

chapter 16



Medication Administration and IV

Poisons and medicine are oftentimes the same substance given with different intents.

—Peter Mere Latham

Need to Know

- ▶ How to perform a drug calculation. (Detailed discussion of drug calculations can be found in Chapter 16 of the companion student workbook.)
- ▶ The proper method to prepare a medication for administration.
- ▶ The indications, contraindications, precautions, and interactions for all medications in the paramedic's formulary.
- ▶ How to safely and properly access all approved administration routes.
- ▶ Safe administration techniques, which include maintaining asepsis, preventing complications or problems with the various administration routes, and proper disposal of contaminated materials.
- ▶ Performing all required preadministration assessments and procedures including history, physical examination, vital signs, and other monitoring devices information. (And knowing when any of these must not be done because of the severity of the emergency.)
- ▶ What authorization is required for administering each medication and whether it is through on-line or off-line medical control.
- ▶ The expected therapeutic effect for all medications used in the prehospital environment.
- ▶ The potential side effects and complications for all medications used in the prehospital environment.
- ▶ Postadministration follow-up procedures, including proper documentation, patient reassessment, and monitoring.

▶ Do	▶ Ask
<ul style="list-style-type: none"> • Check each medication at least three times before giving it to the patient. • Ensure the vital signs have been assessed before and after each medication administration. • Document medication administration appropriately. • Ensure all biological hazardous materials are disposed of in the proper receptacles. 	<ul style="list-style-type: none"> • About allergies and drug interactions the patient has experienced before administering any medication. • About medications the patient is currently taking (as well as over-the-counter or herbal remedies and any illicit drugs).

Introduction

Medication in the prehospital environment is administered by a variety of routes, and each route requires a specific administration technique. You are responsible for ensuring that the correct dose is administered, which may require mathematical conversions or calculations. As discussed in the previous chapter, it is important to understand the indications, contraindications, precautions, and interactions for all medications in your formulary. Safe administration techniques are required which include maintaining the cleanliness of all supplies and equipment (called asepsis), preventing complications during administration, and properly disposing of contaminated materials. You should also understand the expected therapeutic effect for all medications used in the prehospital environment.

Prior to administering any medication, you should collect enough information through history taking and from the physical examination to ensure a correct assessment is made, and the proper therapy is selected. Administration of medication requires authorization from medical direction governing what, where, when,

why, and how it may be used. This permission may take the form of off-line written protocol and standing order or require real-time on-line physician direction via telephone, radio, or satellite consultation. Post-administration follow-up procedures include reassessing and monitoring the patient for effects, both beneficial as well as detrimental. Proper documentation is critical to ensure the patient is followed up appropriately in the hospital setting and to close the loop on the procedure for the paramedic. This chapter will discuss all of these aspects of medication administration. **DOT 1-7.12**

Medication Skill Sheets include: 42: Intravenous Access (also see Step-by-Step 42); 43: Intravenous Access Using Saline Lock (also see Step-by-Step 43); 44: Phlebotomy; 45: Intraosseous Access and Drug Administration (also see Step-by-Step 45); 46: Umbilical Vein Cannulation; 47: Central Line Access for Fluids and Drug Administration; 48: Intravenous Drug Bolus (also see Step-by-Step 48); 49: Intravenous Drug Infusion (also see Step-by-Step 49); 50: Intramuscular Drug Administration (also see Step-by-Step 50); 51: Intranasal Drug Administration; 52: Nebulized Drug Administration (also see Step-by-Step 52); 53: Subcutaneous Drug Administration (also see Step-by-Step 53);

54: Sublingual Drug Administration; 55: Endotracheal Drug Administration; 56: Eye Drop Drug Administration; 57: Oral Drug Administration; 58: Rectal Drug Administration (also see Step-by-Step 58); 59: Autoinjector Drug Administration Device; 89: NREMT Intravenous Therapy; and 91: NREMT Pediatric Intravenous Infusion.

General Guidelines of Medication Administration Responsibilities

The responsibilities associated with medication handling and administration parallel the primary paramedic responsibilities discussed previously. These responsibilities come directly from the DOT curricula and include preparation, response, scene assessment, patient assessment, recognition of injury, management, appropriate disposition, treatment and transport, patient transfer, documentation, and return to service.¹ This order, although identified as pertinent for a standard patient interaction, provides an appropriate plan for medication administration as well, so it will serve as the template for this chapter.

Preparation and Response

Before responding to any emergency, ensure that all necessary medications are stocked at the appropriate number, are in date, and are in good condition. Your governing body will provide a list of approved medications for your individual service's **formulary**. A formulary is the listing of medications approved for use along with pertinent information for each drug on the list.

Read the accompanying literature from the medication package box (called the package insert) to determine if there are any special storing or handling requirements. Some medications require storage within a specific temperature range or out of direct sunlight. For example, most injectable medications should not be frozen or stored for long periods of time in temperatures above 90°F. Another example involves the injectable form of nitroglycerin. It should be administered only in glass bottles using special tubing that accompanies the drug. Nitroglycerin tablets should not be exposed to sunlight or the bottle kept open for too long.² DOT 1-8.10

Check all expiration dates on a regular basis. Medication and most sterile supplies, like IV catheters and tubing, have expiration dates. To make it easier to check for expiration, mark the box clearly with the expiration date or circle the date on the container. Be careful not to obscure information on the container if you do this. Put those medications that are expiring soonest closer to the front of the storage compartment to ensure they are used first.

Expiration checks should be frequent and should follow agency guidelines (Figure 16-1). Some services require a thorough count and expiration date check with the change of every shift while other services may require weekly, monthly, or a spot check to verify an intact seal



Figure 16-1 Check the expiration date of all medication and sterile supplies at the start of every shift or on the schedule required by your service.

remains on a storage cabinet or container. It may be possible to rotate medications that are close to expiring out of your stock and replace them with fresher ones. For an ambulance service closely aligned with a hospital, this may be easier to do than for an independent service.

Some services store drugs at risk for theft or misuse (such as narcotics) with a higher degree of security than other medications (Figure 16-2). This may include the use of a custody log or special counting procedure. It may also include storage in a special location or control and custody by the most senior member of the health-care team. Box 16-1 describes the procedures for handling narcotics. DOT 1-7.22



Figure 16-2 Some medication requires additional security measures.

BOX 16-1 Narcotic Drugs

Narcotic administration requires that paramedics follow specific local, state, and federal regulations. It is necessary that paramedics ensure that all narcotics are accounted for at the beginning and end of their shift and that they are secure throughout the shift. Make sure all custody logs are signed and maintained as per protocol. **DOT 1-8.10**

In addition to preparing the ambulance to respond to patients, paramedics should be ready to respond by being familiar with the protocols and standing orders for all the medications used in their system. Know the pediatric and adult doses as well as all approved routes for administration. Paramedics should understand the indications, contraindications, precautions, and special considerations for each drug. Make a pocket card with the dosages and routes of administration to keep as a reference.

Street Secrets

When marking medication containers with expiration dates, make sure you put the correct month and year of expiration on the box. If the medicine expires on an exact date, for example March 3, 2009, it is better to write 02/09 on the box than 03/09. The 02/09 date will ensure the drug is rotated out of stock prior to the actual expiration date. For expiration dates with just the month and year listed, the last day of the month is considered the expiration date. In this case, a drug with August 2010 could have 08/10 written on the box.

CONNECTIONS Refer to Chapter 15: Pharmacology for more information on medication indications, contraindications, precautions, and special considerations.

Make sure the appropriate supplies are available to prepare and administer every medication in the formulary. This includes having an adequate number of the various sizes of syringes and needles and any solutions needed to dissolve powdered drugs into liquid form.

Pay particular attention to the supplies and equipment used by the facilities that routinely receive your patients. Your ambulance service may interact with medical facilities that support a combination of “needle-less” and “latex-free” environments, which could result in the need to maintain many different sets of supplies. Needle-less equipment and supplies are designed to minimize the possibility of accidental needle stick by replacing some components with special fittings that eliminate the need for needles. Although this equip-



Figure 16-3 Needle-less and latex-free supplies should be clearly labeled and stored separately.

ment makes a safer working environment, it is not compatible with needles. Attempting to use a needle in a needle-less system will contaminate or damage it.

Latex is a natural rubber product derived from tree sap. Many people are allergic to the protein in latex, and there have been some fatalities from anaphylactic reactions caused by latex exposure. Between 5% and 17% of all healthcare workers are estimated to be allergic to latex. The estimated rate of latex allergy in children is 1 in 10,000.³ Some EMS systems and other healthcare settings are moving away from using latex-containing equipment and supplies (Figure 16-3). Care must be exercised not to cross contaminate these supplies with latex-containing products. Separate storage areas are usually required.

Scene Assessment, Patient Assessment, and Problem Recognition

Size up the scene and look for clues. Before administering any medication, ensure you have completed a thorough scene assessment. As you enter a private residence, look at the door frame or window for a sticker that indicates medical information may be located inside (Figure 16-4). Many EMS services and

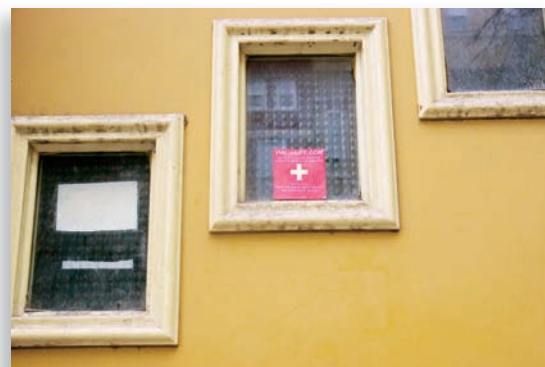


Figure 16-4 Look for clues that the patient has medical information stored somewhere on the scene.

health departments have programs so patients can make medication information available in a consistent location. The refrigerator door is a common location for many of these programs. **DOT 1-8.25, 1-8.26**

Look around for medication bottles. They could be anywhere in the home including the kitchen, bedroom, bathroom, or living room. Don't forget to look for over-the-counter (called OTCs) and herbal preparations. Be alert for drug paraphernalia and any signs of medication misuse or abuse.

Determine if the patient has been **compliant** with the prescribed dosing regimen. The term compliant describes whether or not a patient has adhered to the medication dosing regimen prescribed by the physician. A noncompliant patient is not taking the medication as prescribed. One study found a 76% discrepancy rate in adherence to dosing regimens between the medications the patients were actually taking and those prescribed by their physicians.⁴ This study observed that over three-fourths of all people taking a prescription medication were not taking it according to the directions. Some patients were taking too much (overdosing) or too little (under dosing) or taking it at the wrong time of day (for example in the morning instead of evening) or under the wrong circumstances (for example, with meals instead of on an empty stomach).

Street Secrets

In addition to asking patients if they are compliant, another EMS provider can count pills or measure quantities of medication while you stay with the patient. This permits a comparison between the number of pills that should be missing based on the prescription date versus the number actually missing to help assess medication compliance. This may be necessary if the patient is on a medication that requires continual dosing in order to maintain life or health. Antipsychotic and antidepressant medications are two examples, but blood pressure and cardiac medications are just as important to take regularly.

Before administering any drug, you should obtain a history that includes information about allergies and medications. Perform a patient assessment and obtain vital signs. Begin oxygen administration, as appropriate, and start an intravenous line with the appropriate fluid. Attach any monitoring devices like a pulse oximeter or ECG leads. At this point in patient care, you need to balance gathering enough information from the patient assessment with also ensuring that timely intervention and treatment is delivered. **DOT 1-7.26, 1-7.27**

Some circumstances may prevent you from gathering all of the information you need. If the patient is unconscious and there is no one there to provide information to you, document this in the patient care report. If the

situation is life-threatening, as when the patient is in cardiac arrest, you may not be able to determine if the patient has allergies to all of the medications you are going to administer. You should ask bystanders and family members if the person has any allergies or takes any medication, but seeking this information should not delay treatment.

CONNECTIONS Chapter 10: Therapeutic Communications and History Taking describes techniques that may be helpful in obtaining information from patients and bystanders.

Management and Appropriate Disposition

Once the need for medication use is identified, you must gather the supplies and equipment you need to perform the administration. Collect all the materials together, including the medication and extra supplies in case something becomes contaminated or is not appropriate for use. For example, as you prepare the supplies to administer an injection, you attach a needle to a syringe and set it on a sterile field (the inside of a sterile dressing package) while you open and cleanse the top of the medication vial. The syringe rolls off the paper and you are concerned it is contaminated and now cannot be used. Because you had some extra supplies near by, you can quickly set up a new syringe. (A more thorough discussion of aseptic technique follows later in this chapter.) **DOT 1-8.25, 1-8.26**

Determine if the final destination for your patient has any impact upon your treatment decision. You may decide not to administer a medication that takes 15 to 20 minutes to begin working if the destination is less than five minutes away, particularly when you know other medication options are available once the patient reaches the hospital. Consider the need to obtain on-line physician consultation in situations like this. Asking for clarification may be appropriate, even when there is a standing order already in place.

Confirm whether on-line or off-line medical direction is needed for permission to administer the medication. Perform the patient "rights."¹ If the patient is conscious, in addition to obtaining consent for treatment, you should discuss any side effects the patient may experience once the medication is administered (Box 16-2). For example, a patient with crushing substernal chest pain may have a headache and dizziness as a natural side effect (caused by dilation of blood vessels and the lowering of blood pressure) after nitroglycerin administration. If the patient is prewarned this could happen, it may reduce his anxiety when it occurs. **DOT 1-8.11**

CONNECTIONS See Chapter 15: Pharmacology, Box 15-6 (page 311) for a description of the patient "rights" that are identified in the DOT curricula.

BOX 16-2 Indications and Contraindications

An **indication** is the reason a drug is given. For example, albuterol is indicated for a patient with respiratory distress and a history of asthma. A **contraindication** is a reason a drug should not be administered. Hypersensitivity (allergy to a drug) is always an absolute contraindication to its use.⁵ Pregnancy is often a relative contraindication to the use of many medications.⁶ A **relative contraindication** means there is not enough evidence to absolutely confirm the medication is safe to administer in that particular circumstance, so caution must be used. Patients with certain diseases, such as heart or kidney disease, often have relative contraindications with medicines that could stress that particular

organ. For example, drugs that increase blood pressure should be used with caution in cardiac patients.

Medical control may override a relative contraindication if the physician determines that the risk in giving the medication is outweighed by the benefit the patient may receive. An example of this is when a physician orders the use of epinephrine to treat a severe allergic reaction in a patient who is seven months pregnant. The use of epinephrine may cause the onset of premature labor, but if the patient dies from the allergic reaction, the baby may also die. Medical control should always be consulted if a relative contraindication exists.

Treatment and Transport

Prepare the medication for administration. Always check to confirm that the right medication is being administered. DOT 1-8.14

In the pharmacy profession, this check is routinely performed three times. The first time is when the medication is selected from the storage area. The second check is made prior to opening the container (for example, before drawing the dose from the vial, reconstituting the powder, or assembling the prefilled syringe). The third check occurs immediately before giving it to the patient. Often, each check is performed by a different person, and many times there is a log maintained of one or more of the checks. All of these measures add quality control to the process which helps minimize mistakes.

The EMS environment can emulate this system by (1) repeating back the drug name and dosage when received during online consultation, (2) carefully reading the medication name before taking it out of the box, and (3) asking another member of the patient care team to verify the name on the medication container.⁷

Administer the medication following the patient rights, but also use the appropriate procedures and guidelines to ensure safety (Table 16-1). Paramedics are routinely at risk of exposure to blood and body fluid, so it is important to always take appropriate body substance isolation (BSI) precautions (Figure 16-5). The exact type of BSI required will vary with the procedure being performed or the patient's condition. At a minimum, every EMS provider should wear gloves during every patient encounter. The greater the risk of exposure from splashing or uncontrollable circumstances, the more additional BSI precautions are required. Types of BSI equipment include gloves, goggles, a mask to cover the mouth, a combination face mask with eye shield, and a gown. Respiratory precautions

with a particulate mask may be required if a potential pathogen is airborne. DOT 1-8.14

Preventing Exposure to Infectious Agents

A contaminated needle stick is a common way in which healthcare providers are exposed to infectious diseases.⁶ A 1998 survey of 3,162 emergency medicine residents found that over 50% reported having at least one occupational exposure to blood during their training, and over 70% of the exposures were from a needle stick or sharp object.⁸

There have been a few studies conducted regarding EMS workers and exposure to blood or potentially contaminated bodily fluids and infectious agents. One study, published in 1993, evaluated the frequency of exposure to patients with hepatitis B virus (HBV) and human immunodeficiency virus (HIV) in the city of Portland, Oregon.⁹ During the two year time frame the



Figure 16-5 BSI precautions should be observed any time you have a potential to be exposed to pathogens, including medication administration.

TABLE 16-1 Medication Administration






















<i>See the following Skill Sheets for step-by-step instructions for each method of administration</i>							
Skill Sheet name	Skill Sheet number			Skill Sheet name	Skill Sheet number		
Blood Draw Using Vacutainer and Leuer Adapter	44			Eye Drop Drug Administration	56		
Blood Draw Using Syringe	43			Intramuscular Drug Administration (also see Step-by-Step 50)	50		
Intraosseous Access and Drug Administration (also see Step-by-Step 45)	45			Nebulized Drug Administration (also see Step-by-Step 52)	52		
Intranasal Drug Administration	51			Intravenous Drug Infusion (also see Step-by-Step 49).	49		
Intravenous Drug Bolus	48			Nebulized Drug Administration (Nebulized Mask)	52		
Central Line Access for Fluids and Drug Administration	47			Nebulized Drug Administration (Pipe)	52		
				Oral Drug Administration	57		

TABLE 16-1 (continued)

Skill Sheet name	Skill Sheet number		Skill Sheet name	Skill Sheet number	
Rectal Drug Administration	58		Intravenous Access Using Saline Lock (also see Step-by-Step 43)	43	
Sublingual Drug Administration	54		Autoinjector Drug Administration	59	
Subcutaneous Drug Administration	53		Putting on and Removing Sterile Gloves	60	
Intravenous Access (also see Step-by-Step 42)	42		Handwashing (also see Step-by-Step 61)	61	
			Endotracheal Drug Administration	55	
			Umbilical Vein Cannulation	46	

study was conducted, 256 exposures were documented. The rate of exposure compared to the call volume was 4.4 exposures per 1,000 patient contacts. Fourteen (5.5%) of the exposures were needle sticks, 15 (5.9%) were eye splashes, 8 (3.1%) were mucous membrane exposures, 38 (14.8%) were exposures to nonintact skin, 120 (46.9%) were exposures to intact skin, and 61 (23.8%) were respiratory exposures. Forty-eight of those individuals (including 64% of the needle stick injuries) were treated and followed for signs of infection. While all of the EMS workers were vaccinated against HBV, 26% of those who were exposed during the study actually tested with inadequate HBV titres at the time of their exposures. This means that while they believed they were adequately immunized, their blood work showed they were not within the recommended levels of antibody protection.

Accidental sticks can occur during the use of glucometers as well. The glucometer is the device used to check the blood sugar level. It requires a drop of blood for the test. The blood is most frequently taken from the fingertip, but it can also come from the IV needle or IV site if fluid or drugs have not been infused.

One study examined the frequency of accidental sticks while using glucometers among 477 EMS providers in one EMS system. The study compared the incidence of injury from spring-loaded lancets and nonspring-loaded lancets.¹⁰ The **lancet** is the needle-like device that pricks the finger of the patient so a drop of blood can be obtained for the glucometer. The spring-loaded lancets would quickly pierce the skin and then retract into the device, eliminating the protrusion of the needle, while the nonspring-loaded lancets had a portion of the needle tip remaining

exposed once they were used. The incidence of needle stick injuries decreased from a rate of 16 per 954 EMS workers per year to two per 477 EMS workers per year when the use of spring-loaded lancets was instituted in that EMS system.

In another study, EMS workers in three U.S. cities with high AIDS incidence were observed to determine the frequency and type of exposure the workers encountered in their daily work.¹¹ In an eight-month period of time, EMTs and paramedics were interviewed when they returned to their stations following an EMS call to determine if they were exposed to blood or body fluids. A total of 165 shifts were surveyed with a total of 2,472 patients attended to by the crews. Sixty-two blood contacts were reported by the EMS providers: One was a needle stick, and 62 were skin contacts. The team then surveyed the receiving hospitals to determine the HIV status of the patients transported to them. The three hospitals participating in the survey reported HIV rates among those patients at 8.3, 7.7, and 4.1 per 100 patients. The conclusion of that study is that EMS workers regularly encounter blood contacts, most of which are skin contacts, but because the HIV status is unknown for most patients, EMS providers should always practice universal precautions.

Continual vigilance for safety is crucial to minimize occupational exposure to blood and body fluids. Hand and skin washing, needle-less devices, proper immunizations, and focus on universal precautions all help minimize the risks to EMS providers.

Street Secrets

Minimize the possibility of accidental needle stick due to vehicle movement by performing all injections or IV's while the ambulance is not moving whenever possible. If patient transport has begun, gather and prepare the equipment while the ambulance keeps moving. When ready, ask the driver to pull over and stop for a minute while you perform the venipuncture. Once the flash is obtained, if the road surface is relatively smooth, the driver can go while you finish securing the line.

CONNECTIONS Chapter 9: Safety and Scene Size-Up has additional information on BSI precautions.

Handwashing

Handwashing is the most important form of BSI precaution for a healthcare provider. Hands should be washed in tepid water before and after each patient contact as well as after handling contaminated equipment. Exposed skin should be examined carefully for small cuts or abrasions, and these should be covered with an

occlusive dressing to prevent accidental exposure from splashed blood. It has been proven in many studies that hand and skin washing is the best method of controlling the spread of pathogens.¹² See Skill Sheet 61: Handwashing.

Disposal of Contaminated Material

All equipment and items that have come in contact with blood or body fluids must be treated as potentially infectious and be disinfected or disposed of properly. A **biohazard container**, called a **sharps container**, is specifically designed for disposal of needles and anything capable of piercing the skin (Figure 16-6). In the United States, these devices are rigid containers that are red in color and labeled with a warning about the contents. Sharps containers come in a variety of sizes and shapes. Used nonsharp materials like gloves or face masks should be disposed of in an appropriate biohazard receptacle. These storage devices may be red or yellow and often carry warning labels as well. DOT 1-8.14, 1-8.24

Patient Transfer

Upon arrival at your destination, give a verbal and written report directly to the individual assuming patient care. The report should include the following information:

- The patient presentation upon your arrival, including level of consciousness and amount of distress the patient was having.



Figure 16-6 Sharps containers and biohazard bags should be used to properly dispose of contaminated sharp instruments and equipment.

- The physical examination and history findings leading to your decision to give the medication, including copies of ECG tracing, monitoring device printout, and vital signs prior to the medication administration.
- The name of the drug, dose, strength, route, and time it was administered.
- A description of the patient's response to the medication, including vital signs postadministration and reassessment findings.
- If on-line direction or any other permission was required prior to medication administration, include the name of the physician ordering the medication. This can be especially important if the receiving facility (and physician) is different from the consulting physician.
- If the medication dosing regimen requires repeat administration, inform the receiving facility when the next dose is due, so they may, at their discretion, continue administering the medication.

CONNECTIONS Chapter 17: Documentation and Communication details information on performing a radio consultation. Please consult that chapter for additional information.

Documentation

Appropriate documentation in the patient care report includes the drug name, time administered, dose, strength/concentration (if appropriate), route, and site of administration. Time of administration is very important to include in the report, especially if the drug can be repeated. The vital signs of the patient as well as their response to the medication should also be recorded.

Administration of narcotics or other controlled substances requires that the paramedic follow specific local, state, and federal regulations. It is necessary that paramedics ensure that all narcotics are accounted for at the beginning and end of their shift and that they are secure throughout the shift. Make sure all custody logs are completed as per system protocols. Dispose of any unused medication by following agency requirements. Obtain the signatures of any person who witnesses the disposal of medication in either the patient care report or the medication custody log from the ambulance.

CONNECTIONS Chapter 17: Documentation and Communication details information on what elements are important to capture for the patient care report. Given the number of medication errors occurring throughout all aspects of healthcare, documentation of medication administration is especially important. Please consult this chapter for additional information.

Return to Service

Replace used drugs, supplies, and equipment before returning to service. To ensure the correct medication is obtained, confirm the drug name three times just as when it is given to the patient. Label the expiration date on the new box using the method previously described. Store the new medication in the appropriate location, so those drugs expiring soonest will be chosen first. Complete any logging procedures required to document that the drug was used and replaced appropriately.

Medical Asepsis During Medication Administration

Medical asepsis means the medical environment is free of pathogens. Pathogens are disease-causing organisms such as viruses, bacteria, fungi, spores, etc. The setting for patient care is often contaminated with many of these pathogens, and the patients are susceptible to infection, particularly if they have chronic diseases or traumatic injuries. DOT 1-8.12, 1-8.13, 1-8.14, 1-8.24, 1-8.28, 1-8.30, 1-8.31, 1-8.32, 1-8.33, 1-8.43

Paramedics perform many procedures on patients that place them at an increased risk of infection. Initiating an intravenous line, drawing blood, dressing open wounds, medication administration, needle thoracotomy (chest decompression), and endotracheal tube placement are just a few of the skills that invade the body, exposing it to possible infection. Pathogens are found not only in the environment around us but also in and on us. It is important to keep our environments and ourselves as clean as possible to decrease the potential spread of infection. The use of sterilization procedures, disinfectants, and antiseptics can help in this process. DOT 1-8.12

Sterilization means that the environment or equipment is free of all forms of life, including bacterial spores, which are very difficult to kill. Extreme heat from steam under pressure (**autoclaving**), dry heat, or ethylene oxide gas are the only three acceptable methods for sterilization, so not all equipment is capable of being sterilized.¹³ Also, human tissue is not capable of being sterilized. It is nearly impossible to have a sterile environment and keep objects sterile in the prehospital setting, so medically clean techniques are the accepted standard of care. **Medically clean** means handling sterile equipment in such a way as to prevent contamination. The technique used to prevent infection is called **aseptic**.

All equipment used to initiate an IV, to penetrate into the skin (such as a scalpel used for a surgical airway), or that is introduced into the body (like an endotracheal suction catheter) is sterile. The upper portion of the chamber of the IV tubing (called the **spike**) that is introduced into the IV solution should not be



Figure 16-7 Join the heels of your hands to stabilize yourself and ensure that the flashchamber insertion spike and the newly exposed IV spike port are not touched. The two ends of these devices should remain sterile.

contaminated. The portion of the IV tubing that is placed inside the hub of the catheter should not be touched (Figure 16-7). The IV catheter should be handled carefully, so it is not contaminated once the protective cover has been removed. The portion of the needle and the catheter that enters the skin should not be touched or come into contact with any surface prior to insertion. In this fashion, all of these various pieces of equipment are kept as clean as possible.

Prior to performing any incision or puncture into the skin, the patient's skin should be cleansed with either 70% alcohol or 2% iodine in 90% alcohol. In the operating room setting, if the skin is prepared (cleaned) for one minute using either of these two solutions, it is just as effective in controlling wound infection as the traditional surgical procedure of scrubbing for 5–10 minutes using povidone-iodine.¹³

Disinfectants are cleansing agents that are toxic to living tissue, while **antiseptics** are cleansing agents that are nontoxic to living tissues. Thus, equipment should have disinfectants used on them, and antiseptics are used on patients to cleanse sites for drug administration. Disinfectants and antiseptics are capable of destroying or inhibiting the growth of most microorganisms. The most common antiseptics used in IV initiation and drug administration are alcohol and iodine.¹³ DOT 1-8.13

Follow package guidelines when using all disinfectants and antiseptics. This means maintaining exposure of the disinfecting solution with the contaminated surface for the proper amount of time in order for disinfection to occur. It also means mixing the disinfectant solution correctly. Some disinfectants come in concentrated form and require mixing with water prior to use. Surprisingly, to be most effective, many of these chemi-

icals must be diluted appropriately for optimal cleaning power. In some cases, using a full strength solution is not as effective. The Department of Labor's Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency (EPA) work together to investigate and approve the labeling of all chemicals used for cleaning, disinfection, and sterilizing as they pertain to healthcare worker safety. In addition to these two groups, the Centers for Disease Control and the Food and Drug Administration all work together to set standards regarding bloodborne pathogens.¹⁴

The actual amount of time required for proper hand-washing is not clear, even in the surgical setting in the hospital.¹³ A two-minute scrub with soap and warm water seems to be adequate, provided there is attention paid to the fingertips and nail beds. These areas are known to contain the greatest numbers of bacteria on the hands. The best cleaning product to use on skin is one containing chlorhexidine or one of the iodophors. Alcohol foam can be used as a temporary cleansing agent if soap and water is not available.

Biohazard Exposure Plans

It is required by law that all medical organizations have a biohazard exposure plan in place and that employees are familiar with the process to follow if they are exposed.¹⁵ If you are exposed to blood or body fluid, immediately wash the affected area with soap and water. If soap is unavailable, irrigate with copious amounts of water. Immediately contact your supervisor, medical director, infection control officer, or other designated individual as necessary to implement the exposure plan. Make sure all appropriate documentation is completed, including an incident report of the situation.

Summary

Administering medication is a fundamental part of being a paramedic. Proper techniques need to be followed to ensure proper delivery of the medication to the intended target organ. You should follow the primary paramedic responsibilities of preparation, response, scene and patient assessment, recognition of medical problem, patient management, appropriate disposition, treatment and transport, patient transfer, documentation, and return to service to ensure you cover all the responsibilities associated with medication administration.

Notes

1. Emergency Medical Technician Paramedic: National Standard Curriculum (EMT-P), United States Department of Transportation. (www.nhtsa.dot.gov/people/injury/EMS/EMT-P/index.htm) (accessed August 24, 2006).
2. Clinical Pharmacology Copyright © 2005 Gold Standard.

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