each day of the N₂O machine and every time a gas cylinder is changed, the low-pressure connections should be tested for leaks. High-pressure line connections should be tested for leaks quarterly. A soap solution may be used to test for leaks at connections. Alternatively, a portable infrared spectrophotometer can be used to detect an insidious leak.
- Prior to first use each day, inspect all N₂O equipment (e.g., reservoir bag, tubing, mask, connectors) for worn parts, cracks, holes, or tears. Replace as necessary.
- Connect mask to the tubing and turn on vacuum pump. Verify appropriate flow rate (i.e., up to 45 L/min or manufacturer's recommendations).
- A properly sized mask should be selected and placed on the patient. A good, comfortable fit should be ensured. The reservoir (breathing) bag should not be over- or underinflated while the patient is breathing oxygen (before administering N₂O).
- Encourage the patient to minimize talking, mouth breathing, and facial movement while the mask is in place.
- During N₂O administration, the reservoir bag should be periodically inspected for changes in tidal volume, and the vacuum flow rate should be verified.
- On completing anesthetic administration and before removing the mask, non-anesthetic gases/agents should be delivered to the patient for a sufficient time based on clinical assessment that may vary from patient to patient. In this way, both the patient and the system will be purged of residual N₂O. Do not use an oxygen flush.

5.47c Administrative Controls

Administrative controls represent another approach for reducing worker exposure to waste gases other than through the use of engineering controls, work practices, or personal protective equipment. Administrative controls may be thought of as any administrative decision that results in decreased anesthetic-gas exposure. For workers potentially exposed to waste anesthetic gases, the program administrator should establish and implement policies and procedures to:

- Institute a program of routine inspection and regular maintenance of equipment in order to reduce anesthetic gas leaks and to have the best performance of scavenging equipment and room ventilation. Preventive maintenance should be performed by trained individuals according to the manufacturer's recommendations and at intervals determined by equipment history and frequency of use. Preventive maintenance includes inspection, testing, cleaning, lubrication, and adjustment of various components. Worn or damaged parts should be repaired or replaced. Such maintenance can result in detection of deterioration before an overt malfunction occurs. Documentation of the maintenance program should be kept indicating the nature and date of the work performed, as well as the name of the trained individual servicing the equipment.
- Implement a monitoring program to measure airborne levels of waste gases in the breathing zone or immediate work area of those most heavily exposed in each anesthetizing location. Periodic monitoring (preferably at least semiannually) of waste gas concentrations is needed to ensure that the anesthesia delivery equipment and engineering/environmental controls work properly and that the maintenance program is effective. Monitoring may be performed effectively using conventional time-weighted average air sampling or real-time air sampling techniques.
- Encourage or promote the use of scavenging systems in all anesthetizing locations where inhaled agents are used, recognizing that a waste gas scavenging system is the most effective means of controlling waste anesthetic gases.
- Implement an information and training program for employees exposed to anesthetic agents that complies with OSHA's Hazard Communication Standard ([29 CFR 1910.1200](#)) so that employees can meaningfully participate in, and support, the protective measures instituted in their workplace. See Section 2.00 of the Safety Manual for Hazard Communication policies.
- Define and implement appropriate work practices to help reduce employee exposure. Training and educational programs covering appropriate work practices to minimize levels of anesthetic gases in the operating room should be conducted at least annually. Employers should emphasize the importance of implementing these practices and should ensure that employees are properly using the appropriate techniques on a regular basis.
- Implement a medical surveillance program for all workers exposed to waste gases.

- Manage air monitoring for waste gases following a leak.
- Comply with existing federal, state, and local regulations and guidelines developed to minimize personnel exposure to waste anesthetic gases, including the proper disposal of hazardous chemicals.

5.47d Air Monitoring

Air monitoring is one of the fundamental tools used to evaluate workplace exposures. Accordingly, this section presents some of the appropriate methods that can be used to detect and measure the concentration of anesthetic gases that may be present in the health-care environment. The data provided by monitoring are necessary to establish proper engineering, work practice, and administrative controls to ensure the lowest reasonably achievable gas levels.

OSHA recommends that air sampling for anesthetic gases be conducted every 6 months to measure worker exposures and to check the effectiveness of control measures. Furthermore, OSHA recommends that only the agent(s) most frequently used needs to be monitored, since proper engineering controls, work practices and control procedures should reduce all agents proportionately. However, the decision to monitor only selected agents could depend not only on the frequency of their use, but on the availability of an appropriate analytical method and the cost of instrumentation. [The American Society of Anesthesiologists (ASA) emphasizes regular maintenance of equipment and scavenging systems, daily check-out procedures for anesthesia equipment, and education to ensure use of appropriate work practices. It does not believe that a routine monitoring program is necessary when these actions are being carried out. ASA prefers to use monitoring when indicated such as in the event of known or suspected equipment malfunction. The Academy of General Dentistry also emphasizes properly installed and maintained analgesia delivery systems.]

Three fundamental types of air samples can be taken in order to evaluate the workplace: personal, area, and source samples. Personal samples give the best estimate of a worker's exposure level since they represent the actual airborne contaminant concentration in the worker's breathing zone during the sampling period. This is the preferred method for determining a worker's time-weighted average (TWA) exposure and should be used to assess personal exposures during anesthetic administration and in the PACU. Where several health-care workers perform the same job, on the same shift, and in the same work area, and the length, duration, and level of waste gas exposures are similar, an employer may sample a representative fraction of the employees instead of all employees.

Area sampling is useful for evaluating overall air contaminant levels in a work area and for investigating cross-contamination with other areas in the health-care facility. Source sampling can be used to detect leaks in the anesthesia delivery and scavenging systems as well as ineffective capture by the scavenging system. Thus, how samples are taken is a critical point in any safety program.

The OSHA Chemical Information Manual contains current sampling technology for several of the anesthetic gases that may be present in anesthetizing locations and PACUs. Some of the sampling methods available are summarized below.

Time-Integrated Sampling - Personal N₂O exposures can be determined by using the VAPOR-TRAK nitrous oxide passive monitor (sometimes called a "passive dosimeter" or "diffusive sampler"). The minimum sampling duration for the dosimeter is 15 minutes; however, it can be used for up to 16 hours of passive sampling. This sampler has not been validated by OSHA. Other dosimeters are commercially available and can be used. Although not validated by OSHA at this time, they may be validated in the future. Five liter, 5-layer aluminized gas sampling bags can also be used to collect a sample.

5.48 Medical Surveillance

In all locations where anesthesia is administered, engineering controls such as a scavenging system to remove waste anesthetic gases and adequate room ventilation should be utilized. Medical surveillance of personnel working in scavenged areas is intended primarily to establish a baseline. Routine annual follow-up is primarily educational and at minimum, might consist of a health questionnaire. Examinations and laboratory testing should be available for conditions suspected of being related to occupational exposure.

A medical surveillance program might include:

- A pre-placement medical questionnaire that includes a detailed work history (including past exposures to waste anesthetic gases); a medical history with emphasis on: hepatic (liver), renal (kidney), neurological (nervous system), cardiovascular (heart and circulation), and reproductive functions. Pertinent positive response(s) to the questionnaire should be followed by an appropriate medical evaluation (i.e., in-depth history and physical examination where appropriate) and, where relevant, suitable laboratory tests, such as liver function tests.
- An annual questionnaire emphasizing the issues mentioned above. Again, the need for physical examination or laboratory work may be based on questionnaire responses.
- A system should be created for employees to report health problems which they believe may be associated with anesthetic exposure. Employees should be informed of this reporting system and of the method by which reports can be submitted.
- An acute exposure (i.e., a sudden, high-level exposure) should be documented. Any subsequent health effects should trigger a medical history, and a physical examination (where appropriate).
- A reproductive hazards policy should also be in place at the facility and should address worker exposure and reproductive health effects in male and female employees. The facility

should provide training in the known and potential adverse health effects, including reproductive effects, of waste anesthetic gases, as is required for chemicals covered by the Hazard Communication Standard.

- A final medical review upon job transfer or termination. This should be in the form of a questionnaire that includes any acute or significant exposures as well as a review of symptoms and signs detected during employment, along with a medical evaluation when appropriate.
- Medical and exposure records developed for employees who may be exposed to hazardous chemicals such as N₂O and halogenated anesthetic agents must be retained, made available, and transferred in accordance with OSHA Standard for Access to Employee Exposure and Medical Records ([29 CFR 1910.1020](#)). The occurrence of injury or illness related to occupational exposure must be recorded in accordance with OSHA recordkeeping regulations ([29 CFR 1904](#)).

5.49 Hazard Communication

In accordance with the Hazard Communication Standard ([29 CFR 1910.1200](#)), employers in health-care facilities must develop, implement, and maintain at the workplace a written, comprehensive hazard communication program that includes provisions for container labeling, collection and availability of safety data sheets (SDSs), and an employee training and information program. The standard also requires a list of hazardous chemicals in the workplace as part of the written hazard communication program. Refer to section 2.00 of the Safety Manual for Hazard Communication policies.

Any chemicals subject to the labeling requirements of the FDA are exempt from the labeling requirements under the Hazard Communication Standard. This includes such chemicals as compressed medical gases.

Health-care employers must establish a training and information program for all personnel who are involved in the handling of, or who have potential exposure to, anesthetic gases and other hazardous chemicals to apprise them of the hazards associated with these chemicals in the workplace. Training relative to anesthetic gases should place an emphasis on reproductive risks. Training and information must take place at the time of initial assignment and whenever a new hazard is introduced into the work area. At a minimum, employees must be informed of the following:

- The Hazard Communication Standard ([29 CFR 1910.1200](#)) and its requirements.
- Any operations and equipment in the work area where anesthetic agents and hazardous chemicals are present.
- Location and availability of the written hazard communication program including the required lists of hazardous chemicals and the required SDS forms.

The employee training program must consist of the following elements:

- Measures employees can take to protect themselves from nitrous oxide hazards, including specific procedures put into effect by the employer to provide protection such as engineering controls, appropriate work practices, emergency procedures for spill containment, and the use of personal protective equipment.
- Methods and observations that may be used to detect the presence or release of anesthetic gases and other hazardous chemicals in the work area (such as monitoring conducted by the employer, continuous monitoring devices, and the appearance or odor of chemicals when released).